

**Table 3-1: Concentrations of Trace Metals, Total Organic Carbon (TOC), and Grain Size in Source Samples (Dry Weight)**

Sample Type	Matrix Type	Al (%)	Ca (%)	Fe (%)	K (%)	Mg (%)	TOC (%)	Sand (%)	Silt (%)	Clay (%)
Homer Harbor	Sediment	6.94	1.51	3.84	1.53	1.13	1.6	5.6	43.6	50.7
Susitna River #1 (5/97)	Sediment	6.08	1.99	2.67	1.86	1.03	0.21	--	--	--
Susitna River #2 (5/97)	Sediment	6.08	2.05	2.54	1.86	1.00	0.20	56.2	37.9	5.9
Copper River #1 (7/97)	Sediment	7.38	5.97	3.84	1.25	1.82	0.17	--	--	--
Copper River #2 (7/97)	Sediment	7.45	5.83	3.85	1.27	1.79	0.13	--	--	--
Copper River #3 (7/97)	Sediment	7.21	6.50	4.02	1.25	1.95	0.13	--	--	--
Copper River #4 (7/97)	Sediment	7.46	5.65	3.88	1.34	1.84	--	35.8	48.7	15.5
Susitna River #1 (5/98)	Suspended Solids	6.61	--	5.15	--	--	--	--	--	--
Knik River #1 (5/98)	Suspended Solids	10.13	--	7.01	--	--	--	--	--	--
Matanuska River #1 (5/98)	Suspended Solids	9.00	--	6.19	--	--	--	--	--	--
Copper River #1 (5/98)	Suspended Solids	8.14	--	5.43	--	--	--	--	--	--
Copper River #2 (5/98)	Suspended Solids	7.61	--	4.40	--	--	--	--	--	--
Susitna River #2 (6/98)	Suspended Solids	8.34	--	6.06	--	--	--	--	--	--
Knik River #2 (6/98)	Suspended Solids	9.85	--	6.23	--	--	--	--	--	--
Matanuska River #2 (6/98)	Suspended Solids	9.70	--	6.06	--	--	--	--	--	--
Homer Coal (1997)	Solid	0.42	1.14	1.49	0.06	0.11	67.1	--	--	--
Beluga Coal	Solid	4.76	--	1.03	--	--	--	--	--	--
Homer Coal (1998)	Solid	1.37	--	0.33	--	--	--	--	--	--
Matanuska Coal	Solid	0.18	--	0.14	--	--	--	--	--	--
Ninilchik Coal	Solid	3.04	--	0.96	--	--	--	--	--	--

Coal (USGS,1998)	Solid	0.3-4.0	0.3-1.5	0.2-1	0.02-0.60	0.06-0.55	--	--	--	--
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**Table 3-1: Concentrations of Trace Metals, Total Organic Carbon (TOC), and Grain Size in Source Samples (Dry Weight) (continued)**

Sample Type	Matrix Type	Ag (µg/g)	As (µg/g)	Ba (µg/g)	Be (µg/g)	Cd (µg/g)	Cr (µg/g)	Cu (µg/g)	Hg (µg/g)	Mn (µg/g)
Homer Harbor	Sediment	0.10	9.3	800	1.34	0.13	72.3	32.2	0.075	626
Susitna River #1 (5/97)	Sediment	0.20	13.7	1092	1.56	0.30	76.9	31.8	0.023	602
Susitna River #2 (5/97)	Sediment	0.18	12.3	1092	1.60	0.29	73.5	29.4	0.019	619
Copper River #1 (7/97)	Sediment	0.07	5.5	619	1.03	0.14	60.5	41.1	0.043	810
Copper River #2 (7/97)	Sediment	0.09	6.3	650	1.08	0.17	58.3	43.4	0.057	829
Copper River #3 (7/97)	Sediment	0.08	5.3	611	1.04	0.16	62.8	44.4	0.042	876
Copper River #4 (7/97)	Sediment	0.09	6.0	673	1.09	0.16	67.7	43.1	0.047	821
Susitna River #1 (5/98)	Suspended Solids	0.20	37.2	1050	3.44	0.49	103	46.4	0.304	995
Knik River #1 (5/98)	Suspended Solids	0.10	38.5	1250	2.33	0.40	163	77.9	0.428	1140
Matanuska River #1 (5/98)	Suspended Solids	0.66	23.8	897	0.60	0.19	119	65.5	0.267	1240
Copper River #1 (5/98)	Suspended Solids	0.10	18.0	636	1.14	0.24	98	63.5	0.206	1000
Copper River #2 (5/98)	Suspended Solids	0.07	11.9	514	0.97	0.19	80	53.3	0.183	961
Susitna River #2 (6/98)	Suspended Solids	0.36	34.8	1540	1.99	0.58	159	68.5	0.133	1180
Knik River #1 (6/98)	Suspended Solids	0.20	26.1	1170	2.18	0.21	162	64.9	0.186	1050
Matanuska River #1 (6/98)	Suspended Solids	0.38	23.1	1110	0.82	0.35	114	55.2	0.111	1050
Homer Coal (1997)	Solid	0.09	4.7	348	0.22	0.05	5.0	19.7	0.049	423
Beluga Coal	Solid	0.11	6.1	400	1.10	0.17	75	1.5	0.112	103
Homer Coal (1998)	Solid	0.02	3.8	384	0.74	<0.01	8.3	7.2	0.039	25
Matanuska Coal	Solid	0.02	0.1	63	0.29	<0.01	7.3	51.8	0.021	6

Ninilchik Coal	Solid	0.15	5.9	195	0.58	0.44	24.0	89.4	0.419	204
Coal (USGS, 1998)	Solid	0.01-11	2-20	120-	0.2-3.2	0.02-0.23	2.4-39	7-35	0.02-0.12	18-290

**Table 3-1: Concentrations of Trace Metals, Total Organic Carbon (TOC), and Grain Size in Source Samples (Dry Weight) (continued)**

Sample Type	Matrix Type	Ni (µg/g)	Pb (µg/g)	Sb (µg/g)	Se (µg/g)	Sn (µg/g)	Tl (µg/g)	V (µg/g)	Zn (µg/g)
Homer Harbor	Sediment	33.9	11.5	1.12	0.29	1.56	0.41	114	94.3
Susitna River #1 (5/97)	Sediment	41.3	13.8	1.44	0.42	1.91	0.57	83.2	80.0
Susitna River #2 (5/97)	Sediment	38.6	13.7	1.41	0.31	1.86	0.54	90.5	73.3
Copper River #1 (7/97)	Sediment	35.3	9.0	0.63	<0.1	1.36	0.24	132	70.0
Copper River #2 (7/97)	Sediment	36.7	9.7	0.71	<0.1	1.50	0.27	145	76.8
Copper River #3 (7/97)	Sediment	37.5	9.2	0.75	<0.1	1.48	0.26	141	76.1
Copper River #4 (7/97)	Sediment	36.4	9.6	0.69	<0.1	1.91	0.29	119	79.2
Susitna River #1 (5/98)	Suspended Solids	48.5	16.2	1.92	N.D.	2.82	0.62	170	118
Knik River #1 (5/98)	Suspended Solids	57.8	32.5	2.88	N.D.	3.27	0.75	209	84.3
Matanuska River #1 (5/98)	Suspended Solids	55.0	18.9	1.31	N.D.	2.88	0.53	202	119
Copper River #1 (5/98)	Suspended Solids	41.4	15.0	1.13	N.D.	2.74	0.43	176	109
Copper River #2 (5/98)	Suspended Solids	38.5	12.9	0.86	N.D.	2.00	0.29	145	81.9
Susitna River #2 (6/98)	Suspended Solids	76.7	21.8	2.88	N.D.	3.59	0.98	197	184
Knik River #1 (6/98)	Suspended Solids	70.9	20.8	2.55	N.D.	2.04	0.65	203	143
Matanuska River #1 (6/98)	Suspended Solids	47.2	21.8	0.93	N.D.	1.22	0.57	208	267
Homer Coal (1997)	Solid	8.2	2.7	1.65	0.37	0.39	0.07	12.9	3.7
Beluga Coal	Solid	14.3	8.4	2.66	0.30	0.89	0.31	--	46.3
Homer Coal (1998)	Solid	8.9	1.8	0.26	<0.10	0.23	0.11	--	7.7

Matanuska Coal	Solid	4.9	3.2	10.4	0.11	0.09	0.21	--	5.1
Ninilchik Coal	Solid	14.0	7.9	0.96	<0.10	0.53	0.54	--	15.8
Coal (USGS,1998)	Solid	5-27	1-7	0.2-5	0.07-3.2	0.4-1.7	0.7-2	9-120	3-46

**Table 3-2: Mean and Standard Deviation Values for Total PAH, Total PHC, and Total S/T for Source Samples in Outermost Cook Inlet and Shelikof Strait**

<b>Sample Type</b>	<b>Matrix Type</b>	<b>Total PAH (<math>\mu\text{g/g}</math>)<sup>1</sup> Mean <math>\pm</math> SD</b>	<b>Total PHC (<math>\mu\text{g/g}</math>)<sup>1</sup> Mean <math>\pm</math> SD</b>	<b>Total S/T (<math>\mu\text{g/g}</math>)<sup>1</sup> Mean <math>\pm</math> SD</b>
<b>Cook Inlet Crude</b>	Oil	13,000 $\pm$ 1000 (n=29)	700,000 $\pm$ 34,000 (n=24)	510 $\pm$ 81 (n=21)
<b>Well Creek Seep</b>	Oil	4,400 $\pm$ 2,000 (n=2)	660,000 $\pm$ 130,000 (n=2)	250 $\pm$ 5.6 (n=2)
<b>Swanson River Field</b>	Oil	12,000	630,000	660
<b>Homer Spit Coal</b>	Solid	5.3	1,200	1.4
<b>Homer Coal Bay</b>	Solid	2.4	660	2.1
<b>Ninilchik Coal</b>	Solid	4.7	1400	0.95
<b>Matanuska Coal</b>	Solid	62	1200	1.9
<b>Coyote Lake Coal</b>	Solid	23	400	0.33
<b>Beluga Coal</b>	Solid	4.4 $\pm$ 0.44 (n=2)	750 $\pm$ 180 (n=2)	1.5 $\pm$ 0.46 (n=2)
<b>Homer Harbor</b>	Sediment	0.78 $\pm$ 0.021 (n=2)	120 $\pm$ 7.1 (n=2)	0.26 $\pm$ 0.010 (n=2)
<b>Copper River</b>	Sediment	0.041 $\pm$ 0.013 (n=5)	18 $\pm$ 28 (n=5)	0.0016 $\pm$ 0.00063 (n=5)
<b>Susitna River</b>	Sediment	0.0074 $\pm$ 0.00094 (n=2)	3.4 $\pm$ 1.3 (n=2)	0.0006 $\pm$ 0.00086 (n=2)
<b>Matanuska River</b>	Sediment	0.19	6.3	0.0064
<b>Alaska Coastal Current</b>	Sediment	1.7 $\pm$ 0.06 (n=3)	47 $\pm$ 3.0 (n=3)	0.049 $\pm$ 0.0021 (n=3)
<b>Augustine Island</b>	Sediment	0.17	12	0.019
		<b>Total PAH (<math>\mu\text{g/L}</math>)<sup>1</sup></b>	<b>Total PHC (<math>\mu\text{g/L}</math>)<sup>1</sup></b>	<b>Total S/T (<math>\mu\text{g/L}</math>)<sup>1</sup></b>
<b>Final Effluent Point Woronzof</b>	Water	6.7	2,300	1.3
<b>TBPF Outfall</b>	Water	380	6,200	6.2

Notes:

<sup>1</sup> dry weight for solid and sediments, wet weight for oil and waters

PAH – Polycyclic Aromatic Hydrocarbons

SHC – Saturated Hydrocarbons

S/T – Steranes and Triterpanes

SD – Standard Deviation

n – Number of Samples

**Table 3-3: Ranges of Metal Concentrations in Susitna and Copper River Bottom Sediment and Suspended Solids (This Study), Sedimentary, Volcanic and Plutonic Rocks from Alaska (Los Alamos National Laboratory, 1983), and Average Continental Crust (Wedepohl, 1995)**

<b>Metal*</b>	<b>Bottom Sediments: Susitna and Copper River Bottom Sediments (µg/g)*</b>	<b>Suspended Solids: S-K-M** and Copper Rivers (µg/g)*</b>	<b>Alaskan Rock (µg/g)*</b>	<b>Average Continental Crust (µg/g)*</b>
Ag	0.07-0.20	0.07-0.66	--	0.07
Al	6.08-7.46%	6.61-10.13%	2.67-7.81%	7.96%
As	5.3 -13.7	11.9-38.5	8-39	1.7
Ba	611-1090	514-1540	383-1160	584
Be	1.0-1.6	0.6-3.4	--	2.4
Cd	0.14-0.30	0.19-0.58	--	0.10
Cr	58-77	80-163	47-84	126
Cu	29-44	46-78	16-75	25
Fe	2.54-4.02%	4.40-7.01%	1.59-6.66%	4.32%
Hg	0.019-0.057	0.111-0.428	--	0.040
Mn	602-876	961-1240	351-1710	716
Ni	35-41	38-77	19-47	56
Pb	9-14	13-32	6-25	14.8
Sb	0.6-1.4	0.9-2.9	--	0.30
Se	<0.1-0.4	<0.1	--	0.12
Sn	1.4-1.9	1.2-3.6	--	2.3
Tl	0.24-0.57	0.29-0.98	--	0.52
V	83-145	145-209	55-278	98
Zn	70-80	82-267	96-288	65

Notes:

\*Concentrations in µg/g, except where noted.

\*\* S-K-M = Susitna - Knik - Matanuska.

**Table 3-4: Concentrations of Trace Metal in Source Solutions (Wet Weight)**

Sample Type	Matrix Type	Ag (mg/L)	As (mg/L)	Ba (mg/L)	Be (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)	Hg (mg/L)
TBPF Special Outfall, Unocal	Water	<0.0001	0.0024	20.7	<0.0001	0.0001	0.0032	0.0060	0.76	<0.0005.
Final Effluent Water Pt. Woronzof Water	Water	<0.0001	0.0002	0.010	<0.0001	0.00001	0.0005	0.0020	1.11	<0.0005
Crude Oil TBPF	Oil	<0.0001	<0.0001	0.68	<0.0001	0.0048	0.17	0.0087	1.47	<0.0005

Sample Type	Matrix Type	Mn (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	Sn (mg/L)	Tl (mg/L)	V (mg/L)	Zn (mg/L)
TBPF Special Outfall, Unocal	Water	1.71	0.0075	0.0001	0.0001	<0.0002	0.008	0.00025	0.067	0.0030.
Final Effluent Water Pt. Woronzof Water	Water	0.23	0.0017	0.0003.	0.0002	0.0004	0.004	0.00002	0.001	0.0065
Crude Oil TBPF	Oil	0.03	1.50	0.15	0.005	<0.0002.	<0.0001	0.0023	0.34	0.21

Notes:  
TBPF = Trading Bay Production Facility

**Table 3-5: Means, Standard Deviations and Ranges of Values for Total Organic Carbon (TOC), Sand, Silt and Clay for Surficial (0-2 cm) Sediments from the Alaska Coastal Current (AC) and Zones 0, 1, 2, 3 and 4 in the Shelikof Strait**

	<b>Zone (Year)</b>	<b>TOC (%)</b>	<b>Sand (%)</b>	<b>Mud (Silt and Clay) (%)</b>
<b>Mean Std. Dev.</b>	AC (1998)	1.13 ±0.04	1.4 ±0.4	98.6 ±0.4
<b>Range</b>		1.09-1.16	0.95-1.62	98.4-99.4
<b>Mean Std. Dev.</b>	0 (1997)	0.62 ±0.32	42.1 ±26.9	57.9 ±26.9
<b>Range</b>		0.31-1.22	3.8-84.9	15.1-96.2
<b>Mean Std. Dev.</b>	0 (1998)	0.82 ±0.36	48.2 ±28.7	58.3 ±30.6
<b>Range</b>		0.28-1.37	7.0-78.6	21.5-93.0
<b>Mean Std. Dev.</b>	1 (1997)	0.57 ±0.18	37.1 ±20.9	62.9 ±20.9
<b>Range</b>		0.26-0.94	2.6-70.3	29.7-97.4
<b>Mean Std. Dev.</b>	1 (1998)	0.60 ±0.20	40.8 ±24.5	55.6 ±22.2
<b>Range</b>		0.32-0.92	12.2-68.0	32.0-87.8
<b>Mean Std. Dev.</b>	2 (1997)	0.83 ±0.13	6.7 ±6.9	93.3 ±6.9
<b>Range</b>		0.48-1.05	0.1-27.2	72.8-99.9
<b>Mean Std. Dev.</b>	2 (1998)	0.83 ±0.13	5.0 ±3.4	91.8 ±7.2
<b>Range</b>		0.59-1.49	1.0-23.8	76.2-99.0
<b>Mean Std. Dev.</b>	3 (1997)	0.94 ±0.08	2.1 ±3.7	97.9 ±3.7
<b>Range</b>		0.79-1.16	0.19-17.7	91.5-99.8
<b>Mean Std. Dev.</b>	3 (1998)	0.98 ±0.10	1.9 ±1.8	97.4 ±3.5
<b>Range</b>		0.80-1.15	0.4-12.2	87.8-99.6
<b>Mean Std. Dev.</b>	4 (1998)	1.13 ±0.04	1.1 ±0.7	98.9 ±0.9
<b>Range</b>		1.08-1.18	0.3-2.9	97.1-99.7
<b>Mean Std. Dev.</b>	All Zones excluding AC	0.81 ±0.28	20.5 ±24.4	81.7 ±19.1
<b>Range</b>	(1997-1998)	0.26-1.49	0.1-84.9	15.1-99.9



**Table 3-6: Non-Transformed Mean, Standard Deviation and Range of Total PAH, Total PHC, and Total S/T for Surficial Sediment (0-2cm) from Zones 0, 1, 2, 3 and 4**

	<b>Zone</b>	<b>Total PAH (<math>\mu\text{g/g}</math>)</b>	<b>Total PHC (<math>\mu\text{g/g}</math>)</b>	<b>Total S/T (<math>\mu\text{g/g}</math>)</b>
<b>1997 Results</b>				
<b>Mean <math>\pm</math>SD</b> Range	0	$0.269 \pm 0.134$ 0.120 – 0.490	$25.4 \pm 16.2$ 9.77 – 50.0	$0.029 \pm 0.020$ 0.009 – 0.069
<b>Mean <math>\pm</math>SD</b> Range	1	$0.422 \pm 0.250$ 0.173 – 1.080	$26.2 \pm 10.6$ 12.0 – 48.0	$0.016 \pm 0.005$ 0.011 – 0.030
<b>Mean <math>\pm</math>SD</b> Range	2	$0.542 \pm 0.221$ 0.221 – 0.957	$26.1 \pm 10.1$ 14.0 – 51.0	$0.024 \pm 0.017$ 0.012 – 0.087
<b>Mean <math>\pm</math>SD</b> Range	3	$0.595 \pm 0.152$ 0.314 – 0.857	$36.3 \pm 16.1$ 15.0 – 71.0	$0.022 \pm 0.009$ 0.011 – 0.037
<b>Mean <math>\pm</math>SD</b> Range	Grand Mean: 0, 1, 2 and 3	$0.457 \pm 0.145$ 0.120 - 1.080	$28.5 \pm 5.21$ 9.77 - 71.0	$0.023 \pm 0.005$ 0.009 - 0.087
<b>1998 Results</b>				
<b>Mean <math>\pm</math>SD</b> Range	0	$0.200 \pm 0.119$ 0.066 – 0.420	$25.5 \pm 18.1$ 6.80 – 54.3	$0.027 \pm 0.022$ 0.009 – 0.069
<b>Mean <math>\pm</math>SD</b> Range	1	$0.330 \pm 0.198$ 0.120 – 0.730	$23.6 \pm 8.18$ 14.0 – 39.0	$0.016 \pm 0.004$ 0.011 – 0.021
<b>Mean <math>\pm</math>SD</b> Range	2	$0.525 \pm 0.133$ 0.290 – 0.687	$25.8 \pm 3.58$ 21.0 – 31.0	$0.021 \pm 0.004$ 0.017 – 0.026
<b>Mean <math>\pm</math>SD</b> Range	3	$0.501 \pm 0.060$ 0.360 – 0.550	$33.2 \pm 6.59$ 24.0 – 42.0	$0.030 \pm 0.017$ 0.021 – 0.072
<b>Mean <math>\pm</math>SD</b> Range	4	$0.604 \pm 0.060$ 0.537 – 0.650	$35.8 \pm 6.68$ 30.7 – 43.3	$0.025 \pm 0.001$ 0.024 – 0.027
<b>Mean <math>\pm</math>SD</b> Range	Grand Mean: 0, 1, 2, 3, 4	$0.432 \pm 0.164$ 0.066 – 0.730	$28.8 \pm 5.37$ 6.80 – 54.3	$0.024 \pm 0.005$ 0.009 – 0.072
<b>1997 &amp; 1998</b>				
<b>Mean <math>\pm</math>SD</b>	0	$0.235 \pm 0.049$	$25.5 \pm 0.071$	$0.028 \pm 0.001$
<b>Mean <math>\pm</math>SD</b>	1	$0.376 \pm 0.065$	$24.9 \pm 1.84$	0.016
<b>Mean <math>\pm</math>SD</b>	2	$0.534 \pm 0.012$	$26.0 \pm 0.212$	$0.023 \pm 0.002$
<b>Mean <math>\pm</math>SD</b>	3	$0.548 \pm 0.066$	$34.8 \pm 2.19$	$0.026 \pm 0.006$
<b>Mean <math>\pm</math>SD</b>	4	$0.604 \pm 0.060$	$35.8 \pm 6.68$	$0.025 \pm 0.001$
<b>Mean <math>\pm</math>SD</b>	Grand Mean:	$0.459 \pm 0.151$	$29.4 \pm 5.41$	$0.024 \pm 0.005$

**Table 3-7: Diagnostic Ratios and Parameters of Saturated Hydrocarbons, Polycyclic Aromatic Hydrocarbons, and Steranes and Triterpanes**

Parameter	Relevance in Environmental Samples
<b>Saturated Hydrocarbons (SHC)</b>	
Isoprenoids	The sum of selected branched isoprenoid alkanes including: phytane, pristane, farnesane [1470], and unidentified isoprenoids at relative retention index 1380 and 1650. Isoprenoids are abundant in petroleum and are resistant to degradation relative to the corresponding n-alkanes.
LALK	The sum of lower molecular weight n-alkanes (nC <sub>9</sub> to nC <sub>20</sub> ) generally associated with “fresh” petroleum inputs.
TALK	The sum of total alkanes which includes those of biogenic and petrogenic origin (nC <sub>9</sub> to nC <sub>44</sub> ).
PHY/PRIS	Source of phytane (PHY) is mainly petroleum, whereas pristane (PRIS) is derived from both biological matter and oil. In “clean” environmental samples, this ratio is very low and increases as oil is added.
nC <sub>16</sub> /(nC <sub>15</sub> + nC <sub>17</sub> )	The ratio of n-alkane hexadecane (nC <sub>16</sub> ) over pentadecane (nC <sub>15</sub> ) and heptadecane (nC <sub>17</sub> ). At “background” levels of total hydrocarbons nC <sub>15</sub> and nC <sub>17</sub> can be used as indicators of plankton (algal) hydrocarbon inputs. As plankton productivity increases the ratio decreases.
CPI	Carbon preference index. Describes the relative amounts of odd-and-even-chain alkanes within a specific alkane boiling range. CPI of 2 - 4 indicate terrestrial plants, as oil additions increase the CPI is lowered to near 1.0. The equation for CPI is (nC <sub>27</sub> + nC <sub>29</sub> + nC <sub>31</sub> )/(nC <sub>26</sub> + nC <sub>28</sub> + nC <sub>30</sub> ).
TPHC	Total hydrocarbons, the sum of the resolved plus unresolved saturated and aromatic hydrocarbons.
<b>Polycyclic Aromatic Hydrocarbons (PAH)</b>	
N/P	The naphthalenes (N) to phenanthrenes/anthracenes (P) ratio is diagnostic for inputs of fresh petroleum, and as a weathering indicator. Naphthalenes are characteristic of fresh crude oil, the ratio decreases with increased weathering. (N= Naphthalene series [C0N + C1N + C2N + C3N + C4N]; P= Phenanthrene/Anthracene Series [C0P/A + C1P/A + C2P/A + C3P/A + C4P/A]).
C2D/C2P	Ratio of C2 alkyl dibenzothiophenes (D) and C2 alkyl phenanthrenes (P) is a useful diagnostic source ratio for petroleum.
C3D/C3P	Ratio of C3-alkyl dibenzothiophenes (D) and C3-alkyl phenanthrenes (P) is a useful diagnostic source ratio for petroleum.
Perylene	A biogenic PAH formed during the early diagenesis in marine and lacustrine sediments, may be associated with terrestrial plant source precursors.
Total PAH	The sum of all PAH target analytes includes 2- through 6-ring parent PAH and C1 - C4 alkyl substituted PAH.
Pyrogenic PAH	The sum of combustion PAH compounds (4-, 5-, and 6-ring PAH: Fluoranthene, pyrene, chrysene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, benzo[g,h,i]perylene, and indeno[1,2,3,-c,d]pyrene).
Petrogenic PAH	The sum of petrogenic PAH compounds (2-, 3-, and 4 -ring PAH: naphthalenes [C0 - C4], acenaphthene, acenaphthylene, fluorene [C0 - C3], phenanthrenes [C0 - C4], dibenzothiophenes [C0 - C3], chrysenes [C1 - C4], and fluoranthenes/pyrenes [C1 - C3]).
Pyrogenic/Petrogenic	The ratio of pyrogenic PAH compounds to petrogenic PAH compounds is useful for determining the relative contribution of pyrogenic and petrogenic hydrocarbons and in differentiating hydrocarbon sources.
<b>Steranes/Triterpanes (S/T)</b>	

**Table 3-7: Diagnostic Ratios and Parameters of Saturated Hydrocarbons, Polycyclic Aromatic Hydrocarbons, and Steranes and Triterpanes**

Parameter	Relevance in Environmental Samples
Total S/T	The sum of all sterane and triterpane biomarker target analytes.
T21/T22	The ratio of C31-homohopane (22S) (T21) to C31-homohopane (22R) (T22), useful for determining the contribution of recent biogenic material.
Hopane	C30-Hopane (T19), commonly one of the most abundant triterpanes in petroleum.
Ts/(Ts +Tm)	Ratio of C27-trisnorhopane(Ts) to C27-trisnorhopane (Tm); used as a maturity indicator for petroleum, also as a source ratio for different crude oils.
Oleanane/Hopane	The ratio of C30-oleanane (T18) to C30-hopane (T19) indicates the relative amounts of oleanane, which is a marker of angiosperm (post-Cretaceous) contribution to petroleum diagenesis.

**Table 3-8a: Mean, Maximum, Minimum, and Student Newman-Keuls Analysis Results for Key Organic Parameters (Non-Transformed) in 1997 Surface Sediments**

Analyte	Zone	n	Significantly Different	Mean	Min	Max	SD	CV
<b>Total PAH</b>	3	17	A	0.403	0.262	0.531	0.080	19.901
(µg/g)	2	17	A	0.376	0.160	0.583	0.120	31.967
	1	17	A	0.315	0.132	0.624	0.162	51.404
	0	8	B	0.179	0.080	0.329	0.087	48.849
<b>Perylene</b>	0	8	A	0.017	0.003	0.040	0.015	86.744
(µg/g)	3	17	AB	0.013	0.006	0.022	0.005	38.815
	2	17	BC	0.009	0.005	0.016	0.003	32.031
	1	17	C	0.006	0.004	0.010	0.002	25.924
<b>Petrogenic PAH</b>	3	17	A	0.364	0.241	0.475	0.069	19.014
(µg/g)	2	17	A	0.343	0.141	0.533	0.110	32.026
	1	17	A	0.289	0.117	0.573	0.151	52.436
	0	8	B	0.143	0.069	0.247	0.063	44.422
<b>Pyrogenic PAH</b>	3	17	A	0.039	0.021	0.058	0.012	30.177
(µg/g)	0	8	A	0.036	0.011	0.082	0.030	82.134
	2	17	A	0.033	0.019	0.057	0.011	33.549
	1	17	A	0.026	0.014	0.051	0.011	40.914
<b>C2D/C2P</b>	0	8	A	0.159	0.131	0.235	0.034	21.549
	2	17	AB	0.151	0.111	0.164	0.012	8.260
	3	17	AB	0.151	0.126	0.177	0.012	8.132
	1	17	B	0.137	0.108	0.164	0.016	11.992
<b>C3D/C3P</b>	0	8	A	0.215	0.127	0.289	0.048	22.293
	2	17	AB	0.197	0.163	0.250	0.024	11.990
	3	17	BC	0.189	0.173	0.225	0.013	7.068
	1	17	C	0.171	0.143	0.200	0.018	10.662
<b>N/P</b>	2	17	A	0.980	0.652	1.568	0.346	35.265
	3	17	A	0.972	0.743	1.492	0.197	20.237
	1	17	A	0.972	0.713	1.144	0.132	13.557
	0	8	B	0.643	0.523	0.792	0.098	15.196
<b>PYRO/PETRO</b>	0	8	A	0.234	0.087	0.471	0.123	52.391
	3	17	B	0.106	0.084	0.139	0.016	15.018
	2	17	B	0.097	0.071	0.134	0.014	14.163
	1	17	B	0.096	0.076	0.124	0.016	16.283
<b>nC16/(nC15+nC17)</b>	1	17	A	0.162	0.087	0.233	0.033	20.615
	3	17	A	0.155	0.128	0.176	0.013	8.470
	2	17	A	0.153	0.114	0.194	0.025	16.642
	0	8	B	0.092	0.027	0.146	0.043	46.531
<b>Pristane</b>	3	17	A	0.078	0.036	0.140	0.029	37.606
(µg/g)	2	17	A	0.066	0.030	0.100	0.021	32.206
	1	17	A	0.062	0.020	0.143	0.033	53.490
	0	8	B	0.024	0.010	0.041	0.012	49.369
<b>Total PHC</b>	3	17	A	23.620	12.000	44.000	8.773	37.143

**Table 3-8a: Mean, Maximum, Minimum, and Student Newman-Keuls Analysis Results for Key Organic Parameters (Non-Transformed) in 1997 Surface Sediments**

Analyte	Zone	n	Significantly Different	Mean	Min	Max	SD	CV
(µg/g)	1	17	A	21.188	9.100	41.000	8.937	42.181
	2	17	A	18.994	10.000	35.000	6.610	34.802
	0	8	A	17.367	6.500	32.667	11.267	64.879
<b>nC15+nC17</b>	3	17	A	0.058	0.033	0.076	0.014	23.315
(µg/g)	2	17	A	0.056	0.030	0.094	0.017	30.651
	1	17	A	0.048	0.025	0.085	0.020	40.499
	0	8	B	0.032	0.013	0.069	0.020	63.567
<b>nC27+nC29+nC31</b>	0	8	A	0.350	0.116	0.845	0.240	68.463
(µg/g)	2	17	A	0.302	0.171	0.490	0.073	24.228
	3	17	A	0.253	0.080	0.385	0.100	39.429
	1	17	A	0.247	0.037	0.400	0.100	40.467
<b>TALK</b>	1	17	A	1.514	0.526	5.929	1.197	79.099
(µg/g)	2	17	A	1.456	0.696	7.248	1.509	103.580
	3	17	A	1.129	0.584	1.707	0.334	29.552
	0	8	A	0.980	0.427	2.045	0.534	54.474
<b>Isoprenoids</b>	3	17	A	0.127	0.063	0.207	0.039	31.017
(µg/g)	1	17	A	0.111	0.056	0.209	0.046	41.086
	2	17	A	0.110	0.048	0.158	0.032	28.893
	0	8	B	0.044	0.019	0.072	0.019	42.955
<b>LALK</b>	1	17	A	0.460	0.194	0.711	0.189	41.097
(µg/g)	3	17	A	0.403	0.272	0.603	0.094	23.232
	2	17	A	0.345	0.151	0.518	0.106	30.763
	0	8	B	0.161	0.066	0.288	0.077	48.010
<b>Phytane/pristane</b>	0	8	A	0.170	0.097	0.262	0.053	31.300
	1	17	B	0.110	0.052	0.205	0.045	41.042
	2	17	B	0.101	0.073	0.136	0.017	16.536
	3	17	B	0.097	0.052	0.229	0.042	42.744
<b>CPI</b>	1	17	A	3.308	1.356	5.425	1.333	40.305
	0	8	A	3.209	1.859	7.000	1.618	50.418
	2	17	A	2.626	1.618	4.579	0.698	26.566
	3	17	A	2.304	1.136	4.811	0.854	37.042
<b>Total S/T</b>	0	8	A	0.020	0.006	0.057	0.017	81.723
(µg/g)	2	17	A	0.016	0.007	0.055	0.011	68.305
	3	17	A	0.013	0.007	0.019	0.004	32.583
	1	17	A	0.012	0.007	0.019	0.003	26.654
<b>Hopane</b>	2	17	A	0.003	0.001	0.013	0.003	88.482
(µg/g)	3	17	A	0.002	0.001	0.004	0.001	34.689
	1	17	A	0.002	0.001	0.004	0.001	37.450
	0	8	A	0.002	0.001	0.004	0.001	56.307

**Table 3-8a: Mean, Maximum, Minimum, and Student Newman-Keuls Analysis Results for Key Organic Parameters (Non-Transformed) in 1997 Surface Sediments**

Analyte	Zone	n	Significantly Different	Mean	Min	Max	SD	CV
<b>Ts/(Ts+Tm)</b>	1	17	A	0.336	0.229	0.393	0.052	15.519
	2	17	AB	0.313	0.228	0.393	0.044	14.196
	0	8	B	0.279	0.180	0.499	0.102	36.573
	3	17	B	0.274	0.244	0.330	0.028	10.094
<b>Oleanane/Hopane</b>	0	8	A	0.184	0.111	0.250	0.043	23.143
	2	17	A	0.169	0.093	0.231	0.039	22.781
	1	17	A	0.167	0.084	0.278	0.063	37.711
	3	17	A	0.160	0.103	0.246	0.033	20.700
<b>T21/T22</b>	3	17	A	0.452	0.400	0.559	0.035	7.750
	2	17	A	0.437	0.250	0.757	0.127	29.064
	1	17	A	0.333	0.146	0.758	0.189	56.697
	0	8	B	0.160	0.057	0.422	0.115	71.931

**Table 3-8b: Mean, Maximum, Minimum, and Student Newman-Keuls Analysis Results for Key Organic Parameters (Non-Transformed) in 1998 Surface Sediments**

Analyte	Zone	n	Significantly Different	Mean	Min	Max	SD	CV
<b>Total PAH</b>	4	3	A	0.604	0.537	0.650	0.060	9.901
(µg/g)	2	8	A	0.525	0.290	0.687	0.133	25.444
	3	8	A	0.501	0.360	0.550	0.060	11.991
	1	8	B	0.330	0.120	0.730	0.198	60.096
	0	8	B	0.200	0.066	0.420	0.119	59.560
<b>Perylene</b>	4	3	A	0.022	0.020	0.025	0.003	12.031
(µg/g)	0	8	A	0.022	0.002	0.065	0.024	109.603
	3	8	A	0.019	0.015	0.022	0.003	14.093
	2	8	A	0.013	0.010	0.018	0.003	21.050
	1	8	A	0.008	0.004	0.013	0.003	39.217
<b>Petrogenic PAH</b>	4	3	A	0.541	0.478	0.581	0.055	10.155
(µg/g)	2	8	A	0.473	0.254	0.625	0.124	26.267
	3	8	A	0.447	0.313	0.492	0.057	12.719
	1	8	B	0.297	0.101	0.668	0.184	61.940
	0	8	C	0.156	0.056	0.316	0.085	54.644
<b>Pyrogenic PAH</b>	4	3	A	0.042	0.040	0.045	0.002	5.824
(µg/g)	2	8	A	0.038	0.022	0.048	0.009	23.662
	3	8	A	0.036	0.029	0.041	0.005	13.010
	1	8	A	0.025	0.011	0.056	0.015	60.955
	0	8	A	0.022	0.005	0.053	0.019	84.783
<b>C2D/C2P</b>	0	8	A	0.170	0.140	0.214	0.022	12.835
	3	8	A	0.168	0.151	0.175	0.009	5.430
	4	3	A	0.163	0.159	0.166	0.004	2.176
	1	8	A	0.156	0.137	0.179	0.013	8.636
	2	8	A	0.156	0.144	0.165	0.006	3.813
<b>C3D/C3P</b>	0	8	A	0.212	0.146	0.291	0.050	23.655
	1	8	AB	0.176	0.119	0.221	0.032	17.976
	2	8	AB	0.176	0.153	0.191	0.011	6.438
	3	8	AB	0.172	0.155	0.200	0.015	8.851
	4	3	B	0.137	0.113	0.169	0.029	20.902
<b>N/P</b>	4	3	A	1.183	1.063	1.260	0.105	8.862
	0	8	A	1.163	0.915	1.422	0.176	15.158
	3	8	A	1.158	1.051	1.340	0.116	10.000
	2	8	A	1.153	1.069	1.217	0.056	4.858
	1	8	A	1.086	0.896	1.271	0.119	10.957
<b>PYRO/PETRO</b>	0	8	A	0.128	0.078	0.267	0.063	49.190
	1	8	A	0.085	0.070	0.105	0.012	13.820
	3	8	A	0.081	0.069	0.092	0.008	10.430
	2	8	A	0.080	0.075	0.088	0.004	5.123
	4	3	A	0.078	0.074	0.084	0.005	6.391
<b>Total PHC</b>	4	3	A	35.778	30.667	43.333	6.678	18.665
(µg/g)	3	8	A	33.250	24.000	42.000	6.585	19.803
	2	8	A	25.750	21.000	31.000	3.576	13.886
	0	8	A	25.504	6.800	54.333	18.095	70.950
	1	8	A	23.583	14.000	39.000	8.180	34.686

**Table 3-8b: Mean, Maximum, Minimum, and Student Newman-Keuls Analysis Results for Key Organic Parameters (Non-Transformed) in 1998 Surface Sediments**

Analyte	Zone	n	Significantly Different	Mean	Min	Max	SD	CV
<b>nC16/(nC15+nC17)</b>	4	3	A	0.366	0.324	0.396	0.037	10.147
	2	8	A	0.366	0.340	0.394	0.021	5.722
	3	8	A	0.349	0.301	0.429	0.053	15.221
	0	8	A	0.343	0.222	0.447	0.067	19.608
	1	8	A	0.331	0.300	0.395	0.030	9.087
<b>Pristane (µg/g)</b>	4	3	A	0.142	0.123	0.173	0.027	19.089
	2	8	A	0.126	0.070	0.167	0.032	25.319
	3	8	A	0.110	0.081	0.140	0.017	15.880
	0	8	A	0.106	0.011	0.400	0.127	120.188
	1	8	A	0.102	0.041	0.210	0.058	56.296
<b>nC15+nC17</b>	4	3	A	0.099	0.092	0.112	0.011	11.604
	3	8	A	0.097	0.077	0.121	0.017	17.783
	2	8	A	0.090	0.057	0.108	0.019	21.423
	1	8	AB	0.072	0.038	0.172	0.046	63.568
	0	8	B	0.041	0.016	0.087	0.025	61.476
<b>nC27+nC29+nC31</b>	0	8	A	0.507	0.139	1.550	0.483	95.101
	3	8	A	0.506	0.390	0.580	0.066	13.100
	4	3	A	0.487	0.447	0.523	0.038	7.902
	2	8	A	0.367	0.314	0.439	0.043	11.663
	1	8	A	0.339	0.169	0.540	0.132	38.972
<b>TALK (µg/g)</b>	4	3	A	2.040	1.838	2.253	0.208	10.185
	3	8	A	1.914	1.612	2.070	0.139	7.240
	2	8	A	1.522	1.215	1.810	0.216	14.220
	1	8	A	1.484	0.896	2.260	0.443	29.881
	0	8	A	1.391	0.523	3.268	0.930	66.847
<b>Isoprenoids (µg/g)</b>	4	3	A	0.229	0.210	0.258	0.025	10.874
	2	8	A	0.203	0.114	0.264	0.050	24.736
	3	8	A	0.189	0.145	0.223	0.023	12.026
	1	8	A	0.155	0.069	0.333	0.088	56.986
	0	8	A	0.135	0.024	0.422	0.129	95.463
<b>LALK (µg/g)</b>	4	3	A	0.658	0.651	0.669	0.009	1.407
	2	8	A	0.632	0.424	0.792	0.126	19.956
	3	8	A	0.572	0.505	0.637	0.054	9.463
	1	8	A	0.434	0.195	0.958	0.242	55.912
	0	8	A	0.402	0.094	0.866	0.277	68.963
<b>Phytane/Pristane</b>	3	8	A	0.113	0.076	0.136	0.021	18.390
	2	8	A	0.102	0.089	0.125	0.012	11.650
	4	3	A	0.097	0.087	0.103	0.009	9.554
	0	8	A	0.093	0.000	0.205	0.072	77.634
	1	8	A	0.087	0.056	0.109	0.018	20.239
<b>CPI</b>	0	8	A	5.410	2.682	8.208	2.123	39.237
	3	8	B	3.598	2.890	4.352	0.430	11.953
	2	8	B	3.433	2.856	5.000	0.703	20.487
	1	8	B	3.103	1.690	4.788	0.973	31.346
	4	3	B	3.076	2.865	3.252	0.196	6.376



**Table 3-8b: Mean, Maximum, Minimum, and Student Newman-Keuls Analysis Results for Key Organic Parameters (Non-Transformed) in 1998 Surface Sediments**

Analyte	Zone	n	Significantly Different	Mean	Min	Max	SD	CV
<b>Total S/T</b>	3	8	A	0.030	0.021	0.072	0.017	57.514
(µg/g)	0	8	A	0.027	0.009	0.069	0.022	79.961
	4	3	A	0.025	0.024	0.027	0.001	4.601
	2	8	A	0.021	0.017	0.026	0.004	16.911
	1	8	A	0.016	0.011	0.021	0.004	24.246
<b>T19-Hopane</b>	3	8	A	0.006	0.004	0.016	0.004	74.763
(µg/g)	4	3	A	0.004	0.004	0.004	0.000	1.312
	2	8	A	0.004	0.002	0.005	0.001	22.640
	1	8	A	0.003	0.002	0.004	0.001	37.821
	0	8	A	0.002	0.001	0.004	0.001	61.322
<b>Ts/(Ts+Tm)</b>	1	8	A	0.330	0.293	0.363	0.021	6.442
	2	8	A	0.318	0.259	0.353	0.034	10.686
	3	8	A	0.293	0.167	0.423	0.083	28.389
	0	8	A	0.282	0.191	0.456	0.079	27.922
	4	3	A	0.270	0.240	0.288	0.026	9.733
<b>Oleanane/Hopane</b>	2	8	A	0.178	0.121	0.204	0.026	14.866
	1	8	AB	0.172	0.075	0.218	0.049	28.537
	4	3	AB	0.168	0.159	0.174	0.008	4.494
	3	8	AB	0.144	0.106	0.177	0.022	15.044
	0	8	B	0.119	0.094	0.206	0.037	30.835
<b>T21/T22</b>	2	8	A	0.511	0.342	0.650	0.105	20.593
	3	8	A	0.479	0.339	0.736	0.116	24.254
	4	3	A	0.413	0.379	0.450	0.036	8.650
	1	8	A	0.384	0.161	0.741	0.221	57.593
	0	8	B	0.154	0.059	0.378	0.100	64.850
<b>Crude Oil</b>	2	8	A	47.375	0.000	302.000	104.672	220.944
<b>Emulsifiers</b>	0	8	A	12.625	0.000	56.000	23.561	186.623
(cells per gram)	3	8	A	10.500	0.000	84.000	29.698	282.843
	1	8	A	0.000	0.000	0.000	0.000	
	4	3	A	0.000	0.000	0.000	0.000	
<b>Marine</b>	0	8	A	1183609	8444	7870544	2705535	229
<b>Heterotrophs</b>	2	8	A	158306	93398	437014	114225	72
(cells per gram)	4	3	A	141362	63499	250187	97119	69
	1	8	A	98442	9406	305966	92817	94
	3	8	A	74180	54054	113273	18601	25

**Table 3-9: Average Total Organics Concentrations in Surficial Sediments from Zones 0, 1, 2, 3 and 4 in Outermost Cook Inlet and the Shelikof Strait, Concentrations of Alaska Marine Sediments, and Concentrations in Cook Inlet and the Shelikof Strait from Previous Studies**

<b>Organic Parameter</b>	<b>Study Average Concentrations for Surficial Sediment (µg/g)</b>	<b>Concentrations in Alaska Marine Sediments (µg/g)<sup>a</sup></b>	<b>Concentrations in Cook Inlet and Shelikof Strait (µg/g)<sup>b</sup></b>
<b>Total PAH</b>	0.459	0.016 - 2.4	0.001 - 0.958
<b>Total PHC</b>	29.4	0.47 - 38	0.9 - 69.0
<b>Total S/T</b>	0.024	NA	NA

<sup>a</sup> Prince William sound subtidal and Beaufort Sea (Bence, *et al.*, 1996, Boehm *et al.*, 1991).

<sup>b</sup> ENRI - UAA, 1995, Hyland, *et al.*, 1995, ADL, 1996, KLI, 1996, KLI, 1997.

**Table 3-10: Means, Standard Deviations, and Ranges of Values for Metals, Total Organic Carbon (TOC), Sand, Silt and Clay for Surficial (0-2 cm) Sediments from Zones AC, 0, 1, 2, 3 and 4 in Outermost Cook Inlet and the Shelikof Strait (dry weight)**

	<b>Zone (Year)</b>	<b>Al (%)</b>	<b>Ca (%)</b>	<b>Fe (%)</b>	<b>K (%)</b>	<b>Mg (%)</b>	<b>TOC (%)</b>	<b>Sand (%)</b>	<b>Silt+Clay (%)</b>
<b>Mean</b>	AC	8.33	--	5.73	--	--	1.13	1.4	98.6
<b>Std. Dev.</b>	(1998)	±0.23		±0.10			±0.04	±0.4	±0.4
<b>Range</b>		8.11-8.57		5.64-5.83			1.09-1.16	0.9-1.6	98.4-99.4
<b>Mean</b>	0	7.29	2.68	3.98	1.68	1.51	0.64	42.2	57.9
<b>Std. Dev.</b>	(1997)	±0.64	±0.92	±0.64	±0.17	±0.17	±0.33	±26.8	±26.9
<b>Range</b>		6.02-8.23	1.26-4.57	2.79-5.31	1.38-2.03	1.12-1.89	0.31-1.22	3.8-84.9	15.1-96.2
<b>Mean</b>	0	7.44	--	3.92	--	--	0.84	41.7	58.3
<b>Std. Dev.</b>	(1998)	±0.45		±0.63			±0.41	±29.6	±30.6
<b>Range</b>		6.70-7.92		2.74-4.87			0.28-1.37	7.0-78.5	21.5-93.0
<b>Mean</b>	1	7.46	2.21	3.90	1.62	1.45	0.57	32.4	62.9
<b>Std. Dev.</b>	(1997)	±0.36	±0.17	±0.31	±0.20	±0.17	±0.17	±22.4	±20.9
<b>Range</b>		6.57-8.16	1.87-2.91	3.37-4.40	1.39-2.03	1.21-1.82	0.26-0.94	2.6-70.3	29.7-97.4
<b>Mean</b>	1	8.02	--	4.03	--	--	0.59	44.4	55.6
<b>Std. Dev.</b>	(1998)	±0.64		±0.35			±0.19	±22.4	±22.2
<b>Range</b>		7.53-9.37		3.42-4.48			0.32-0.92	12.2-68.0	32.0-87.8
<b>Mean</b>	2	7.48	1.86	4.28	1.68	1.71	0.84	6.3	93.3
<b>Std. Dev.</b>	(1997)	±0.23	±0.19	±0.24	±0.07	±0.08	±0.14	±7.5	±6.9
<b>Range</b>		6.66-7.74	1.49-2.18	3.76-4.57	1.42-1.88	1.55-1.84	0.48-1.05	0.10-27.18	72.8-99.9
<b>Mean</b>	2	7.96	--	4.52	--	--	1.02	8.2	91.8
<b>Std. Dev.</b>	(1998)	±0.25		±0.18			±0.27	±7.1	±7.2
<b>Range</b>		6.69-8.44		3.30-4.86			0.59-1.49	1.0-23.8	76.2-99.0
<b>Mean</b>	3	7.17	1.75	4.51	1.82	1.85	0.95	2.5	97.9
<b>Std. Dev.</b>	(1997)	±0.48	±0.13	±0.08	±0.09	±0.07	±0.08	±4.4	±3.7
<b>Range</b>		5.64-7.64	1.51-1.97	4.38-4.71	1.50-2.02	1.64-2.01	0.79-1.16	0.2-17.69	91.5-99.8
<b>Mean</b>	3	7.99	--	4.53	--	--	0.95	2.6	97.4
<b>Std. Dev.</b>	(1998)	±0.11		±0.15			±0.11	±3.5	±3.5
<b>Range</b>		7.82-8.17		4.18-4.65			0.80-1.15	0.4-12.2	87.8-99.6
<b>Mean</b>	4	7.71	--	4.33	--	--	1.13	1.1	98.9
<b>Std. Dev.</b>	(1998)	±0.12		±0.16			±0.04	±0.8	±0.9
<b>Range</b>		7.46-7.94		4.08-4.54			1.08-1.18	0.3-2.9	97.1-99.7

<b>Mean Std. Dev.</b>	Avg. of 0,1, 2, 3, and 4 (excluding AC)	7.45 ±0.51	2.14 ±0.61	4.18 ±0.43	1.70 ±0.17	1.63 ±0.20	0.81 ±0.28	20.5 ±24.4	81.7 ±19.1
<b>Range</b>		5.64-9.37	1.26-4.57	2.74-5.31	1.38-2.03	1.12-2.01	0.26-1.49	0.1-84.9	15.1-99.9

**Table 3-10: Means, Standard Deviations and Ranges of Values for Metals, Total Organic Carbon (TOC), Sand, Silt and Clay for Surficial (0-2 cm) Sediments from Zones AC, 0, 1, 2, 3 and 4 in Outermost Cook Inlet and the Shelikof Strait (continued)**

	<b>Zone (Year)</b>	<b>Ag (µg/g)</b>	<b>As (µg/g)</b>	<b>Ba (µg/g)</b>	<b>Be (µg/g)</b>	<b>Cd (µg/g)</b>	<b>Cr (µg/g)</b>	<b>Cu (µg/g)</b>	<b>Hg (µg/g)</b>	<b>Mn (µg/g)</b>
<b>Mean Std. Dev.</b>	AC (1998)	0.03 ±0.01	4.2 ±0.4	695 ±13	1.1 ±0.1	0.10 ±0.01	94.4 ±10.9	31.7 ±0.5	0.064 ±0.003	790 ±19
<b>Range</b>		0.3-0.4	4.0-4.7	682-707	1.0-1.1	0.10-0.11	86.9-107	31.3-32.3	0.062-0.068	771-808
<b>Mean Std. Dev.</b>	0 (1997)	0.07 ±0.03	10.0 ±4.2	758 ±126	1.1 ±0.1	0.09 ±0.01	66.3 ±15.8	34.1 ±10.5	0.057 ±0.035	819 ±126
<b>Range</b>		0.04-0.13	3.8-16.0	518-924	0.89-1.40	0.04-0.11	42.8-95.3	20.3-52.0	0.023-0.125	615-1000
<b>Mean Std. Dev.</b>	0 (1998)	0.04 ±0.02	8.2 ±4.3	775 ±123	1.2 ±0.0	0.09 ±0.01	69.0 ±15.8	32.5 ±10.2	0.057 ±0.035	830 ±122
<b>Range</b>		0.01-0.08	2.5-14.6	571-957	1.0-1.4	0.07-0.11	47.5-94.6	20.3-50.3	0.024-0.123	610-999
<b>Mean Std. Dev.</b>	1 (1997)	0.07 ±0.01	8.0 ±2.1	814 ±57	1.1 ±0.1	0.10 ±0.01	62.4 ±7.1	30.6 ±6.4	0.043 ±0.009	846 ±109
<b>Range</b>		0.05-0.09	4.8-11.8	708-914	1.01-1.36	0.08-0.14	49.1-76.4	19.9-41.1	0.022-0.067	720-1220
<b>Mean Std. Dev.</b>	1 (1998)	0.05 ±0.02	8.2 ±2.8	783 ±73	1.2 ±0.2	0.10 ±0.04	63.1 ±12.1	28.8 ±7.0	0.042 ±0.010	895 ±122
<b>Range</b>		0.01-0.08	5.3-13.1	630-888	1.0-1.4	0.08-0.16	46.0-77.1	21.4-41.9	0.028-0.054	664-1049
<b>Mean Std. Dev.</b>	2 (1997)	0.07 ±0.02	9.5 ±1.6	854 ±32	1.1 ±0.1	0.12 ±0.02	73.4 ±5.3	37.7 ±2.9	0.058 ±0.007	936 ±328
<b>Range</b>		0.05-0.10	5.7-13.7	775-916	0.96-1.32	0.09-0.20	59.2-80.9	29.4-41.2	0.047-0.072	688-2140
<b>Mean Std. Dev.</b>	2 (1998)	0.06 ±0.01	12.0 ±1.7	904 ±29	1.3 ±0.1	0.11 ±0.01	82.1 ±5.5	38.8 ±1.5	0.062 ±0.006	1122 ±174
<b>Range</b>		0.03-0.10	7.4-14.0	709-964	1.0-1.4	0.10-0.18	58.7-90.0	30.0-40.8	0.052-0.069	564-1565
<b>Mean Std. Dev.</b>	3 (1997)	0.09 ±0.01	9.0 ±1.3	878 ±17	1.4 ±0.0	0.16 ±0.02	75.2 ±3.6	37.4 ±1.5	0.060 ±0.004	1007 ±206
<b>Range</b>		0.08-0.11	7.0-13.4	826-928	1.34-1.48	0.12-0.23	65.1-80.7	33.9-41.5	0.050-0.067	72-1570
<b>Mean Std. Dev.</b>	3 (1998)	0.06 ±0.00	8.9 ±0.9	888 ±26	1.3 ±0.0	0.15 ±0.02	79.9 ±4.7	36.5 ±1.6	0.060 ±0.003	904 ±92
<b>Range</b>		0.05-0.07	7.4-11.2	846-925	1.2-1.4	0.12-0.18	69.0-85.7	33.0-38.0	0.056-0.066	687-981

<b>Mean Std. Dev.</b>	4 (1998)	0.06 ±0.01	8.4 ±1.6	850 ±22	1.3 ±0.0	0.15 ±0.01	78.9 ±3.0	32.7 ±1.4	0.065 ±0.003	908 ±169
<b>Range</b>		0.05-0.07	6.0-11.1	808-900	1.2-1.4	0.13-0.17	71.8-84.0	30.9-34.4	0.062- 0.068	689-1209
<b>Mean Std. Dev.</b>	Avg. of 0,1, 2, 3 and 4 (excluding AC)	0.07 ±0.02	9.1 ±2.6	826 ±81	1.2 ±0.1	0.14 ±0.00	71.0 ±11.0	34.5 ±6.8	0.056 ±0.020	907 ±208
<b>Range</b>		0.01-0.13	2.5-16.0	518-964	0.9-1.5	0.04-0.23	44.5-95.3	19.9-52.0	0.022-0.125	564-2140

**Table 3-10: Means, Standard Deviations and Ranges of Values for Metals, Total Organic Carbon (TOC), Sand, Silt and Clay for Surficial (0-2 cm) Sediments from Zones AC, 0, 1, 2, 3 and 4 in Outermost Cook Inlet and the Shelikof Strait (continued)**

	<b>Zone (Year)</b>	<b>Ni (µg/g)</b>	<b>Pb (µg/g)</b>	<b>Sb (µg/g)</b>	<b>Se (µg/g)</b>	<b>Sn (µg/g)</b>	<b>Tl (µg/g)</b>	<b>V (µg/g)</b>	<b>Zn (µg/g)</b>
<b>Mean Std. Dev.</b>	AC (1998)	51.9 ±0.9	14.6 ±0.4	0.59 ±0.02	0.36 ±0.03	1.40 ±0.06	0.37 ±0.01	176 ±4	121 ±5
<b>Range</b>		51.1-52.9	14.2-15.0	0.57-0.61	0.33-0.38	1.33-1.44	0.36-0.37	171-179	116-126
<b>Mean Std. Dev.</b>	0 (1997)	33.5 7.9	11.0 ±2.2	0.90 ±0.36	0.20 ±0.10	1.50 ±0.30	0.41 ±0.04	126 ±26	100 ±20
<b>Range</b>		24.7-51.4	7.3-14.5	0.46-1.74	0.05-0.35	1.01-1.91	0.32-0.49	87.0-180	64.8-132
<b>Mean Std. Dev.</b>	0 (1998)	36.1 8.0	11.2 ±2.3	0.87 ±0.34	0.26 ±0.12	1.18 ±0.31	0.42 ±0.05	132 ±23	93.8 ±19.2
<b>Range</b>		25.9-49.9	8.0-14.0	0.48-1.53	0.14-0.55	0.71-1.53	0.34-0.51	89.3-173	66.0-125
<b>Mean Std. Dev.</b>	1 (1997)	30.8 ±5.3	12.0 ±1.2 9.6-13.7	0.84 ±0.14	0.25 ±0.11	1.62 ±0.20	0.42 ±0.03	126 ±11	98.4 ±12.4
<b>Range</b>		22.9-39.9		0.63-1.08	0.10-0.53	1.14-1.96	0.34-0.48	106-141	77.7-117
<b>Mean Std. Dev.</b>	1 (1998)	32.1 ±4.2	11.7 ±1.3	0.81 ±0.14	0.24 ±0.07	1.38 ±0.28	0.41 ±0.05	127 ±10	93.3 ±14.5
<b>Range</b>		26.1-38.6	10.0-13.8	0.64-1.11	0.13-0.33	1.00-1.75	0.33-0.50	111-145	73.8-118
<b>Mean Std. Dev.</b>	2 (1997)	35.1 ±3.8	13.7 ±0.7	0.98 ±0.07	0.38 ±0.08	1.73 ±0.08	0.47 ±0.03	143 ±10	115 ±7
<b>Range</b>		27.7-40.7	12.0-14.9	0.80-1.11	0.22-0.56	1.51-1.87	0.40-0.50	119-159	100-127
<b>Mean Std. Dev.</b>	2 (1998)	37.3 ±4.0	13.8 ±0.7	1.02 ±0.05	0.24 ±0.11	1.60 ±0.15	0.46 ±0.02	151 ±8	119 ±3.1
<b>Range</b>		29.1-41.7	11.7-14.8	0.82-1.08	0.10-0.42	1.38-1.80	0.39-0.50	94.3-167	85.1-124
<b>Mean Std. Dev.</b>	3 (1997)	38.5 ±1.1	14.0 ±0.3	1.16 ±0.03	0.33 ±0.05	1.83 ±0.06	0.47 ±0.02	144 ±7	126 ±2
<b>Range</b>		35.4-39.9	13.1-14.8	1.06-1.22	0.25-0.42	1.75-1.95	0.44-0.52	129-154	122-133

<b>Mean Std. Dev.</b>	3 (1998)	38.6 ±1.4	14.4 ±0.4	1.08 ±0.06	0.24 ±0.03	1.73 ±0.05	0.50 ±0.02	153 ±5	121 ±4
<b>Range</b>		35.6-40.1	13.6-14.8	0.95-1.14	0.20-0.30	1.64-1.80	0.47-0.52	144-160	114-126
<b>Mean Std. Dev.</b>	4 (1998)	37.4 ±2.4	14.2 ±0.3	1.03 ±0.07	0.24 ±0.05	1.59 ±0.04	0.46 ±0.01	144 ±3	117 ±4
<b>Range</b>		33.6-40.9	13.8-14.9	0.90-1.15	0.16-0.30	1.38-1.73	0.44-0.47	137-153	111-123
<b>Mean Std. Dev.</b>	Avg. of 0,1, 2, 3 and 4 (excluding AC)	35.1 ±5.7	12.8 ±1.7	0.97 ±0.22	0.29 ±0.10	1.60 ±0.24	0.44 ±0.04	137 ±18	109 ±16
<b>Range</b>		21.6-51.4	7.3-14.9	0.47-1.74	0.05-0.56	0.71-1.96	0.32-0.52	87.0-180	66.0-133

**Table 3-11: Average Metal Concentrations in Surficial Sediments from Zones AC, 0, 1, 2, 3, and 4 in Outermost Cook Inlet and the Shelikof Strait, Average Continental Crust (Wedepohl, 1995) and Average Concentrations for Bottom Sediment from the Susitna and Copper Rivers**

Metal (µg/g)*	All Zones in Study Area			Continental Crust	Susitna and Copper Rivers
	<u>1997</u>	<u>1998</u>	<u>1997-1998</u>		
Ag	0.08	0.05	0.07	0.07	0.12
Al	7.29%	7.75%	7.45%	7.96%	6.94%
As	9.1	8.8	9.1	1.7	8.2
Ba	823	819	826	584	789
Be	1.2	1.2	1.2	2.4	1.23
Cd	0.12	0.12	0.12	0.10	0.20
Cr	69.1	74.8	71.0	126	66.6
Cu	34.5	33.6	34.5	25	38.9
Fe	4.15%	4.30%	4.18%	4.32%	3.47%
Hg	0.054	0.060	0.056	0.040	0.038
Mn	905	893	907	716	759
Ni	34.3	37.0	35.1	56	37.6
Pb	12.6	13.0	12.8	14.8	0.8
Sb	0.96	0.94	0.97	0.30	0.94
Se	0.29	0.28	0.29	0.12	0.2
Sn	1.66	1.46	1.60	2.3	1.67
Tl	0.44	0.44	0.44	0.52	0.36
V	134	141	137	98	119
Zn	109	108	109	65	73.7

Notes:

\*Concentrations in µg/g, except where noted.

**Table 3-12: Groupings of Metals in Surficial Sediments from Zones 0, 1, 2, 3 and 4 in Outermost Cook Inlet and the Shelikof Strait Based on Coefficient of Variation**

<b>Coefficient of Variation</b>	<b>Metal</b>
≤10%	Al, Ba, K, Tl
>10-20%	Be, Cr, Cu, Fe, Mg, Ni, Pb, Sn, V, Zn
>20-30%	As, Ca, Cd, Mn, Sb
>30%	Ag, Hg, Se



**Table 3-13: Results of the Student Newman Keuls Statistical Test Performed on Metal/Fe Ratios from Surficial Sediments in Zones 0, 1, 2 and 3**

<b>1997 SNK Grouping</b>					
<b>Metal</b>	<b>Zone 0</b>	<b>Zone 1</b>	<b>Zone 2</b>	<b>Zone 3</b>	<b># of Groups</b>
Ag	A	A	A	A	1
As	A	B	A/B	B	2
Ba	B	A	A/B	B	2
Be	B	A/B	C	A	3
Cd	C	B/C	A/B	A	3
Cr	A/B	B	A	A/B	2
Cu	A/B	B	A	A/B	2
Hg	A	B	A/B	A/B	2
Pb	B	A	A	A	2
Mn	A	A	A	A	1
Ni	A	A	A	A	1
Sb	B	B	B	A	2
Se	C	B/C	A	B	3
Sn	B	A	A	A	2
Tl	A	A	A	A	1
V	B	B	A	B	2
Zn	B	B	A	A	2
<b>1997 and 1998 Combined Data SNK Grouping</b>					
<b>Metal</b>	<b>Zone 0</b>	<b>Zone 1</b>	<b>Zone 2</b>	<b>Zone 3</b>	<b># of Groups</b>
Ag	A	A	A	A	1
As	A	A	A	A	1
Ba	A	A	A	A	1
Be	A	A	A	A	1
Cd	B	A/B	A/B	A	2
Cr	A	A	A	A	1
Cu	A	A	A	A	1
Hg	A	A	A	A	1
Pb	A	A	A	A	1
Mn	A/B	A	A/B	B	2
Ni	A	A	A	A	1
Sb	A	A	A	A	1
Se	A	A	A	A	1
Sn	B	A/B	A/B	A	2
Tl	A	A	A	A	1
V	A	A	A	A	1
Zn	B	A/B	A/B	A	2

**Table 3-14: Percent Survival of *Eohaustorius estuarius* in the Sediment for Toxicity Tests**

1997 Sediment Site	Percent Survival in Test Replicates				Mean Percent Survival
	Rep A	Rep B	Rep C	Rep D	
<b>Home Control</b>	<b>95</b>	<b>100</b>	<b>90</b>	<b>100</b>	<b>96.25</b>
<b>Z0F1</b>	65	75	65	75	70 <sup>†*</sup>
<b>Z0F2</b>	95	90	100	90	93.75
<b>Z0F4</b>	95	85	100	85	91.25
<b>Z0F5</b>	100	90	85	85	90
<b>Z0F6</b>	90	70	70	70	75 <sup>†*</sup>
<b>Z0F8</b>	85	85	80	75	81.25 <sup>†</sup>
<b>Z0F13</b>	95	85	100	90	92.5
<b>Z0F14</b>	85	95	90	85	88.75 <sup>†</sup>
<b>Z1F1</b>	100	90	90	95	93.75
<b>Z1F2</b>	75	75	85	85	80 <sup>†</sup>
<b>Z1R07</b>	80	90	90	90	87.5 <sup>†</sup>
<b>Z1R13</b>	90	75	85	80	82.5 <sup>†</sup>
<b>Z2F1</b>	75	70	80	85	77.5 <sup>†*</sup>
<b>Z2F2</b>	60	70	50	75	63.75 <sup>†*</sup>
<b>Z2R01</b>	75	85	80	75	78.75 <sup>†*</sup>
<b>Z2R13</b>	80	80	70	90	80 <sup>†</sup>
<b>Z3F1</b>	80	70	70	75	73.75 <sup>†*</sup>
<b>Z3F2</b>	65	70	80	70	71.25 <sup>†*</sup>
<b>Z3R11</b>	70	40	60	55	56.25 <sup>†*</sup>
<b>Z3R14</b>	55	60	70	55	60 <sup>†*</sup>

<sup>†</sup> Statistical analysis indicates that amphipod survival at this site was significantly less than the 'home' control at  $p < 0.05$ .

\* Sites at which mean survival was less than 80% of mean Control survival.

See Appendix A for results of grain size analyses.

**Table 3-15: Percent Survival of *Ampelisca abdita* in the Sediment for Toxicity Tests**

1998 Sediment Site	Percent Survival in Test Replicates				Mean Percent Survival
	Rep A	Rep B	Rep C	Rep D	
<b>Home Control</b>	100	100	100	100	100
<b>Reference Control</b>	90	90	90	95	91.25
<b>Z0F1</b>	100	95	85	90	92.5 <sup>†</sup>
<b>Z0F6</b>	90	85	95	90	90 <sup>†</sup>
<b>Z2F1</b>	95	85	95	100	93.75
<b>Z3F1</b>	95	90	100	95	95 <sup>†</sup>
<b>Z3F2</b>	95	85	90	95	91.25 <sup>†</sup>
<b>Z3R11</b>	100	90	90	100	95
<b>Z3R14</b>	95	100	90	95	95 <sup>†</sup>

<sup>†</sup> Statistical analysis indicates that amphipod survival at this site was significantly less than the 'home' control at  $p < 0.05$ , but not significantly different than the 'reference' sediment at  $p < 0.05$ .  
See Appendix A for results of grain size analyses.