



STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504 • (206) 753-2353

M E M O R A N D U M

July 26, 1983

To: Jim Krull

From: Art Johnson *AJ*

Subject: Comparison of Contaminants in Sediment from the Port of Tacoma Proposed Dredging Project in Blair Waterway with Sediment at the Commencement Bay Deep Water Disposal Site

As requested, we compared the data you provided on sediment from the proposed dredging project in Blair Waterway with data from EPA stations 25-35 within the Commencement Bay deep water disposal site. Tables 1 and 2 summarize the metals and PAH data from these two areas. Table 3 is a summary of concentration ranges and averages and also shows the ratio of metals and PAH concentrations between project and disposal site sediments. Figure 1 contains depth profiles of PAH in project site sediments. Figure 2 is a plot of PAH concentration against percent sand.

We conclude the following from these data:

1. Metals - Most Blair project sediments had average metals concentrations not substantially greater than those from the deep water disposal site. Blair core C-2 had the highest average metals concentrations. Nickel, copper, chromium, lead, zinc, mercury, and arsenic were approximately two to four times higher than the average disposal site concentrations.
2. PAH - PAH concentrations in project sediments are much higher than at the disposal site. Of the six sites sampled in or near the project area, four had average PAH concentrations one to two orders of magnitude higher than disposal site concentrations. Some of the highest PAH concentrations measured in the Blair sediments are greater than has been previously reported in Commencement Bay. The sample from Pier #4 in Blair was lower in PAH than those from the deep disposal site. High PAH did not appear to be consistently associated with a particular strata within the Blair sediment cores.

Bill Yake noted an inverse relationship between sand content and PAH concentration. Based on limited data (only 10 Blair samples analyzed for percent sand-silt-clay), it appears that sediments which are 90 percent or more sand do not have elevated PAH relative to the deep water disposal site.

AJ:cp

Attachments

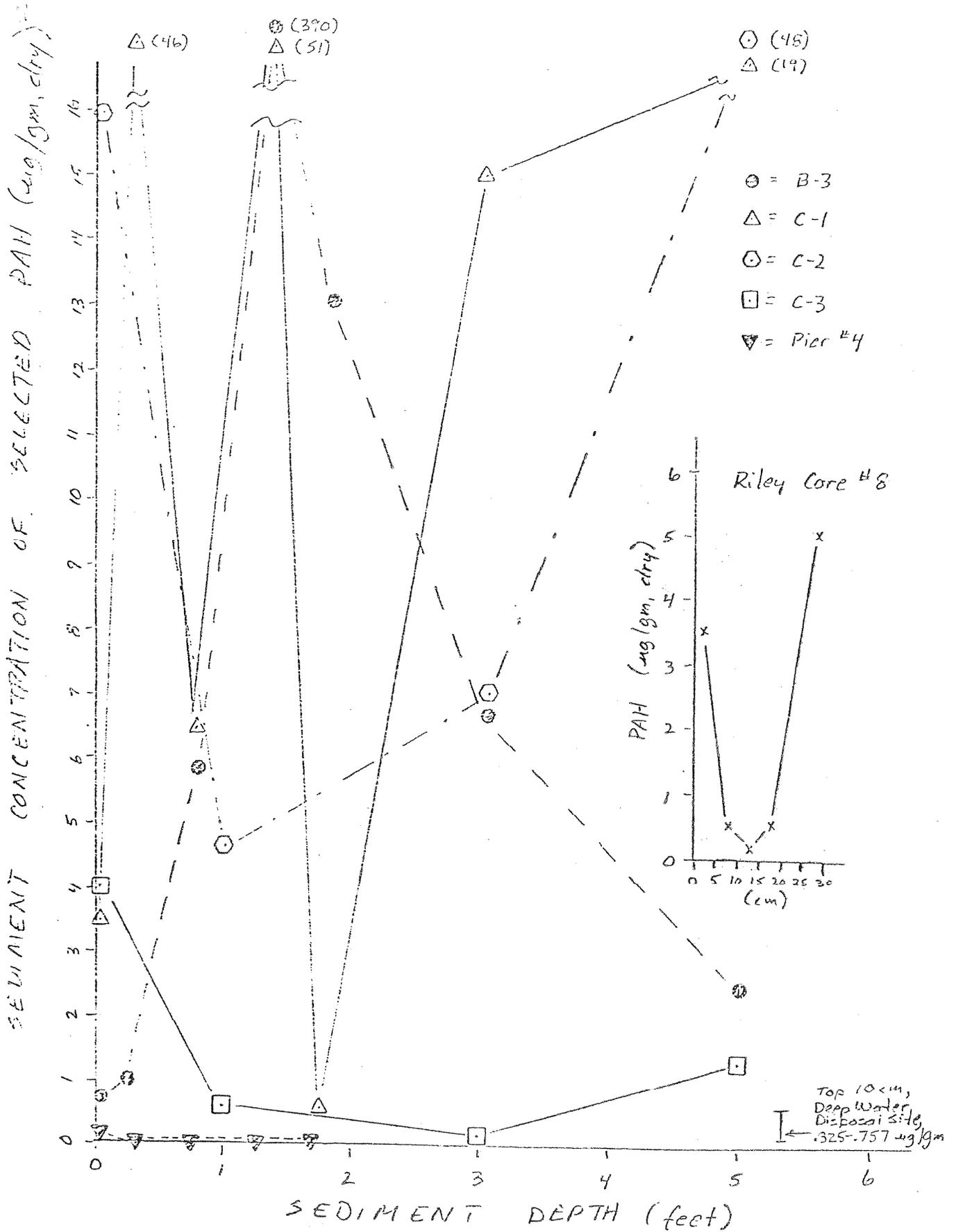


Figure 1. PAH profiles for Blair Waterway dredge project sediments.

Figure 2. PAH concentration vs. percent sand for Blair Waterway dredging project sediments (sample numbers shown).

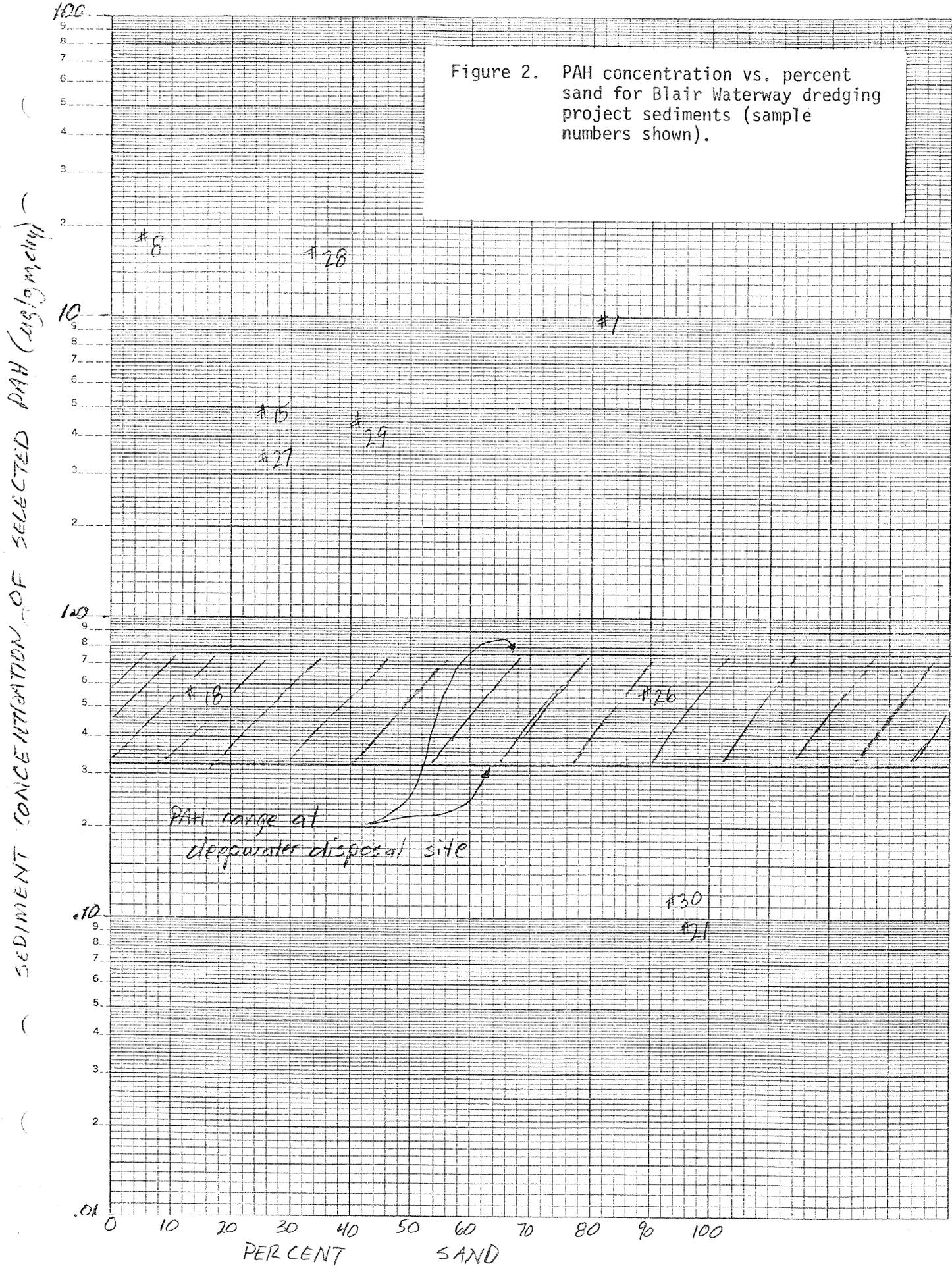


Table 1. Summary of EPA metals and PAH data on sediment from the Commencement Bay deep water disposal site ($\mu\text{g}/\text{gm}$, dry).*

EPA Station Number	Cu	Zn	As	Hg	Cd	Pb	Cr	Ni	Sum of Selected PAH **
25	53.2	59.3	8.3	.10	.25	24	16	17	.325
26	52.9	63.9	9.5	.11	.21	29	16	16	.499
27	43.8	52.7	6.8	.10	.33	25	12	12	.411
28	43.9	51.1	6.8	.09	.48	22	12	11	.474
29	65.9	121.2	19.3	.13	.26	42	18	19	.361
30	55.0	66.3	13.0	.13	.24	29	15	17	.592
31	54.6	89.0	15.3	.10	.27	27	13	18	.485
32	69.8	107.2	29.0	.12	.36	34	16	22	.636
33	55.7	93.8	18.3	.09	.23	32	20	18	.664
34	30.8	33.6	4.5	.05	.23	10	9	10	.548
35	59.2	72.2	10.8	.15	.24	31	21	25	.757
Range	30.8-69.8	33.6-121.2	4.5-29.0	.05-.15	.21-.48	10-42	9-21	10-25	.325-.757
Average	53.2	73.7	12.9	.11	.28	28	14	14	.523
Median	54.6	66.3	10.8	.10	.25	29	16	17	.499

*Top 10 cm

**Naphthalene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzoanthracene, chrysene

Source: Hileman, J.K. and M. Matta, 1983. Commencement Bay Deep Water Sediment Investigation, Tacoma, Washington, September 15-17, 1982. EPA, Seattle.

Table 2. Summary of metals and PAH data on sediment from the Port of Tacoma proposed dredging project in Blair Waterway (µg/gm, dry).

Sample Description	Nickel	Copper	Chromium	Lead	Zinc	Mercury	Arsenic	Cadmium	Sum of** Selected PAH
Blair, B-3, 0-2" (#26)			(not analyzed for metals)						.54
" " 0-6" (#4)			" "	" "	" "	" "	" "	" "	.84
" " 6-12" (#5)			" "	" "	" "	" "	" "	" "	5.7
" " 12-18" (#6)			" "	" "	" "	" "	" "	" "	390
" " 18-24" (#7)			" "	" "	" "	" "	" "	" "	13
" " 0-2' (#1)	12	66	20	92	160	.1	14	.1	9.5
" " 2-4' (#2)	12	50	20	70	150	.3	12	.3	6.7
" " 4-6' (#3)	9.1	37	15	63	88	.8	7.7	.2	2.5
" " Average 0-6'***	11	51	18	75	130	.4	11	.2	6.2
Blair, C-1, 0-2" (#27)			(not analyzed for metals)						3.4
" " 0-6" (#11)			" "	" "	" "	" "	" "	" "	46
" " 6-12" (#12)			" "	" "	" "	" "	" "	" "	6.4
" " 12-18" (#13)			" "	" "	" "	" "	" "	" "	51
" " 18-24" (#14)			" "	" "	" "	" "	" "	" "	.51
" " 0-2' (#8)	14	94	35	100	150	.2	22	.6	17
" " 2-4' (#9)	13	82	26	57	110	.2	17	.3	15
" " 4-6' (#10)	12	90	26	.77	150	.2	21	.6	19
" " Average 0-6'***	13	87	29	78	140	.2	20	.5	17
Blair, C-2, 0-2" (#28)			(not analyzed for metals)						16
" " 0-2' (#15)	150	280	130	270	480	.2	42	.5	4.7
" " 2-4' (#16)	13	74	23	52	120	.2	10	.2	7.0
" " 4-6' (#17)	15	94	26	41	120	.2	13	.2	48
" " Average 0-6'	59	150	60	120	240	.2	22	.3	20
Blair, C-3, 0-2" (#29)			(not analyzed for metals)						4.0
" " 0-2' (#18)	15	96	28	63	130	.2	23	.3	.55
" " 2-4' (#19)	10	31	15	10	35	<.1	7.5	<.1	.12
" " 4-6' (#20)	9.2	31	15	16	48	<.1	8.7	<.1	1.3
" " Average 0-6'***	11	53	19	30	71	.1	13	.1	.66
Blair, Pier #4, 0-2" (#30)			(not analyzed for metals)						.12
" " 0-6" (#22)			" "	" "	" "	" "	" "	" "	.093
" " 6-12" (#23)			" "	" "	" "	" "	" "	" "	.079
" " 12-18" (#24)			" "	" "	" "	" "	" "	" "	.078
" " 18-24" (#25)			" "	" "	" "	" "	" "	" "	.066
" " 0-2' (#21)	20	9.3	13	<2	21	<.1	2.6	<.1	.097
Blair, Riley Core #8, 0-5cm			(not analyzed for metals)						3.5
" " 5-10cm			" "	" "	" "	" "	" "	" "	.48
" " 10-15cm			" "	" "	" "	" "	" "	" "	.17
" " 15-20cm			" "	" "	" "	" "	" "	" "	.48
" " 20-30cm			" "	" "	" "	" "	" "	" "	5.0
" " Average 0-30cm			" "	" "	" "	" "	" "	" "	1.9

*Naphthalene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzanthracene, chrysene

**Calculated from 0-2', 2-4', and 4-6' composites

Sources: Laucks Laboratories, Inc., July 15, 1983, data report to Hart Crowser and Associates

Riley, R.G., et al., 1981. Organic Pollutants in Waterways Adjacent to Commencement Bay (Puget Sound). NOAA Tech. Memo. OMPA-12

Table 3. Comparison of average sediment metals and PAH concentrations: deep water disposal site vs. Blair Waterway dredging project.

	Nickel	Copper	Chromium	Lead	Zinc	Mercury	Arsenic	Cadmium	Sum of Selected PAH
Deep Water Disposal Site (range)	10-25	30.8-69.8	9-21	10-42	33.6-121.2	.05-.15	4.5-29.0	.21-.48	.325-.757
" " " " (average)	14	53.2	14	28	73.7	.11	12.9	.28	.523
Blair, B-3, all strata (range)	9.1-12	37-66	15-20	63-92	88-160	.1-.8	7.7-14	.1-.3	.54-390
" " 0 - 6 feet (average)	11	51	18	75	130	.4	11	.2	6.2
" B-3: Disposal Site ratio	.79	.96	1.3	2.7	1.8	3.6	.85	.71	12
Blair, C-1, all strata (range)	12-14	82-94	26-35	57-100	110-150	.2(all)	17-22	.3-.6	.51-51
" " 0 - 6 feet (average)	13	87	29	78	140	.2	20	.5	17
" C-1: Disposal Site ratio	.93	1.6	2.1	2.8	1.9	1.8	1.6	1.8	33
Blair, C-2, all strata (range)	13-150	74-280	23-130	41-270	120-480	.2(all)	10-42	.2-.5	4.7-48
" " 0 - 6 feet (average)	59	150	60	120	240	.2	22	.3	20
" C-2: Disposal Site ratio	4.2	2.8	4.3	4.3	3.3	1.8	1.7	1.1	38
Blair, C-3, all strata (range)	9.2-14	31-96	15-28	10-63	35-130	<.1-.2	7.5-23	<.1-.3	.12-4.0
" " 0 - 6 feet (average)	11	53	19	30	71	.1	13	.1	.66
" C-3: Disposal Site ratio	.79	1.0	1.4	1.1	.96	1.0	1.0	.36	1.3
Blair, Pier #4, all strata (range)				(only one strata analyzed)					.066-.12
" " 0 - 2 feet (composite)	20	9.3	13	<2	21	<.1	2.6	<.1	.097
" Pier #4: Disposal Site ratio	1.4	.17	.93		.28		.2		.19
Blair, Core #8, all strata (range)				(not analyzed for metals)					.17-5.0
" " 0 - 30cm (average)									1.9
" Core #8: Disposal Site ratio									3.6