

Watershed Summary Information

Accounting Unit Name: Puget Sound

State(s): WA

Political Boundaries: Whatcom, Skagit, San Juan

Major Waterways: Sammish R
Friday Cr
Dakota Cr
Silver Cr
L Whatcom

Number of Stations in Watershed: Tier1 - 32
Tier2 - 168
Tier3 - 63

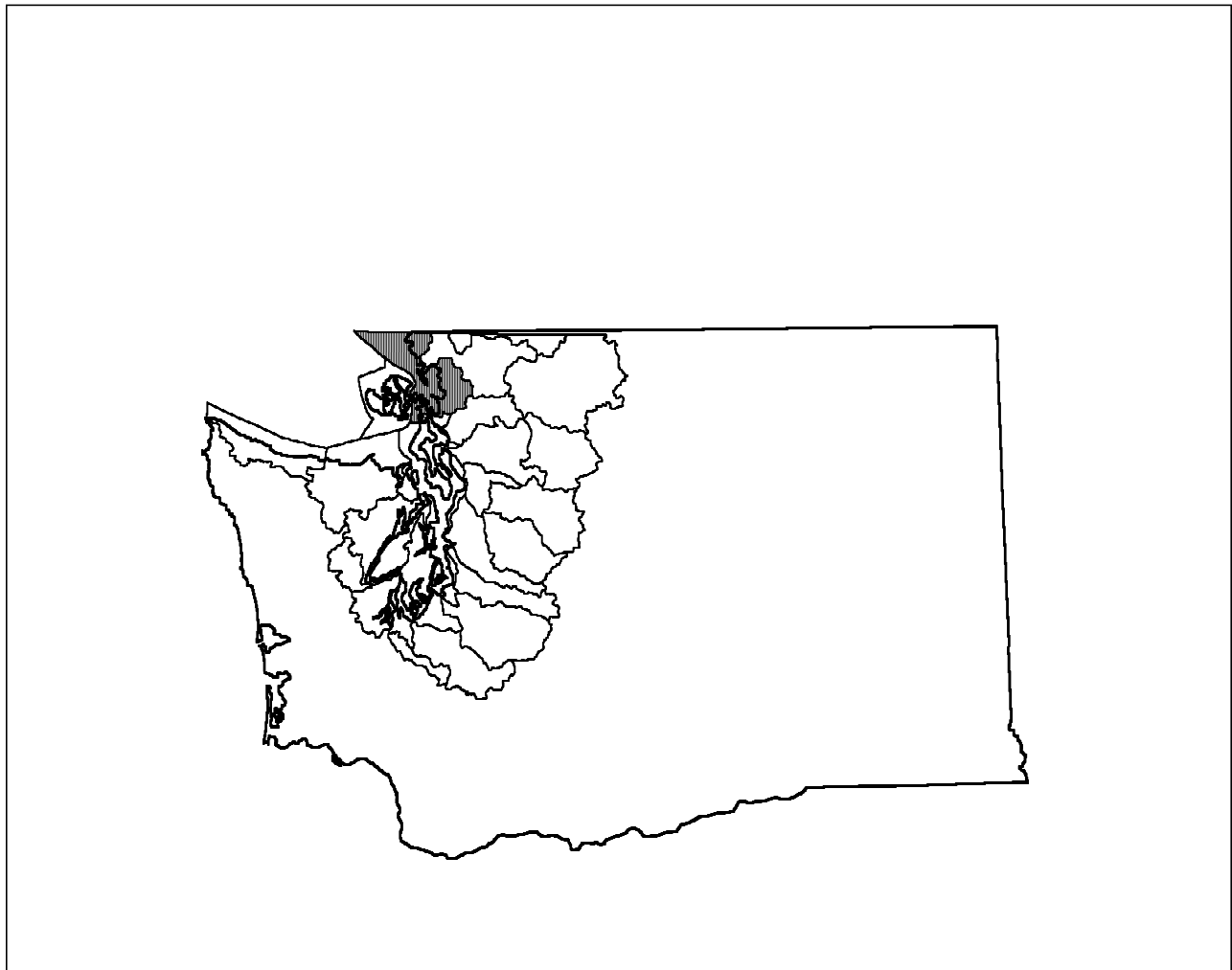


Figure 165. Watershed Location Map

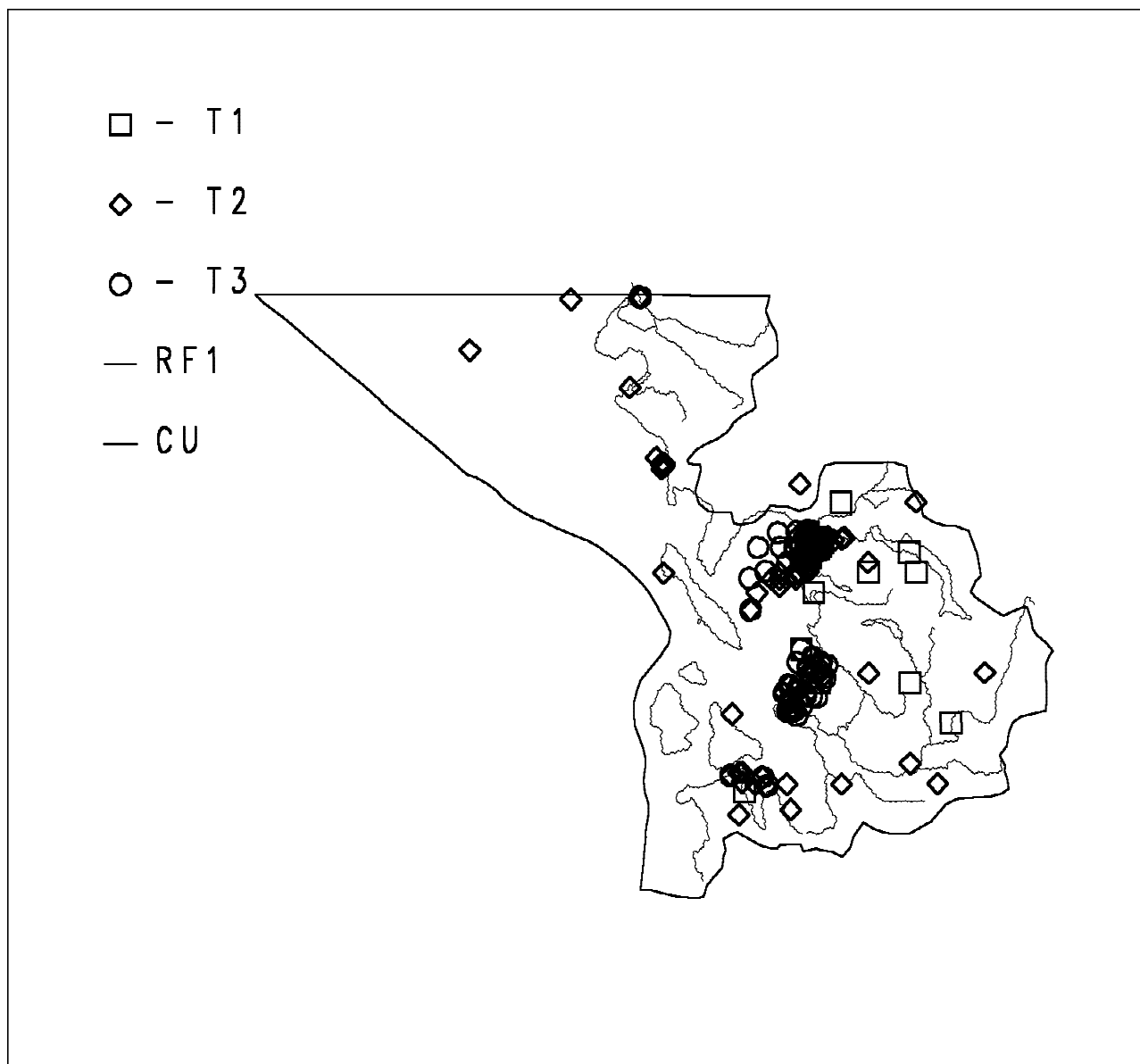


Figure 166. Major Waterways and Location of Sampling Stations

Data Source(s) Used in Evaluation

Source: **COSED** Agency: **NS&T**
 Monitoring Program: **NOAA/National Status and Trends**
 Num. of Stations: 6 Date Range: 1986-87

Source: **ODES** Agency: **PS**
 Monitoring Program: **Puget Sound**
 Num. of Stations: 4 Date Range: 1989

Source: **SEACOE** Agency: **AK_FERRY**
 Monitoring Program: **Alaska Ferry Terminal construct. survey.**
 Num. of Stations: 2 Date Range: 1989

Source: **SEACOE** Agency: **ANCHO029**
Monitoring Program: **Anchor Cove Condominium Marina Project.**
Num. of Stations: 2 Date Range: 1990

Source: **SEACOE** Agency: **BLAINE89**
Monitoring Program: **Port of Bellingham/Blaine Marina expansn**
Num. of Stations: 6 Date Range: 1989

Source: **SEACOE** Agency: **BLGM_91A**
Monitoring Program: **Maint./other dredging of Bellingham Bay.**
Num. of Stations: 31 Date Range: 1990-91

Source: **SEACOE** Agency: **BLGM_91B**
Monitoring Program: **Follow up to BLGM_91A: resample for Zn.**
Num. of Stations: 38 Date Range: 1991

Source: **SEACOE** Agency: **BPOIL_FC**
Monitoring Program: **BP Oil/Ferndale Full Characterization.**
Num. of Stations: 16 Date Range: 1990

Source: **SEACOE** Agency: **BPOIL_PC**
Monitoring Program: **BP Oil Ferndale Partial Characterization**
Num. of Stations: 6 Date Range: 1990

Source: **SEACOE** Agency: **COLUMBIA**
Monitoring Program: **Columbia Cement proposed maint. dredging**
Num. of Stations: 1 Date Range: 1986

Source: **SEACOE** Agency: **DNRREC91**
Monitoring Program: **Aq. Lands Sediment Qual. Reconnaissance.**
Num. of Stations: 9 Date Range: 1991

Source: **SEACOE** Agency: **EIGHTBAY**
Monitoring Program: **1985 Puget Sound Eight-Bay survey.**
Num. of Stations: 32 Date Range: 1983-84

Source: **SEACOE** Agency: **GAPAC_C2**
Monitoring Program: **NPDES Georgia Pacific - Bellingham.**
Num. of Stations: 4 Date Range: 1988

Source: **SEACOE** Agency: **METROEBP**
Monitoring Program: **WestPoint emergency bypass outfall.**
Num. of Stations: 1 Date Range: 1989

Source: **SEACOE** Agency: **NAVYHPFC**
Monitoring Program: **Everett Homeport (full characterization)**
Num. of Stations: 1 Date Range: 1989

Source: **SEACOE** Agency: **POSTPTC2**
Monitoring Program: **NPDES B'ham Post Point treatment plant.**
Num. of Stations: 3 Date Range: 1987

Source: **SEACOE** Agency: **PSDDA2**
Monitoring Program: **PSDDA Phase 2 baseline survey**

Num. of Stations: 8 Date Range: 1989

Source: **SEACOE** Agency: **PSREF90**
Monitoring Program: **Puget Sound Reference Areas Survey**
Num. of Stations: 7 Date Range: 1990

Source: **SEACOE** Agency: **SED18903**
Monitoring Program: **March-April 1989 Sediment Survey**
Num. of Stations: 5 Date Range: 1989

Source: **SEACOE** Agency: **SED19003**
Monitoring Program: **Puget Sound Ambient Monitoring - 1990**
Num. of Stations: 3 Date Range: 1990

Source: **SEACOE** Agency: **SHELL055**
Monitoring Program: **Shell Oil, Anacortes, DY93**
Num. of Stations: 3 Date Range: 1992

Source: **SEACOE** Agency: **SWINOM88**
Monitoring Program: **Swinomish Channel Maintenance Dredging.**
Num. of Stations: 1 Date Range: 1988

Source: **SEACOE** Agency: **2MARINAS**
Monitoring Program: **Port Townsend & Cap Sante Marinas Study**
Num. of Stations: 19 Date Range: 1988

Source: **STORET** Agency: **10EPACOP**
Monitoring Program: **USEPA Region 10 Cooperative Water Data**
Num. of Stations: 6 Date Range: 1986-87

Source: **STORET** Agency: **10EPAINT**
Monitoring Program: **USEPA Region 10 Intensive Survey Data**
Num. of Stations: 48 Date Range: 1983-84

Source: **STORET** Agency: **11BIOACC**
Monitoring Program: **USEPA National Bioaccumulation Study**
Num. of Stations: 1 Date Range: 1987

Chemicals Responsible for Sampling Station Classification as Tier 1 or Tier 2

Classifying Parameter	Number of Stations							
	All Parameters				Aquatic Life		Human Health	
	Total	T.1&2	Tier1	Tier2	Tier1	Tier2	Tier1	Tier2
Copper	153	127	.	127	.	127	.	.
Nickel	130	124	.	124	.	124	.	.
Arsenic	138	75	1	74	1	73	.	1
Mercury	151	67	16	51	16	51	.	.
Naphthalene	148	61	1	60	1	60	.	.
Pyrene	141	58	5	53	5	53	.	.
Chrysene	153	51	4	47	4	47	.	1
Benzo(a)anthracene	151	51	2	49	2	49	.	14

Classifying Parameter	Number of Stations							
	All Parameters				Aquatic Life		Human Health	
	Total	T.1&2	Tier1	Tier2	Tier1	Tier2	Tier1	Tier2
Benzo(a)pyrene	159	50	.	50	.	33	.	48
Zinc	186	50	.	50	.	50	.	.
Dibenzo(a,h)anthracene	155	49	12	37	12	37	.	37
Fluorene	149	49	1	48	1	48	.	.
Methylnaphthalene, 2-	102	34	.	34	.	34	.	.
DDT	117	31	4	27	4	27	.	4
Chromium	59	31	.	31	.	31	.	.
Bis(2-ethylhexyl)phthalate	127	30	4	26	4	26	.	3
Acenaphthylene	152	30	.	30	.	30	.	.
Lead	189	26	.	26	.	26	.	.
HMW_PAHs	104	25	4	21	4	21	.	.
LMW_PAHs	112	25	4	21	4	21	.	.
Cadmium	124	23	.	23	.	23	.	.
Phenanthrene	148	16	1	15	1	15	.	.
Polychlorinated biphenyls	80	16	1	15	1	12	.	16
Fluoranthene	148	15	1	14	1	14	.	.
Aldrin	98	15	.	15	.	.	.	15
Acenaphthene	154	6	.	6	.	6	.	.
Anthracene	29	4	.	4	.	4	.	.
Chlordane	104	4	.	4	.	4	.	1
Indeno(1,2,3-cd)pyrene	142	3	.	3	.	2	.	3
BHC	60	2	.	2	.	2	.	.
Dieldrin	103	2	.	2	.	1	.	2
Silver	182	2	.	2	.	2	.	.
Cresol, p-	16	1	.	1	.	1	.	.
Dimethyl phthalate	112	1	.	1	.	1	.	.
Dimethylphenol, 2,4-	134	1	.	1	.	1	.	.
Xylenes	43	1	.	1	.	1	.	.

Sediment Chemistry Data: Chemical Summary

Sediment Parameter	Total Observations			Detected Observations		
	Num.	Mean (ppb)	Median (ppb)	Num.	Max (ppb)	Min (ppb)
Acenaphthene	166	23.69	0.00	38	450.00	7.20
Acenaphthylene	165	13.63	0.00	31	517.00	11.00
Acetone	8	0.00	0.00	0	.	.
Acrylonitrile	12	0.00	0.00	0	.	.
Aldrin	108	1.12	0.00	21	23.00	1.10
Anthracene	36	38.79	0.00	14	470.00	7.30
Antimony	141	1958.16	200.00	78	110000.0	40.00
Arsenic	156	9176.92	7700.00	150	220000.0	3.10
Benzene	19	0.02	0.00	3	0.12	0.08
Benzo(a)anthracene	162	133.55	21.00	88	2100.00	8.30

Sediment Parameter	Total Observations			Detected Observations		
	Num.	Mean (ppb)	Median (ppb)	Num.	Max (ppb)	Min (ppb)
Benzo(a)pyrene	169	57.21	0.00	69	1511.00	13.00
Benzo(b)fluoranthene	8	23.25	20.00	4	53.00	40.00
Benzo(ghi)perylene	156	31.88	0.00	35	638.00	10.00
Benzo(k)fluoranthene	10	18.20	0.00	4	52.00	39.00
Benzoic acid	85	21.45	0.00	11	410.00	6.00
Benzyl alcohol	96	0.00	0.00	0	.	.
Biphenyl	6	27.50	27.00	6	43.00	12.00
Bis(2-ethylhexyl)phthalate	137	217.23	0.00	66	3500.00	5.00
Bromophenyl phenyl ether, 4-	33	0.00	0.00	0	.	.
Butyl benzyl phthalate	134	2.24	0.00	2	280.00	20.00
BHC	153	0.01	0.00	2	0.60	0.60
Cadmium	142	456.67	330.00	135	3500.00	20.00
Chlordane	112	0.21	0.00	11	4.50	0.30
Chlorobenzene	19	0.00	0.00	0	.	.
Chromium	74	65820.64	61500.00	74	230000.0	16.90
Chrysene	168	289.19	38.50	99	9838.00	14.00
Copper	174	48135.50	42000.00	174	400000.0	6.70
Cresol, m-	109	31.04	24.00	94	280.00	2.00
Cresol, o	130	15.15	7.10	98	250.00	3.20
Cresol, p-	16	75.00	0.00	1	1200.00	1200.00
Di-n-butyl phthalate	136	3.45	0.00	6	154.00	5.00
Di-n-octyl phthalate	139	53.37	0.00	12	4200.00	69.00
Diazinon/Spectracide	5	0.00	0.00	0	.	.
Dibenzo(a,h)anthracene	289	58.35	0.00	75	5001.00	3.00
Dibenzofuran	90	8.68	0.00	11	200.00	13.00
Dibromochloromethane	19	0.00	0.00	0	.	.
Dichlorobenzene, 1,2-	126	0.00	0.00	0	.	.
Dichlorobenzene, 1,3-	126	0.00	0.00	0	.	.
Dichlorobenzene, 1,4-	126	0.00	0.00	0	.	.
Dichloroethane 1,1-	20	0.00	0.00	0	.	.
Dichloroethane 1,2-	19	0.00	0.00	0	.	.
Dichloroethene, trans-1,2-	12	0.00	0.00	0	.	.
Dichloromethane	18	16.77	0.00	2	300.00	1.90
Dichloropropane, 1,2-	19	0.00	0.00	0	.	.
Dieldrin	111	0.34	0.00	18	6.40	0.21
Diethyl phthalate	134	0.26	0.00	1	35.00	35.00
Dimethyl phthalate	122	3.24	0.00	3	350.00	19.00
Dimethylphenol, 2,4-	150	0.23	0.00	1	35.00	35.00
DDT	359	2.63	0.00	99	123.00	0.21
Endosulfan, alpha-	19	0.00	0.00	0	.	.
Endosulfan, beta-	31	0.00	0.00	0	.	.
Endrin	31	0.00	0.00	0	.	.
Ethion/Bladen	5	0.00	0.00	0	.	.
Ethylbenzene	69	0.00	0.00	3	0.08	0.07

Sediment Parameter	Total Observations			Detected Observations		
	Num.	Mean (ppb)	Median (ppb)	Num.	Max (ppb)	Min (ppb)
Fluoranthene	162	454.20	92.00	121	9484.00	22.00
Fluorene	162	35.31	0.00	58	480.00	7.50
Heptachlor	104	0.97	0.00	12	32.00	0.20
Heptachlor epoxide	32	0.01	0.00	1	0.40	0.40
Hexachlorobenzene	134	0.02	0.00	8	0.85	0.10
Hexachlorobutadiene	123	0.00	0.00	0	.	.
Hexachloroethane	117	0.00	0.00	0	.	.
HMW_PAHs	114	1533.03	0.00	35	31000.00	68.00
Indeno(1,2,3-cd)pyrene	154	36.48	0.00	38	878.00	4.00
Isophorone	60	0.15	0.00	1	9.00	9.00
Lead	223	18432.65	15000.00	219	190000.0	2000.00
LMW_PAHs	122	348.07	0.00	32	6600.00	54.90
Malathion	5	0.00	0.00	0	.	.
Mercury	165	481.27	117.00	146	34900.00	0.14
Methyl ethyl ketone	8	0.00	0.00	0	.	.
Methylnaphthalene, 2-	106	24.85	0.00	38	206.00	12.00
Mirex/Dechlorane	1	0.06	0.06	1	0.06	0.06
Naphthalene	162	92.36	5.00	81	1362.00	10.00
Nickel	156	64968.78	50200.00	156	180000.0	23.80
Nitrosodiphenylamine, N-	123	0.00	0.00	0	.	.
Pentachlorophenol	143	0.05	0.00	1	7.00	7.00
Phenanthrene	163	203.12	90.00	116	2141.00	12.00
Phenol	139	5.55	0.00	14	220.00	5.00
Polychlorinated biphenyls	263	4.26	0.00	16	510.00	3.00
Pyrene	155	473.81	110.00	115	12370.00	26.00
Silver	222	153.74	130.00	175	1470.00	0.12
Tetrachloroethane, 1,1,2,2-	19	0.00	0.00	0	.	.
Tetrachloroethene	69	0.00	0.00	3	0.05	0.04
Tetrachloromethane	19	0.00	0.00	0	.	.
Toluene	19	0.62	0.00	4	11.00	0.20
Toxaphene	17	0.00	0.00	0	.	.
Tribromomethane/Bromoform	19	0.00	0.00	0	.	.
Trichlorobenzene, 1,2,4-	126	0.00	0.00	0	.	.
Trichloroethane, 1,1,1-	12	0.00	0.00	0	.	.
Trichloroethane, 1,1,2-	19	0.00	0.00	0	.	.
Trichloroethene	69	0.00	0.00	0	.	.
Trichlorofluoromethane	12	0.00	0.00	0	.	.
Trichloromethane/Chloroform	31	0.02	0.00	3	0.31	0.19
Xylenes	53	0.45	0.00	5	12.00	0.25
Zinc	204	104790.4	106500.0	204	520000.0	28.20

Tissue Residue Data: Chemical Summary

Tissue Parameter	Total Observations			Detected Observations		
	Num.	Mean (ppb)	Median (ppb)	Num.	Max (ppb)	Min (ppb)
Acenaphthene	2	0.00	0.00	0	.	.
Arsenic	2	1450.00	1450.00	2	1700.00	1200.00
Benzo(a)anthracene	2	0.00	0.00	0	.	.
Benzo(a)pyrene	2	0.00	0.00	0	.	.
Benzo(b)fluoranthene	2	0.00	0.00	0	.	.
Benzo(k)fluoranthene	2	0.00	0.00	0	.	.
Biphenyl	1	0.00	0.00	0	.	.
BHC	4	0.00	0.00	0	.	.
Cadmium	2	160.00	160.00	2	180.00	140.00
Chlordane	4	0.00	0.00	0	.	.
Chlorpyrifos/Dursban	1	0.00	0.00	0	.	.
Copper	2	1150.00	1150.00	2	1300.00	1000.00
Dibenzo(a,h)anthracene	2	0.00	0.00	0	.	.
Dicofol/Kelthane	1	0.00	0.00	0	.	.
Dieldrin	3	0.00	0.00	0	.	.
Dioxins	2	0.00	0.00	1	0.00	0.00
DDT	7	0.17	0.00	2	1.00	0.19
Endosulfan, alpha-	2	0.00	0.00	0	.	.
Endosulfan, beta-	2	0.00	0.00	0	.	.
Endrin	3	0.00	0.00	0	.	.
Fluoranthene	2	0.00	0.00	0	.	.
Fluorene	2	0.00	0.00	0	.	.
Heptachlor	3	0.00	0.00	0	.	.
Heptachlor epoxide	3	0.00	0.00	0	.	.
Hexachlorobenzene	3	0.00	0.00	0	.	.
Hexachlorobutadiene	3	0.00	0.00	0	.	.
Indeno(1,2,3-cd)pyrene	2	0.00	0.00	0	.	.
Isopropalin	1	0.00	0.00	0	.	.
Lead	2	0.00	0.00	0	.	.
Mercury	3	22.00	5.00	3	60.00	1.00
Methoxychlor	1	0.00	0.00	0	.	.
Mirex/Dechlorane	1	0.00	0.00	0	.	.
Naphthalene	2	0.00	0.00	0	.	.
Pentachlorobenzene	1	0.00	0.00	0	.	.
Pentachloronitrobenzene/Quin	1	0.00	0.00	0	.	.
Polychlorinated biphenyls	15	0.00	0.00	0	.	.
Pyrene	2	0.00	0.00	0	.	.
Tetrachlorobenzene, 1,2,4,5-	1	0.00	0.00	0	.	.
Toxaphene	2	0.00	0.00	0	.	.
Trichlorobenzene, 1,2,4-	1	0.00	0.00	0	.	.
Trifluralin/Treflan	1	0.00	0.00	0	.	.
Zinc	2	13600.00	13600.00	2	13900.00	13300.00

Biotoxicity Data

Lat.	Long.	Date	Species Name	Phase	% Mortality		Sign.
					Test	Control	
Monitoring Program: Puget Sound Reference Areas Survey							
48.5817	122.5356	90-06-22	Neanthes Arenaceodontata	S	0.00	20.00	no
			Rhepoxynius Abronius	S	7.00	9.00	no
48.5819	122.5344	90-06-21	Neanthes Arenaceodontata	S	0.00	20.00	no
			Rhepoxynius Abronius	S	10.00	9.00	no
48.5819	122.5347	90-06-22	Neanthes Arenaceodontata	S	0.00	20.00	no
			Rhepoxynius Abronius	S	4.00	9.00	no
48.5822	122.5350	90-06-21	Neanthes Arenaceodontata	S	0.00	20.00	no
			Rhepoxynius Abronius	S	19.00	9.00	no
48.5822	122.5361	90-06-22	Neanthes Arenaceodontata	S	0.00	20.00	no
			Rhepoxynius Abronius	S	6.50	9.00	no
48.5828	122.5392	90-06-21	Neanthes Arenaceodontata	S	4.00	20.00	no
			Rhepoxynius Abronius	S	7.00	9.00	no
48.5831	122.5286	90-06-21	Neanthes Arenaceodontata	S	0.00	20.00	no
			Rhepoxynius Abronius	S	12.00	9.00	no
Monitoring Program: PSDDA Phase 2 baseline survey							
48.7000	122.5833	89-05-06	Rhepoxynius Abronius	S	10.00	4.00	no
48.7138	122.5262	89-05-06	Rhepoxynius Abronius	S	16.00	4.00	no
48.7138	122.5505	89-05-06	Rhepoxynius Abronius	S	19.00	4.00	no
48.7304	122.5179	89-05-06	Rhepoxynius Abronius	S	9.00	4.00	no