

CHAPTER IV

RESULTS

A 200 fold increase in concentration of all elements above the normal level could be obtained by the preconcentration procedure described in Section 3.5. If the detection limit of an element is x ppm, the minimum amount of the element in 1 dm^3 of sample must therefore be $\frac{10x}{2} \mu\text{g}$, which is equivalent to a concentration of $\frac{10x}{2}$ ppb. This means that the element could not be detected by this technique if its concentration in the sample is lower than this limit ($\frac{10x}{2}$ ppb). The minimum concentration of the six elements under investigation are reported in Table 4-1 in comparison to their limits of detection .

Table 4-1 The detection limit and the minimum concentration of the elements Ag, Hg, Cu, Pb, Cd and Co.

Element	detection limit (ppm)	minimum concentration (ppb)
Ag	0.033	0.165
Hg	8.421	42.105
Cu	0.072	0.360
Pb	0.383	1.915
Cd	0.027	0.135
Co	0.098	0.490

All the 24 samples were processed as described in Section 3.5. The absorbance of each fraction was measured and the concentration was read from the calibration curve which was prepared for each series of measurements. The absorbance of each fraction was measured repeatedly for 6 times on a single day and remeasured 6 times a couple of days later. This was to prevent any instrumental or personal error which might take place. The standard deviation from the twelve measurements was then calculated. The absorbances and their equivalent concentrations of the 24 samples are tabulated in Tables 4-2 to 4-16. The concentration of an element in a sample would be $\frac{10y}{2}$ ppb, if y in ppm represents the concentration of the sample as read from the calibration curve. The chemical yield of the preconcentration procedure was assumed to be quantitative. From the Tables it could be observed that, the concentrations of Hg in the samples were all too low to be detected via this technique. This is mainly governed by the detection limit of the instrument. In the case of Cd, Co and Ag, very low concentrations, corresponding to absorbance below 0.0269 (94 % T), were measured. For such low concentration the precision is naturally lower, especially in this case, where the scale expansion unit was not in normal function as already mentioned in Section 3.2.2. The standard deviations for the results of Co and Ag were hence large. In some sample

a relative standard deviation of as much as 85 % was obtained. The precision for the determination of Cu and Pb was much better. A relative standard deviation of about 10 % was generally attained. The concentrations of Ag, Hg, Cu, Pb, Cd and Co in the 24 samples were retabulated in Tables 4-17 to 4-19.

Table 4-2 Concentration of Ag (Sample collected on June 18, 1974)

No. of experiment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0044	0.27	0	0	0	0	0	0	0.0022	0.15	0	0	0	0	0.0044	0.20
2	0.0088	0.53	0	0	0	0	0.0044	0.20	0	0	0	0	0.0022	0.15	0.0044	0.20
3	0.0132	0.77	0	0	0	0	0	0	0.0022	0.15	0	0	0.0044	0.23	0	0
4	0.0044	0.27	0	0	0	0	0	0	0	0	0	0	0.0044	0.23	0.0066	0.33
5	0.0044	0.27	0	0	0	0	0	0	0.0066	0.40	0	0	0.0044	0.23	0	0
6	0.0088	0.53	0	0	0	0	0.0044	0.20	0.0044	0.25	0	0	0.0022	0.15	0.0022	0.10
7*	0.0044	0.20	0.0044	0.25	0	0	0	0	0.0044	0.22	0.0044	0.35	0.0044	0.35	0.0022	0.25
8*	0.0088	0.40	0	0	0	0	0	0	0.0066	0.35	0.0022	0.23	0	0	0.0022	0.25
9*	0.0044	0.20	0.0044	0.25	0	0	0	0	0.0044	0.22	0	0	0.0022	0.23	0	0
10*	0.0132	0.80	0.0044	0.25	0	0	0.0044	0.23	0.0088	0.42	0	0	0	0	0.0044	0.38
11*	0.0088	0.40	0	0	0	0	0.0022	0.15	0.0066	0.35	0.0022	0.23	0.0022	0.23	0	0
12*	0.0044	0.20	0	0	0	0	0	0	0.0044	0.22	0.0022	0.23	0.0044	0.35	0.0022	0.25
		0.40 ±0.21		N		N		N		0.23 ±0.14		N		0.18 ±0.12		0.16 ±0.14

Note : measurements with asterisk represent replicate measurements on other day

A = sample collected from Samut Prakan

B = sample collected from Bangkok Bridge (Bangkok)

C = sample collected from Ban Sai Ma (Nonthaburi)

D = sample collected from Nonthaburi Bridge (Pathumthani)

N = concentration which was lower than the detection limit

Table 4-3 Concentration of Ag (Sample collected on August 18, 1974)

No. of experiment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0177	1.00	0	0	0	0	0.0044	0.20	0	0	0	0	0.0066	0.38	0.0066	0.33
2	0.0132	0.77	0	0	0	0	0.0044	0.20	0.0044	0.25	0.0022	0.13	0.0022	0.15	0.0044	0.20
3	0.0177	1.00	0	0	0	0	0	0	0	0	0.0022	0.13	0.0044	0.23	0.0022	0.10
4	0.0132	0.77	0	0	0	0	0	0			0	0	0.0044	0.23	0.0044	0.20
5	0.0110	0.63	0	0	0	0	0	0	0.0044	0.25	0.0022	0.13	0.0044	0.23	0.0022	0.20
6	0.0177	1.00	0	0	0	0	0.0044	0.20	0	0	0.0022	0.13	0	0	0.0066	0.33
7*	0.0177	0.88	0	0	0.0088	0.50	0	0	0.0022	0.15	0	0	0.0044	0.35	0	0
8*	0.0132	0.70	0	0	0.0066	0.40	0	0	0.0044	0.22	0.0044	0.35	0.0022	0.23	0	0
9*	0.0177	0.88	0	0	0.0022	0.13	0.0044	0.23	0	0	0.0044	0.35	0.0044	0.23	0.0022	0.25
10*	0.0155	0.75	0	0	0.0022	0.13	0	0	0	0	0.0022	0.23	0.0022	0.23	0.0044	0.38
11*	0.0132	0.70	0	0	0	0	0	0	0	0	0.0022	0.23	0.0022	0.23	0.0022	0.25
12*	0.0132	0.70	0	0	0	0	0	0	0.0044	0.22	0.0044	0.35	0	0	0	0
		0.81 ±0.13		N		N		N		N		0.17 ±0.12		0.22 ±0.12		0.18 ±0.14

Table 4-4 Concentration of Ag (Sample collected on August 24, 1974)

No. of experiment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0066	0.33
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0044	0.20
3	0	0	0	0	0	0	0	0	0	0	0	0	0.0044	0.23	0.0022	0.10
4	0	0	0	0	0	0	0.0044	0.20	0	0	0	0	0.0044	0.23	0.0044	0.10
5	0	0	0	0	0	0	0	0	0	0	0	0	0.0022	0.23	0.0088	0.43
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0066	0.33
7*	0.0044	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0.0044	0.38
8*	0.0066	0.30	0.0022	0.15	0	0	0	0	0.0044	0.22	0	0	0	0	0.0022	0.25
9*	0	0	0	0	0.0044	0.25	0	0	0.0044	0.22	0	0	0.0022	0.23	0.0044	0.38
10*	0.0044	0.20	0	0	0.0022	0.13	0.0044	0.23	0	0	0	0	0.0022	0.23	0.0044	0.38
11*	0	0	0.0044	0.25	0	0	0	0	0.0044	0.22	0	0	0	0	0.0022	0.25
12*	0.0044	0.20	0.0022	0.15	0	0	0	0	0.0044	0.22	0	0	0	0	0	0
		N		N		N		N		N		N		N		0.27 ±0.10

Table 4-5 Concentration of Cu (Sample collected on June 18, 1974)

No. of experi- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0942	7.88	0.0915	6.19	0.0690	6.00	0.0969	8.13	0.1707	12.13	0.1079	6.31	0.0458	3.41	0.0506	3.81
2	0.1024	8.56	0.0969	6.63	0.0888	5.50	0.0915	7.63	0.1675	11.88	0.1024	5.97	0.0434	3.22	0.0605	4.56
3	0.0969	8.13	0.0888	6.06	0.0915	5.63	0.0888	7.44	0.1739	12.38	0.1051	6.16	0.0410	3.06	0.0555	4.19
4	0.0996	8.31	0.0862	5.88	0.0862	5.31	0.0915	7.63	0.1675	11.88	0.1079	6.31	0.0434	3.22	0.0506	3.81
5	0.1024	8.56	0.0969	6.63	0.0809	5.00	0.0888	7.44	0.1707	12.13	0.1107	6.53	0.0458	3.41	0.0555	4.19
6	0.1024	8.56	0.0915	6.19	0.0862	5.31	0.0915	7.63	0.1805	12.81	0.1135	6.69	0.0458	3.41	0.0655	4.91
7*	0.0915	7.63	0.0757	5.01	0.0969	5.69	0.0809	6.00	0.1487	11.06	0.1051	6.94	0.0458	3.28	0.0580	3.81
8*	0.0969	8.13	0.0783	5.56	0.0915	5.38	0.0757	5.63	0.1427	10.63	0.1107	7.31	0.0482	3.44	0.0630	4.19
9*	0.0915	7.63	0.0757	5.01	0.0942	5.53	0.0783	5.78	0.1487	10.88	0.1024	6.75	0.0458	3.28	0.0605	3.94
10*	0.0915	7.63	0.0862	6.13	0.0996	5.84	0.0731	5.37	0.1549	11.50	0.1024	6.75	0.0482	3.44	0.0655	4.31
11*	0.0862	7.19	0.0862	6.13	0.0942	5.53	0.0757	5.63	0.1457	10.88	0.1051	6.94	0.0482	3.44	0.0630	4.19
12*	0.0915	7.63	0.0757	5.01	0.0969	5.69	0.0731	5.38	0.1427	10.63	0.1079	7.13	0.0458	3.28	0.0630	4.19
		7.98		5.87		5.53		6.64		11.56		6.65		3.32		4.18
		±0.46		±0.61		±0.28		±1.08		±0.74		±0.40		±0.12		±0.32

Table 4-6 Concentration of Cu (Sample collected on August 18, 1974)

No. of experi- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0757	6.31	0.1221	8.31	0.0757	4.69	0.0809	6.75	0.1487	10.56	0.1549	9.00	0.0915	6.75	0.0969	7.28
2	0.0809	6.81	0.1192	8.13	0.0757	4.69	0.0809	6.75	0.1427	10.13	0.1549	9.00	0.0862	6.38	0.0915	6.81
3	0.0835	7.00	0.1249	8.56	0.0809	5.00	0.0706	5.94	0.1457	10.31	0.1580	9.25	0.0835	6.16	0.0942	7.00
4	0.0809	6.81	0.1163	7.88	0.0757	4.69	0.0757	6.31	0.1457	10.31	0.1675	9.81	0.0888	6.56	0.1024	7.63
5	0.0862	7.25	0.1192	8.13	0.0706	4.44	0.0809	6.75	0.1427	10.13	0.1675	9.81	0.0862	6.38	0.0969	7.28
6	0.0809	6.81	0.1249	8.56	0.0757	4.69	0.0757	6.31	0.1487	10.56	0.1643	8.69	0.0888	6.56	0.0942	7.00
7*	0.0809	6.75	0.1051	7.44	0.0731	4.31	0.0605	4.50	0.1221	9.13	0.1549	10.06	0.0969	6.38	0.0969	6.41
8*	0.0757	6.25	0.1079	7.69	0.0706	4.19	0.0630	4.69	0.1192	8.81	0.1580	10.31	0.0996	6.56	0.0915	6.03
9*	0.0809	6.75	0.1024	7.31	0.0757	4.44	0.0655	4.88	0.1135	8.44	0.1518	10.00	0.0996	6.56	0.0996	6.56
10*	0.0757	6.25	0.1135	8.06	0.0757	4.44	0.0680	5.00	0.1163	8.13	0.1518	10.00	0.0969	6.38	0.0969	6.41
11*	0.0862	7.19	0.1107	7.81	0.0706	4.19	0.0655	4.88	0.1192	8.81	0.1518	10.00	0.1079	7.13	0.0969	6.41
12*	0.0809	6.75	0.1135	8.06	0.0731	4.31	0.0605	4.50	0.1163	8.13	0.1487	9.81	0.1051	6.94	0.0942	6.19
		6.75		7.99		4.51		5.60		9.45		9.65		6.56		6.75
		±0.33		±0.39		±0.25		±0.94		±1.09		±0.52		±0.27		±0.49

Table 4-7 Concentration of Cu (Sample collected on August 24, 1974)

No. of experi- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.1367	11.44	0.0809	5.44	0.0605	3.75	0.0809	6.75	0.3468	18.63	0.1367	8.00	0.0757	5.59	0.0757	5.69
2	0.1308	11.00	0.0862	5.81	0.0655	4.06	0.0757	6.31	0.3468	18.63	0.1487	8.75	0.0731	5.41	0.0783	5.88
3	0.1367	11.44	0.0835	5.63	0.0630	3.88	0.0655	5.50	0.3565	19.13	0.1427	8.38	0.0706	5.25	0.0757	5.69
4	0.1427	11.94	0.0809	5.44	0.0605	3.75	0.0706	5.94	0.3468	18.63	0.1457	8.56	0.0706	5.25	0.0809	6.06
5	0.1427	11.94	0.0835	5.63	0.0605	3.75	0.0706	5.94	0.3516	19.00	0.1427	8.38	0.0757	5.59	0.0757	5.69
6	0.1427	11.94	0.0862	5.81	0.0655	4.06	0.0731	6.13	0.3468	18.63	0.1487	8.75	0.0731	5.41	0.0783	5.89
7*	0.1249	10.38	0.0862	6.19	0.0630	3.72	0.0605	4.81	0.3325	19.88	0.1337	8.81	0.0862	5.69	0.0731	5.19
8*	0.1221	10.06	0.0809	5.75	0.0605	3.56	0.0655	5.19	0.3279	19.75	0.1308	8.63	0.0809	5.38	0.0757	5.38
9*	0.1278	10.63	0.0862	6.19	0.0580	3.44	0.0680	5.38	0.3372	20.13	0.1367	9.06	0.0835	5.50	0.0809	5.75
10*	0.1249	10.38	0.0835	5.88	0.0580	3.44	0.0680	5.38	0.3279	19.75	0.1308	8.63	0.0862	5.69	0.0757	5.38
11*	0.1192	9.94	0.0809	5.75	0.0555	3.28	0.0655	5.19	0.3325	19.88	0.1337	8.81	0.0835	5.50	0.0757	5.38
12*	0.1192	9.94	0.0835	5.88	0.0605	3.56	0.0630	5.00	0.3325	19.88	0.1367	9.06	0.0835	5.50	0.0835	5.88
		10.92 ±0.80		5.78 ±0.25		3.69 ±0.24		5.63 ±0.59		19.32 ±0.60		8.65 ±0.30		5.48 ±0.15		5.65 ±0.27



Table 4-8 Concentration of Pb (Sample collected on June 18, 1974)

No. of experi- ment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.1249	22.00	0.2007	33.25	0.0862	15.63	0.1427	24.50	0.0862	15.50	0.1549	24.50	0.0555	15.13	0.0915	18.06
2	0.1367	24.00	0.1871	31.50	0.0862	15.63	0.1367	23.50	0.0915	16.38	0.1518	24.00	0.0506	14.00	0.0835	16.50
3	0.1308	23.00	0.1871	31.50	0.0915	16.50	0.1391	24.00	0.0888	15.94	0.1487	23.25	0.0531	14.63	0.0915	18.06
4	0.1367	24.00	0.1805	30.00	0.0915	16.50	0.1308	22.75	0.0969	17.19	0.1487	23.25	0.0580	15.88	0.0942	18.63
5	0.1249	23.00	0.1938	32.25	0.0862	15.63	0.1367	23.50	0.1024	17.28	0.1518	24.00	0.0555	15.13	0.0862	17.06
6	0.1278	22.50	0.1871	31.50	0.0969	17.50	0.1427	22.25	0.0942	16.88	0.1549	24.50	0.0555	15.13	0.0888	17.63
7*	0.1367	25.50	0.1938	33.00	0.1024	16.25	0.1192	25.00	0.0809	16.06	0.1612	24.50	0.0809	12.75	0.1163	18.38
8*	0.1367	25.50	0.2007	34.00	0.1107	17.63	0.1249	26.00	0.0783	15.50	0.1549	23.75	0.0862	13.63	0.1135	17.88
9*	0.1249	23.25	0.1904	32.50	0.1079	17.00	0.1221	25.75	0.0757	14.94	0.1580	24.25	0.0835	13.25	0.1107	17.56
10*	0.1308	24.38	0.2007	34.00	0.1079	17.00	0.1192	25.00	0.0862	17.13	0.1643	25.00	0.0809	12.75	0.1192	18.88
11*	0.1308	24.38	0.1871	32.00	0.1024	16.25	0.1163	24.75	0.0835	16.5	0.1612	24.50	0.0783	12.38	0.1135	17.88
12*	0.1249	23.25	0.1904	32.50	0.1024	16.25	0.1278	26.75	0.0809	16.06	0.1612	24.50	0.0809	12.75	0.1163	18.38
		23.65		32.33		16.48		24.48		16.28		24.1		13.95		17.91
		±1.19		±0.69		±0.69		±1.38		±0.75		±0.54		±1.19		±0.56

Table 4-9 Concentration of Pb (Sample collected on August 18, 1974)

No. of exper- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.1427	25.13	0.1805	30.50	0.0969	17.50	0.1249	21.75	0.0410	7.38	0.1805	28.00	0.0757	20.75	0.1612	28.75
2	0.1427	25.13	0.1739	29.25	0.1024	18.38	0.1163	20.50	0.0410	7.38	0.1838	28.25	0.0783	21.50	0.1675	29.75
3	0.1427	25.13	0.1805	30.50	0.0862	15.63	0.1192	21.00	0.0362	6.50	0.1739	26.75	0.0809	22.25	0.1643	29.25
4	0.1397	24.38	0.1805	30.50	0.1079	19.50	0.1249	21.75	0.0362	6.50	0.1772	27.50	0.0757	20.75	0.1612	28.75
5	0.1367	24.06	0.1612	27.50	0.1024	18.38	0.1278	22.25	0.0362	6.50	0.1805	28.00	0.0783	21.50	0.1643	29.25
6	0.1367	24.06	0.1739	29.25	0.1024	18.38	0.1192	21.00	0.0339	6.19	0.1739	26.75	0.0731	20.00	0.1612	28.75
7*	0.1249	23.25	0.1871	32.00	0.0969	15.38	0.1024	22.50	0.0410	7.75	0.1805	27.25	0.1135	17.98	0.1739	26.50
8*	0.1308	24.38	0.1805	31.00	0.1024	16.13	0.0969	21.25	0.0362	6.88	0.1871	28.25	0.1163	18.38	0.1871	28.25
9*	0.1249	23.25	0.1739	30.00	0.0862	13.75	0.0996	21.75	0.0458	8.63	0.1838	27.75	0.1192	18.88	0.1805	27.25
10*	0.1308	24.38	0.1871	32.00	0.1079	17.13	0.0969	21.25	0.0386	7.38	0.1739	26.25	0.1135	17.98	0.1772	27.00
11*	0.1192	22.00	0.1805	31.00	0.1024	16.13	0.0969	21.25	0.0458	8.63	0.1805	27.25	0.1107	17.56	0.1838	29.25
12*	0.1308	24.38	0.1739	30.00	0.1024	16.13	0.1024	22.50	0.0362	6.88	0.1772	26.75	0.1079	17.00	0.1772	27.00
		24.13		30.29		16.87		21.56		7.21		27.40		19.54		28.31
		±0.92		±1.25		±1.61		±0.63		±0.81		±0.67		±1.83		±1.01

Table 4-10 Concentration of Pb (Sample collected on August 24, 1974)

No. of experi- ment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0269	4.88	0.1739	29.75	0.1249	22.63	0.1739	29.25	0.0915	16.38	0.1549	24.50	0.0605	16.63	0.0706	14.13
2	0.0223	4.00	0.1675	28.50	0.1163	20.88	0.1805	30.00	0.0862	15.50	0.1612	25.25	0.0580	16.00	0.0680	13.50
3	0.0269	4.88	0.1675	28.50	0.1135	20.44	0.1772	29.50	0.0862	15.50	0.1675	26.25	0.0605	16.63	0.0757	15.00
4	0.0223	4.00	0.1612	27.50	0.1221	22.00	0.1612	27.25	0.0888	15.75	0.1487	23.50	0.0630	17.38	0.0655	13.00
5	0.0292	5.13	0.1707	29.00	0.1192	21.50	0.1612	27.25	0.0888	15.75	0.1427	22.75	0.0655	18.00	0.0680	13.50
6	0.0313	5.69	0.1739	29.75	0.1192	21.50	0.1675	28.25	0.0862	15.50	0.1487	23.50	0.0605	16.63	0.0655	13.00
7*	0.0223	4.38	0.1675	29.25	0.1249	19.88	0.1367	28.25	0.1079	21.25	0.1675	25.50	0.0969	15.38	0.0835	13.19
8*	0.0246	4.81	0.1805	31.00	0.1163	18.44	0.1367	28.25	0.1024	20.13	0.1643	25.25	0.0915	13.38	0.0809	12.28
9*	0.0223	4.38	0.1805	31.00	0.1135	17.69	0.1308	27.50	0.1024	20.13	0.1487	23.00	0.0942	13.63	0.0835	13.19
10*	0.0246	4.81	0.1739	30.00	0.1221	17.75	0.1308	27.50	0.0969	18.50	0.1612	26.50	0.0888	12.88	0.0862	13.63
11*	0.0223	4.38	0.1675	29.25	0.1192	18.94	0.1337	27.75	0.1024	20.13	0.1549	24.75	0.0969	15.38	0.0809	12.88
12*	0.0269	5.19	0.1805	31.00	0.1192	18.94	0.1278	27.00	0.1024	20.13	0.1675	25.50	0.0942	13.63	0.0783	12.38
		4.71		29.54		20.05		28.15		17.88		24.69		15.46		13.35
		±0.50		±1.11		±1.69		±0.97		±2.34		±1.25		±1.77		±0.68

Table 4-11 Concentration of Cd (Sample collected on June 18, 1974)

No. of experi- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0088	0.18	0.0269	0.88	0.0088	0.20	0.0269	0.58	0.0223	0.48	0.0177	0.48	0.0177	0.38	0.0132	0.28
2	0.0177	0.35	0.0223	0.73	0.0044	0.11	0.0269	0.58	0.0200	0.43	0.0223	0.44	0.0155	0.33	0.0110	0.23
3	0.0177	0.35	0.0246	0.75	0.0044	0.11	0.0223	0.48	0.0223	0.48	0.0132	0.25	0.0177	0.38	0.0132	0.28
4	0.0177	0.35	0.0223	0.73	0.0088	0.20	0.0200	0.43	0.0246	0.54	0.0223	0.44	0.0177	0.38	0.0088	0.18
5	0.0088	0.18	0.0200	0.65	0.0044	0.11	0.0223	0.48	0.0223	0.48	0.0200	0.39	0.0177	0.38	0.0110	0.23
6	0.0110	0.23	0.0223	0.73	0.0110	0.25	0.0269	0.58	0.0200	0.43	0.0223	0.44	0.0200	0.43	0.0132	0.28
7*	0.0155	0.33	0.0269	0.59	0.0132	0.25	0.0223	0.48	0.0315	0.65	0.0110	0.25	0.0132	0.30	0.0088	0.21
8*	0.0132	0.28	0.0315	0.68	0.0110	0.21	0.0246	0.53	0.0246	0.53	0.0132	0.30	0.0155	0.35	0.0110	0.25
9*	0.0155	0.33	0.0315	0.68	0.0132	0.25	0.0223	0.48	0.0292	0.61	0.0177	0.40	0.0132	0.30	0.0088	0.21
10*	0.0132	0.28	0.0315	0.68	0.0088	0.18	0.0246	0.53	0.0269	0.58	0.0200	0.45	0.0155	0.35	0.0066	0.15
11*	0.0132	0.28	0.0339	0.73	0.0110	0.21	0.0246	0.53	0.0223	0.46	0.0132	0.30	0.0132	0.30	0.0066	0.15
12*	0.0110	0.25	0.0362	0.79	0.0132	0.25	0.0269	0.58	0.0269	0.58	0.0155	0.35	0.0200	0.45	0.0132	0.30
		0.28 ±0.05		0.72 ±0.07		0.20 ±0.06		0.52 ±0.05		0.52 ±0.07		0.37 ±0.09		0.36 ±0.05		0.23 ±0.05

Table 4-12 Concentration of Cd (Sample collected on August 18, 1974)

No. of experi- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0506	1.01	0.0132	0.43	0.0177	0.39	0.0269	0.58	0.0044	0.08	0.0110	0.21	0.0132	0.28	0.0200	0.43
2	0.0506	1.01	0.0155	0.50	0.0044	0.11	0.0246	0.53	0.0088	0.18	0.0132	0.25	0.0132	0.28	0.0177	0.36
3	0.0506	1.01	0.0155	0.50	0.0088	0.20	0.0177	0.38	0.0132	0.28	0.0132	0.25	0.0132	0.28	0.0200	0.43
4	0.0555	1.11	0.0177	0.58	0.0132	0.30	0.0223	0.48	0.0088	0.18	0.0110	0.21	0.0155	0.33	0.0177	0.36
5	0.0555	1.11	0.0088	0.28	0.0088	0.20	0.0200	0.43	0.0110	0.24	0.0088	0.18	0.0155	0.33	0.0155	0.33
6	0.0482	0.96	0.0110	0.35	0.0132	0.30	0.0177	0.38	0.0110	0.24	0.0177	0.48	0.0177	0.38	0.0132	0.28
7*	0.0410	0.88	0.0132	0.28	0.0132	0.25	0.0177	0.38	0.0110	0.24	0.0088	0.19	0.0110	0.25	0.0132	0.30
8*	0.0410	0.88	0.0177	0.39	0.0110	0.21	0.0155	0.33	0.0132	0.28	0.0132	0.30	0.0088	0.20	0.0088	0.21
9*	0.0458	0.98	0.0132	0.28	0.0155	0.30	0.0177	0.38	0.0155	0.33	0.0110	0.25	0.0110	0.25	0.0110	0.25
10*	0.0434	0.90	0.0132	0.28	0.0132	0.25	0.0223	0.48	0.0132	0.28	0.0132	0.30	0.0110	0.25	0.0110	0.25
11*	0.0410	0.88	0.0177	0.39	0.0177	0.35	0.0223	0.48	0.0088	0.18	0.0132	0.30	0.0088	0.20	0.0132	0.30
12*	0.0434	0.90	0.0200	0.43	0.0132	0.25	0.0200	0.43	0.0110	0.24	0.0155	0.35	0.0110	0.25	0.0088	0.21
		0.97 ±0.09		0.39 ±0.10		0.26 ±0.07		0.43 ±0.07		0.22 ±0.07		0.27 ±0.09		0.27 ±0.05		0.31 ±0.07

Table 4-13 Concentration of Cd (Sample collected on August 24, 1974)

No. of experi- ment	Low tide								high tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0132	0.25	0.0223	0.73	0.0132	0.30	0.0223	0.48	0.0044	0.08	0.0200	0.39	0.0132	0.28	0.0155	0.33
2	0.0177	0.35	0.0177	0.58	0.0088	0.20	0.0177	0.38	0.0044	0.08	0.0177	0.48	0.0088	0.20	0.0132	0.28
3	0.0088	0.18	0.0155	0.50	0.0110	0.26	0.0132	0.28	0.0088	0.18	0.0200	0.39	0.0110	0.24	0.0110	0.24
4	0.0088	0.18	0.0223	0.73	0.0132	0.30	0.0223	0.48	0.0088	0.18	0.0200	0.39	0.0132	0.28	0.0088	0.20
5	0.0088	0.18	0.0177	0.58	0.0155	0.35	0.0177	0.38	0.0044	0.08	0.0177	0.48	0.0155	0.33	0.0155	0.33
6	0.0110	0.23	0.0132	0.43	0.0132	0.30	0.0155	0.34	0.0088	0.18	0.0177	0.48	0.0110	0.24	0.0132	0.28
7*	0.0132	0.29	0.0088	0.18	0.0132	0.25	0.0155	0.33	0.0088	0.19	0.0246	0.58	0.0132	0.30	0.0088	0.21
8*	0.0155	0.34	0.0110	0.24	0.0177	0.35	0.0223	0.48	0.0044	0.08	0.0223	0.51	0.0066	0.51	0.0110	0.25
9*	0.0177	0.38	0.0110	0.23	0.0155	0.30	0.0177	0.38	0.0044	0.08	0.0246	0.58	0.0066	0.15	0.0088	0.21
10*	0.0132	0.29	0.0132	0.28	0.0132	0.25	0.0223	0.48	0.0088	0.19	0.0177	0.40	0.0066	0.15	0.0066	0.15
11*	0.0155	0.34	0.0132	0.28	0.0155	0.30	0.0177	0.38	0.0044	0.08	0.0200	0.45	0.0132	0.30	0.0088	0.21
12*	0.0177	0.38	0.0110	0.24	0.0132	0.25	0.0200	0.43	0.0044	0.08	0.0223	0.51	0.0110	0.25	0.0110	0.25
		0.28 ±0.08		0.41 ±0.20		0.28 ±0.04		0.40 ±0.07		0.12 ±0.05		0.47 ±0.07		0.24 ±0.06		0.24 ±0.05

Table 4-14 Concentration of Co (Sample collected on June 18, 1974)

No. of experi- ment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0	0	0.0132	1.31	0	0	0	0	0.0088	1.00	0.0044	0.44	0.0088	1.06	0.0110	1.31
2	0.0044	0.47	0.0088	0.94	0	0	0.0044	0.50	0.0044	0.44	0	0	0.0044	0.50	0.0066	0.88
3	0	0	0.0177	1.88	0	0	0.0088	1.00	0.0132	0.47	0.0044	0.44	0.0066	0.88	0.0044	0.50
4	0	0	0.0132	1.31	0.0044	0.44	0.0088	1.00	0.0088	1.00	0	0	0.0088	1.06	0.0088	1.09
5	0	0	0.0223	2.31	0	0	0.0044	0.50	0.0155	1.75	0	0	0.0110	1.31	0.0066	0.88
6	0	0	0.0088	0.94	0.0044	0.44	0.0132	1.44	0.0088	1.00	0	0	0.0066	0.88	0.0088	1.09
7*	0	0	0.0088	1.03	0	0	0.0088	1.13	0.0088	1.06	0.0044	0.50	0.0088	1.06	0	0
8*	0	0	0.0132	1.44	0.0044	0.44	0	0	0.0044	0.56	0	0	0.0044	0.53	0	0
9*	0.0044	0.50	0.0132	1.44	0	0	0.0044	0.53	0.0044	0.56	0	0	0.0066	0.81	0.0022	0.31
10*	0	0	0.0110	1.25	0	0	0.0066	0.85	0.0088	1.06	0.0044	0.50	0.0022	0.25	0	0
11*	0	0	0.0088	1.03	0	0	0.0044	0.53	0	0	0	0	0	0	0.0044	0.53
12*	0	0	0.0132	1.44	0	0	0.0022	0.31	0.0044	0.56	0	0	0	0	0.0022	0.31
		N		1.36 ±0.42		N		0.65 ±0.46		0.87 ±0.48		N		0.70 ±0.44		0.58 ±0.47

Table 4-15 Concentration of Co (Sample collected on August 18, 1974)

No. of experiment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppt
1	0.0088	0.94	0.0177	1.88	0.0223	2.22	0.0066	0.75	0.0088	1.00	0.0088	0.94	0.0110	1.31	0.0088	1.09
2	0	0	0.0132	1.31	0.0132	1.31	0.0044	0.50	0.0066	0.75	0.0044	0.44	0.0132	1.56	0.0132	1.56
3	0	0	0.0223	2.31	0.0177	1.75	0.0044	0.50	0.0044	0.44	0.0044	0.44	0.0088	1.06	0.0044	0.50
4	0.0044	0.47	0.0177	1.88	0.0132	1.31	0.0088	1.00	0.0044	0.44	0.0088	0.94	0.0088	1.06	0.0088	1.09
5	0.0044	0.47	0.0269	2.84	0.0088	0.94	0.0044	0.50	0.0066	0.75	0.0044	0.44	0.0088	1.06	0.0066	0.88
6	0	0	0.0223	2.31	0.0132	1.31	0.0088	1.00	0.0044	0.44	0.0088	0.94	0.0110	1.31	0.0044	0.50
7*	0.0044	0.50	0.0269	2.88	0	0	0.0088	1.13	0.0066	0.81	0.0022	0.28	0.0044	0.53	0.0044	0.53
8*	0	0	0.0177	1.94	0.0044	0.44	0.0044	0.53	0.0088	1.06	0.0044	0.50	0.0088	1.06	0.0088	1.06
9*	0	0	0.0223	2.50	0.0088	0.94	0	0	0.0044	0.56	0	0	0.0110	1.31	0.0066	0.88
10*	0	0	0.0177	1.94	0	0	0.0088	1.13	0	0	0.0022	0.28	0.0066	0.81	0.0022	0.31
11*	0.0044	0.50	0.0223	2.50	0	0	0.0044	0.53	0.0022	0.31	0.0066	0.84	0.0044	0.53	0.0066	0.88
12*	0	0	0.0200	2.25	0	0	0.0044	0.53	0.0044	0.56	0.0044	0.50	0.0066	0.81	0.0044	0.31
		N		2.21 ±0.45		0.85 ±0.76		0.63 ±0.39		0.59 ±0.32		0.50 ±0.31		1.04 ±0.28		0.80 ±0.38

Table 4-16 Concentration of Co (Sample collected on August 24, 1974)

No. of experi- ment	Low tide								High tide							
	A		B		C		D		A		B		C		D	
	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb	Abs	ppb
1	0.0044	0.47	0.0088	0.94	0.0088	0.94	0	0	0.0044	0.44	0.0223	2.22	0.0088	1.06	0.0088	1.09
2	0.0044	0.47	0.0022	0.25	0.0044	0.44	0.0044	0.50	0.0044	0.44	0.0132	1.31	0.0044	0.50	0.0044	0.50
3	0.0088	0.94	0.0100	1.06	0.0088	0.94	0	0	0.0044	0.44	0.0177	1.75	0.0088	1.06	0.0066	0.88
4	0.0088	0.94	0.0088	0.94	0.0088	0.94	0	0	0.0044	0.44	0.0132	1.31	0	0	0.0110	1.31
5	0.0110	1.25	0.0044	0.50	0.0044	0.44	0.0088	1.00	0	0	0.0088	0.94	0.0044	0.50	0.0066	0.88
6	0.0110	1.25	0.0044	0.50	0.0044	0.44	0.0044	0.50	0	0	0.0088	0.94	0.0044	0.50	0.0088	1.09
7*	0.0044	0.50	0.0022	0.25	0.0044	0.44	0.0044	0.53	0.0044	0.56	0.0088	1.09	0.0022	0.25	0	0
8*	0.0088	1.00	0.0088	1.03	0.0088	0.94	0.0022	0.31	0.0066	0.81	0.0132	1.59	0.0088	1.06	0.0044	0.53
9*	0.0066	0.81	0.0066	0.75	0.0110	1.09	0.0088	1.13	0.0044	0.56	0.0177	2.13	0.0044	0.53	0.0088	1.06
10*	0.0044	0.25	0.0044	0.50	0.0088	0.94	0	0	0	0	0.0088	1.09	0.0088	1.06	0.0066	0.88
11*	0.0022	0.25	0.0022	0.25	0.0044	0.44	0	0	0.0044	0.56	0.0088	1.09	0	0	0.0022	0.31
12*	0.0044	0.50	0.0066	0.75	0.0044	0.44	0.0044	0.53	0	0	0.0132	1.59	0	0	0.0044	0.53
		0.74 ±0.33		0.64 ±0.31		0.70 ±0.28		N		N		1.42 ±0.46		0.54 ±0.43		0.76 ±0.38

Table 4-17 Concentration of Ag, Hg, Cu, Pb, Cd and Co (ppb) (Sample collected on June 18, 1974)

Element	Low tide				high tide			
	A	B	C	D	A	B	C	D
Ag	0.40 [±] 0.21	N	N	N	0.23 [±] 0.14	N	0.18 [±] 0.12	0.16 [±] 0.14
Hg	N	N	N	N	N	N	N	N
Cu	7.98 [±] 0.46	5.87 [±] 0.61	5.53 [±] 0.28	6.64 [±] 1.08	11.56 [±] 0.74	6.65 [±] 0.40	3.32 [±] 0.12	4.18 [±] 0.32
Pb	23.65 [±] 1.19	32.33 [±] 1.15	16.48 [±] 0.69	24.48 [±] 1.38	16.28 [±] 0.75	24.17 [±] 0.54	13.95 [±] 1.19	17.91 [±] 0.56
Cd	0.28 [±] 0.06	0.72 [±] 0.07	0.20 [±] 0.06	0.52 [±] 0.05	0.52 [±] 0.07	0.37 [±] 0.09	0.36 [±] 0.05	0.23 [±] 0.05
Co	N	1.36 [±] 0.42	N	0.65 [±] 0.46	0.87 [±] 0.48	N	0.70 [±] 0.44	0.58 [±] 0.47

Table 4-18 Concentration of Ag, Hg, Cu, Pb, Cd and Co (ppb) (Sample collected on August 18, 1974)

Element	Low tide				High tide			
	A	B	C	D	A	B	C	D
Ag	0.81 [±] 0.13	N	N	N	N	0.17 [±] 0.12	0.22 [±] 0.12	0.18 [±] 0.14
Hg	N	N	N	N	N	N	N	N
Cu	6.75 [±] 0.33	7.99 [±] 0.39	4.51 [±] 0.25	5.60 [±] 0.94	9.45 [±] 1.09	9.65 [±] 0.52	6.56 [±] 0.27	6.75 [±] 0.49
Pb	24.13 [±] 0.92	30.29 [±] 1.25	16.87 [±] 1.61	21.56 [±] 0.63	7.21 [±] 0.81	27.40 [±] 0.67	19.54 [±] 1.83	28.31 [±] 1.01
Cd	0.97 [±] 0.09	0.39 [±] 0.10	0.26 [±] 0.07	0.43 [±] 0.07	0.22 [±] 0.07	0.27 [±] 0.09	0.27 [±] 0.05	0.31 [±] 0.07
Co	N	2.21 [±] 0.45	0.85 [±] 0.76	0.63 [±] 0.39	0.59 [±] 0.32	0.55 [±] 0.31	1.04 [±] 0.28	0.80 [±] 0.38

Table 4-19

Concentration of Ag, Hg, Cu, Pb, Cd and Co (ppb) (Sample collected on August 24, 1974)

Element	Low tide				High tide			
	A	B	C	D	A	B	C	D
Ag	N	N	N	N	N	N	N	0.27 [±] 0.10
Hg	N	N	N	N	N	N	N	N
Cu	10.92 [±] 0.80	5.78 [±] 0.25	3.69 [±] 0.24	5.63 [±] 0.59	19.32 [±] 0.60	8.65 [±] 0.30	5.48 [±] 0.15	5.65 [±] 0.27
Pb	4.71 [±] 0.50	29.54 [±] 1.11	20.05 [±] 1.69	28.15 [±] 0.97	17.88 [±] 2.34	24.69 [±] 1.25	15.46 [±] 1.77	13.35 [±] 0.68
Cd	0.28 [±] 0.08	0.41 [±] 0.20	0.28 [±] 0.04	0.40 [±] 0.07	0.12 [±] 0.05	0.47 [±] 0.07	0.24 [±] 0.06	0.24 [±] 0.05
Co	0.74 [±] 0.33	0.64 [±] 0.31	0.70 [±] 0.28	N	N	1.42 [±] 0.46	0.54 [±] 0.43	0.76 [±] 0.38