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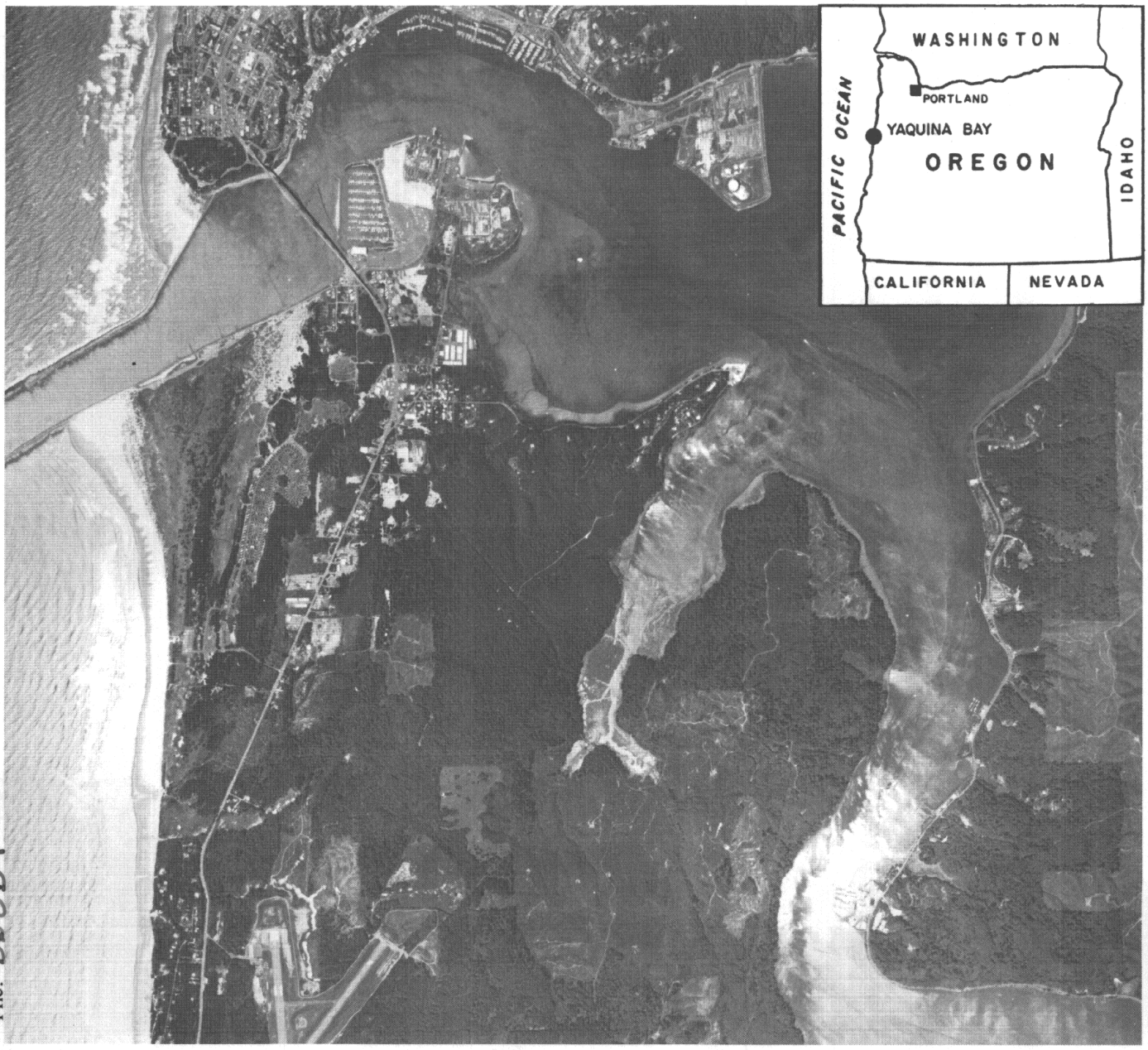
US Army Corps
of Engineers
Portland District

EPA
Region 10

Final Report

Characterization of Sediments at Yaquina Bay and Harbor



April 1991

Characterization of Sediments at Yaquina Bay & Harbor

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Characterization of Sediments at Yaquina Bay & Harbor

Abstract

Sediments from Yaquina Bay, especially in marina/dock areas, were sampled and analyzed to extend our knowledge of their physical and chemical characteristics. Marina/dock sediments were fine grained material higher in percent fines, volatile solids and TOC than channel sediments. They also showed a higher contaminant load of metals, PAHs, phenols, TBT and AVS . No pesticides or PCBs were detected in any sample. Concentrations of dioxin/furans were also measured.

Introduction

1. In March 1990 EPA, Region 10, Seattle contracted with the U. S. Army Corp of Engineers (USACE), Portland District to sample sediments from Yaquina Bay and have them analyzed for amounts of dioxin/furans, heavy metals, pesticides, total organic carbon (TOC), tributyltin and other semivolatiles from the priority pollutant list. Samples were taken by box core on the 4th and 5th of April 1990 between River Mile (RM) 1.0 and 5.2. The following is a report of the results.

Background

2. Yaquina Bay is the fifth largest estuary in Oregon. The estuary is 6.7 miles long and has a surface area at high water of 4,233 acres. At low tide there are about 1,751 acres of tidelands. The bay is fed by the Yaquina River and its tributaries which drain an area of 253 square miles (1). River flows are estimated to be 1,078 cfs during normal conditions. The diurnal tidal range in the estuary is 7.9 feet with an extreme of 11.5 feet. Tidal influences extend up through the estuary to Yaquina River mile 26.

3. Annually, about 30,000 to 50,000 tons of sediment is deposited in the estuary by the Yaquina River and its tributaries. Some littoral drift enters the estuary causing shoaling in the entrance bar (2).

4. The bay and estuary supports a diversity of organisms and is a rich habitat containing extensive eelgrass beds, hardshell and softshell clam habitats, commercial oyster rearing, herring spawning and dungeness crab nursery areas. All of these border the navigation channel that passes through the estuary.

5. The main commercial activities around Yaquina Bay include commercial and sport fisheries, fish and wood processing plants. The city of Toledo is a hub for the wood processing industry for the entire mid-coast basin (2).

6. Much of what is known about Yaquina Bay sediments comes from studies of the Federal navigation channel. Generally, Federal navigation channel sediments are relatively free of contaminants (USACE, Portland District 1980 and 86). The extent and nature of contamination of sediments outside the navigation channel along the edges of the estuary or in local marinas has not been extensively studied. To partially characterize these sediments, EPA, Region 10 and

USACE, Portland District chose sites around the estuary, in marinas, near slough outlets, near a deep draft ship-loading facility and in backwater areas, where fine grained sediment would be expected to accumulate, to sample and test for possible chemical contamination. Data from Federal Navigation Project samples, which were taken at the same time, are included in this report to assist in the comparison of the physical and chemical characteristics of sandy channel vs fine gained, non-channel sediments.

Methods

7. Samples were taken with a modified 0.096 square meter Gray-O'Hare box corer at 24 stations around Yaquina Bay and estuary (figures 1-3). The 24 stations were sampled as follows: four samples were taken inside the South Beach Marina located near the Marine Science Center, four were taken at the Newport Docks located on the north side of the harbor, and six other stations were sampled at various places along the side of the bay from RM 2.5 to just downstream of the River Bend Marina, near the outlet to Parker Slough (RM 5.2). These fourteen samples represented sediment from fine-grained areas. Finally, ten samples, representing coarser, sandy material, were taken from within the Federal Navigation Project between the outlet at the ocean and the turning basin at RM 2.4 in Yaquina Bay.

8. Physical analysis was performed on all of the 24 samples. Samples were placed in plastic baggies and taken to CENPD Materials Lab in Troutdale, Oregon where grain size distribution and volatile solids were determined.

9. Twelve of the 24 samples were subjected to chemical analysis. Samples for chemical analysis were taken and handled according to methods suggested in a manual developed by EPA and the Corps of Engineers titled, Ecological Evaluation of Proposed Discharge of Dredged Material in Ocean Waters - the "Green Book" (3). Using acid rinsed stainless steel spatulas, the sediment samples were placed in 250 ml I-Chem jars topped with teflon lined lids. These samples were cold stored and shipped to Battelle Marine Sciences Laboratory in Sequim, Washington for chemical analysis. Using EPA methods the concentrations of the following chemicals were determined: 15 congeners of dioxin/furans, Polyaromatic hydrocarbons (PAHs), phenols, other semivolatiles from the priority pollutant list, pesticides/PCBs, heavy metals, acid volatile sulfide (AVS), total organic carbon (TOC) and tributyltin (TBT, by an in-house Battelle method).

Results/discussion

10. The raw data from the physical and chemical analyses of the sediment samples is presented in the enclosed appendix. For the sake of brevity, raw data sample labels in the appendix have been given shorter labels in the text of this report. For instance, sample YQ-EPA-10 has been shortened to EPA-10 and YQ-BC-9 shortened to BC-9.

Physical

11. The results of the physical analysis of the sediment samples are shown in Table 1. For comparison, the samples were organized into two groups based on location, percent fines and volatile solids content. These two groups generally sorted out into marina/dock and

channel/slough outlet areas.

12. The mean percent fines was 38.6 percent at Marina/Dock locations and 5.1 percent in the Channel/Slough Outlet locations. The highest percent fines was found in sediment at station EPA-9 in a V-shaped backwater area upstream from Newport International Terminal. A nearby sample, BC-9, from the federal project turning basin was also high in fines.

13. The marina/dock areas, on the average, contained very fine sand (mean grain size 0.104 mm), whereas, the channel/slough outlets contained fine sand with an average grain size of 0.211 mm.

14. The volatile solids content of the marina/dock areas (6.5%) averaged about 5 times higher than that of Channel/Slough Outlets (1.3%). The percent volatile solids is a rough measure of the organic content of the sediment samples. Contaminants, such as trace metals and hydrophobic organic chemicals, can accumulate in the organic fraction.

Chemical

15. For ease of viewing, the raw data from the appendix were condensed and presented in Tables 1 through 5. The metals and organics concentrations of the samples are shown in Tables 2 and 4 respectively. Table 3 compares metals concentrations between marina/dock and channel/slough outlet areas. Table 5 presents dioxin/furans results.

Heavy metals

16. The concentration of every heavy metal in marina/Dock sediments is roughly twice that of Channel/Slough Outlet sediments (Table 3). This is probably because high fines/organics sediments tend to accumulate metals. Festul (4) reported the average metals concentrations for Oregon estuaries. For comparison, these values are also shown in Table 3. Channel/slough outlet samples were generally lower in metals concentrations than the average for Oregon estuaries. In marina/dock sediments only arsenic and chromium were higher than the Oregon average. When the marina/dock and channel/slough outlet samples are combined, the mean concentrations of arsenic and chromium exceed the Oregon estuaries average, while cadmium, copper, lead, nickel and zinc are lower than the average. The combined average concentration of arsenic was about twice that of the Oregon average. Arsenic compounds are used in pigments, anti-fouling paints and for sludge control in lubricating oils, all of which may be present in the local environment. The combined average concentration of chromium barely exceeded the Oregon average. The higher than average chromium could be related to the "scavaging" effects of high fines/organics material, the high amount of chromium predicted to be in local crustal rocks (4) and the increased salinity of estuarine water (5). The adsorption of chromium to sediments is salinity dependent, being greater at salinities of 0.1 to 1.0 parts per thousand (salinity of fresh water is <0.5 parts per thousand).

TBT

17. The concentration of TBT, an anti-fouling agent in marine paints, was highest in the high fines sediment from South Beach Marina where one sample showed a concentration of 278 ppb

(Table 2). There was a wide variation in TBT concentrations - from 3.0 to 278 ppb. The "patchiness" of TBT concentrations in South Beach Marina sediment may be caused by local paint spills or paint chips sloughing off of painted surfaces.

Acid volatile sulfides

18. The highest AVS values were measured in high fines sediment from the South Beach Marina (70.32 uM/g), Newport Docks (12.25 uM/G) and the ship loading facility at RM 2.4 (13.27 uM/g) (Table 2). There is some evidence AVS might help protect the environment from the toxic effects of heavy metals (5). These sulfides may represent the potential ability of the sediment to "bind-up" heavy metals since the sulfur atoms in the sulfides can combine with metal atoms and render them insoluble. The source of AVS is decomposing organic matter in sediment. The high organic content of sediments at these locations is predictive of increased AVS.

19. In summary, there seems to be a trend towards increased metals concentrations in Yaquina Bay marina/dock sediments, high in fines, relative to channel/slough outlet sediments, low in fines, but the average heavy metal concentrations do not exceed the average for all of Oregon's estuaries. TBT and AVS are also higher in marina/dock locations vs channel/slough outlets.

TOC

20. The TOC content of the sediment varied widely with a low of 0.31 percent at RM 4.0, near mid channel, to 6.62 percent from sediment inside the South Beach Marina (Table 4). Generally the values were higher near high fines, marina/dock locations with an average of 2.51 % while low fines, channel/slough outlet samples averaged 0.72 % (see figure 1 and table 4).

Pesticides/PCBs

21. Pesticides and PCBs were undetected in the sediment samples (Table 4). Studies in 1980 and 1986 by USACE of sediments in Yaquina River showed similar results (2).

PAHs

22. PAHs were detected in four of the twelve sediment samples taken (Table 4). The total concentration of PAHs in these samples ranged from 268 to 560 ppb. The detected PAHs were limited to four chemicals - phenanthrene, fluoranthrene, pyrene and chrysene. Fluoranthrene (130-270 ppb), pyrene (94-170 ppb) and chrysene (44-120 ppb) were detected in four of the five sediment samples taken from South Beach Marina, Newport Docks and Newport International Terminal (NIT). Phenanthrene was detected in a sample from the Newport Docks (76 ppb) and NIT (130 ppb). Chrysene is the only one of the four that is carcinogenic. PAHs are ubiquitous in the environment: around 43,000 metric tons are discharged into the atmosphere while 230,000 tons enter aquatic environments (8). Major sources of PAHs to the aquatic environment are domestic and industrial sewage effluents, surface runoff, atmospheric deposition and petroleum spillage.

Other semivolatiles

23. Bis(2-ethylhexyl)phthalate was detected in six of the ten sediment samples taken, ranging in concentration from 77 to 750 ppb (Table 4). The highest concentrations were found in the South Beach Marina (340-750 ppb). This substance is a common constituent of plastics. It is used as a plasticizer to make plastic flexible and is also used in vacuum pumps. Its probable source is plastic debris lost or thrown over board from boats using the marinas (6).

24. Phenol (83-480 ppb) and 4-methylphenol (140-170 ppb) were detected in the South Beach Marina, Newport Dock and Newport International Terminal samples. Neither phenol was detected between RM 2.4 and 5.1 upriver from these stations. Phenol and 4-methylphenol, one of the creosols, are associated with the wood products industry. Both are used as disinfectants. Phenols occur naturally in bark and are associated with decaying vegetation, log rafting and forest product wastes. Phenols are highly soluble in water and in high concentrations are bacteriocidal but in lower concentrations are rapidly degraded by bacteria (2).

Dioxin/furans

25. Table 5 shows a detailed breakdown of the concentrations of dioxin/furan congeners in each sample. The maximum and minimum values for each congener in each sample are also shown.

26. The dioxin/furan analysis was performed by Twin City Testing Corporation, St. Paul, Minnesota, a leading laboratory in the detection of dioxin/furans. The concentrations of seventeen congeners were measured in the sediment samples. Also, the total concentration of each congener class (tetra, penta, hexa, hepta and octa chlorinated dioxin/furans) was reported.

27. Only two samples showed trace amounts of the most toxic congener -2,3,7,8-TCDD. These were sample EPA-9 with 0.38 ppt and sample EPA-13 with 0.29 ppt 2,3,7,8-TCDD (Table 5). Sample EPA-9 showed the highest percent fines (75.6 %) and second highest TOC (3.08%) of all samples and one would expect that, if 2,3,7,8-TCDD were to be found, this would be a likely location since dioxin/furans tend to accumulate in fine-grained, organics enriched material and can persist for a long time. Sample EPA-13, on the other hand, showed the lowest level of percent fines (13.1%) and TOC (0.51%) of all the dioxin/furans sampling stations. It also showed the lowest concentrations for 15 of the 17 congeners tested in those samples where congeners were detected. These samples probably reveal the inherent variability of the method used in measuring such low concentrations. The mean detection limit for the other 6 samples was 0.77 ppt which indicates that the values for EPA-9 and 13 are near the detection limit for the method and type of sample.

28. The next most toxic congeners are 2,3,4,7,8-PeCDF and 1,2,3,7,8-PeCDD which were found in 6 of the 8 samples. The congener 2,3,4,7,8-PeCDF ranged in concentration from 0.17 to 0.52 ppt and congener 1,2,3,7,8-PeCDD ranged in concentration from 0.35 to 1.90 ppt.

29. The hexa, hepta and octa dioxin/furan congeners showed the highest concentrations in all samples. The two congener classes with the highest concentrations in the samples were OCDDs, averaging about 57.4 percent of the total, and HpCDDs, averaging about 27.2 percent of the total concentration of dioxin/furans. These congeners are ubiquitous in the environment and are the least toxic.

30. In comparing dioxin vs furan congener concentrations, about 75 to 95 percent of the total concentration of dioxin/furans was in the dioxin class - mostly in the HpCDD and OCDDs. Figure 4 shows the average concentration for each congener class for all 8 Yaquina Bay samples. The pattern revealed in the bar graph in Figure 4 was the basic pattern for each individual sample as well.

31. Table 5 shows that the highest levels of dioxin/furan congeners occurred in samples EPA-2 and EPA-3. The sum total of all congeners in these two samples (2205.50 and 3317.48 ppt) was 2 to 17 times higher than the sums (ranging from 194.60 to 973.90 ppt) for the other stations. These two samples were from South Beach Marina.

32. The quality control data from the dioxin/furan analysis was good. The recoveries of radioactively labeled PCDD/PCDF internal standards in the samples were generally in the range of 50-75 %, indicating a level of efficiency through the extraction and enrichment steps that is considered typical for this sample matrix type. Analysis of a laboratory method blank, processed with the sample extraction batch, showed the blank contained selected PCDD/PCDF isomers at low background levels at less than 0.2 ppt/isomer (see appendix) except those congeners in the hepta and octa classes, which were present at levels of 3-40 ppt. The levels in the blanks did not significantly contribute to those in the sediment samples. Two matrix spike samples revealed that recoveries were in the range of 75-115 %, a high level of accuracy.

33. The sources of dioxin/furans in Oregon are bleached kraft pulp mills, sewage treatment facilities that chlorinate, wood treatment facilities using pentachlorophenol, hog fuel boilers using wood chips contaminated with pentachlorophenol or salt water (which contains chlorine) and automobiles or boats using leaded fuel. Although there is a paper mill in Toledo, upstream from Yaquina Bay, it is not a bleached kraft mill and its outfall is in the ocean. The city of Newport's sewage treatment outfall is also in the ocean. The city of Toledo 14 miles upstream dumps treated sewage into the Yaquina River. Potential sources for dioxin/furans in Yaquina Bay are wood treatment facilities, sewage treatment facilities, lead fuel used by boats, forest fires, incinerators in the surrounding area and other atmospheric deposition . The slight, apparent increase in dioxin/furans in Marinas, if real, is most likely attributable to combustion products and the high fines/organics nature of the sites. There are not enough comparative control samples in this study to come to a definite conclusion regarding possible increased dioxin/furans in Marina/Dock locations.

Conclusions

34. The sediments from marina and dock locations are smaller in grain size, higher in fines, volatile solids and TOC than channel sediments.

35. Marina/dock areas have higher concentrations of the constituents tested than that of

channel/slough outlets. This is expected since sediments high in fines and organics tend to accumulate contaminants. Metals in marina/dock sediments were about twice as high in concentration as those in channel sediments. PAHs were detected in marina/dock sediments but not channel/slough outlet sediments. Phenols were also detected in marina/dock sediments and in one channel/slough outlet sample. Bis(2-ethylhexyl)-phthalate was detected in both types of sediment - 5 out of 8 marina/dock and 1 out of 4 channel/slough outlet samples. A South Beach Marina sample contained the highest concentration at 750 ppb. Acid volatile sulfides (AVS) were always higher in marina/dock sediments. TBT was detected in all 6 of the samples tested. One sample from South Beach Marina contained the greatest amount of TBT (278 ppb). No pesticides or PCBs were detected. The significance of the dioxin/furan levels found in Yaquina Bay sediments is unknown.

36. The South Beach Marina is scheduled to be dredged in late summer or fall of 1991. Bioassays, including a 48-hour oyster larva, 10-day amphipod and 20-day polychaete, along with further chemical testing, including TBT and phenols, will be conducted prior to dredging and in-water disposal.

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Table 1.

Results of Physical Analysis of Yaquina Bay Sediment Samples

Sample	Grain Size mm	Sand %	Fines %	Vol. Solids %
Marina/Dock Areas				
EPA-1	0.093	56.2	43.8	9.6
EPA-2	0.091	46.4	53.6	17.0
EPA-3	0.128	71.9	28.1	3.2
EPA-4	0.151	83.5	16.5	2.4
EPA-5	0.140	81.4	18.6	2.8
EPA-6	0.141	81.9	18.1	3.4
EPA-8	0.125	75.4	24.6	3.6
EPA-9	0.030	24.4	75.6	11.1
EPA-14	0.088	55.4	44.6	6.6
EPA-12	0.059	37.4	62.6	7.2
BC-9*	0.097	61.8	38.2	5.1
Mean	0.104	61.4	38.6	6.5
Channel/Slough Outlets				
EPA-10	0.124	76.2	23.8	4.0
EPA-11	0.300	96.8	3.2	2.4
EPA-13	0.168	86.9	13.1	2.0
BC-1	0.187	99.8	0.2	0.6
BC-2	0.187	99.7	0.3	0.7
BC-3	0.283	98.9	0.8	0.6
BC-7	0.230	98.4	1.6	0.5
BC-8	0.220	98.2	1.8	0.5
BC-10	0.223	94.9	5.1	1.2
BC-11	0.187	99.0	1.0	0.4
Mean	0.211	94.9	5.1	1.3

Samples EPA-7, BC-5, BC-6 were gravel and were not included in the table. See figure 1 for locations of sampling stations.

* BC-9 was included in the Marina/Dock group because it was on the side slope of the Federal Project and close to the V-shaped backwater area near Newport International Terminal (see figure 1).

Table 2.

Concentrations of Heavy Metals, TBT and AVS in Yaquina Bay Sediment

	EPA Sample Station										BC Station	
	2	3	6	8	9	10	11	12	13	14	9	10
						ppm						
Metals												
As	21.80	8.70	8.50	11.50	18.90	8.10	9.80	27.50	5.80	16.10	9.40	6.10
Cd	0.70	0.46	0.17	0.33	0.24	0.14	0.05	0.20	0.21	0.14	0.14	0.07
Cr	49.20	32.00	26.00	32.30	56.70	29.40	14.40	44.90	18.10	41.40	41.00	16.80
Cu	23.80	14.00	7.90	12.70	23.80	9.40	2.60	20.30	5.20	14.00	14.30	4.30
Pb	14.70	6.73	3.65	4.46	12.70	5.23	3.18	14.70	5.11	7.80	4.40	1.57
Hg	0.06	0.03	0.02	0.03	0.06	0.02	0.03	0.06	0.02	0.04	0.05	0.02
Ni	36.00	22.00	17.00	23.00	40.00	20.00	9.00	30.00	11.00	30.00	29.00	11.00
Ag	0.60	0.40	0.30	0.30	0.50	0.40	0.30	0.40	0.30	0.40	0.40	0.30
Zn	81.70	52.10	33.70	58.70	79.10	44.20	31.90	76.00	22.70	59.00	55.60	22.10
						ppb						
TBT	278.00	8.40	3.80	4.50	-	-	-	-	-	-	5.60	1.50
						uM/gm						
AVS	70.32	24.96	2.96	12.25	13.27	0.06	0.84	1.48	1.10	2.65	4.09	1.30

BC-9,10 are USACE sample stations.

Table 3.

Comparison of Mean Heavy Metal Concentrations in Marina/Dock vs Channel/Slough Outlet locations and Combined vs the Average for All Oregon Estuaries.

Metal	Marina/Dock Areas N=8	Channel/Slough Outlets N=4	Combined N=12	Oregon† Estuaries
	mean			
As	15.30	7.45	12.68	6.56
Cd	0.30	0.12	0.24	0.42
Cr	40.44	19.68	33.52	28.75
Cu	16.35	5.40	12.69	23.97
Pb	8.64	3.77	7.02	14.07
Hg	0.04	0.02	0.04	0.05
Ni	28.38	12.75	23.17	28.96
Ag	0.41	0.33	0.38	-
Zn	61.99	30.23	51.40	84.19

Marina/Dock stations were EPA-2,3,6,8,9,12,14 and BC-9.
Channel/Slough Outlets stations were EPA-10,11,13 and BC-10.
† From Festul(4)

Table 4.

Concentrations of Organic Contaminants in Yaquina Bay Sediments

	EPA Sample Station										BC Station	
	2	3	6	8	9	10	11	12	13	14	9	10
						%						
TOC	6.62	1.19	0.58	1.33	2.40	1.81	0.31	2.72	0.51	2.70	2.57	0.25
						ppb						
Pesticides	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAHs (total)	560	268	ND	532	ND	ND	ND	ND	ND	ND	392	-
Phenanthrene	ND	ND	ND	76	ND	ND	ND	ND	ND	ND	130	ND
fluoranthrene	270	130	ND	230	ND	ND	ND	ND	ND	ND	100	ND
Pyrene	170	94	ND	150	ND	ND	ND	ND	ND	ND	67	ND
Chrysene	120	44	ND	76	ND	ND	ND	ND	ND	ND	95	ND
Phenol	480	120	83	310	170	ND	ND	ND	ND	260	ND	ND
4-methylphenol	170	ND	ND	190	ND	ND	ND	ND	ND	140	ND	ND
bis(2-ethylhexyl)-phthalate	750	340	77	150	ND	260	ND	ND	ND	110	ND	ND

BC-9,10 are USACE sample stations

Table 5

Concentrations of Dioxin/furan Congeners in Yaquina Bay Sediment

Sample	2378 TCDD	TOTAL TCDD	12378 PeCDD	TOTAL PeCDD	123478 HxCDD	123678 HxCDD	123789 HxCDD	TOTAL HxCDD	1234678 HpCDD	TOTAL HpCDD	OCDD
					ppt						
EPA-2	-0.46	2.00	1.50	2.50	2.20	11.00	4.00	55.00	240.00	630.00	1400.00
-3	-0.84	0.98	1.90	1.90	3.50	19.00	7.30	72.00	380.00	770.00	2300.00
-6	-0.41	1.30	-0.59	ND	0.47	1.50	1.00	8.10	27.00	59.00	180.00
-8	-0.36	2.40	0.62	1.10	-0.89	3.10	1.80	20.00	58.00	130.00	390.00
-9	0.38	6.40	1.20	1.20	0.97	3.90	2.70	25.00	85.00	220.00	620.00
-12	-1.90	3.60	-0.83	1.90	0.74	3.20	2.10	29.00	72.00	160.00	550.00
-13	0.29	7.70	0.35	2.30	0.32	0.78	0.55	7.20	13.00	28.00	130.00
-14	-0.64	1.60	0.51	1.80	0.86	0.86	1.10	13.00	23.00	54.00	200.00
Minimum	0.29	0.98	0.35	1.10	0.32	0.78	0.55	7.20	13.00	28.00	62.00
Maximum	0.38	7.70	1.90	2.50	3.50	19.00	7.30	72.00	380.00	770.00	2300.00

	2378 TCDF	TOTAL TCDF	12378 PeCDF	23478 PeCDF	TOTAL PeCDF	123478 HxCDF	123678 HxCDF	123789 HxCDF	234678 HxCDF	TOTAL HxCDF	1234678 HpCDF	1234789 HpCDF	TOTAL HpCDF	OCDF
EPA-2	1.40	6.00	0.23	-0.66	12.00	1.50	-11.00	1.40	-0.41	48.00	15.00	1.10	16.00	34.00
-3	0.95	6.60	0.36	0.52	14.00	-7.90	1.30	1.80	0.20	71.00	29.00	1.30	30.00	51.00
-6	0.61	1.40	-0.36	0.17	2.30	0.41	0.81	0.60	-0.52	9.20	2.80	0.46	8.30	7.20
-8	0.97	4.40	-0.53	0.31	4.90	0.79	1.00	0.86	-0.29	15.00	6.20	-0.96	10.00	21.00
-9	1.30	7.30	-0.46	0.52	7.30	-15.00	-0.45	0.70	-0.16	19.00	11.00	0.77	40.00	32.00
-12	1.50	11.00	0.44	0.51	8.40	1.10	-3.70	0.99	0.44	21.00	12.00	1.30	46.00	43.00
-13	0.59	4.40	0.18	-0.21	1.40	0.32	0.39	0.45	-0.33	3.90	1.60	-0.72	5.00	4.70
-14	0.52	3.20	0.29	0.28	2.60	0.61	0.55	0.64	-0.24	6.60	3.40	-0.58	3.40	10.00
Minimum	0.52	1.40	0.18	0.17	1.40	0.32	0.39	0.45	0.20	3.90	1.60	0.46	3.40	4.70
Maximum	1.50	11.00	0.44	0.52	14.00	1.50	1.30	1.80	0.44	71.00	29.00	1.30	46.00	51.00

Minus signs in front of values indicate detection limits.

Figure 1

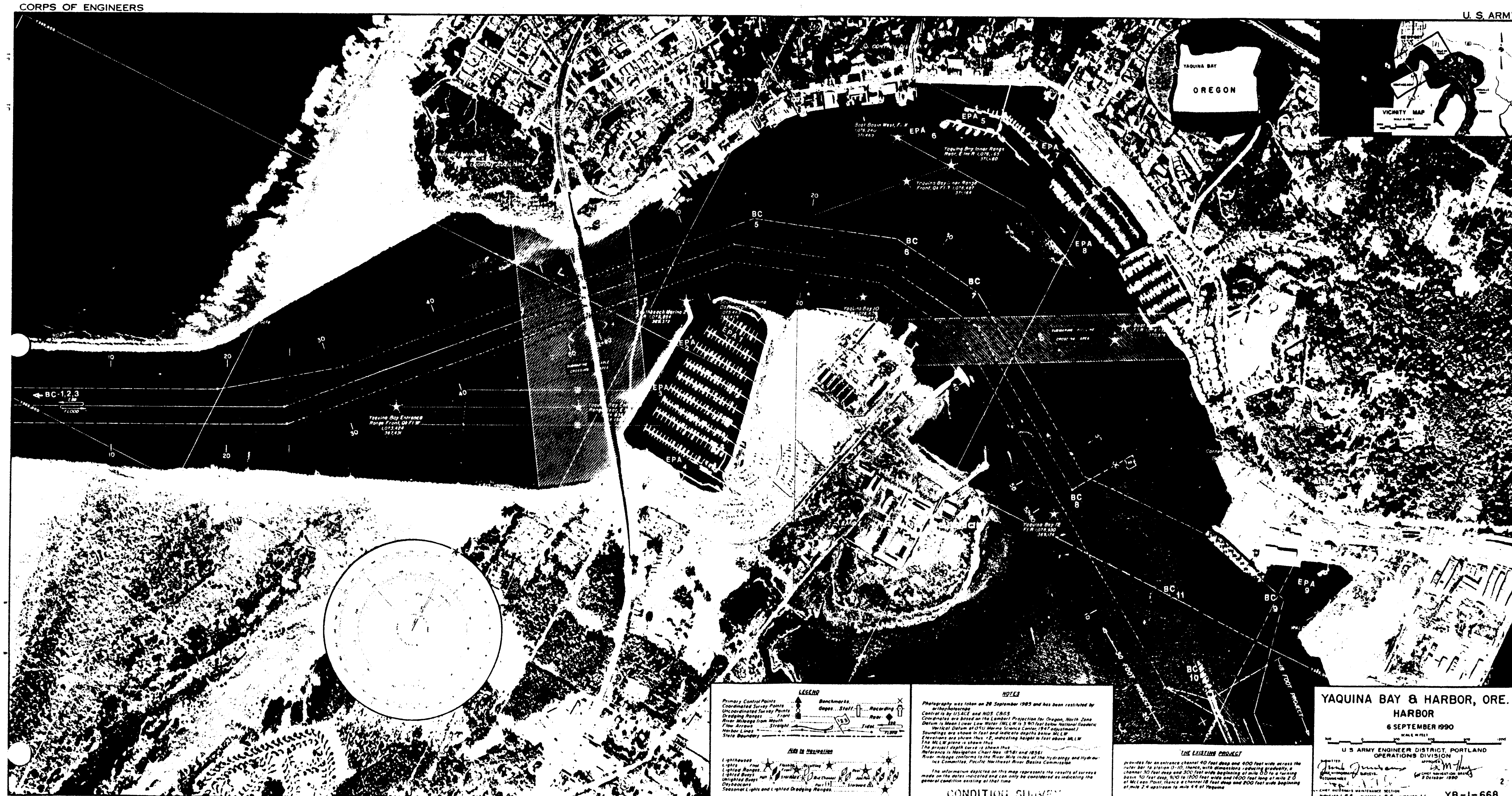
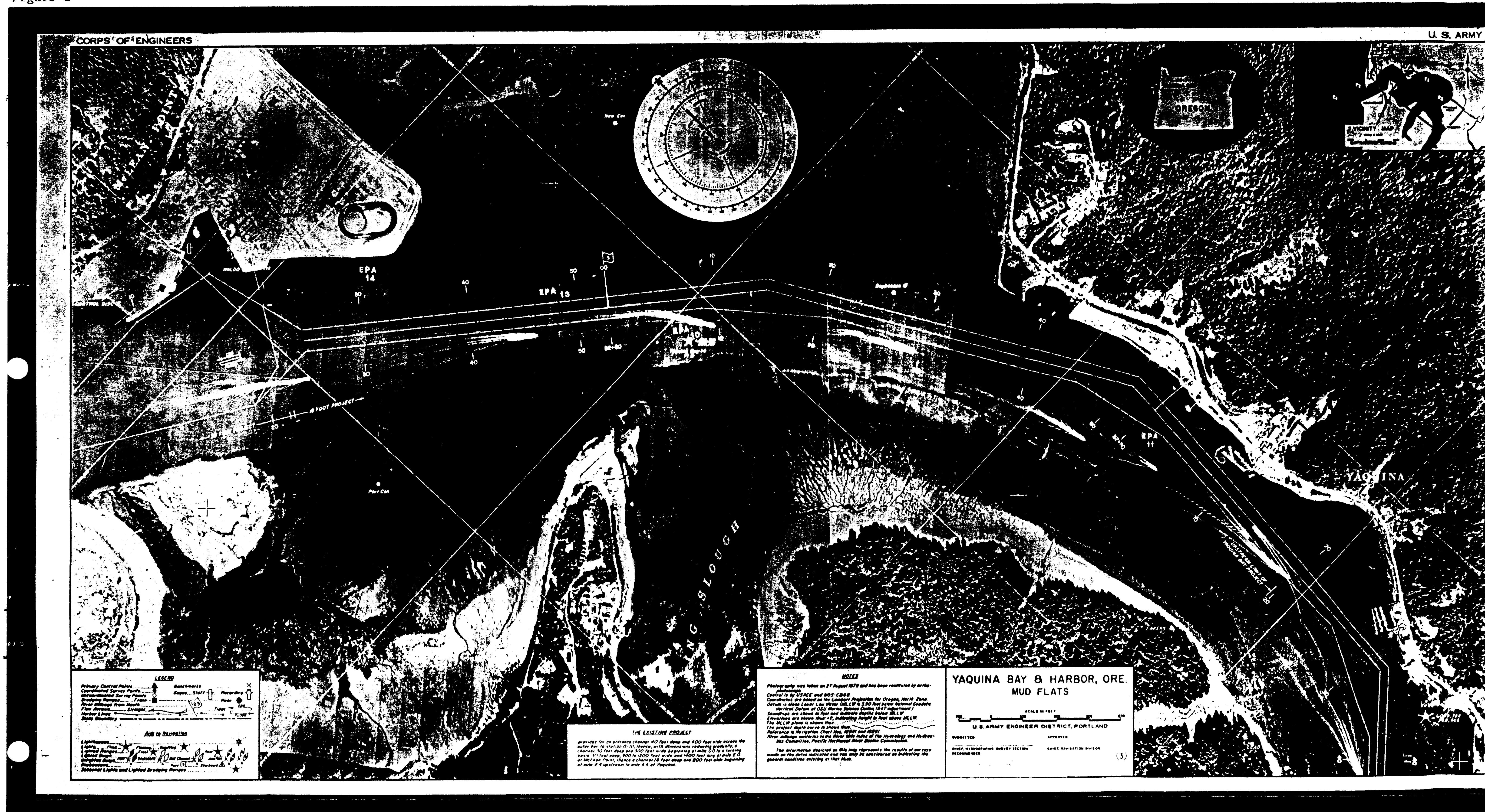

CORPS OF ENGINEERS
U. S. ARMY
YAQUINA BAY
OREGON
VICINITY MAP
LEGEND
Aids to Navigation
NOTES
CONDITION SURVEY
THE EXISTING PROJECT
YAQUINA BAY & HARBOR, ORE.
HARBOR
6 SEPTEMBER 1990
U S ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION
YB-1-668

Figure 2


CORPS OF ENGINEERS
U. S. ARMY
EPA 14
EPA 13
EPA 11
OREGON
YAQUINA
SLOUGH
LEGEND
Aids to Navigation
THE EXISTING PROJECT
NOTES
YAQUINA BAY & HARBOR, ORE.
MUD FLATS
U.S. ARMY ENGINEER DISTRICT, PORTLAND

ure 3

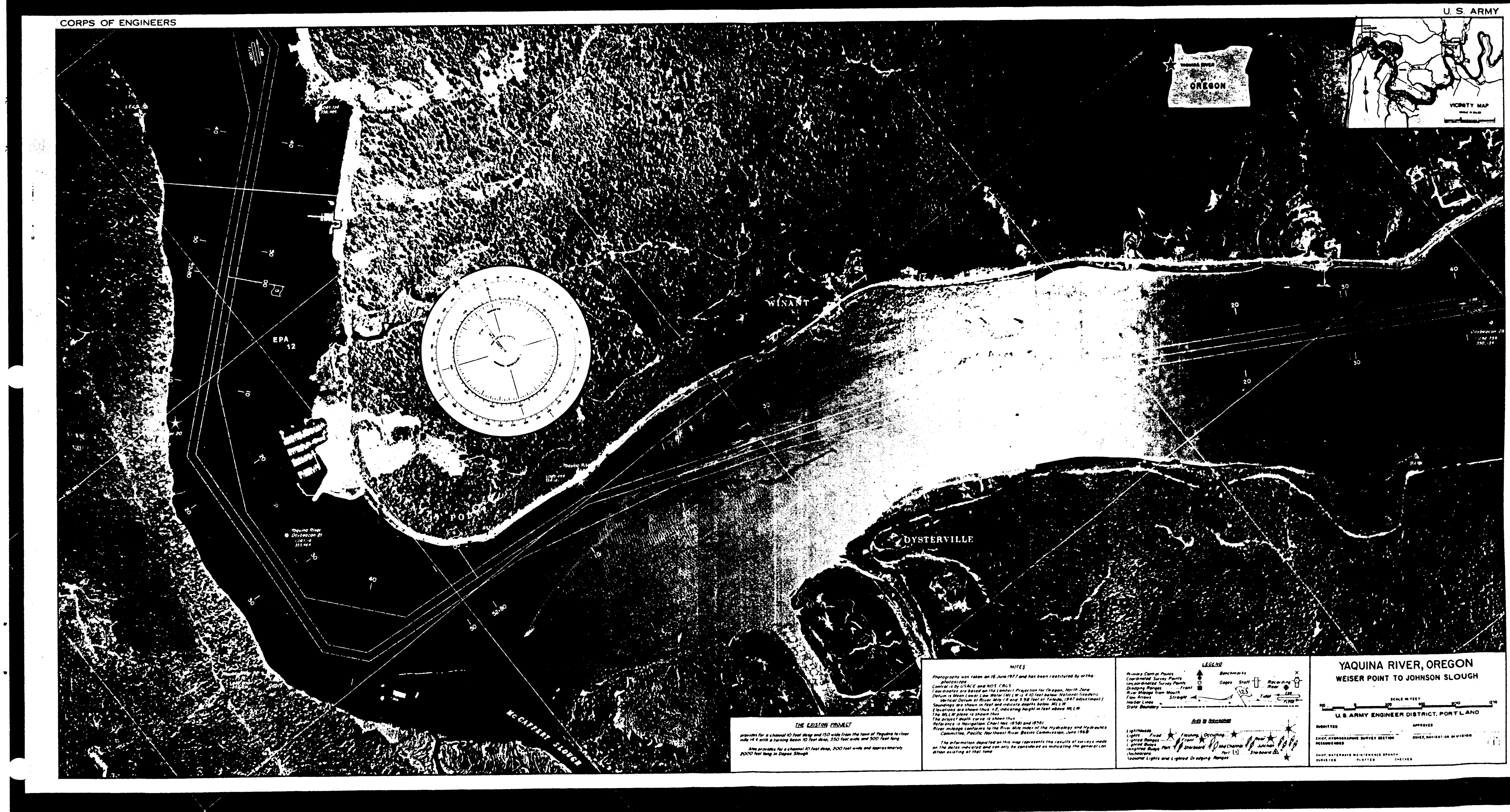
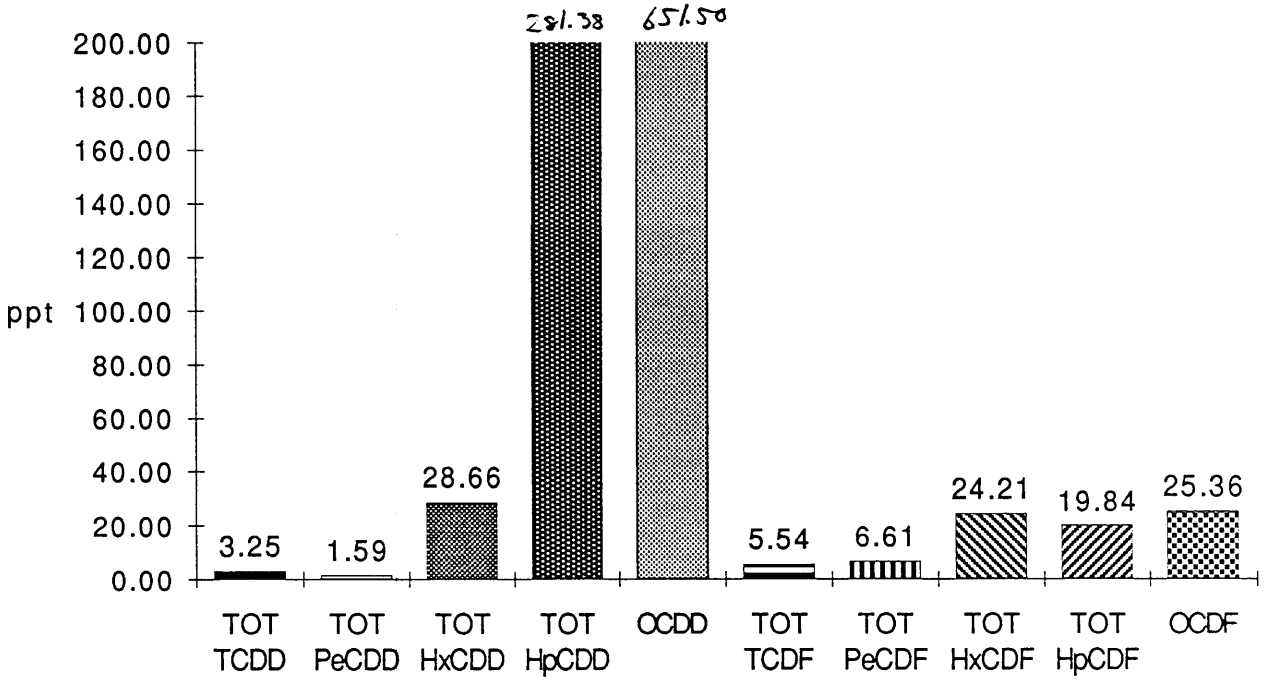

CORPS OF ENGINEERS
U. S. ARMY
OREGON
VICINITY MAP
EPA 12
WINANT
OYSTERVILLE
MC CAFFERY SLOUGH
THE EXISTING PROJECT
provides for a channel 10 feet deep and 150 wide from the town of Yaquina to river mile 14.4 with a turning basin 10 feet deep, 350 feet wide and 500 feet long
Also provides for a channel 10 feet deep, 200 feet wide and approximately 2000 feet long in Depoe Slough
NOTES
Photography was taken on 16 June 1977 and has been restituted by ortho-photoscope
Control is by USACE and NOS CRGS
Coordinates are based on the Lambert Projection for Oregon, North Zone
Datum is Mean Lower Low Water (MLLW is 4.10 feet below National Geodetic Vertical Datum at River Mile 1.8 and 3.98 feet at Toledo, 1947 adjustment)
Soundings are shown in feet and indicate depths below MLLW
Elevations are shown thus +8, indicating height in feet above MLLW
The MLLW plane is shown thus
The project depth curve is shown thus
Reference is Navigation Chart Nos. 18581 and 18561
River mileage conforms to the River Mile Index of the Hydrology and Hydraulics Committee, Pacific Northwest River Basins Commission, June 1968
The information depicted on this map represents the results of surveys made on the dates indicated and can only be considered as indicating the general condition existing at that time
LEGEND
Primary Control Points
Coordinated Survey Points
Uncoordinated Survey Points
Dredging Ranges
River Mileage from Mouth
Flow Arrows
Harbor Lines
State Boundary
Benchmarks
Gages
Staff
Recording
Front
Rear
Straight
Tidal
Aids to Navigation
Lighthouses
Lights
Fixed
Flashing
Occulting
Lighted Ranges
Lighted Buoys
Unlighted Buoys
Port
Starboard
Mid Channel
Junction
Daybeacons
Seasonal Lights and Lighted Dredging Ranges
YAQUINA RIVER, OREGON
WEISER POINT TO JOHNSON SLOUGH
SCALE IN FEET
U.S. ARMY ENGINEER DISTRICT, PORTLAND
SUBMITTED
APPROVED
CHIEF, HYDROGRAPHIC SURVEY SECTION
CHIEF, NAVIGATION DIVISION
RECOMMENDED
CHIEF, WATERWAYS MAINTENANCE BRANCH
SURVEYED
PLOTTED
CHECKED

Figure 4. Average concentration of each dioxin/furan congener class in Yaquina Bay sediment.



APPENDIX

Physical and Chemical Data From Yaquina Bay Sediments

YAQUINA BAY SEDIMENTS

Results of Dredge Test Analysis

CENPP Sample No.	Resuspended Density,gms/L	Void Ratio	Volatile Solids,%	Specific Gravity	Particle Roundness Grading
BC-1	1902	0.83	0.6	2.65	subangular to subround
BC-2	1923	0.80	0.7	2.66	subangular to subround
BC-3	1934	0.77	0.6	2.65	subangular to subround
BC-5	NO TESTS - SAMPLE CONSISTED ENTIRELY OF SHELLS				
BC-6	NO TESTS - SAMPLE CONSISTED ENTIRELY OF SHELLS				
BC-7	1912	0.84	0.5	2.68	subangular to subround
BC-8	1903	0.86	0.5	2.68	subangular to subround
C-9	1518	2.15	5.1	2.63	subangular to subround
BC-10	1809	1.13	1.2	2.72	subangular to subround
BC-11	1922	0.86	0.4	2.72	subangular to subround

Received : 6 Apr 90

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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 1 Depth: -- Lab No.: 17101

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	77.90	0.0
No. 18	0.10	99.9
No. 35	0.70	99.1
No. 60	3.20	95.9
No. 120	28.00	64.1
No. 230	48.00	38.4
Pan	77.90	0.0

Hydrometer Analysis

Sample Weight: 77.9 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	25.6	0.0466	33.2
3	20.0	18.6	0.0282	24.3
10	20.0	14.1	0.0158	18.6
100	20.0	8.7	0.0067	11.7
200	20.0	7.7	0.0047	10.4

Rm 1.2

$\bar{x} = 0.093$

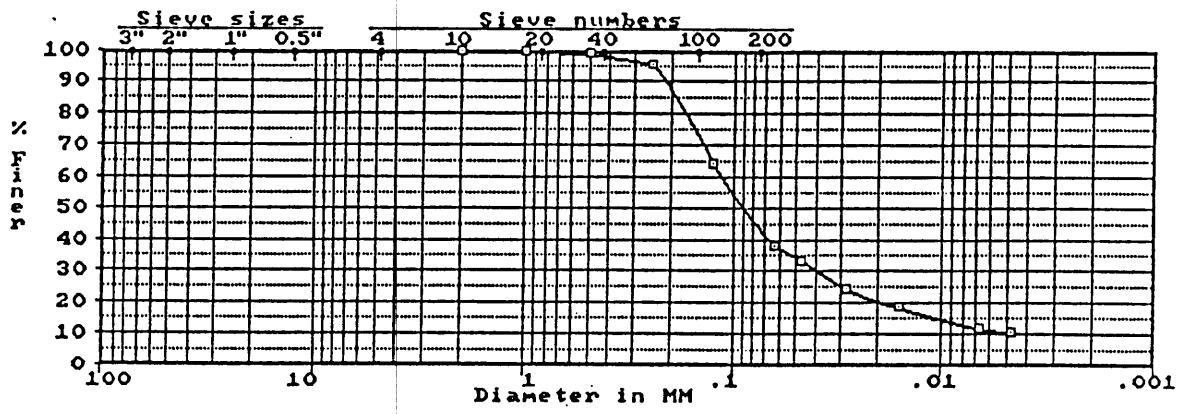
D85: 0.19 D60: 0.11 D50: .089 D30: .039 D15: .011 mm

Gravel: 0.0% Sand: 56.2% Fines: 43.8%

Comments

- VOLATILE SOLIDS = 9.6%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 2 Depth: -- Lab No.: 17102

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	60.00	0.0
No. 18	0.10	99.8
No. 35	1.80	97.0
No. 60	5.20	91.3
No. 120	18.40	69.3
No. 230	30.60	49.0
Pan	60.00	0.0

Hydrometer Analysis

Sample Weight: 60. gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	25.6	0.0466	43.1
3	20.0	20.1	0.0279	34.0
10	20.0	14.1	0.0158	24.1
100	20.0	7.7	0.0067	13.5
200	20.0	6.7	0.0048	11.9

$\bar{x} = 0.091$

Rm 1.2

D85: 0.20 D60: .093 D50: .065 D30: .022 D15: .0079 mm

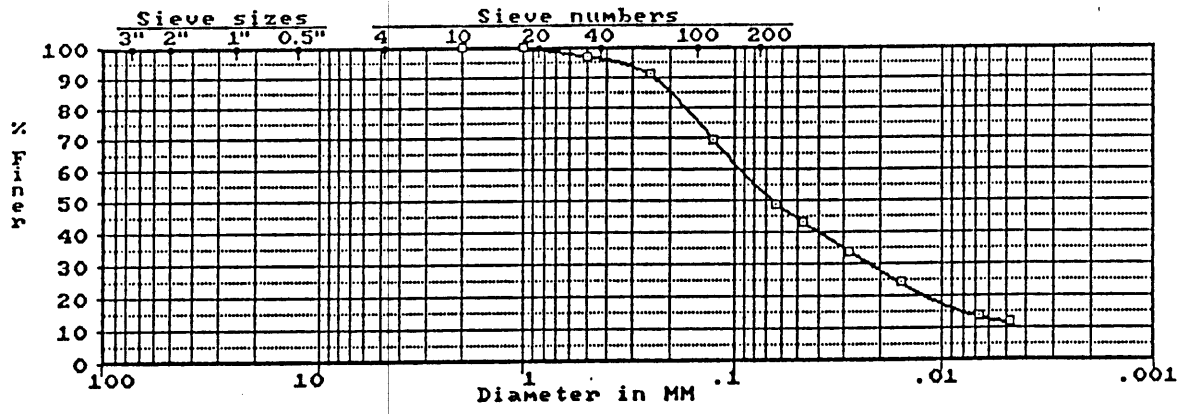
Gravel: 0.0% Sand: 46.4% Fines: 53.6%

ASTM

Comments

- VOLATILE SOLIDS = 17.0%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 3 Depth: -- Lab No.: 17103

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	80.40	0.0
No. 18	0.00	100.0
No. 35	0.10	99.9
No. 60	7.50	90.7
No. 120	47.80	40.5
No. 230	58.80	26.9
Pan	80.40	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 80.4 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	19.6	0.0485	24.7
3	20.0	17.1	0.0284	21.7
10	20.0	13.1	0.0159	16.7
100	20.0	7.7	0.0067	10.1
200	20.0	5.7	0.0048	7.6

Rm 1.2

$\bar{X} = 0.128$

D85: 0.23 D60: 0.16 D50: 0.14 D30: .085 D15: .013 D10: .0066 mm

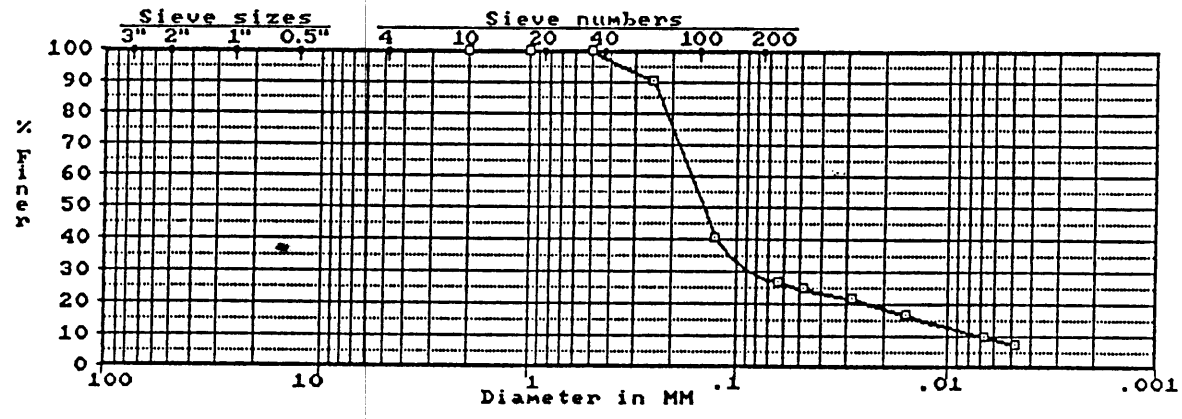
Cu: 24.6 Cc: 6.74

Gravel: 0.0% Sand: 71.9% Fines: 28.1%

---------- Comments ----------

- VOLATILE SOLIDS = 3.2%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 4 Depth: -- Lab No.: 17104

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	91.40	0.0
No. 18	0.10	99.9
No. 35	0.20	99.8
No. 60	5.10	94.4
No. 120	71.80	21.4
No. 230	77.90	14.8
Pan	91.40	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 91.4 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	12.9	0.0505	14.5
3	20.0	11.9	0.0293	13.4
10	20.0	9.9	0.0162	11.3
100	20.0	5.4	0.0068	6.4
200	20.0	4.5	0.0048	5.4

Rm 1.2

$\bar{x} = 0.151$

D85: 0.23 D60: 0.18 D50: 0.16 D30: 0.14 D15: .064 D10: .013 mm

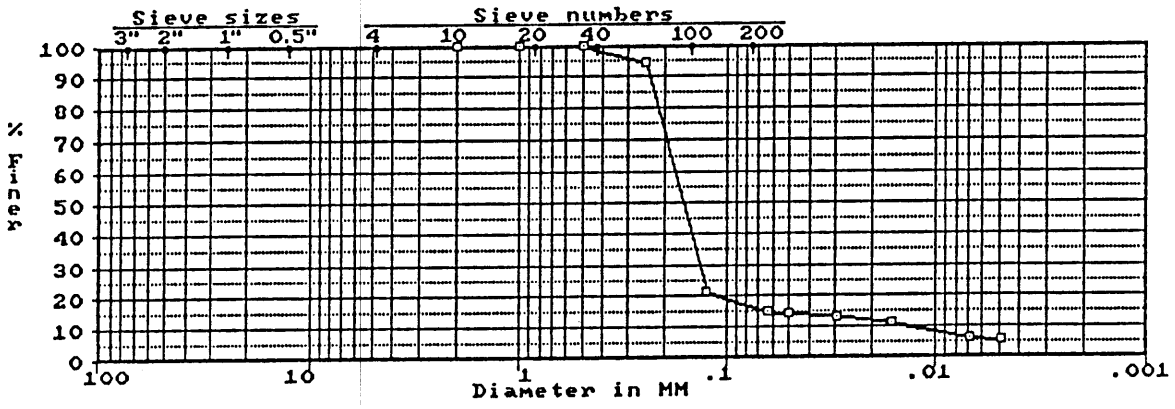
Cu: 13.8 Cc: 7.84

Gravel: 0.0% Sand: 83.5% Fines: 16.5%

---------- Comments ----------

- VOLATILE SOLIDS = 2.4%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 5 Depth: -- Lab No.: 17105

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	81.00	0.0
No. 18	0.10	99.9
No. 35	0.40	99.5
No. 60	2.30	97.2
No. 120	52.20	35.6
No. 230	67.40	16.8
Pan	81.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 81. gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	11.9	0.0508	15.2
3	20.0	9.4	0.0297	12.1
10	20.0	7.4	0.0165	9.7
100	20.0	4.9	0.0068	6.6
200	20.0	4.0	0.0048	5.5

$\bar{x} = 0.140$ grain size

Rm 1.6

D85: 0.22 D60: 0.16 D50: 0.15 D30: 0.11 D15: .049 D10: .018 mm

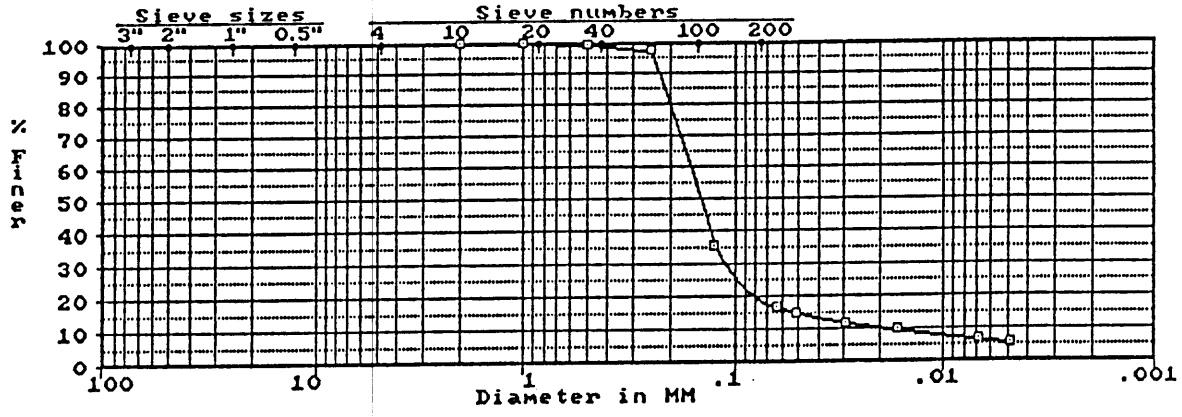
Cu: 9.09 Cc: 4.21

Gravel: 0.0% Sand: 81.4% Fines: 18.6%

---------- Comments ----------

- VOLATILE SOLIDS = 2.8%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 6 Depth: -- Lab No.: 17106

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	72.60	0.0
No. 18	0.00	100.0
No. 35	0.20	99.7
No. 60	4.20	94.2
No. 120	47.50	34.6
No. 230	60.70	16.4
Pan	72.60	0.0

$\bar{X} = 0.141$

Rm 1.6

---------- Hydrometer Analysis ----------

Sample Weight: 72.6 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	10.4	0.0512	14.9
3	20.0	8.9	0.0298	12.8
10	20.0	6.9	0.0165	10.1
100	20.0	4.4	0.0068	6.7
200	20.0	3.0	0.0049	4.8

D85: 0.22 D60: 0.17 D50: 0.15 D30: 0.11 D15: .052 D10: .016 mm

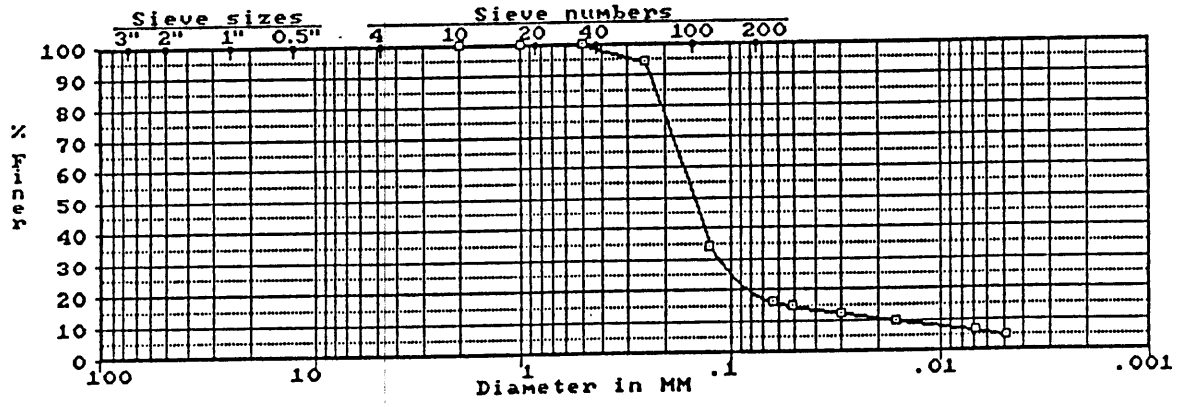
Cu: 10.4 Cc: 4.78

Gravel: 0.0% Sand: 81.9% Fines: 18.1%

---------- Comments ----------

- VOLATILE SOLIDS = 3.4%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 7 Depth: -- Lab No.: 17107

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	58.20	91.1
5/16 In.	250.10	61.8
No. 5	376.40	42.6
No. 10	432.90	33.9
Pan	655.40	0.0
No. 18	6.80	31.8
No. 35	18.20	28.3
No. 60	53.10	17.5
No. 120	95.40	4.3
No. 230	99.70	3.0
Pan	109.30	0.0

No hydrometer analysis.

Rm 1,7

$\bar{x} = 6.433$

D85: 13.6 D60: 7.60 D50: 5.48 D30: 0.64 D15: 0.22 D10: 0.17 mm

Cu: 43.7 Cc: 0.31

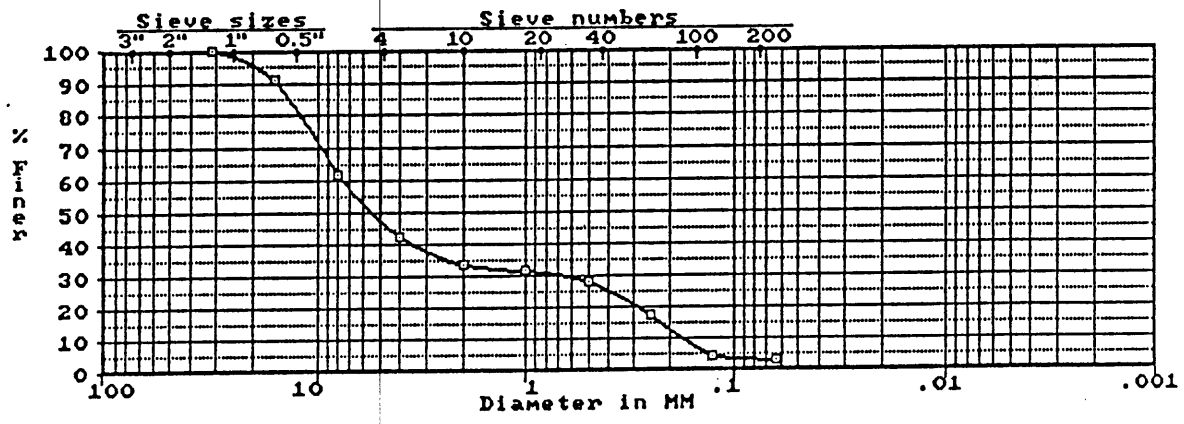
Gravel: 53.6% Sand: 43.1% Fines: 3.3%

---------- ASTM D 2487 Classification ----------

GP Poorly graded GRAVEL with sand

---------- Comments ----------

- VOLATILE SOLIDS = 2.4%
- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 8 Depth: -- Lab No.: 17108

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	68.10	0.0
No. 18	0.00	100.0
No. 35	0.10	99.9
No. 60	2.90	95.7
No. 120	38.40	43.6
No. 230	53.30	21.7
Pan	68.10	0.0

$\bar{X} = 0.125$

---------- Hydrometer Analysis ----------

Sample Weight: 68.1 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	13.4	0.0503	20.2
3	20.0	10.4	0.0296	15.8
10	20.0	7.9	0.0164	12.2
100	20.0	4.9	0.0068	7.9
200	20.0	3.5	0.0049	5.8

Qm 1.8

D85: 0.21 D60: 0.15 D50: 0.14 D30: .091 D15: .026 D10: .010 mm

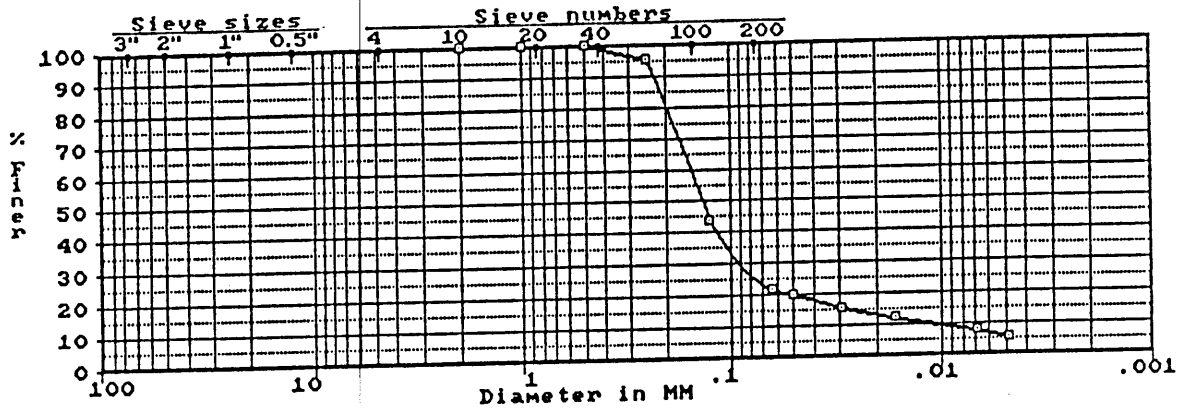
Cu: 14.7 Cc: 5.18

Gravel: 0.0% Sand: 75.4% Fines: 24.6%

---------- Comments ----------

- VOLATILE SOLIDS = 3.6%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 9 Depth: -- Lab No.: 17109

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	69.50	0.0
No. 18	0.00	100.0
No. 35	0.10	99.9
No. 60	1.40	98.0
No. 120	6.50	90.6
No. 230	20.90	69.9
Pan	69.50	0.0

Hydrometer Analysis

Sample Weight:69.5 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	41.3	0.0414	59.5
3	20.0	31.3	0.0259	45.3
10	20.0	22.8	0.0150	33.2
100	20.0	12.9	0.0065	19.1
200	20.0	10.5	0.0047	15.7

Rm 2.4

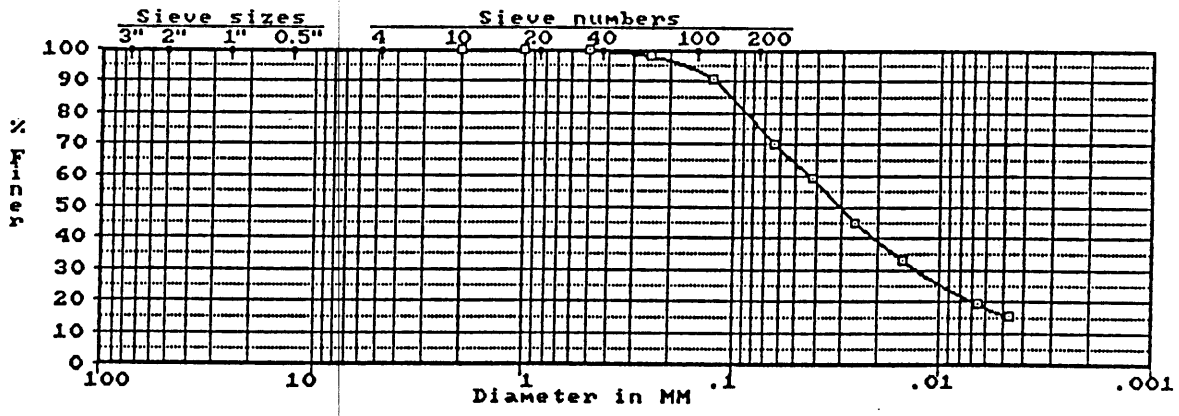
D85: 0.10 D60: .042 D50: .030 D30: .013 mm

Gravel: 0.0% Sand: 24.4% Fines: 75.6%

Comments

- VOLATILE SOLIDS - 11.1%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 10 Depth: -- Lab No.: 17110

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	102.20	0.0
No. 18	0.10	99.9
No. 35	0.50	99.5
No. 60	2.10	97.9
No. 120	56.60	44.6
No. 230	81.60	20.2
Pan	102.20	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 102.2 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	18.3	0.0489	18.2
3	20.0	14.3	0.0289	14.3
10	20.0	11.8	0.0161	11.9
100	20.0	7.4	0.0067	7.7
200	20.0	6.5	0.0048	6.8

Rm 3.2

$\bar{x} = 0.124$

D85: 0.21 D60: 0.15 D50: 0.13 D30: .091 D15: .032 D10: .011 mm

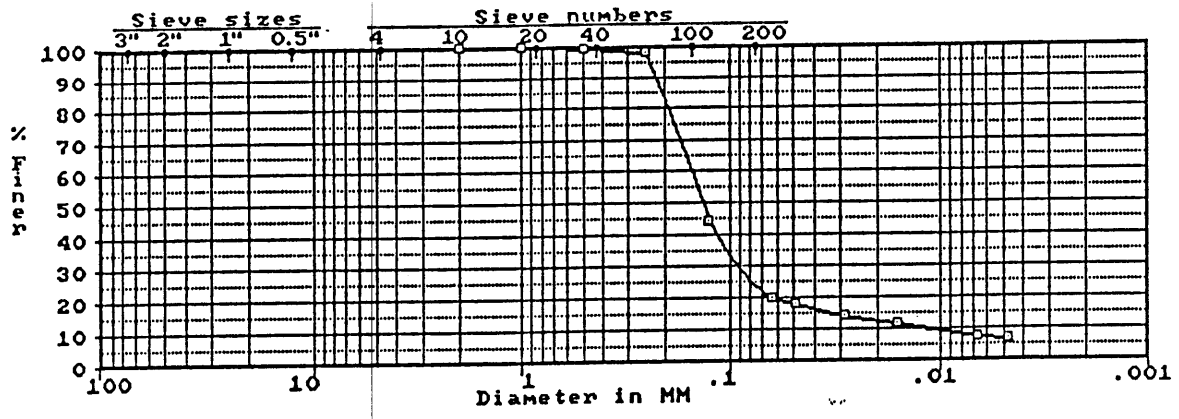
Cu: 13.6 Cc: 5.00

Gravel: 0.0% Sand: 76.2% Fines: 23.8%

---------- Comments ----------

- VOLATILE SOLIDS = 4.0%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 11 Depth: -- Lab No.: 17111

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	197.50	0.0
No. 18	0.90	99.5
No. 35	7.20	96.4
No. 60	129.60	34.4
No. 120	183.50	7.1
No. 230	193.70	1.9
Pan	197.50	0.0

No hydrometer analysis.

Rm 3.9

$\bar{X} = 0.30$

D85: 0.44 D60: 0.33 D50: 0.29 D30: 0.23 D15: 0.17 D10: 0.14 mm

Cu: 2.31 Cc: 1.15

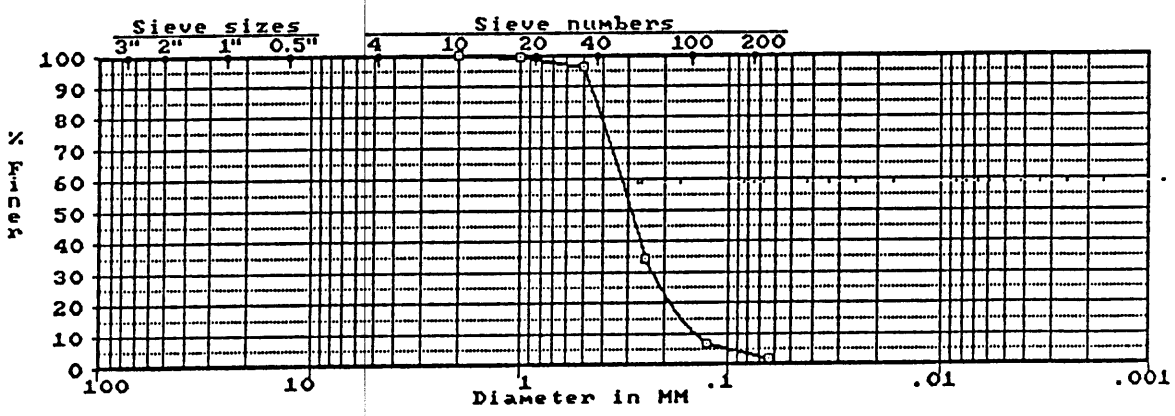
Gravel: 0.0% Sand: 96.8% Fines: 3.2%

---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

---------- Comments ----------

- VOLATILE SOLIDS = 2.4%
- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 12 Depth: -- Lab No.: 17112

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	82.30	0.0
No. 18	0.10	99.9
No. 35	0.30	99.6
No. 60	1.00	98.8
No. 120	4.50	94.5
No. 230	39.90	51.5
Pan	82.30	0.0

Hydrometer Analysis

Sample Weight: 82.3 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	35.4	0.0434	43.2
3	20.0	25.4	0.0270	31.2
10	20.0	18.9	0.0154	23.3
100	20.0	11.9	0.0066	14.9
200	20.0	9.5	0.0047	12.0

Rm 5.2

X = 0.059

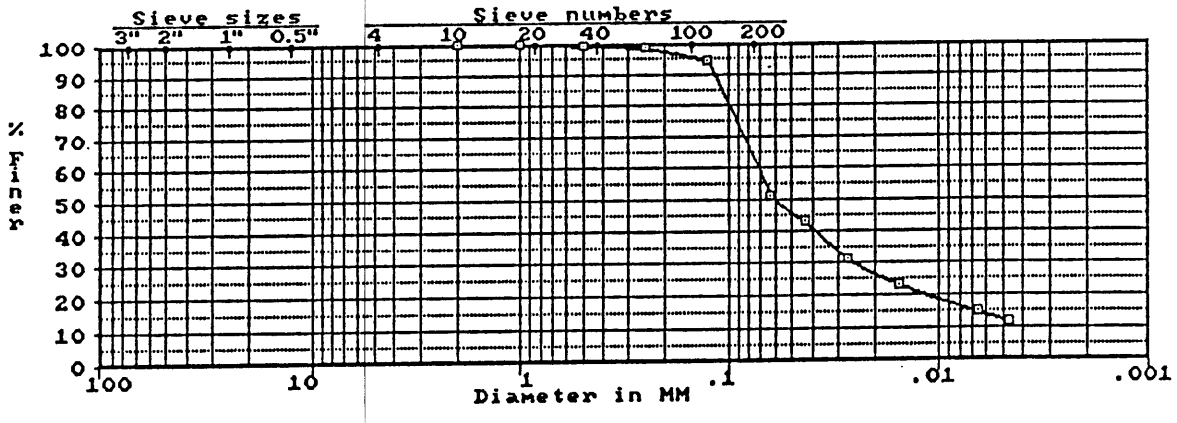
D85: 0.11 D60: .072 D50: .060 D30: .025 D15: .0066 mm

Gravel: 0.0% Sand: 37.4% Fines: 62.6%

Comments

- VOLATILE SOLIDS = 7.2%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 13 Depth: -- Lab No.: 17113

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	124.30	0.0
No. 18	0.10	99.9
No. 35	0.60	99.5
No. 60	17.90	85.6
No. 120	96.90	22.0
No. 230	111.90	10.0
Pan	124.30	0.0

No hydrometer analysis.

Rm 2.9

$\bar{X} = 0.168$

D85: 0.25 D60: 0.19 D50: 0.17 D30: 0.14 D15: .084 D10: .063 mm

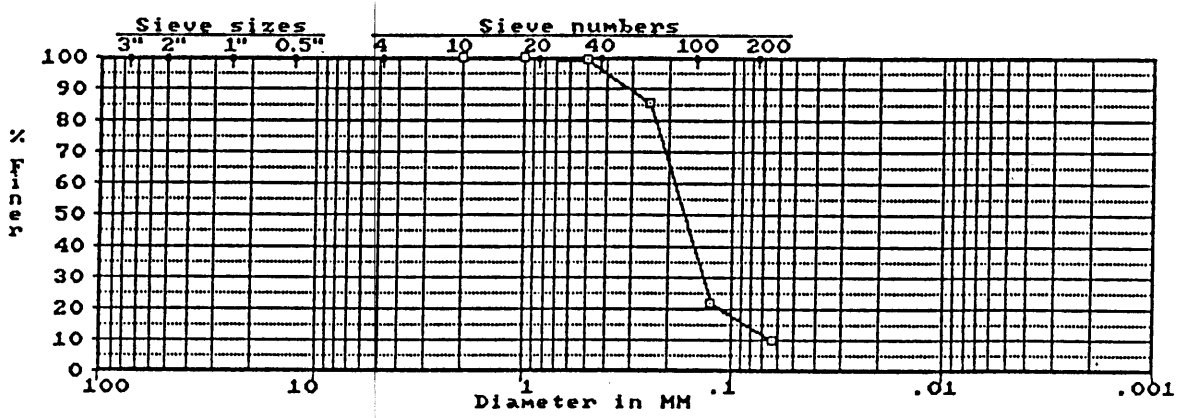
Cu: 3.01 Cc: 1.56

Gravel: 0.0% Sand: 86.9% Fines: 13.1%

---------- Comments ----------

- VOLATILE SOLIDS = 2.0%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 14 Depth: -- Lab No.: 17114

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	51.30	0.0
No. 18	0.00	100.0
No. 35	0.30	99.4
No. 60	1.30	97.5
No. 120	15.10	70.6
No. 230	32.20	37.2
Pan	51.30	0.0

Hydrometer Analysis

Sample Weight: 51.3 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	16.4	0.0494	32.6
3	20.0	12.4	0.0292	24.9
10	20.0	9.4	0.0163	19.1
100	20.0	5.6	0.0068	11.8
200	20.0	5.0	0.0048	10.6

Rm 2.6

$\bar{x} = 0.088$

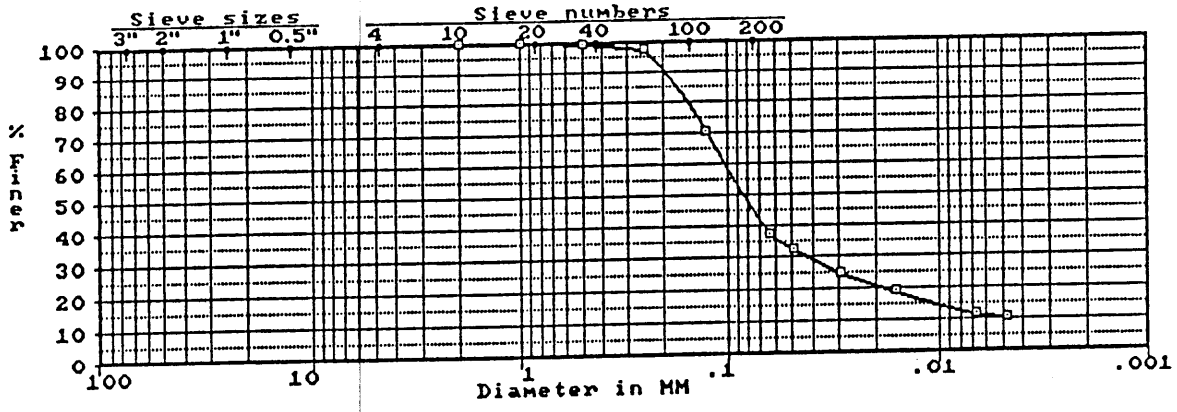
D85: 0.17 D60: 0.10 D50: .084 D30: .042 D15: .011 mm

Gravel: 0.0% Sand: 55.4% Fines: 44.6%

Comments

- VOLATILE SOLIDS = 6.6%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-1 Depth: -- Lab No.: 17115

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	66.00	0.0
No. 18	0.00	100.0
No. 35	0.10	99.8
No. 60	4.50	93.2
No. 120	65.50	0.8
No. 230	66.00	0.0
Pan	66.00	0.0

No hydrometer analysis.

Rm 0.1

$\bar{X} = 0.187$

D85: 0.24 D60: 0.20 D50: 0.18 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.46 Cc: 0.93

Gravel: 0.0% Sand: 99.8% Fines: 0.2%

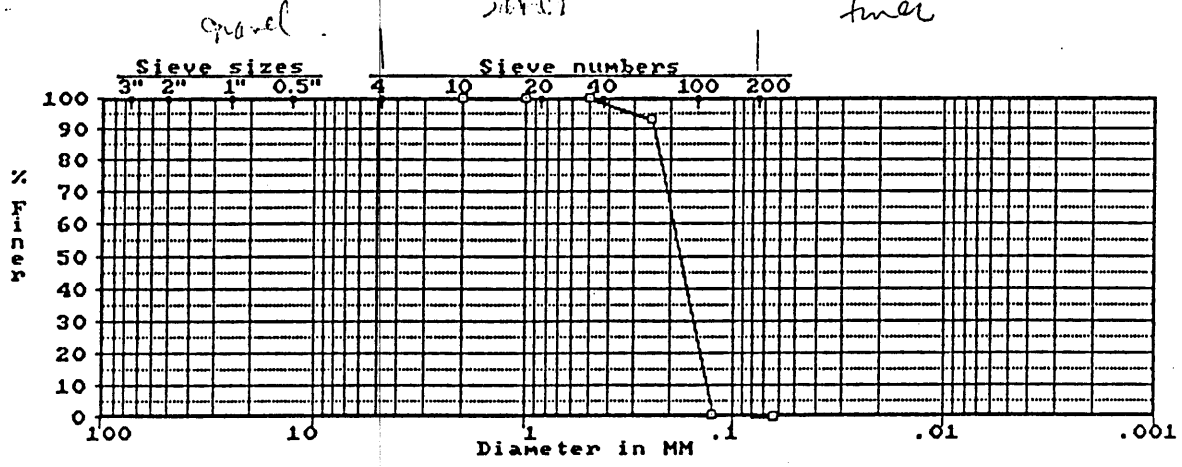
ASTM D 2487 Classification

SP Poorly graded SAND

Vol. sol. 0.6

Comments

- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-2 Depth: -- Lab No.: 17116

-- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	107.90	0.0
No. 18	0.10	99.9
No. 35	0.70	99.4
No. 60	8.20	92.4
No. 120	107.10	0.7
No. 230	107.80	0.1
Pan	107.90	0.0

No hydrometer analysis.

Rm – 0.1

$\bar{x} = 0.187$

D85: 0.24 D60: 0.20 D50: 0.18 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.46 Cc: 0.93

Gravel: 0.0% Sand: 99.7% Fines: 0.3%

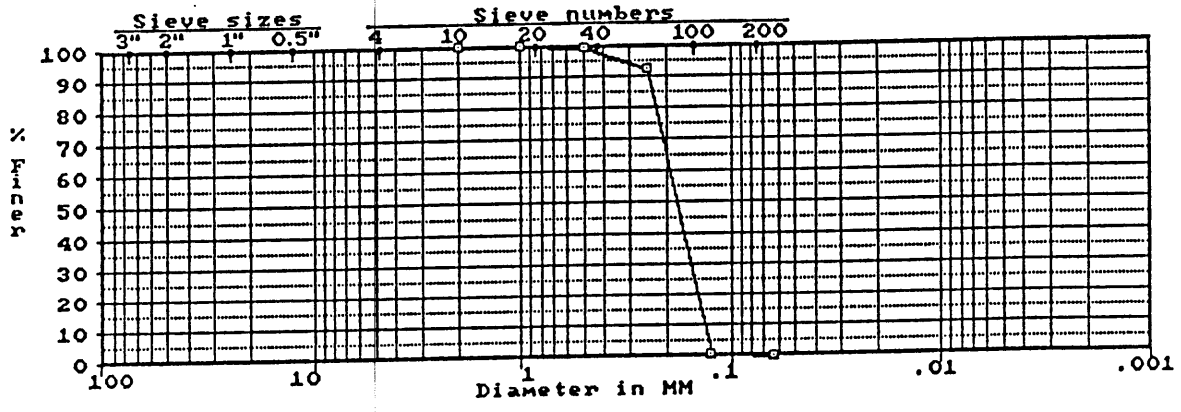
ASTM D 2487 Classification

SP Poorly graded SAND

Vol sol 0.7

Comments

- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-3 Depth: -- Lab No.: 17117

-- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	1.60	99.8
No. 5	3.90	99.6
No. 10	7.80	99.2
Pan	991.20	0.0
No. 18	2.60	97.2
No. 35	10.20	91.2
No. 60	63.90	49.0
No. 120	122.80	2.7
No. 230	126.20	0.1
Pan	126.30	0.0

No hydrometer analysis.

Rm -0.2

$\bar{X} = 0.283$

D85: 0.44 D60: 0.29 D50: 0.25 D30: 0.19 D15: 0.16 D10: 0.14 mm

Cu: 2.04 Cc: 0.91

Gravel: 0.3% Sand: 98.9% Fines: 0.8%

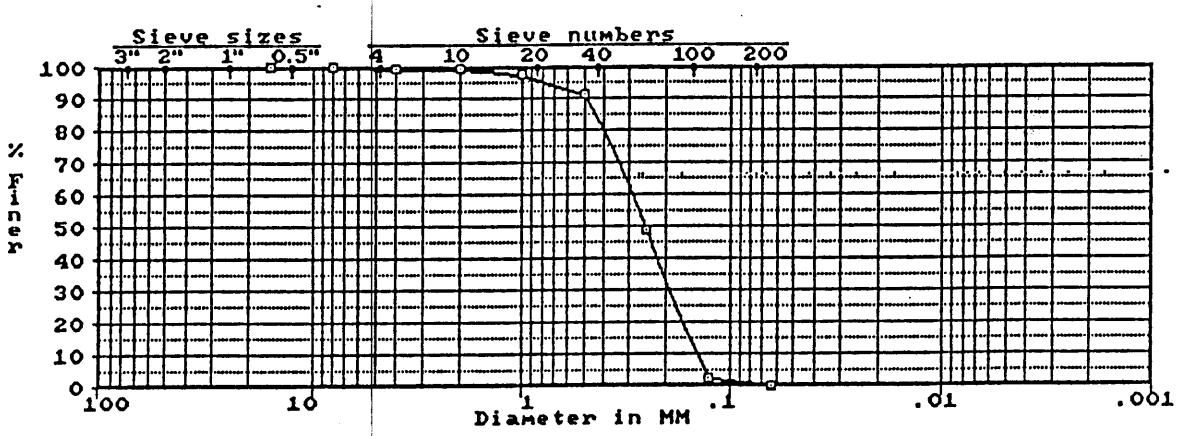
---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

Vol sol 0.6

---------- Comments ----------

- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-5 Depth: -- Lab No.: 17118

-- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	0.0
2.5 In.	0.00	0.0
1.25 In.	0.00	0.0
5/8 In.	0.00	0.0
5/16 In.	0.00	0.0
No. 5	0.00	0.0
No. 10	0.00	0.0
Pan	0.00	0.0
No. 18	0.00	0.0
No. 35	0.00	0.0
No. 60	0.00	0.0
No. 120	0.00	0.0
No. 230	0.00	0.0
Pan	0.00	0.0

No hydrometer analysis.

Rm 1.3

Gravel: 0.0

Comments

SAMPLE CONSISTED ENTIRELY OF 502 GRAMS OF SHELLS - NO SEDIMENT

No sieve analysis, cumulative weight retained for final pan is 0

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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-6 Depth: -- Lab No.: 17119

-- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	0.0
2.5 In.	0.00	0.0
1.25 In.	0.00	0.0
5/8 In.	0.00	0.0
5/16 In.	0.00	0.0
No. 5	0.00	0.0
No. 10	0.00	0.0
Pan	0.00	0.0
No. 18	0.00	0.0
No. 35	0.00	0.0
No. 60	0.00	0.0
No. 120	0.00	0.0
No. 230	0.00	0.0
Pan	0.00	0.0

No hydrometer analysis.

RM 1.5

Gravel: 0.0

Comments

- SAMPLE CONSISTED ENTIRELY OF 518 GRAMS OF SHELLS - NO SEDIMENT
-
-

No sieve analysis, cumulative weight retained for final pan is 0

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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-7 Depth: -- Lab No.: 17120

-- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	132.00	0.0
No. 18	2.00	98.5
No. 35	5.70	95.7
No. 60	41.30	68.7
No. 120	124.70	5.5
No. 230	131.60	0.3
Pan	132.00	0.0

No hydrometer analysis.

Rm 1,7

$\bar{X} = 0.23$

D85: 0.34 D60: 0.23 D50: 0.21 D30: 0.17 D15: 0.14 D10: 0.13 mm

Cu: 1.73 Cc: 0.91

Gravel: 0.0% Sand: 98.4% Fines: 1.6%

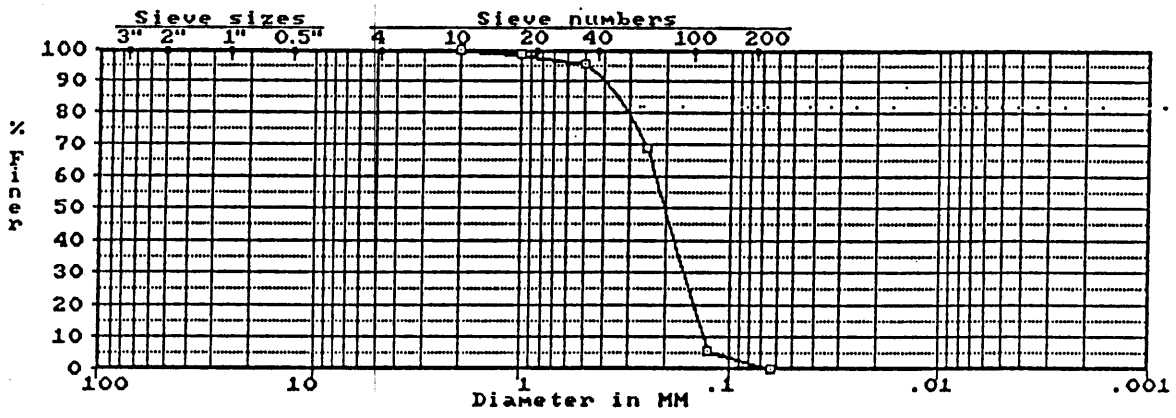
---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

Vol Sol 0.5

---------- Comments ----------

- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-8 Depth: -- Lab No.: 17121

-- Sieve Analysis ----

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	129.30	0.0
No. 18	0.30	99.8
No. 35	1.30	99.0
No. 60	36.80	71.5
No. 120	121.40	6.1
No. 230	128.90	0.3
Pan	129.30	0.0

No hydrometer analysis.

RM 2.0

$\bar{x} = 0.22$

D85: 0.32 D60: 0.22 D50: 0.20 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.71 Cc: 0.91

Gravel: 0.0% Sand: 98.2% Fines: 1.8%

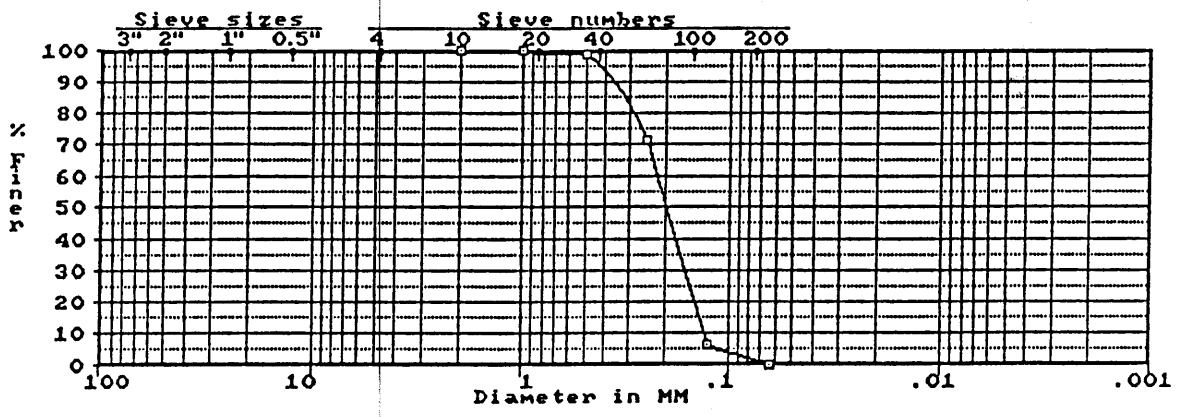
ASTM D 2487 Classification

SP Poorly graded SAND

very well sorted 0.5

Comments

- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-9 Depth: -- Lab No.: 17122

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	66.30	0.0
No. 18	0.00	100.0
No. 35	0.20	99.7
No. 60	1.10	98.3
No. 120	22.10	66.7
No. 230	46.20	30.3
Pan	66.30	0.0

Hydrometer Analysis

Sample Weight: 66.3 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	16.7	0.0493	25.7
3	20.0	12.7	0.0292	19.7
10	20.0	9.7	0.0163	15.2
100	20.0	5.7	0.0068	9.3
200	20.0	4.7	0.0048	7.8

Rm 2.4

$\bar{X} = 0.097$

D85: 0.18 D60: 0.11 D50: .094 D30: .062 D15: .016 D10: .0077 mm

Cu: 14.7 Cc: 4.51

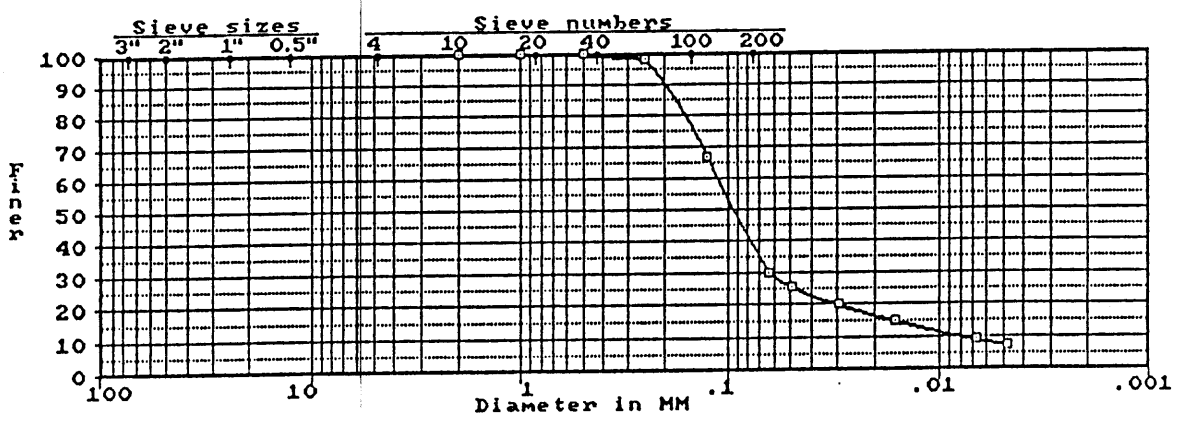
Gravel: 0.0% Sand: 61.8% Fines: 38.2%

Vol Sol 5.1

Comments

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-10 Depth: -- Lab No.: 17123

--- Sieve Analysis ---

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.40	100.0
No. 10	5.50	99.4
Pan	896.40	0.0
No. 18	1.30	98.1
No. 35	3.70	95.8
No. 60	30.30	69.7
No. 120	91.50	9.9
No. 230	98.00	3.5
Pan	101.60	0.0

No hydrometer analysis.

Rm 2.4

$\bar{X} = 0.223$

D85: 0.34 D60: 0.23 D50: 0.20 D30: 0.16 D15: 0.13 D10: 0.13 mm

Cu: 1.80 Cc: 0.91

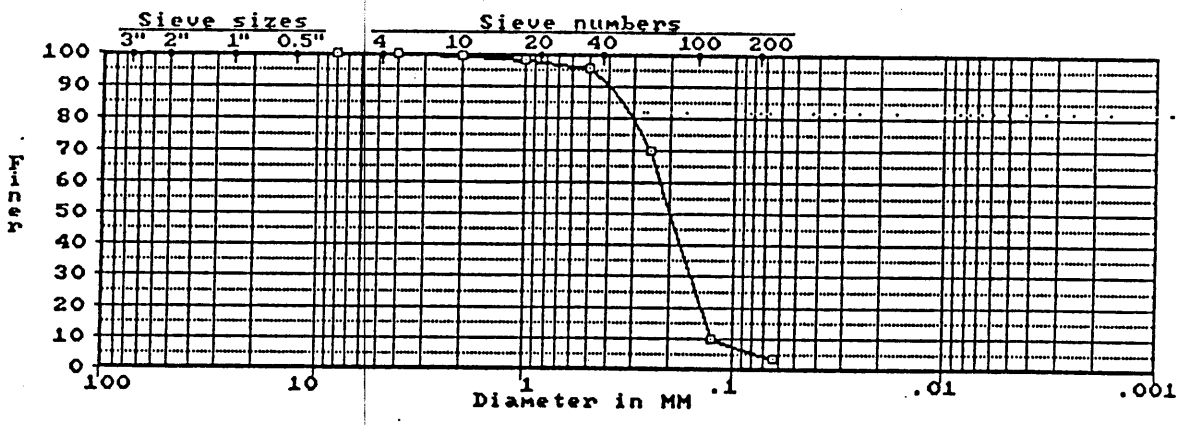
Gravel: 0.0% Sand: 94.9% Fines: 5.1%

Vol mol 1.2

--- Comments ---

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-11 Depth: -- Lab No.: 17124

----- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	112.80	0.0
No. 18	0.10	99.9
No. 35	0.40	99.6
No. 60	11.80	89.5
No. 120	108.80	3.5
No. 230	112.60	0.2
Pan	112.80	0.0

No hydrometer analysis.

RM 2.3

$\bar{x} = 0.187$

D85: 0.24 D60: 0.20 D50: 0.18 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.50 Cc: 0.92

Gravel: 0.0% Sand: 99.0% Fines: 1.0%

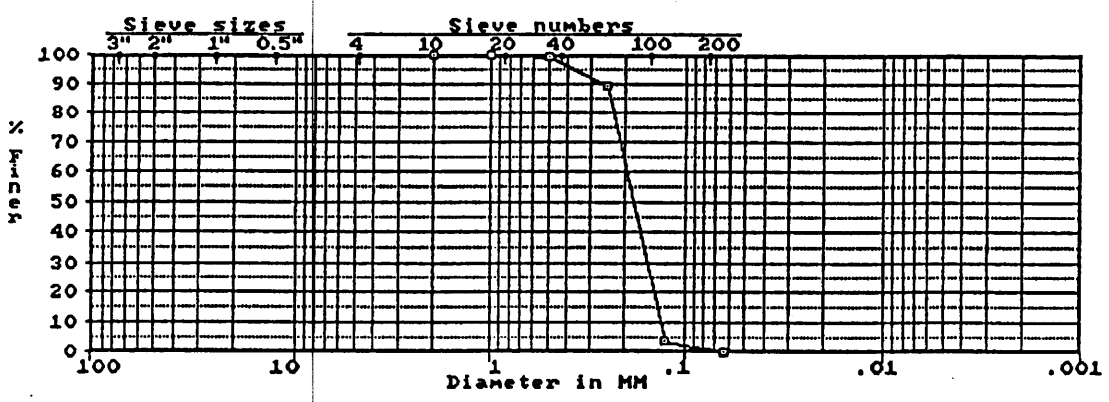
---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

val sal 0,4

---------- Comments ----------

- BOX CORE SAMPLE



TOC data for samples submitted by
Battelle Pacific N.W.

		TOC* (Weight %)	
G-2	5011-1*	3.47	3.16
G-3 Comp	5011-2*	2.64	2.95
G-6	5011-3*	2.67	2.35
YQ-BC 10	5011-4*	0.26	0.24
YQ-BC 9	5011-5*	2.37	2.43
YQ-EPA 2	5011-6	6.53	6.70
YQ-EPA 3	5011-7*	0.66	1.71
YQ-EPA 6	5011-8*	0.55	0.60
YQ-EPA 8	5011-9*	1.29	1.37
YQ-EPA 10	5011-10*	1.78	1.45
YQ-EPA 10 Dup	5011-11*	1.20	1.99
YQ-EPA 11	5011-12*	0.36	0.26
YQ-EPA 12	5011-13*	2.84	2.59
YQ-EPA 13	5011-14*	0.48	0.54
~~MESS-1-STD~~	~~5011-15~~	~~2.30~~	2.29
YQ-EPA 14	5011-16*	2.84	2.56
YQ-EPA 9	5011-17	3.06	3.10
TP-SF-C3	5011-18	1.03	1.09
TP-SF-C3 Dup	5011-19	1.02	1.08
TP-SF-D1	5011-20	0.04	0.04
TP-SF-E3	5011-21*	0.63	0.54
TP-SF-A4	5011-22	0.07	0.07
TP-SF-D4	5011-23	0.71	0.69
TP-SF-G4	5011-24	0.04	0.03
TP-SF-B2	5011-25	0.29	0.26
TP-SF-D7	5011-26	0.05	0.04
TP-SF-C5	5011-27	0.38	0.39
TP-SF-E5	5011-28	0.04	0.03
TP-SF-F6	5011-29	0.04	0.04
TP-SF-F2	5011-30	0.08	0.07
TP-SF-B6	5011-31	0.07	0.06

* Differences in sample repeat values may have been caused by sample inhomogeneity. Tiny pieces of shells and plant material were found in the majority of the samples.

ACID VOLATILE SULFIDE RESULTS
Portland COE

Sample ID	Sulfide Concentration (micromoles/gram)
YQ EPA 2	70.32±1.63
YQ EPA 3	24.96±1.46
YQ EPA 6	2.96
YQ EPA 8	12.25
YQ EPA 9	13.27
YQ BC 9	4.09
YQ EPA 10	0.06
YQ BC 10	1.30
YQ EPA 11	0.84
YQ EPA 12	1.48
YQ EPA 13	1.10
YQ EPA 14	2.65
ANALYTICAL BLANK	ND
DETECTION LIMIT	0.03

μM/g

μM/g

ANALYSIS COMPLETED 5/18/90

Yaquina - EPA: + Bt results

Organotin Results

Butyltin Studies - Sediment Samples

Sample Submittal Date or Group Code Number COE

Date 5/7/90

Technician Tim Forbes

Sample		Internal Standard % Recovery		Butyltin Species (ng/g dry sediment weight.) as Sn				Comment
ID	Size (g)	Propyltin	Pentyltin	Tetrabutyltin	Tributyltin	Dibutyltin	Monobutyltin	
YQEPA 2	4.03	91	129	<8.0	278	53	21	
YQEPA 3	6.50	80	153	<4.2	8.4	6.9	<4.2	
YQ BC 9	5.36	75	98	<0.66	5.6	7.2	2.6	
YQCC 10	8.04	62	111	<0.42	1.5	2.2	<0.40	
Blank	assume 5g	50	109	<0.69	<0.77	1.4	0.88	

46

1/2 wind

Organotin Results

Butyltin Studies - Sediment Samples
Sample Submittal Date or Group Code Number COE

Date 7 19 90
Technician Tim Farley

Sample		Internal Standard % Recovery		Butyltin Species (ng/g dry Sediment weight.) e SN				
ID	Size (g)	Propyltin	Penlyltin	Tetrabutyltin	Tributyltin	Dibutyltin	Monobutyltin	Comment
YR EPA-6	5.35	70	105	<1.1	3.8	3.3	1.0	
~~YR EPA-8~~	~~4.96~~	~~51~~	~~94~~	<1.3	4.6	5.8	1.6	

Rel: DE-MS-3A01
5/89

Entered 9-6-90
in dBase

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 2
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	21.8 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.702 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	49.2 mg/kg-dry		SWN	ICP
7440-50-8	Copper	23.8 mg/kg-dry		SWN	ICP
7439-92-1	Lead	14.7 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	36 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.6 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	81.7 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 3
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	8.7 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.456 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	32.0 mg/kg-dry		SWN	ICP
7440-50-8	Copper	14.0 mg/kg-dry		SWN	ICP
7439-92-1	Lead	6.73 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	22 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	52.1 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 6
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	8.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.171 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	26.0 mg/kg-dry		SWN	ICP
7440-50-8	Copper	7.9 mg/kg-dry		SWN	ICP
7439-92-1	Lead	3.65 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	17 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	33.7 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 8
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	11.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.332 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	32.3 mg/kg-dry		SWN	ICP
7440-50-8	Copper	12.7 mg/kg-dry		SWN	ICP
7439-92-1	Lead	4.46 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	23 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	58.7 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 9
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	18.9 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.240 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	56.7 mg/kg-dry		SWN	ICP
7440-50-8	Copper	23.8 mg/kg-dry		SWN	ICP
7439-92-1	Lead	12.7 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	40 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.5 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	79.1 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 10
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	8.1 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.140 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	29.4 mg/kg-dry		SWN	ICP
7440-50-8	Copper	9.4 mg/kg-dry		SWN	ICP
7439-92-1	Lead	5.23 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	20 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	44.2 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 11
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	9.8 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.05 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	14.4 mg/kg-dry		SWN	ICP
7440-50-8	Copper	2.6 mg/kg-dry		SWN	ICP
7439-92-1	Lead	3.18 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry	U	SCM	CVA
7440-02-0	Nickel	9 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	31.9 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 12
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	27.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.195 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	44.9 mg/kg-dry		SWN	ICP
7440-50-8	Copper	20.3 mg/kg-dry		SWN	ICP
7439-92-1	Lead	14.7 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	30 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	76.0 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 13
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	5.8 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.21 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	18.1 mg/kg-dry		SWN	ICP
7440-50-8	Copper	5.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	5.11 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	11 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	22.7 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 14
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	16.1 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.136 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	41.4 mg/kg-dry		SWN	ICP
7440-50-8	Copper	14.0 mg/kg-dry		SWN	ICP
7439-92-1	Lead	7.8 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.04 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	30 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	59.0 mg/kg-dry		SWN	ICP

ID number: YQ-BC 9
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

ANALYTICAL RESULTS

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	9.4 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.135 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	41.0 mg/kg-dry		SWN	ICP
7440-50-8	Copper	14.1 mg/kg-dry		SWN	ICP
7439-92-1	Lead	4.4 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.05 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	29 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	55.6 mg/kg-dry		SWN	ICP

ID number: YQ-BC 10
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

ANALYTICAL RESULTS

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	6.1 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.07 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	16.8 mg/kg-dry		SWN	ICP
7440-50-8	Copper	4.3 mg/kg-dry		SWN	ICP
7439-92-1	Lead	1.57 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry	U	SCM	CVA
7440-02-0	Nickel	11 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	22.1 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130F
Matrix: Soil

Sample No.: YQ-EPA-2

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized: _____

DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 12.9 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	6.0U
319-85-7	Beta-BHC	6.0U
319-86-8	Delta-BHC	9.0U
58-89-9	Gamma-BHC (Lindane)	6.0U
76-44-8	Heptachlor	6.0U
309-00-2	Aldrin	6.0U
1024-57-3	Heptachlor Epoxide	6.0U
959-98-8	Endosulfan I	6.0U
60-57-1	Dieldrin	12U
72-55-9	4,4'-DDE	12U
72-20-8	Endrin	12U
33212-65-9	Endosulfan II	12U
72-54-8	4,4'-DDD	12U
1031-07-8	Endosulfan Sulfate	24U
50-29-3	4,4'-DDT	12U
72-43-5	Methoxychlor	24U
53494-70-5	Endrin Ketone	18U
5103-74-2	Gamma-Chlordane	9.0U
5103-71-9	Alpha-Chlordane	9.0U
8001-35-2	Toxaphene	900U
-	Aroclor-1242/1016	120U
12672-29-6	Aroclor-1248	120U
11097-69-1	Aroclor-1254	120U
11096-82-5	Aroclor-1260	120U

*** Pesticide Surrogate Recovery**	
Dibutylchlorendate	**78%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130G
Matrix: Soil

Sample No.: TQ-EPA 3

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized: _____
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 19.1 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**76%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130H
Matrix: Soil

Sample No.: YQ-EPA-6

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized: Peter M. Taylor
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 21.5 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**67%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 61301
Matrix: Soil

Sample No.: YQ-EPA-8

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 19.1 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0 U
319-85-7	Beta-BHC	4.0 U
319-86-8	Delta-BHC	6.0 U
58-89-9	Gamma-BHC (Lindane)	4.0 U
76-44-8	Heptachlor	4.0 U
309-00-2	Aldrin	4.0 U
1024-57-3	Heptachlor Epoxide	4.0 U
959-98-8	Endosulfan I	4.0 U
60-57-1	Dieldrin	4.0 U
72-55-9	4,4'-DDE	8.0 U
72-20-8	Endrin	8.0 U
33212-65-9	Endosulfan II	8.0 U
72-54-8	4,4'-DDD	8.0 U
1031-07-8	Endosulfan Sulfate	16 U
50-29-3	4,4'-DDT	8.0 U
72-43-5	Methoxychlor	16 U
53494-70-5	Endrin Ketone	12 U
5103-74-2	Gamma-Chlordane	6.0 U
5103-71-9	Alpha-Chlordane	6.0 U
8001-35-2	Toxaphene	600 U
-	Aroclor-1242/1016	80 U
12672-29-6	Aroclor-1248	80 U
11097-69-1	Aroclor-1254	80 U
11096-82-5	Aroclor-1260	80 U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**66%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130J
Matrix: Soil

Sample No.: YQ-EPA-9

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized: _____
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 14.0 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	6.0U
319-85-7	Beta-BHC	6.0U
319-86-8	Delta-BHC	9.0U
58-89-9	Gamma-BHC (Lindane)	6.0U
76-44-8	Heptachlor	6.0U
309-00-2	Aldrin	6.0U
1024-57-3	Heptachlor Epoxide	6.0U
959-98-8	Endosulfan I	6.0U
60-57-1	Dieldrin	12U
72-55-9	4,4'-DDE	12U
72-20-8	Endrin	12U
33212-65-9	Endosulfan II	12U
72-54-8	4,4'-DDD	12U
1031-07-8	Endosulfan Sulfate	24U
50-29-3	4,4'-DDT	12U
72-43-5	Methoxychlor	24U
53494-70-5	Endrin Ketone	18U
5103-74-2	Gamma-Chlordane	9.0U
5103-71-9	Alpha-Chlordane	9.0U
8001-35-2	Toxaphene	900U
-	Aroclor-1242/1016	120U
12672-29-6	Aroclor-1248	120U
11097-69-1	Aroclor-1254	120U
11096-82-5	Aroclor-1260	120U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**73%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 K Dupl.
Matrix: Soil

Sample No.: YQ-EPA-10 Dupl.

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 21.2 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0 U
319-85-7	Beta-BHC	4.0 U
319-86-8	Delta-BHC	6.0 U
58-89-9	Gamma-BHC (Lindane)	4.0 U
76-44-8	Heptachlor	4.0 U
309-00-2	Aldrin	4.0 U
1024-57-3	Heptachlor Epoxide	4.0 U
959-98-8	Endosulfan I	4.0 U
60-57-1	Dieldrin	4.0 U
72-55-9	4,4'-DDE	8.0 U
72-20-8	Endrin	8.0 U
33212-65-9	Endosulfan II	8.0 U
72-54-8	4,4'-DDD	8.0 U
1031-07-8	Endosulfan Sulfate	16 U
50-29-3	4,4'-DDT	8.0 U
72-43-5	Methoxychlor	16 U
53494-70-5	Endrin Ketone	12 U
5103-74-2	Gamma-Chlordane	6.0 U
5103-71-9	Alpha-Chlordane	6.0 U
8001-35-2	Toxaphene	600 U
-	Aroclor-1242/1016	80 U
12672-29-6	Aroclor-1248	80 U
11097-69-1	Aroclor-1254	80 U
11096-82-5	Aroclor-1260	80 U

*** Pesticide Surrogate Recovery**	
Dibutylchlorendate	**61%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 K Dupl.
Matrix: Soil

Sample No.: YQ-EPA-10 Dupl.

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized: _____
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 21.2 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0 U
319-85-7	Beta-BHC	4.0 U
319-86-8	Delta-BHC	6.0 U
58-89-9	Gamma-BHC (Lindane)	4.0 U
76-44-8	Heptachlor	4.0 U
309-00-2	Aldrin	4.0 U
1024-57-3	Heptachlor Epoxide	4.0 U
959-98-8	Endosulfan I	4.0 U
60-57-1	Dieldrin	4.0 U
72-55-9	4,4'-DDE	8.0 U
72-20-8	Endrin	8.0 U
33212-65-9	Endosulfan II	8.0 U
72-54-8	4,4'-DDD	8.0 U
1031-07-8	Endosulfan Sulfate	16 U
50-29-3	4,4'-DDT	8.0 U
72-43-5	Methoxychlor	16 U
53494-70-5	Endrin Ketone	12 U
5103-74-2	Gamma-Chlordane	6.0 U
5103-71-9	Alpha-Chlordane	6.0 U
8001-35-2	Toxaphene	600 U
-	Aroclor-1242/1016	80 U
12672-29-6	Aroclor-1248	80 U
11097-69-1	Aroclor-1254	80 U
11096-82-5	Aroclor-1260	80 U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**61%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 L
Matrix: Soil

Sample No.: YQ-EPA-11

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 22.7 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0 U
319-85-7	Beta-BHC	4.0 U
319-86-8	Delta-BHC	6.0 U
58-89-9	Gamma-BHC (Lindane)	4.0 U
76-44-8	Heptachlor	4.0 U
309-00-2	Aldrin	4.0 U
1024-57-3	Heptachlor Epoxide	4.0 U
959-98-8	Endosulfan I	4.0 U
60-57-1	Dieldrin	4.0 U
72-55-9	4,4'-DDE	8.0 U
72-20-8	Endrin	8.0 U
33212-65-9	Endosulfan II	8.0 U
72-54-8	4,4'-DDD	8.0 U
1031-07-8	Endosulfan Sulfate	16 U
50-29-3	4,4'-DDT	8.0 U
72-43-5	Methoxychlor	16 U
53494-70-5	Endrin Ketone	12 U
5103-74-2	Gamma-Chlordane	6.0 U
5103-71-9	Alpha-Chlordane	6.0 U
8001-35-2	Toxaphene	600 U
-	Aroclor-1242/1016	80 U
12672-29-6	Aroclor-1248	80 U
11097-69-1	Aroclor-1254	80 U
11096-82-5	Aroclor-1260	80 U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**68%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130M
Matrix: Soil

Sample No.: YQ-EPA-12

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized: _____

DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 16.4 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	5.0U
319-85-7	Beta-BHC	5.0U
319-86-8	Delta-BHC	7.0U
58-89-9	Gamma-BHC (Lindane)	5.0U
76-44-8	Heptachlor	5.0U
309-00-2	Aldrin	5.0U
1024-57-3	Heptachlor Epoxide	5.0U
959-98-8	Endosulfan I	5.0U
60-57-1	Dieldrin	10U
72-55-9	4,4'-DDE	10U
72-20-8	Endrin	10U
33212-65-9	Endosulfan II	10U
72-54-8	4,4'-DDD	10U
1031-07-8	Endosulfan Sulfate	20U
50-29-3	4,4'-DDT	10U
72-43-5	Methoxychlor	20U
53494-70-5	Endrin Ketone	15U
5103-74-2	Gamma-Chlordane	7.0U
5103-71-9	Alpha-Chlordane	7.0U
8001-35-2	Toxaphene	750U
-	Aroclor-1242/1016	100U
12672-29-6	Aroclor-1248	100U
11097-69-1	Aroclor-1254	100U
11096-82-5	Aroclor-1260	100U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**75%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130N
Matrix: Soil

Sample No.: YQ-EPA 13

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 28.7 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0 U
319-85-7	Beta-BHC	4.0 U
319-86-8	Delta-BHC	6.0 U
58-89-9	Gamma-BHC (Lindane)	4.0 U
76-44-8	Heptachlor	4.0 U
309-00-2	Aldrin	4.0 U
1024-57-3	Heptachlor Epoxide	4.0 U
959-98-8	Endosulfan I	4.0 U
60-57-1	Dieldrin	4.0 U
72-55-9	4,4'-DDE	8.0 U
72-20-8	Endrin	8.0 U
33212-65-9	Endosulfan II	8.0 U
72-54-8	4,4'-DDD	8.0 U
1031-07-8	Endosulfan Sulfate	16 U
50-29-3	4,4'-DDT	8.0 U
72-43-5	Methoxychlor	16 U
53494-70-5	Endrin Ketone	12 U
5103-74-2	Gamma-Chlordane	6.0 U
5103-71-9	Alpha-Chlordane	6.0 U
8001-35-2	Toxaphene	600 U
-	Aroclor-1242/1016	80 U
12672-29-6	Aroclor-1248	80 U
11097-69-1	Aroclor-1254	80 U
11096-82-5	Aroclor-1260	80 U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**65%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130O
Matrix: Soil

Sample No.: YQ-EPA 14

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:
DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 20.6 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**78%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Lab Sample ID: 6130A
Matrix: Soil

Sample No.: YQ-BC9

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 17.9 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0 U
319-85-7	Beta-BHC	4.0 U
319-86-8	Delta-BHC	6.0 U
58-89-9	Gamma-BHC (Lindane)	4.0 U
76-44-8	Heptachlor	4.0 U
309-00-2	Aldrin	4.0 U
1024-57-3	Heptachlor Epoxide	4.0 U
959-98-8	Endosulfan I	4.0 U
60-57-1	Dieldrin	4.0 U
72-55-9	4,4'-DDE	8.0 U
72-20-8	Endrin	8.0 U
33212-65-9	Endosulfan II	8.0 U
72-54-8	4,4'-DDD	8.0 U
1031-07-8	Endosulfan Sulfate	16 U
50-29-3	4,4'-DDT	8.0 U
72-43-5	Methoxychlor	16 U
53494-70-5	Endrin Ketone	12 U
5103-74-2	Gamma-Chlordane	6.0 U
5103-71-9	Alpha-Chlordane	6.0 U
8001-35-2	Toxaphene	600 U
-	Aroclor-1242/1016	80 U
12672-29-6	Aroclor-1248	80 U
11097-69-1	Aroclor-1254	80 U
11096-82-5	Aroclor-1260	80 U

* Pesticide Surrogate Recovery	
Dibutylchlorendate	76%

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Lab Sample ID: 6130B
Matrix: Soil

Sample No.: YQ-BC10

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 24.4 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery	
Dibutylchlorendate	65%

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130F
Matrix: Solls/Sediments

Sample No: YQ - EPA2

QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized: _____
Report prepared 05/17/90 MAC:B

Sample Wt: 12.9 gm (Dry Weight)
Date extracted: 04/27/90 Percent Moisture: 61.7%
Analyzed (FINN 2): 05/16/90 pH: 8.0
GPC Clean-up: YES (1 of 2) Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	**Phenol**	**480**
111-44-4	bis(2-Chloroethyl)Ether	160U
95-57-8	2-Chlorophenol	160U
541-73-1	1,3-Dichlorobenzene	160U
106-46-7	1,4-Dichlorobenzene	160U
100-51-6	Benzyl Alcohol	780U
95-50-1	1,2-Dichlorobenzene	160U
95-48-7	2-Methylphenol	160U
108-60-1	bis(2-chloroisopropyl)Ether	160U
106-44-5	**4-Methylphenol**	**170**
21-64-7	N-Nitroso-Di-n-Propylamine	160U
67-72-1	Hexachloroethane	310U
98-95-3	Nitrobenzene	160U
78-59-1	Isophorone	160U
88-75-5	2-Nitrophenol	780U
105-67-9	2,4-Dimethylphenol	310U
65-85-0	Benzoic Acid	1600U
111-91-1	bis(2-Chloroethoxy)Methane	160U
120-83-2	2,4-Dichlorophenol	470U
120-82-1	1,2,4-Trichlorobenzene	160U
91-20-3	Naphthalene	160U
106-47-8	4-Chloroaniline	470U
87-68-3	Hexachlorobutadiene	310U
59-50-7	4-Chloro-3-Methylphenol	310U
91-57-6	2-Methylnaphthalene	160U
77-47-4	Hexachlorocyclopentadiene	780U
88-06-2	2,4,6-Trichlorophenol	780U
95-95-4	2,4,5-Trichlorophenol	780U
91-58-7	2-Chloronaphthalene	160U
88-74-4	2-Nitroaniline	780U
131-11-3	Dimethyl Phthalate	160U
208-96-8	Acenaphthylene	160U
99-09-2	3-Nitroaniline	780U

CAS Number		µg/Kg
83-32-9	Acenaphthene	160U
51-28-5	2,4-Dinitrophenol	1600U
100-02-7	4-Nitrophenol	780U
132-64-9	Dibenzofuran	160U
121-14-2	2,4-Dinitrotoluene	780U
606-20-2	2,6-Dinitrotoluene	780U
84-66-2	Diethylphthalate	160U
7005-72-3	4-Chlorophenyl-phenylether	160U
86-73-7	Fluorene	160U
100-01-6	4-Nitroaniline	780U
534-52-1	4,6-Dinitro-2-Methylphenol	1600U
86-30-6	N-Nitrosodiphenylamine(1)	160U
101-55-3	4-Bromophenyl-phenylether	160U
118-74-1	Hexachlorobenzene	160U
87-86-5	Pentachlorophenol	780U
85-01-8	Phenanthrene	160U
120-12-7	Anthracene	160U
84-74-2	Di-n-Butylphthalate	160U
206-44-0	**Fluoranthene**	**270**
129-00-0	**Pyrene**	**170**
85-68-7	Butylbenzylphthalate	160U
91-94-1	3,3'-Dichlorobenzidine	780U
56-55-3	Benzo(a)Anthracene	160U
117-81-7	**bis(2-Ethylhexyl)Phthalate**	**750**
218-01-9	**Chrysene**	**120J**
117-84-0	Di-n-Octyl Phthalate	160U
205-99-2	Benzo(b)Fluoranthene	160U
207-08-9	Benzo(k)Fluoranthene	160U
50-32-8	Benzo(a)Pyrene	160U
193-39-5	Indeno(1,2,3-cd)Pyrene	160U
53-70-3	Dibenz(a,h)Anthracene	160U
191-24-2	Benzo(ghi)Perylene	160U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	69.0%
2-Fluorobiphenyl	83.4%
d14-p-Terphenyl	81.5%

***Acid surrogate recoveries**

d5-Phenol	76.2%
2-Fluorophenol	76.4%
2,4,6-Tribromophenol	82.0%

ORGANICS ANALYSIS DATA SHEET **Sample No: YQ - EPA3**

Semivolatiles by Methods 625/8270

Lab ID: 6130G QC Report No: 6130 - Battelle

Matrix: Soils/Sediments Project No: Batch No 9 &10

VTSR: 04/18/90

Date Release Authorized: _____

Report prepared 05/17/90 MAC:B

Sample Wt: 19.1 gm (Dry Weight)

Date extracted: 04/27/90 Percent Moisture: 38.6%

Analyzed (FINN 2): 05/15/90 pH: 7.7

GPC Clean-up: NO (1 of 2) Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	**Phenol**	**120 M**
111-44-4	bis(2-Chloroethyl)Ether	100U
95-57-8	2-Chlorophenol	100U
541-73-1	1,3-Dichlorobenzene	100U
106-46-7	1,4-Dichlorobenzene	100U
100-51-6	Benzyl Alcohol	520U
95-50-1	1,2-Dichlorobenzene	100U
95-48-7	2-Methylphenol	100U
108-60-1	bis(2-chloroisopropyl)Ether	100U
106-44-5	4-Methylphenol	100U
621-64-7	N-Nitroso-Di-n-Propylamine	100U
67-72-1	Hexachloroethane	210U
98-95-3	Nitrobenzene	100U
78-59-1	Isophorone	100U
88-75-5	2-Nitrophenol	520U
105-67-9	2,4-Dimethylphenol	210U
65-85-0	Benzoic Acid	1000U
111-91-1	bis(2-Chloroethoxy)Methane	100U
120-83-2	2,4-Dichlorophenol	310U
120-82-1	1,2,4-Trichlorobenzene	100U
91-20-3	Naphthalene	100U
106-47-8	4-Chloroaniline	310U
87-68-3	Hexachlorobutadiene	210U
59-50-7	4-Chloro-3-Methylphenol	210U
91-57-6	2-Methylnaphthalene	100U
77-47-4	Hexachlorocyclopentadiene	520U
88-06-2	2,4,6-Trichlorophenol	520U
95-95-4	2,4,5-Trichlorophenol	520U
91-58-7	2-Chloronaphthalene	100U
88-74-4	2-Nitroaniline	520U
131-11-3	Dimethyl Phthalate	100U
208-96-8	Acenaphthylene	100U
99-09-2	3-Nitroaniline	520U

CAS Number		µg/Kg
83-32-9	Acenaphthene	100U
51-28-5	2,4-Dinitrophenol	1000U
100-02-7	4-Nitrophenol	520U
132-64-9	Dibenzofuran	100U
121-14-2	2,4-Dinitrotoluene	520U
606-20-2	2,6-Dinitrotoluene	520U
84-66-2	Diethylphthalate	100U
7005-72-3	4-Chlorophenyl-phenylether	100U
86-73-7	Fluorene	100U
100-01-6	4-Nitroaniline	520U
534-52-1	4,6-Dinitro-2-Methylphenol	1000U
86-30-6	N-Nitrosodiphenylamine(1)	100U
101-55-3	4-Bromophenyl-phenylether	100U
118-74-1	Hexachlorobenzene	100U
87-86-5	Pentachlorophenol	520U
85-01-8	Phenanthrene	100U
120-12-7	Anthracene	100U
84-74-2	Di-n-Butylphthalate	100U
206-44-0	**Fluoranthene**	**130**
129-00-0	**Pyrene**	**94**
85-68-7	Butylbenzylphthalate	100U
91-94-1	3,3'-Dichlorobenzidine	520U
56-55-3	Benzo(a)Anthracene	100U
117-81-7	**bis(2-Ethylhexyl)Phthalate**	**340**
218-01-9	**Chrysene**	**44J**
117-84-0	Di-n-Octyl Phthalate	100U
205-99-2	Benzo(b)Fluoranthene	100U
207-08-9	Benzo(k)Fluoranthene	100U
50-32-8	Benzo(a)Pyrene	100U
193-39-5	Indeno(1,2,3-cd)Pyrene	100U
53-70-3	Dibenz(a,h)Anthracene	100U
191-24-2	Benzo(ghi)Perylene	100U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	53.0%
2-Fluorobiphenyl	75.3%
d14-p-Terphenyl	73.3%

***Acid surrogate recoveries**

d5-Phenol	69.1%
2-Fluorophenol	59.0%
2,4,6-Tribromophenol	70.7%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130H
Matrix: Soils/Sediments

Sample No: YQ - EPA6

QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized: _____
Report prepared 05/17/90 MAC:B

Sample Wt: 21.5 gm (Dry Weight)
Percent Moisture: 30.2%
pH: 7.7
Conc/Dilution: 1 to 1

Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 of 2)

CAS Number		µg/Kg
108-95-2	**Phenol**	**83 M**
111-44-4	bis(2-Chloroethyl)Ether	93U
95-57-8	2-Chlorophenol	93U
541-73-1	1,3-Dichlorobenzene	93U
106-46-7	1,4-Dichlorobenzene	93U
100-51-6	Benzyl Alcohol	470U
95-50-1	1,2-Dichlorobenzene	93U
95-48-7	2-Methylphenol	93U
108-60-1	bis(2-chloroisopropyl)Ether	93U
106-44-5	4-Methylphenol	93U
621-64-7	N-Nitroso-Di-n-Propylamine	93U
67-72-1	Hexachloroethane	190U
98-95-3	Nitrobenzene	93U
78-59-1	Isophorone	93U
88-75-5	2-Nitrophenol	470U
105-67-9	2,4-Dimethylphenol	190U
65-85-0	Benzoic Acid	930U
111-91-1	bis(2-Chloroethoxy)Methane	93U
120-83-2	2,4-Dichlorophenol	280U
120-82-1	1,2,4-Trichlorobenzene	93U
91-20-3	Naphthalene	93U
106-47-8	4-Chloroaniline	280U
87-68-3	Hexachlorobutadiene	190U
59-50-7	4-Chloro-3-Methylphenol	190U
91-57-6	2-Methylnaphthalene	93U
77-47-4	Hexachlorocyclopentadiene	470U
88-06-2	2,4,6-Trichlorophenol	470U
95-95-4	2,4,5-Trichlorophenol	470U
91-58-7	2-Chloronaphthalene	93U
88-74-4	2-Nitroaniline	470U
131-11-3	Dimethyl Phthalate	93U
208-96-8	Acenaphthylene	93U
99-09-2	3-Nitroaniline	470U

CAS Number		µg/Kg
83-32-9	Acenaphthene	93U
51-28-5	2,4-Dinitrophenol	930U
100-02-7	4-Nitrophenol	470U
132-64-9	Dibenzofuran	93U
121-14-2	2,4-Dinitrotoluene	470U
606-20-2	2,6-Dinitrotoluene	470U
84-66-2	Diethylphthalate	93U
7005-72-3	4-Chlorophenyl-phenylether	93U
86-73-7	Fluorene	93U
100-01-6	4-Nitroaniline	470U
534-52-1	4,6-Dinitro-2-Methylphenol	930U
86-30-6	N-Nitrosodiphenylamine(1)	93U
101-55-3	4-Bromophenyl-phenylether	93U
118-74-1	Hexachlorobenzene	93U
87-86-5	Pentachlorophenol	470U
85-01-8	Phenanthrene	93U
120-12-7	Anthracene	93U
84-74-2	Di-n-Butylphthalate	93U
206-44-0	Fluoranthene	93U
129-00-0	Pyrene	93U
85-68-7	Butylbenzylphthalate	93U
91-94-1	3,3'-Dichlorobenzidine	470U
56-55-3	Benzo(a)Anthracene	93U
117-81-7	**bis(2-Ethylhexyl)Phthalate**	**77J**
218-01-9	Chrysene	93U
117-84-0	Di-n-Octyl Phthalate	93U
205-99-2	Benzo(b)Fluoranthene	93U
207-08-9	Benzo(k)Fluoranthene	93U
50-32-8	Benzo(a)Pyrene	93U
193-39-5	Indeno(1,2,3-cd)Pyrene	93U
53-70-3	Dibenz(a,h)Anthracene	93U
191-24-2	Benzo(ghi)Perylene	93U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	60.2%
2-Fluorobiphenyl	76.6%
d14-p-Terphenyl	79.3%

***Acid surrogate recoveries**

d5-Phenol	70.2%
2-Fluorophenol	65.8%
2,4,6-Tribromophenol	69.4%

ORGANICS ANALYSIS DATA SHEET **Sample No: YQ - EPA8**

Semivolatiles by Methods 625/8270

Lab ID: 61301 QC Report No: 6130 - Battelle

Matrix: Soils/Sediments Project No: Batch No 9 &10

VTSR: 04/18/90

Date Release Authorized: S D Dunnivant

Report prepared 05/17/90 MAC:B

Sample Wt: 19.1 gm (Dry Weight)

Date extracted: 04/27/90 Percent Moisture: 38.0%

Analyzed (FINN 2): 05/15/90 pH: 7.8

GPC Clean-up: NO (1 of 2) Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	**Phenol**	**310**
111-44-4	bis(2-Chloroethyl)Ether	100U
95-57-8	2-Chlorophenol	100U
541-73-1	1,3-Dichlorobenzene	100U
106-46-7	1,4-Dichlorobenzene	100U
100-51-6	Benzyl Alcohol	520U
95-50-1	1,2-Dichlorobenzene	100U
95-48-7	2-Methylphenol	100U
108-60-1	bis(2-chloroisopropyl)Ether	100U
106-44-5	**4-Methylphenol**	**190**
621-64-7	N-Nitroso-Di-n-Propylamine	100U
67-72-1	Hexachloroethane	210U
98-95-3	Nitrobenzene	100U
78-59-1	Isophorone	100U
88-75-5	2-Nitrophenol	520U
105-67-9	2,4-Dimethylphenol	210U
65-85-0	Benzoic Acid	1000U
111-91-1	bis(2-Chloroethoxy)Methane	100U
120-83-2	2,4-Dichlorophenol	310U
120-82-1	1,2,4-Trichlorobenzene	100U
91-20-3	Naphthalene	100U
106-47-8	4-Chloroaniline	310U
87-68-3	Hexachlorobutadiene	210U
59-50-7	4-Chloro-3-Methylphenol	210U
91-57-6	2-Methylnaphthalene	100U
77-47-4	Hexachlorocyclopentadiene	520U
88-06-2	2,4,6-Trichlorophenol	520U
95-95-4	2,4,5-Trichlorophenol	520U
91-58-7	2-Chloronaphthalene	100U
88-74-4	2-Nitroaniline	520U
131-11-3	Dimethyl Phthalate	100U
208-96-8	Acenaphthylene	100U
99-09-2	3-Nitroaniline	520U

CAS Number		µg/Kg
83-32-9	Acenaphthene	100U
51-28-5	2,4-Dinitrophenol	1000U
100-02-7	4-Nitrophenol	520U
132-64-9	Dibenzofuran	100U
121-14-2	2,4-Dinitrotoluene	520U
606-20-2	2,6-Dinitrotoluene	520U
84-66-2	Diethylphthalate	100U
7005-72-3	4-Chlorophenyl-phenylether	100U
86-73-7	Fluorene	100U
100-01-6	4-Nitroaniline	520U
534-52-1	4,6-Dinitro-2-Methylphenol	1000U
86-30-6	N-Nitrosodiphenylamine(1)	100U
101-55-3	4-Bromophenyl-phenylether	100U
118-74-1	Hexachlorobenzene	100U
87-86-5	Pentachlorophenol	520U
85-01-8	**Phenanthrene**	**76J**
120-12-7	Anthracene	100U
84-74-2	Di-n-Butylphthalate	100U
206-44-0	**Fluoranthene**	**230**
129-00-0	**Pyrene**	**150**
85-68-7	Butylbenzylphthalate	100U
91-94-1	3,3'-Dichlorobenzidine	520U
56-55-3	Benzo(a)Anthracene	100U
117-81-7	**bis(2-Ethylhexyl)Phthalate**	**150**
218-01-9	**Chrysene**	**76J**
117-84-0	Di-n-Octyl Phthalate	100U
205-99-2	Benzo(b)Fluoranthene	100U
207-08-9	Benzo(k)Fluoranthene	100U
50-32-8	Benzo(a)Pyrene	100U
193-39-5	Indeno(1,2,3-cd)Pyrene	100U
53-70-3	Dibenz(a,h)Anthracene	100U
191-24-2	Benzo(ghi)Perylene	100U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	65.9%
2-Fluorobiphenyl	98.0%
d14-p-Terphenyl	97.3%

***Acid surrogate recoveries**

d5-Phenol	87.8%
2-Fluorophenol	73.5%
2,4,6-Tribromophenol	97.7%

ORGANICS ANALYSIS DATA SHEET **Sample No: YQ - EPA9**

Semivolatiles by Methods 625/8270

Lab ID: 6130J
Matrix: Soils/Sediments

QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized:

Report prepared 05/17/90 MAC:B

Sample Wt: 14.0 gm (Dry Weight)
Percent Moisture: 58.0%
pH: 7.8
Conc/Dilution: 1 to 1

Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 of 2)

CAS Number		µg/Kg
108-95-2	**Phenol**	**170 M**
111-44-4	bis(2-Chloroethyl)Ether	140U
95-57-8	2-Chlorophenol	140U
541-73-1	1,3-Dichlorobenzene	140U
106-46-7	1,4-Dichlorobenzene	140U
100-51-6	Benzyl Alcohol	710U
95-50-1	1,2-Dichlorobenzene	140U
95-48-7	2-Methylphenol	140U
108-60-1	bis(2-chloroisopropyl)Ether	140U
106-44-5	4-Methylphenol	140U
621-64-7	N-Nitroso-Di-n-Propylamine	140U
67-72-1	Hexachloroethane	290U
98-95-3	Nitrobenzene	140U
78-59-1	Isophorone	140U
88-75-5	2-Nitrophenol	710U
105-67-9	2,4-Dimethylphenol	290U
65-85-0	Benzoic Acid	1400U
111-91-1	bis(2-Chloroethoxy)Methane	140U
120-83-2	2,4-Dichlorophenol	430U
120-82-1	1,2,4-Trichlorobenzene	140U
91-20-3	Naphthalene	140U
106-47-8	4-Chloroaniline	430U
87-68-3	Hexachlorobutadiene	290U
59-50-7	4-Chloro-3-Methylphenol	290U
91-57-6	2-Methylnaphthalene	140U
77-47-4	Hexachlorocyclopentadiene	710U
88-06-2	2,4,6-Trichlorophenol	710U
95-95-4	2,4,5-Trichlorophenol	710U
91-58-7	2-Chloronaphthalene	140U
88-74-4	2-Nitroaniline	710U
131-11-3	Dimethyl Phthalate	140U
208-96-8	Acenaphthylene	140U
99-09-2	3-Nitroaniline	710U

CAS Number		µg/Kg
83-32-9	Acenaphthene	140U
51-28-5	2,4-Dinitrophenol	1400U
100-02-7	4-Nitrophenol	710U
132-64-9	Dibenzofuran	140U
121-14-2	2,4-Dinitrotoluene	710U
606-20-2	2,6-Dinitrotoluene	710U
84-66-2	Diethylphthalate	140U
7005-72-3	4-Chlorophenyl-phenylether	140U
86-73-7	Fluorene	140U
100-01-6	4-Nitroaniline	710U
534-52-1	4,6-Dinitro-2-Methylphenol	1400U
86-30-6	N-Nitrosodiphenylamine(1)	140U
101-55-3	4-Bromophenyl-phenylether	140U
118-74-1	Hexachlorobenzene	140U
87-86-5	Pentachlorophenol	710U
85-01-8	Phenanthrene	140U
120-12-7	Anthracene	140U
84-74-2	Di-n-Butylphthalate	140U
206-44-0	Fluoranthene	140U
129-00-0	Pyrene	140U
85-68-7	Butylbenzylphthalate	140U
91-94-1	3,3'-Dichlorobenzidine	710U
56-55-3	Benzo(a)Anthracene	140U
117-81-7	bis(2-Ethylhexyl)Phthalate	140U
218-01-9	Chrysene	140U
117-84-0	Di-n-Octyl Phthalate	140U
205-99-2	Benzo(b)Fluoranthene	140U
207-08-9	Benzo(k)Fluoranthene	140U
50-32-8	Benzo(a)Pyrene	140U
193-39-5	Indeno(1,2,3-cd)Pyrene	140U
53-70-3	Dibenz(a,h)Anthracene	140U
191-24-2	Benzo(ghi)Perylene	140U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	46.4%
2-Fluorobiphenyl	75.2%
d14-p-Terphenyl	74.9%

***Acid surrogate recoveries**

d5-Phenol	61.2%
2-Fluorophenol	51.2%
2,4,6-Tribromophenol	63.4%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130KDUP
Matrix: Soils/Sediments

Sample No: YQ - EPA10
Duplicate
QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized: S D Summers
Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 of 2)

Sample Wt: 21.2 gm (Dry Weight)
Percent Moisture: 34.0%
pH: 7.9
Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	Phenol	190U
111-44-4	bis(2-Chloroethyl)Ether	94U
95-57-8	2-Chlorophenol	94U
541-73-1	1,3-Dichlorobenzene	94U
106-46-7	1,4-Dichlorobenzene	94U
100-51-6	Benzyl Alcohol	470U
95-50-1	1,2-Dichlorobenzene	94U
95-48-7	2-Methylphenol	94U
108-60-1	bis(2-chloroisopropyl)Ether	94U
106-44-5	4-Methylphenol	94U
621-64-7	N-Nitroso-Di-n-Propylamine	94U
67-72-1	Hexachloroethane	190U
98-95-3	Nitrobenzene	94U
78-59-1	Isophorone	94U
88-75-5	2-Nitrophenol	470U
105-67-9	2,4-Dimethylphenol	190U
65-85-0	Benzoic Acid	940U
111-91-1	bis(2-Chloroethoxy)Methane	94U
120-83-2	2,4-Dichlorophenol	280U
120-82-1	1,2,4-Trichlorobenzene	94U
91-20-3	Naphthalene	94U
106-47-8	4-Chloroaniline	280U
87-68-3	Hexachlorobutadiene	190U
59-50-7	4-Chloro-3-Methylphenol	190U
91-57-6	2-Methylnaphthalene	94U
77-47-4	Hexachlorocyclopentadiene	470U
88-06-2	2,4,6-Trichlorophenol	470U
95-95-4	2,4,5-Trichlorophenol	470U
91-58-7	2-Chloronaphthalene	94U
88-74-4	2-Nitroaniline	470U
131-11-3	Dimethyl Phthalate	94U
208-96-8	Acenaphthylene	94U
99-09-2	3-Nitroaniline	470U

CAS Number		µg/Kg
83-32-9	Acenaphthene	94U
51-28-5	2,4-Dinitrophenol	940U
100-02-7	4-Nitrophenol	470U
132-64-9	Dibenzofuran	94U
121-14-2	2,4-Dinitrotoluene	470U
606-20-2	2,6-Dinitrotoluene	470U
84-66-2	Diethylphthalate	94U
7005-72-3	4-Chlorophenyl-phenylether	94U
86-73-7	Fluorene	94U
100-01-6	4-Nitroaniline	470U
534-52-1	4,6-Dinitro-2-Methylphenol	940U
86-30-6	N-Nitrosodiphenylamine(1)	94U
101-55-3	4-Bromophenyl-phenylether	94U
118-74-1	Hexachlorobenzene	94U
87-86-5	Pentachlorophenol	470U
85-01-8	Phenanthrene	94U
120-12-7	Anthracene	94U
84-74-2	Di-n-Butylphthalate	94U
206-44-0	Fluoranthene	94U
129-00-0	Pyrene	94U
85-68-7	Butylbenzylphthalate	94U
91-94-1	3,3'-Dichlorobenzidine	470U
56-55-3	Benzo(a)Anthracene	94U
117-81-7	**bis(2-Ethylhexyl)Phthalate**	**260**
218-01-9	Chrysene	94U
117-84-0	Di-n-Octyl Phthalate	94U
205-99-2	Benzo(b)Fluoranthene	94U
207-08-9	Benzo(k)Fluoranthene	94U
50-32-8	Benzo(a)Pyrene	94U
193-39-5	Indeno(1,2,3-cd)Pyrene	94U
53-70-3	Dibenz(a,h)Anthracene	94U
191-24-2	Benzo(ghi)Perylene	94U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	46.0%
2-Fluorobiphenyl	69.6%
d14-p-Terphenyl	72.8%

***Acid surrogate recoveries**

d5-Phenol	58.3%
2-Fluorophenol	51.2%
2,4,6-Tribromophenol	61.0%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130L
Matrix: Soils/Sediments

Sample No: YQ - EPA11

QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized: _____

Report prepared 05/17/90 MAC:B

Sample Wt: 22.6 gm (Dry Weight)
Percent Moisture: 27.6%
pH: 7.2
Conc/Dilution: 1 to 1

Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 of 2)

CAS Number		µg/Kg
108-95-2	Phenol	180U
111-44-4	bis(2-Chloroethyl)Ether	89U
95-57-8	2-Chlorophenol	89U
541-73-1	1,3-Dichlorobenzene	89U
106-46-7	1,4-Dichlorobenzene	89U
100-51-6	Benzyl Alcohol	440U
95-50-1	1,2-Dichlorobenzene	89U
95-48-7	2-Methylphenol	89U
108-60-1	bis(2-chloroisopropyl)Ether	89U
106-44-5	4-Methylphenol	89U
621-64-7	N-Nitroso-Di-n-Propylamine	89U
67-72-1	Hexachloroethane	180U
98-95-3	Nitrobenzene	89U
78-59-1	Isophorone	89U
88-75-5	2-Nitrophenol	440U
105-67-9	2,4-Dimethylphenol	180U
65-85-0	Benzoic Acid	880U
111-91-1	bis(2-Chloroethoxy)Methane	89U
120-83-2	2,4-Dichlorophenol	270U
120-82-1	1,2,4-Trichlorobenzene	89U
91-20-3	Naphthalene	89U
106-47-8	4-Chloroaniline	270U
87-68-3	Hexachlorobutadiene	180U
59-50-7	4-Chloro-3-Methylphenol	180U
91-57-6	2-Methylnaphthalene	89U
77-47-4	Hexachlorocyclopentadiene	440U
88-06-2	2,4,6-Trichlorophenol	440U
95-95-4	2,4,5-Trichlorophenol	440U
91-58-7	2-Chloronaphthalene	89U
88-74-4	2-Nitroaniline	440U
131-11-3	Dimethyl Phthalate	89U
208-96-8	Acenaphthylene	89U
99-09-2	3-Nitroaniline	440U

CAS Number		µg/Kg
83-32-9	Acenaphthene	89U
51-28-5	2,4-Dinitrophenol	880U
100-02-7	4-Nitrophenol	440U
132-64-9	Dibenzofuran	89U
121-14-2	2,4-Dinitrotoluene	440U
606-20-2	2,6-Dinitrotoluene	440U
84-66-2	Diethylphthalate	89U
7005-72-3	4-Chlorophenyl-phenylether	89U
86-73-7	Fluorene	89U
100-01-6	4-Nitroaniline	440U
534-52-1	4,6-Dinitro-2-Methylphenol	880U
86-30-6	N-Nitrosodiphenylamine(1)	89U
101-55-3	4-Bromophenyl-phenylether	89U
118-74-1	Hexachlorobenzene	89U
87-86-5	Pentachlorophenol	440U
85-01-8	Phenanthrene	89U
120-12-7	Anthracene	89U
84-74-2	Di-n-Butylphthalate	89U
206-44-0	Fluoranthene	89U
129-00-0	Pyrene	89U
85-68-7	Butylbenzylphthalate	89U
91-94-1	3,3'-Dichlorobenzidine	440U
56-55-3	Benzo(a)Anthracene	89U
117-81-7	bis(2-Ethylhexyl)Phthalate	89U
218-01-9	Chrysene	89U
117-84-0	Di-n-Octyl Phthalate	89U
205-99-2	Benzo(b)Fluoranthene	89U
207-08-9	Benzo(k)Fluoranthene	89U
50-32-8	Benzo(a)Pyrene	89U
193-39-5	Indeno(1,2,3-cd)Pyrene	89U
53-70-3	Dibenz(a,h)Anthracene	89U
191-24-2	Benzo(ghi)Perylene	89U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	54.9%
2-Fluorobiphenyl	69.4%
d14-p-Terphenyl	74.8%

***Acid surrogate recoveries**

d5-Phenol	61.7%
2-Fluorophenol	57.5%
2,4,6-Tribromophenol	68.4%

ORGANICS ANALYSIS DATA SHEET **Sample No: YQ - EPA12**

Semivolatiles by Methods 625/8270

Lab ID: 6130M
Matrix: Soils/Sediments

QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized: S. D. Gunther

Report prepared 05/17/90 MAC:B

Sample Wt: 16.4 gm (Dry Weight)
Date extracted: 04/27/90 Percent Moisture: 47.3%
Analyzed (FINN 2): 05/15/90 pH: 7.5
GPC Clean-up: NO (1 of 2) Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	Phenol	240U
111-44-4	bis(2-Chloroethyl)Ether	120U
95-57-8	2-Chlorophenol	120U
541-73-1	1,3-Dichlorobenzene	120U
106-46-7	1,4-Dichlorobenzene	120U
100-51-6	Benzyl Alcohol	610U
95-50-1	1,2-Dichlorobenzene	120U
95-48-7	2-Methylphenol	120U
108-60-1	bis(2-chloroisopropyl)Ether	120U
106-44-5	4-Methylphenol	120U
621-64-7	N-Nitroso-Di-n-Propylamine	120U
67-72-1	Hexachloroethane	240U
98-95-3	Nitrobenzene	120U
78-59-1	Isophorone	120U
88-75-5	2-Nitrophenol	610U
105-67-9	2,4-Dimethylphenol	240U
65-85-0	Benzoic Acid	1200U
111-91-1	bis(2-Chloroethoxy)Methane	120U
120-83-2	2,4-Dichlorophenol	370U
120-82-1	1,2,4-Trichlorobenzene	120U
91-20-3	Naphthalene	120U
106-47-8	4-Chloroaniline	370U
87-68-3	Hexachlorobutadiene	240U
59-50-7	4-Chloro-3-Methylphenol	240U
91-57-6	2-Methylnaphthalene	120U
77-47-4	Hexachlorocyclopentadiene	610U
88-06-2	2,4,6-Trichlorophenol	610U
95-95-4	2,4,5-Trichlorophenol	610U
91-58-7	2-Chloronaphthalene	120U
88-74-4	2-Nitroaniline	610U
131-11-3	Dimethyl Phthalate	120U
208-96-8	Acenaphthylene	120U
99-09-2	3-Nitroaniline	610U

CAS Number		µg/Kg
83-32-9	Acenaphthene	120U
51-28-5	2,4-Dinitrophenol	1200U
100-02-7	4-Nitrophenol	610U
132-64-9	Dibenzofuran	120U
121-14-2	2,4-Dinitrotoluene	610U
606-20-2	2,6-Dinitrotoluene	610U
84-66-2	Diethylphthalate	120U
7005-72-3	4-Chlorophenyl-phenylether	120U
86-73-7	Fluorene	120U
100-01-6	4-Nitroaniline	610U
534-52-1	4,6-Dinitro-2-Methylphenol	1200U
86-30-6	N-Nitrosodiphenylamine(1)	120U
101-55-3	4-Bromophenyl-phenylether	120U
118-74-1	Hexachlorobenzene	120U
87-86-5	Pentachlorophenol	610U
85-01-8	Phenanthrene	120U
120-12-7	Anthracene	120U
84-74-2	Di-n-Butylphthalate	120U
206-44-0	Fluoranthene	120U
129-00-0	Pyrene	120U
85-68-7	Butylbenzylphthalate	120U
91-94-1	3,3'-Dichlorobenzidine	610U
56-55-3	Benzo(a)Anthracene	120U
117-81-7	bis(2-Ethylhexyl)Phthalate	120U
218-01-9	Chrysene	120U
117-84-0	Di-n-Octyl Phthalate	120U
205-99-2	Benzo(b)Fluoranthene	120U
207-08-9	Benzo(k)Fluoranthene	120U
50-32-8	Benzo(a)Pyrene	120U
193-39-5	Indeno(1,2,3-cd)Pyrene	120U
53-70-3	Dibenz(a,h)Anthracene	120U
191-24-2	Benzo(ghi)Perylene	120U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	59.5%
2-Fluorobiphenyl	76.9%
d14-p-Terphenyl	81.6%

***Acid surrogate recoveries**

d5-Phenol	67.9%
2-Fluorophenol	65.6%
2,4,6-Tribromophenol	79.6%

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130N

Matrix: Soils/Sediments

Sample No: YQ - EPA13

QC Report No: 6130 - Battelle

Project No: Batch No 9 &10

VTSR: 04/18/90

Date Release Authorized: _____

Report prepared 05/17/90 MAC:B

Sample Wt: 28.7 gm (Dry Weight)

Date extracted: 04/27/90

Percent Moisture: 22.9%

Analyzed (FINN 2): 05/16/90

pH: 8.4

GPC Clean-up: NO (1 of 2)

Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	Phenol	140U
111-44-4	bis(2-Chloroethyl)Ether	70U
95-57-8	2-Chlorophenol	70U
541-73-1	1,3-Dichlorobenzene	70U
106-46-7	1,4-Dichlorobenzene	70U
100-51-6	Benzyl Alcohol	350U
95-50-1	1,2-Dichlorobenzene	70U
95-48-7	2-Methylphenol	70U
108-60-1	bis(2-chloroisopropyl)Ether	70U
106-44-5	4-Methylphenol	70U
621-64-7	N-Nitroso-Di-n-Propylamine	70U
67-72-1	Hexachloroethane	140U
98-95-3	Nitrobenzene	70U
78-59-1	Isophorone	70U
88-75-5	2-Nitrophenol	350U
105-67-9	2,4-Dimethylphenol	140U
65-85-0	Benzoic Acid	700U
111-91-1	bis(2-Chloroethoxy)Methane	70U
120-83-2	2,4-Dichlorophenol	210U
120-82-1	1,2,4-Trichlorobenzene	70U
91-20-3	Naphthalene	70U
106-47-8	4-Chloroaniline	210U
87-68-3	Hexachlorobutadiene	140U
59-50-7	4-Chloro-3-Methylphenol	140U
91-57-6	2-Methylnaphthalene	70U
77-47-4	Hexachlorocyclopentadiene	350U
88-06-2	2,4,6-Trichlorophenol	350U
95-95-4	2,4,5-Trichlorophenol	350U
91-58-7	2-Chloronaphthalene	70U
88-74-4	2-Nitroaniline	350U
131-11-3	Dimethyl Phthalate	70U
208-96-8	Acenaphthylene	70U
99-09-2	3-Nitroaniline	350U

CAS Number		µg/Kg
83-32-9	Acenaphthene	70U
51-28-5	2,4-Dinitrophenol	700U
100-02-7	4-Nitrophenol	350U
132-64-9	Dibenzofuran	70U
121-14-2	2,4-Dinitrotoluene	350U
606-20-2	2,6-Dinitrotoluene	350U
84-66-2	Diethylphthalate	70U
7005-72-3	4-Chlorophenyl-phenylether	70U
86-73-7	Fluorene	70U
100-01-6	4-Nitroaniline	350U
534-52-1	4,6-Dinitro-2-Methylphenol	700U
86-30-6	N-Nitrosodiphenylamine(1)	70U
101-55-3	4-Bromophenyl-phenylether	70U
118-74-1	Hexachlorobenzene	70U
87-86-5	Pentachlorophenol	350U
85-01-8	Phenanthrene	70U
120-12-7	Anthracene	70U
84-74-2	Di-n-Butylphthalate	70U
206-44-0	Fluoranthene	70U
129-00-0	Pyrene	70U
85-68-7	Butylbenzylphthalate	70U
91-94-1	3,3'-Dichlorobenzidine	350U
56-55-3	Benzo(a)Anthracene	70U
117-81-7	bis(2-Ethylhexyl)Phthalate	70U
218-01-9	Chrysene	70U
117-84-0	Di-n-Octyl Phthalate	70U
205-99-2	Benzo(b)Fluoranthene	70U
207-08-9	Benzo(k)Fluoranthene	70U
50-32-8	Benzo(a)Pyrene	70U
193-39-5	Indeno(1,2,3-cd)Pyrene	70U
53-70-3	Dibenz(a,h)Anthracene	70U
191-24-2	Benzo(ghi)Perylene	70U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	63.1%
2-Fluorobiphenyl	79.4%
d14-p-Terphenyl	79.9%

***Acid surrogate recoveries**

d5-Phenol	71.9%
2-Fluorophenol	69.1%
2,4,6-Tribromophenol	84.0%

ORGANICS ANALYSIS DATA SHEET **Sample No: YQ - EPA14**

Semivolatiles by Methods 625/8270

Lab ID: 61300 QC Report No: 6130 - Battelle

Matrix: Soils/Sediments Project No: Batch No 9 &10

VTSR: 04/18/90

Date Release Authorized: Susan K. Faber

Report prepared 05/17/90 MAC:B

Sample Wt: 20.6 gm (Dry Weight)

Date extracted: 04/27/90 Percent Moisture: 41.3%

Analyzed (FINN 2): 05/16/90 pH: 8.0

GPC Clean-up: NO (1 of 2) Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	**Phenol**	**260**
111-44-4	bis(2-Chloroethyl)Ether	97U
95-57-8	2-Chlorophenol	97U
541-73-1	1,3-Dichlorobenzene	97U
106-46-7	1,4-Dichlorobenzene	97U
100-51-6	Benzyl Alcohol	490U
95-50-1	1,2-Dichlorobenzene	97U
95-48-7	2-Methylphenol	97U
108-60-1	bis(2-chloroisopropyl)Ether	97U
106-44-5	**4-Methylphenol**	**140**
621-64-7	N-Nitroso-Di-n-Propylamine	97U
67-72-1	Hexachloroethane	190U
98-95-3	Nitrobenzene	97U
78-59-1	Isophorone	97U
88-75-5	2-Nitrophenol	490U
105-67-9	2,4-Dimethylphenol	190U
65-85-0	Benzoic Acid	970U
111-91-1	bis(2-Chloroethoxy)Methane	97U
120-83-2	2,4-Dichlorophenol	290U
120-82-1	1,2,4-Trichlorobenzene	97U
91-20-3	Naphthalene	97U
106-47-8	4-Chloroaniline	290U
87-68-3	Hexachlorobutadiene	190U
59-50-7	4-Chloro-3-Methylphenol	190U
91-57-6	2-Methylnaphthalene	97U
77-47-4	Hexachlorocyclopentadiene	490U
88-06-2	2,4,6-Trichlorophenol	490U
95-95-4	2,4,5-Trichlorophenol	490U
91-58-7	2-Chloronaphthalene	97U
88-74-4	2-Nitroaniline	490U
131-11-3	Dimethyl Phthalate	97U
208-96-8	Acenaphthylene	97U
99-09-2	3-Nitroaniline	490U

CAS Number		µg/Kg
83-32-9	Acenaphthene	97U
51-28-5	2,4-Dinitrophenol	970U
100-02-7	4-Nitrophenol	490U
132-64-9	Dibenzofuran	97U
121-14-2	2,4-Dinitrotoluene	490U
606-20-2	2,6-Dinitrotoluene	490U
84-66-2	Diethylphthalate	97U
7005-72-3	4-Chlorophenyl-phenylether	97U
86-73-7	Fluorene	97U
100-01-6	4-Nitroaniline	490U
534-52-1	4,6-Dinitro-2-Methylphenol	970U
86-30-6	N-Nitrosodiphenylamine(1)	97U
101-55-3	4-Bromophenyl-phenylether	97U
118-74-1	Hexachlorobenzene	97U
87-86-5	Pentachlorophenol	490U
85-01-8	Phenanthrene	97U
120-12-7	Anthracene	97U
84-74-2	Di-n-Butylphthalate	97U
206-44-0	Fluoranthene	97U
129-00-0	Pyrene	97U
85-68-7	Butylbenzylphthalate	97U
91-94-1	3,3'-Dichlorobenzidine	490U
56-55-3	Benzo(a)Anthracene	97U
117-81-7	**bis(2-Ethylhexyl)Phthalate**	**110**
218-01-9	Chrysene	97U
117-84-0	Di-n-Octyl Phthalate	97U
205-99-2	Benzo(b)Fluoranthene	97U
207-08-9	Benzo(k)Fluoranthene	97U
50-32-8	Benzo(a)Pyrene	97U
193-39-5	Indeno(1,2,3-cd)Pyrene	97U
53-70-3	Dibenz(a,h)Anthracene	97U
191-24-2	Benzo(ghi)Perylene	97U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	52.8%
2-Fluorobiphenyl	81.2%
d14-p-Terphenyl	78.3%

***Acid surrogate recoveries**

d5-Phenol	68.4%
2-Fluorophenol	57.9%
2,4,6-Tribromophenol	76.2%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130A
Matrix: Soils/Sediments

Sample No: YQ - BC9

QC Report No: 6130 - Battelle
Project No: Batch No 9 & 10
VTSR: 04/18/90

Date Release Authorized:
Report prepared 05/17/90 MAC:B

Chemists & Consultants
333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 of 2)

Sample Wt: 17.9 gm (Dry Weight)
Percent Moisture: 40.8%
pH: 8.0
Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	Phenol	220U
111-44-4	bis(2-Chloroethyl)Ether	110U
95-57-8	2-Chlorophenol	110U
541-73-1	1,3-Dichlorobenzene	110U
106-46-7	1,4-Dichlorobenzene	110U
100-51-6	Benzyl Alcohol	560U
95-50-1	1,2-Dichlorobenzene	110U
95-48-7	2-Methylphenol	110U
108-60-1	bis(2-chloroisopropyl)Ether	110U
106-44-5	4-Methylphenol	110U
[illegible]-64-7	N-Nitroso-Di-n-Propylamine	110U
[illegible]2-1	Hexachloroethane	220U
[illegible]-95-3	Nitrobenzene	110U
78-59-1	Isophorone	110U
88-75-5	2-Nitrophenol	560U
105-67-9	2,4-Dimethylphenol	220U
65-85-0	Benzoic Acid	1100U
111-91-1	bis(2-Chloroethoxy)Methane	110U
120-83-2	2,4-Dichlorophenol	340U
120-82-1	1,2,4-Trichlorobenzene	110U
91-20-3	Naphthalene	110U
106-47-8	4-Chloroaniline	340U
87-68-3	Hexachlorobutadiene	220U
59-50-7	4-Chloro-3-Methylphenol	220U
91-57-6	2-Methylnaphthalene	110U
77-47-4	Hexachlorocyclopentadiene	560U
88-06-2	2,4,6-Trichlorophenol	560U
95-95-4	2,4,5-Trichlorophenol	560U
91-58-7	2-Chloronaphthalene	110U
88-74-4	2-Nitroaniline	560U
131-11-3	Dimethyl Phthalate	110U
208-96-8	Acenaphthylene	110U
99-09-2	3-Nitroaniline	560U

CAS Number		µg/Kg
83-32-9	Acenaphthene	110U
51-28-5	2,4-Dinitrophenol	1100U
100-02-7	4-Nitrophenol	560U
132-64-9	Dibenzofuran	110U
121-14-2	2,4-Dinitrotoluene	560U
606-20-2	2,6-Dinitrotoluene	560U
84-66-2	Diethylphthalate	110U
7005-72-3	4-Chlorophenyl-phenylether	110U
86-73-7	Fluorene	110U
100-01-6	4-Nitroaniline	560U
534-52-1	4,6-Dinitro-2-Methylphenol	1100U
86-30-6	N-Nitrosodiphenylamine(1)	110U
101-55-3	4-Bromophenyl-phenylether	110U
118-74-1	Hexachlorobenzene	110U
87-86-5	Pentachlorophenol	560U
85-01-8	**Phenanthrene**	130
120-12-7	Anthracene	110U
84-74-2	Di-n-Butylphthalate	110U
206-44-0	**Fluoranthene**	100J
129-00-0	**Pyrene**	67J
85-68-7	Butylbenzylphthalate	110U
91-94-1	3,3'-Dichlorobenzidine	560U
56-55-3	Benzo(a)Anthracene	110U
117-81-7	bis(2-Ethylhexyl)Phthalate	110U,
218-01-9	**Chrysene**	95J
117-84-0	Di-n-Octyl Phthalate	110U
205-99-2	Benzo(b)Fluoranthene	110U
207-08-9	Benzo(k)Fluoranthene	110U
50-32-8	Benzo(a)Pyrene	110U
193-39-5	Indeno(1,2,3-cd)Pyrene	110U
53-70-3	Dibenz(a,h)Anthracene	110U
191-24-2	Benzo(ghi)Perylene	110U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	53.8%
2-Fluorobiphenyl	75.1%
d14-p-Terphenyl	73.1%

***Acid surrogate recoveries**

d5-Phenol	67.9%
2-Fluorophenol	60.9%
2,4,6-Tribromophenol	67.9%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 61308
Matrix: Soils/Sediments

Date Release Authorized: [signature]
Report prepared 05/17/90 MAC:B

Sample No: YQ - BC10

QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Chemists & Consultants

3[illegible] Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-8490
(206) 621-7523 (FAX)

Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 of 2)

Sample Wt: 24.4 gm (Dry Weight)
Percent Moisture: 24.0%
pH: 8.0
Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	Phenol	160U
111-44-4	bis(2-Chloroethyl)Ether	82U
95-57-8	2-Chlorophenol	82U
541-73-1	1,3-Dichlorobenzene	82U
106-46-7	1,4-Dichlorobenzene	82U
100-51-6	Benzyl Alcohol	410U
95-50-1	1,2-Dichlorobenzene	82U
95-48-7	2-Methylphenol	82U
108-60-1	bis(2-chloroisopropyl)Ether	82U
106-44-5	4-Methylphenol	82U
621-64-7	N-Nitroso-Di-n-Propylamine	82U
67-72-1	Hexachloroethane	160U
98-95-3	Nitrobenzene	82U
78-59-1	Isophorone	82U
88-75-5	2-Nitrophenol	410U
105-67-9	2,4-Dimethylphenol	160U
65-85-0	Benzoic Acid	820U
111-91-1	bis(2-Chloroethoxy)Methane	82U
120-83-2	2,4-Dichlorophenol	250U
120-82-1	1,2,4-Trichlorobenzene	82U
91-20-3	Naphthalene	82U
106-47-8	4-Chloroaniline	250U
87-68-3	Hexachlorobutadiene	160U
59-50-7	4-Chloro-3-Methylphenol	160U
91-57-6	2-Methylnaphthalene	82U
77-47-4	Hexachlorocyclopentadiene	410U
88-06-2	2,4,6-Trichlorophenol	410U
95-95-4	2,4,5-Trichlorophenol	410U
91-58-7	2-Chloronaphthalene	82U
88-74-4	2-Nitroaniline	410U
131-11-3	Dimethyl Phthalate	82U
208-96-8	Acenaphthylene	82U
99-09-2	3-Nitroaniline	410U

CAS Number		µg/Kg
83-32-9	Acenaphthene	82U
51-28-5	2,4-Dinitrophenol	820U
100-02-7	4-Nitrophenol	410U
132-64-9	Dibenzofuran	82U
121-14-2	2,4-Dinitrotoluene	410U
606-20-2	2,6-Dinitrotoluene	410U
84-66-2	Diethylphthalate	82U
7005-72-3	4-Chlorophenyl-phenylether	82U
86-73-7	Fluorene	82U
100-01-6	4-Nitroaniline	410U
534-52-1	4,6-Dinitro-2-Methylphenol	820U
86-30-6	N-Nitrosodiphenylamine(1)	82U
101-55-3	4-Bromophenyl-phenylether	82U
118-74-1	Hexachlorobenzene	82U
87-86-5	Pentachlorophenol	410U
85-01-8	Phenanthrene	82U
120-12-7	Anthracene	82U
84-74-2	Di-n-Butylphthalate	82U
206-44-0	Fluoranthene	82U
129-00-0	Pyrene	82U
85-68-7	Butylbenzylphthalate	82U
91-94-1	3,3'-Dichlorobenzidine	410U
56-55-3	Benzo(a)Anthracene	82U
117-81-7	bis(2-Ethylhexyl)Phthalate	82U
218-01-9	Chrysene	82U
117-84-0	Di-n-Octyl Phthalate	82U
205-99-2	Benzo(b)Fluoranthene	82U
207-08-9	Benzo(k)Fluoranthene	82U
50-32-8	Benzo(a)Pyrene	82U
193-39-5	Indeno(1,2,3-cd)Pyrene	82U
53-70-3	Dibenz(a,h)Anthracene	82U
191-24-2	Benzo(ghi)Perylene	82U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	51.3%
2-Fluorobiphenyl	65.9%
d14-p-Terphenyl	74.1%

***Acid surrogate recoveries**

d5-Phenol	60.4%
2-Fluorophenol	57.1%
2,4,6-Tribromophenol	65.7%

Recd 9/24/90 S

REPORT OF CHEMICAL ANALYSES

Reported to:

Battelle Marine Sciences Laboratory
Attn: Mr. Eric A. Crecelius
439 West Sequim Bay Road
Sequim, WA 98382

By:

Twin City Testing Corporation
Organic Chemistry Department
662 Cromwell Avenue
St. Paul, MN 55114

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662 CROMWELL AVENUE
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REPORT OF: CHEMICAL ANALYSES

PROJECT: BATTELLE

DATE: June 21, 1990

ISSUED TO: Battelle Marine Sciences Laboratory
Attn: Mr. Eric A. Crecelius
439 West Sequim Bay Road
Sequim, WA 98382

INVOICE NO: 4410 90-4452

INTRODUCTION

This report summarizes the results of the analyses performed on eight sediment samples and two QA samples which were submitted by a representative of Battelle Marine Sciences Laboratory. The samples were analyzed for the presence or absence of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) using a modified version of USEPA method 8290.

SAMPLE IDENTIFICATION

Client ID	Sample Type	TCT ID
YQ-EPA 2	Sediment	190672
YQ-EPA 3	Sediment	190673
YQ-EPA 6	Sediment	190674
YQ-EPA 8	Sediment	190675
YQ-EPA 9	Sediment	190677
YQ-EPA 12	Sediment	190678
YQ-EPA 13	Sediment	190679
YQ-EPA 14	Sediment	190680
YQ-EPA 14 Spike	Sediment	190680-MS
YQ-EPA 14 Spike Dup	Sediment	190680-MSD

METHODOLOGY

PCDD/PCDF Extraction

A portion of each sample was spiked with $^{13}C_{12}$-labeled PCDD/PCDF internal standards (Table 1) and continuously extracted with benzene for 18 hours in a Dean-Stark Soxhlet extractor. The extracts were quantitatively transferred to Kuderna Danish concentrators, concentrated, and solvent exchanged to hexane. The hexane extracts were then spiked with 2,3,7,8-TCDD-$^{37}Cl_4$ enrichment efficiency standard (Table 1) and processed through the analyte enrichment procedures described below.

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Analyte Enrichment for PCDD/PCDF Analyses

The extraction procedure often removes a variety of compounds, in addition to the PCDDs and PCDFs, from the sample matrix. Some of these compounds can directly interfere with the analyses while others can overload the capillary column causing degradation in chromatographic resolution or sensitivity. The analyte enrichment steps described below were used to remove interferences from the extracts.

The sample extracts were dissolved in 100 ml of hexane, transferred to separatory funnels, and washed with 1N sodium hydroxide, concentrated sulfuric acid, and distilled water. The hexane layers were concentrated to 1 ml and quantitatively transferred to liquid chromatography columns containing alternating layers of silica gel, 44% concentrated sulfuric acid on silica gel, and 33% 1 N sodium hydroxide on silica gel. The columns were eluted with 60 ml of hexane and each entire eluate was collected and concentrated, under a gentle stream of dry nitrogen, to a volume of 1 ml.

The extracts were then fractionated on liquid chromatography columns containing 4 g of activated alumina. The columns were eluted with 10 ml of hexane followed by 7 ml of 2.0% methylene chloride/hexane and 25 ml of 60% methylene chloride/hexane. The 60% methylene chloride/hexane fractions were concentrated to 1 ml under a stream of dry nitrogen and applied to the tops of chromatography columns containing 1 g of 5% AX-21 activated carbon on silica gel. Each column was eluted with cyclohexane/methylene chloride (50:50 V/V) and cyclohexane/methanol/benzene (75:20:5 V/V) in the forward direction, and then with benzene in the reverse direction. Each benzene fraction was collected, spiked with recovery standards (1,2,3,4-TCDD-$^{13}C_{12}$ and 1,2,3,7,8,9-HxCDD-$^{13}C_{12}$) and concentrated to a final volume of 20 uL.

PCDD/PCDF Analyses

The extracts were analyzed for the presence of PCDDs and PCDFs using combined capillary column gas chromatography/high resolution mass spectrometry (HRGC/HRMS). The instrumentation consisted of a Hewlett Packard Model 5890 gas chromatograph and a VG Model 70SE high resolution mass spectrometer. The capillary column was interfaced directly into the ion source of the mass spectrometer, thus providing the highest possible sensitivity while minimizing degradation of the chromatographic resolution.

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PCDD/PCDF Analyses (Cont.)

The mass spectrometer was operated in the electron impact ionization mode at a mass resolution of 10,000-11,000 (M/ΔM, 10 percent valley definition). This resolution is sufficient to resolve most interferences, such as PCBs, thus providing the highest level of confidence that the detected levels of PCDD/PCDF are not false positives resulting from interferences. Typical operating parameters for the HRGC/HRMS analyses are summarized in Table 2.

The data were acquired by selected-ion-recording (SIR) monitoring the groups of ion masses described in EPA method 8290. The five groups corresponded to the tetrachlorinated through octachlorinated congener classes. Each group contained three ion masses for the PCDDs (with the exception of TCDD which contained two ion masses), two ion masses for the PCDFs, the corresponding ion masses from the two isotopically labeled internal standards, and the ion mass characteristic of the polychlorinated diphenylether (PCDPE) which, if present, could cause false responses in the dibenzofuran channels. The third PCDD ion mass monitored in the pentachloro through octachlorodibenzo-p-dioxin groups prevented the possibility of misinterpretation of a polychlorinated biphenylene isomer as a PCDD. The two ion masses monitored for TCDD also fulfilled this purpose.

Each group of ion masses also contained a lock mass which was monitored during the analyses to detect suppressive interferences. It is particularly important to detect this type of interference since it can cause the quantification of congener class levels to be artificially high if it occurs during the elution of an internal standard or low if it occurs during the elution of the native analytes.

The lock mass was also used by the data system to automatically correct the mass focus of the instrument. The data system determined the centroid of the lock mass during each data acquisition cycle and corrected the mass focus of the analyte and internal standard ion masses to assure that the centers of the mass peaks were being monitored.

The criteria used to judge positive responses for the PCDD/PCDF isomer included:

- Simultaneous response at both ion masses of the PCDD or PCDF
- Signal to noise ratio equal to or greater than 2.5:1.0 for both ion masses

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PCDD/PCDF Analyses (Cont.)

- Chlorine isotope ratio within 15% of the theoretical value
- Chromatographic retention time within -1 to +3 seconds of the authentic standards (where applicable)
- Chromatographic retention times within elution windows determined from analyses of standard mixtures
- Absence of simultaneous response between the PCDF and diphenylether ion traces

A list of the exact ion masses monitored for the determination of PCDD/PCDF isomers and the PCDPE interferences is presented in Table 3. Also included are the theoretical chlorine isotope ratios for the ten congener classes.

PCDD/PCDF Quantification and Calculations

The PCDD/PCDF isomers were quantified by comparison of their responses to the responses of the labeled internal standards as described in the draft version of EPA Method 8290. Relative response factors were calculated from analyses of standard mixtures containing representatives of each of the PCDD/PCDF congener classes at five concentration levels, and each of the internal standards at one concentration level, as shown in Table 4. The PCDD/PCDF response factors were calculated by comparing the sum of the responses from the two ion masses monitored for each chlorine congener class to the sum of the responses from the two ion masses of the corresponding isotopically labeled internal standard. Table 5 shows the response factor at each of the calibration levels as well as the average response factors and the relative percent deviation for each. The formula for the response factor calculation is:

$$Rf = \frac{An \times Qis}{Ais \times Qn}$$

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PCDD/PCDF Quantification and Calculations (Cont.)

where:

Rf = Response factor
An = Sum of integrated areas for native isomer
Qis = Quantity of labeled internal standard
Ais = Sum of integrated areas for labeled internal standard
Qn = Quantity of native isomer

The levels of PCDD/PCDF in the samples were quantified using the following equation:

$$C = \frac{An \times Qis}{Ais \times W \times Rf}$$

where:

C = Concentration of target isomer or congener class
An = Sum of integrated area for the target isomer or congener class
Qis = Amount of labeled internal standard added to the sample
Ais = Sum of integrated areas for the labeled internal standard
W = Sample weight, volume or area
Rf = Response factor

Each pair of ion mass peaks in the selected-ion-current chromatograms was evaluated manually to determine if it met the criteria for a PCDD or PCDF isomer. Areas of all peaks exhibiting correct ion ratios and having retention times within the correct windows were then summed for calculations of total congener concentrations. A summary of the high resolution initial calibration chlorine isotope ratios is presented in Table 6.

A limit of detection (LOD) based on producing a signal that is 2.5 times the noise level, was calculated for each undetected 2,3,7,8-substituted isomer of any tetra through octa chlorinated congener class. The noise heights used to calculate the detection limits were measured at the retention time of the specific isomer. The formula used for calculating the LOD is:

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PCDD/PCDF Quantification and Calculations (Cont.)

$$LOD = \frac{Hn \times Qis \times 2.5}{His \times W \times Rf}$$

where:

LOD = Single isomer limit of detection
Hn = Sum of noise heights at native isomer retention time
Qis = Quantity of labeled internal standard
His = Sum of peak heights for labeled internal standard
W = Sample weight, volume or surface area
Rf = Response factor

The recovery of the $^{37}Cl_4$ enrichment efficiency standard and each $^{13}C_{12}$-labeled internal standard, relative to either 1,2,3,4-TCDD-$^{13}C_{12}$ or 1,2,3,7,8,9-HxCDD-$^{13}C_{12}$, was calculated using the following equation:

$$\%R = \frac{Ais \times Wrs \times 100\%}{Rfr \times Ars \times Wis}$$

where:

%R = Percent recovery of labeled internal standard
Ais = Sum of integrated areas of internal standard
Wrs = ng of recovery standard
Ars = Sum of integrated areas of recovery standard
Rfr = Response factor of the specific labeled internal standard isomer relative to the recovery standard
Wis = ng of the labeled internal standard added to the sample prior to extraction

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RESULTS

The results of the sample analyses are included in Appendix A and are expressed on a dry sample weight basis.

DISCUSSION

The recoveries of the $^{13}C_{12}$-labeled PCDD/PCDF internal standards in the samples were generally in the range of 50-75%, indicating a level of efficiency through the extraction and enrichment steps that is considered typical for this sample matrix type. Since the method is based on isotope dilution, the quantifications are automatically corrected for variations in recovery and accurate values are obtained for the 2,3,7,8-substituted PCDD/PCDF in the samples. The samples were found to contain chlorinated diphenylethers (PCDPEs), substances which can cause a false positive responses for PCDFs. The instrument monitors for the presence of PCDPEs, and any simultaneous response in the PCDPE and PCDF ion channels is reported as "not detected" due to the possibility that the furan is an artifact produced from the diphenylether. The detection limit for each affected isomer is, therefore, elevated.

A laboratory method blank was prepared and processed along with the sample extraction batch as part of our routine quality assurance/quality control procedures. The data from this analysis, included at the beginning of Appendix A, show the blank to contain selected PCDD/PCDF isomers at low background levels (less than 0.2 parts-per-trillion/isomer) with the exception of those in the hepta and octa congener classes, which were present at levels of approximately 3-40 parts-per-trillion. These levels were below the levels determined for the same isomers in the actual samples, thus indicating that the sample processing steps did not contribute significantly to the levels determined for the samples.

Two quality control matrix spike samples were prepared by extracting separate aliquots of actual sample matrix fortified with native standard materials. The data sheets, included at the end of Appendix A, show that the native analytes were recovered at levels that typically ranged from 75-115%. This indicates a high level of accuracy for these determinations.

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REMARKS

The sample extracts will be retained for a period of 60 days from the date of this report and then discarded unless other arrangements are made. The raw mass spectral and chromatographic data will be archived on magnetic tape for a period of not less than one year.

TWIN CITY TESTING CORPORATION

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SWH/CVS/tls

TABLE 1

Spike Levels of PCDD/PCDF Standards

Internal Standards:	Spike Level (ng)
2,3,7,8-TCDF-$^{13}C_{12}$	2.0
2,3,7,8-TCDD-$^{13}C_{12}$	2.0
1,2,3,7,8-PeCDF-$^{13}C_{12}$	2.0
2,3,4,7,8-PeCDF-$^{13}C_{12}$	2.0
1,2,3,4,7,8-PeCDD-$^{13}C_{12}$	2.0
1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	2.0
1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	2.0
1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	2.0
2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	2.0
1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	2.0
1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	2.0
1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	2.0
1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	2.0
1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	2.0
OCDD-$^{13}C_{12}$	4.0
Recovery Standards	
1,2,3,4-TCDD-$^{13}C_{12}$	2.0
1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	2.0
Enrichment Efficiency Standard	
2,3,7,8-TCDD-$^{37}Cl_4$	0.8

TABLE 2

High Resolution PCDD/PCDF Analyses
HRGC/HRMS Operating Parameters

Mass Resolution	10,000-11,000 (M/ΔM, 10% valley)
Electron Energy	32 electron volts
Accelerating Voltage	8,000 volts
Source Temperature	275°C
Preamplifier Gain	10^{-6} amp/volt
Multiplier Gain	~10^{5}
Chromatographic Column	60 M DB-5
Transfer Line Temperature	300°C
Injection Mode	Splitless
Carrier Gas	Helium
Carrier Flow Velocity	~30 cm/sec

TABLE 3

Exact Ion Masses Monitored for the Determination of PCDDs, PCDFs, and PCDPEs

Compound	Accurate Mass Mass 1	Mass 2	Mass 3	Theoretical Ratio Mass 2/Mass 3
Tetra-CDDs		319.8965	321.8936	0.77
Tetra-CDFs		303.9016	305.8987	0.77
Hexa-CDPEs	375.8364			
Penta-CDDs	353.8576	355.8546	357.8517	1.54
Penta-CDFs		339.8597	341.8567	1.54
Hepta-CDPEs	409.7974			
Hexa-CDDs	387.8187	389.8156	391.8127	1.23
Hexa-CDFs		373.8207	375.8178	1.23
Octa-CDPEs	445.7555			
Hepta-CDDs	421.7798	423.7766	425.7737	1.03
Hepta-CDFs		407.7817	409.7788	1.03
Nona-CDPEs	479.7165			
Octa-CDD	455.7409	457.7377	459.7347	0.88
Octa-CDF		441.7428	443.7398	0.88
Deca-CDPE	513.6775			

CDDs = Chlorinated Dibenzo-p-dioxins
CDFs = Chlorinated Dibenzofurans
CDPEs = Chlorinated Diphenylethers

TABLE 4

High Resolution Calibration Solutions

Native CDDs/CDFs	Concentration (pg/uL) CS1	CS2	CS3	CS4	CS5
2,3,7,8-TCDD	0.5	2	10	40	200
2,3,7,8 TCDF	0.5	2	10	40	200
1,2,3,7,8-PeCDD	2.5	10	50	200	1000
1,2,3,7,8-PeCDF	2.5	10	50	200	1000
2,3,4,7,8-PeCDF	2.5	10	50	200	1000
1,2,3,4,7,8-HxCDD	2.5	10	50	200	1000
1,2,3,6,7,8-HxCDD	2.5	10	50	200	1000
1,2,3,7,8,9-HxCDD	2.5	10	50	200	1000
1,2,3,4,7,8-HxCDF	2.5	10	50	200	1000
1,2,3,6,7,8-HxCDF	2.5	10	50	200	1000
1,2,3,7,8,9-HxCDF	2.5	10	50	200	1000
2,3,4,6,7,8-HxCDF	2.5	10	50	200	1000
1,2,3,4,6,7,8-HpCDD	2.5	10	50	200	1000
1,2,3,4,6,7,8-HpCDF	2.5	10	50	200	1000
1,2,3,4,7,8,9-HpCDF	2.5	10	50	200	1000
OCDD	5.0	20	100	400	2000
OCDF	5.0	20	100	400	2000
Internal Standards					
2,3,7,8-TCDD$^{13}C_{12}$	100	100	100	100	100
2,3,7,8-TCDF$^{13}C_{12}$	100	100	100	100	100
1,2,3,7,8-PeCDD$^{13}C_{12}$	100	100	100	100	100
1'2,3,7,8-PeCDF$^{13}C_{12}$	100	100	100	100	100
2,3,4,7,8-PeCDF$^{13}C_{12}$	100	100	100	100	100
1,2,3,4,7,8-HxCDD$^{13}C_{12}$	100	100	100	100	100
1,2,3,6,7,8-HxCDD$^{13}C_{12}$	100	100	100	100	100
1,2,3,4,7,8-HxCDF$^{13}C_{12}$	100	100	100	100	100
1,2,3,6,7,8-HxCDF$^{13}C_{12}$	100	100	100	100	100
1,2,3,7,8,9-HxCDF$^{13}C_{12}$	100	100	100	100	100
2,3,4,6,7,8-HxCDF$^{13}C_{12}$	100	100	100	100	100
1,2,3,4,6,7,8-HpCDD$^{13}C_{12}$	100	100	100	100	100
1,2,3,4,6,7,8-HpCDF$^{13}C_{12}$	100	100	100	100	100
1,2,3,4,7,8,9-HpCDF$^{13}C_{12}$	100	100	100	100	100
OCDD$^{13}C_{12}$	200	200	200	200	200
Recovery Standards					
1,2,3,4-TCDD$^{13}C_{12}$	100	100	100	100	100
1,2,3,7,8,9-HxCDD$^{13}C_{12}$	100	100	100	100	100
Enrichment Efficiency Standard					
2,3,7,8-TCDD $^{37}Cl_4$	0.5	2	10	40	200

Not Std alone

<20% SD
is ok

TABLE #5
HRGC/HRMS Analyses VG70-VSE
HRGC/HRMS Initial Calibration (5-11-90) Summary of Response Factors

Isomer	TCT Std #	LOW CS-1	CS-2	CS-3	CS-4	HIGH CS-5	Average RF	Percent RSD
2,3,7,8-TCDF		0.9148	0.9802	0.9862	0.9519	1.0151	0.9696	3.51
2,3,7,8-TCDD		1.1126	1.0557	1.0907	1.0511	1.1394	1.0899	3.08
1,2,3,7,8-PnCDF		1.2275	1.1425	1.2359	1.1070	1.1325	1.1691	4.49
2,3,4,7,8-PnCDF		1.0101	1.0234	0.9944	0.9665	1.0016	0.9992	1.90
1,2,3,7,8-PnCDD		1.0389	1.0648	1.0446	1.0437	1.0825	1.0549	1.55
1,2,3,4,7,8-HxCDF		1.1516	1.2370	1.1478	1.0368	1.0288	1.1204	6.99
1,2,3,6,7,8-HxCDF		1.3791	1.1674	1.1334	1.2213	1.2061	1.2214	6.92
1,2,3,7,8,9-HxCDF		1.3002	1.2165	1.1301	1.1565	1.1426	1.1892	5.29
2,3,4,6,7,8-HxCDF		1.1632	1.1873	1.1112	1.1293	1.1232	1.1429	2.46
1,2,3,4,7,8-HxCDD		0.8602	1.1387	1.0716	0.8514	0.8682	0.9580	12.75
1,2,3,6,7,8-HxCDD		1.0920	0.9425	0.9346	1.0791	1.0899	1.0276	7.09
1,2,3,7,8,9-HxCDD		0.8753	0.8454	0.7403	0.9389	0.9951	0.8790	9.85
1,2,3,4,6,7,8-HpCDF		1.6464	1.7181	1.5804	1.5228	1.5820	1.6100	4.15
1,2,3,4,7,7,8-HpCDF		1.2606	1.3318	1.3161	1.2155	1.2978	1.2844	3.26
1,2,3,4,6,7,8-HpCDD		0.9518	0.9814	0.9949	0.9184	0.9703	0.9633	2.76
OCDF		1.3118	1.4911	1.3767	1.3427	1.4300	1.3904	4.59
OCDD		1.4222	1.2827	1.2205	1.1549	1.2349	1.2630	7.08
TOTAL PeCDFs		1.1188	1.0830	1.1151	1.0368	1.0671	1.0842	2.83
TOTAL HxCDFs		1.2485	1.2020	1.1306	1.1360	1.1252	1.1685	4.17
TOTAL HxCDDs		0.9425	0.9755	0.9155	0.9565	0.9844	0.9549	2.57
TOTAL HpCDFs		1.4535	1.5250	1.4483	1.3692	1.4399	1.4472	3.42
2,3,7,8-TCDF*		1.6143	1.6875	1.6743	1.6315	1.6115	1.6438	1.91
2,3,7,8-TCDD*		0.9146	0.8841	1.0926	0.8957	1.0108	0.9596	8.35
2,3,7,8,-TCDD-Cl37		0.9803	0.9025	1.1565	0.9707	1.1169	1.0254	9.32
1,2,3,7,8-PnCDF*		1.2455	1.4014	0.9197	1.3184	1.4389	1.2648	14.64
2,3,4,7,8-PnCDF*		1.6584	1.6988	1.5903	1.6464	1.7880	1.6764	3.92
1,2,3,7,8-PnCDD*		0.9412	0.9767	0.9243	0.9342	1.0320	0.9617	4.09
1,2,3,4,7,8-HxCDF*		1.2089	1.2013	1.2901	1.1751	1.0682	1.1887	6.02
1,2,3,6,7,8-HxCDF*		1.0746	1.2521	1.3178	0.9615	0.9772	1.1166	12.92
1,2,3,7,8,9-HxCDF*		1.2797	1.2322	1.3894	1.1730	1.1184	1.2385	7.51
2,3,4,6,7,8-HxCDF*		1.0564	0.9996	1.2623	0.9723	0.9905	1.0562	10.11
1,2,3,4,7,8-HxCDD*		0.9564	0.7845	0.9689	0.9437	0.8206	0.8948	8.56
1,2,3,6,7,8-HxCDD*		0.9368	1.0491	1.1516	0.8772	0.8570	0.9743	11.39
1,2,3,4,6,7,8-HpCDF*		0.9305	0.9544	0.9674	0.8902	0.8411	0.9167	5.02
1,2,3,4,7,8,9-HpCDF*		0.9057	0.9118	0.9751	0.8407	0.8405	0.8948	5.64
1,2,3,4,6,7,8-HpCDD*		0.9004	0.9801	0.9870	0.8871	0.8476	0.9204	5.91
OCDD*		0.6925	0.6767	0.7723	0.6395	0.6191	0.6800	7.79

* = C13 Labeled Isomer

TABLE #5 -A
HRGC/HRMS Analyses VG70-VSE
HRGC/HRMS Initial Calibration (6-15-90) Summary of Response Factors

Isomer TCT Std #	LOW CS-1	CS-2	CS-3	CS-4	HIGH CS-5	Average RF	Percent RSD
2,3,7,8-TCDF	0.8512	0.7905	0.7791	0.8291	0.9110	0.8322	5.67
2,3,7,8-TCDD	0.9079	0.7612	0.8082	0.8821	1.0663	0.8851	11.81
1,2,3,7,8-PnCDF	1.1318	1.1261	1.1415	1.2097	1.3334	1.1885	6.60
2,3,4,7,8-PnCDF	0.9936	0.9680	0.9865	1.0839	1.1383	1.0341	6.36
1,2,3,7,8-PnCDD	1.0155	1.0384	1.0851	0.9842	1.0711	1.0389	3.53
1,2,3,4,7,8-HxCDF	1.0802	1.2021	1.2316	1.2171	1.2284	1.1919	4.76
1,2,3,6,7,8-HxCDF	1.2605	1.0971	1.1477	1.1587	1.3661	1.2060	7.96
1,2,3,7,8,9-HxCDF	1.1978	1.1528	1.1860	1.1149	1.2755	1.1854	4.51
2,3,4,6,7,8-HxCDF	1.1065	1.0972	1.1808	1.1092	1.2987	1.1585	6.58
1,2,3,4,7,8-HxCDD	0.8610	1.0173	0.8382	1.0514	0.8904	0.9317	9.25
1,2,3,6,7,8-HxCDD	1.0689	0.8530	1.0632	0.8973	1.1187	1.0002	10.49
1,2,3,7,8,9-HxCDD	1.0443	0.8786	1.0384	0.8764	1.1218	0.9919	9.87
1,2,3,4,6,7,8-HpCDF	1.6097	1.7573	1.5866	1.7777	1.7038	1.6870	4.55
1,2,3,4,7,7,8-HpCDF	1.2529	1.1841	1.3123	1.3446	1.3923	1.2973	5.59
1,2,3,4,6,7,8-HpCDD	0.9837	0.8759	1.0003	0.9304	0.9668	0.9514	4.66
OCDF	1.3699	1.3148	1.5137	1.3246	1.5707	1.4187	7.34
OCDD	1.2985	1.1809	1.2177	1.1642	1.2571	1.2237	4.02
TOTAL PeCDFs	1.0627	1.0470	1.0640	1.1468	1.2359	1.1113	6.43
TOTAL HxCDFs	1.1613	1.1373	1.1865	1.1500	1.2922	1.1855	4.71
TOTAL HxCDDs	0.9914	0.9163	0.9799	0.9417	1.0436	0.9746	4.49
TOTAL HpCDFs	1.4313	1.4707	1.4495	1.5611	1.5480	1.4921	3.53
2,3,7,8-TCDF*	1.6638	1.7749	1.6897	1.6448	1.6454	1.6837	2.88
2,3,7,8-TCDD*	0.8877	0.7410	0.9815	0.8150	0.9972	0.8845	11.03
2,3,7,8,-TCDD-Cl37	0.8751	0.5819	0.8490	0.7633	1.0381	0.8215	18.16
1,2,3,7,8-PnCDF*	1.2188	1.3538	1.4780	1.4759	1.4034	1.3860	6.91
2,3,4,7,8-PnCDF*	1.4044	1.4531	1.8385	1.5826	1.7053	1.5968	10.02
1,2,3,7,8-PnCDD*	0.7710	0.7495	0.9640	0.9238	1.0418	0.8900	12.67
1,2,3,4,7,8-HxCDF*	1.1790	1.1159	1.1003	1.0862	1.0589	1.1081	3.62
1,2,3,6,7,8-HxCDF*	1.3427	1.4614	1.2090	1.4145	1.1153	1.3086	9.85
1,2,3,7,8,9-HxCDF*	1.1862	1.1709	1.1048	1.1740	1.0352	1.1342	5.03
2,3,4,6,7,8-HxCDF*	0.9055	0.8687	0.9746	0.9615	0.9271	0.9275	4.12
1,2,3,4,7,8-HxCDD*	0.7922	0.7255	0.7439	0.7144	0.8132	0.7578	5.07
1,2,3,6,7,8-HxCDD*	0.8049	0.9477	0.7992	0.9291	0.7882	0.8538	8.14
1,2,3,4,6,7,8-HpCDF*	0.7349	0.6943	0.7589	0.7609	0.6806	0.7259	4.55
1,2,3,4,7,8,9-HpCDF*	0.7003	0.6495	0.7423	0.6875	0.6909	0.6941	4.28
1,2,3,4,6,7,8-HpCDD*	0.6962	0.6898	0.6959	0.7274	0.6728	0.6964	2.54
OCDD*	0.5547	0.5315	0.5582	0.6210	0.5573	0.5645	5.30

* = C13 Labeled Isomer

TABLE #6
HRGC/HRMS Analyses VG70-VSE
HRGC/HRMS Initial Calibration (5-11-90) Summary of Isotope Ratios

Isomer TCT Std #	LOW CS-1	CS-2	CS-3	CS-4	HIGH CS-5	Limits
2,3,7,8-TCDF	0.80	0.78	0.79	0.79	0.78	0.65-0.89
2,3,7,8-TCDD	0.82	0.78	0.79	0.77	0.78	0.65-0.89
1,2,3,7,8-PnCDF	1.41	1.59	1.59	1.56	1.54	1.32-1.78
2,3,4,7,8-PnCDF	1.62	1.57	1.57	1.57	1.55	1.32-1.78
1,2,3,7,8-PnCDD	1.66	1.61	1.56	1.57	1.57	1.32-1.78
1,2,3,4,7,8-HxCDF	1.28	1.31	1.25	1.23	1.16	1.05-1.43
1,2,3,6,7,8-HxCDF	1.30	1.25	1.26	1.27	1.22	1.05-1.43
1,2,3,7,8,9-HxCDF	1.21	1.30	1.26	1.23	1.21	1.05-1.43
2,3,4,6,7,8-HxCDF	1.34	1.28	1.27	1.24	1.21	1.05-1.43
1,2,3,4,7,8-HxCDD	1.20	1.21	1.23	1.24	1.21	1.05-1.43
1,2,3,6,7,8-HxCDD	1.28	1.23	1.25	1.27	1.27	1.05-1.43
1,2,3,7,8,9-HxCDD	1.29	1.28	1.26	1.23	1.25	1.05-1.43
1,2,3,4,6,7,8-HpCDF	1.02	1.03	1.01	1.02	1.03	0.88-1.20
1,2,3,4,7,7,8-HpCDF	1.03	0.98	1.02	1.05	1.04	0.88-1.20
1,2,3,4,6,7,8-HpCDD	1.01	1.02	1.03	1.05	1.05	0.88-1.20
OCDF	0.83	0.90	0.90	0.91	0.92	0.76-1.02
OCDD	0.95	0.89	0.90	0.91	0.89	0.76-1.02
1234-TCDD-REC	0.78	0.78	0.78	0.81	0.80	0.65-0.89
123789-HxCDD-REC	1.26	1.20	1.29	1.24	1.25	1.05-1.43
2,3,7,8-TCDF*	0.80	0.80	0.79	0.80	0.77	0.65-0.89
2,3,7,8-TCDD*	0.78	0.79	0.78	0.79	0.79	0.65-0.89
2,3,7,8,-TCDD-C137	****	****	****	****	****	*********
1,2,3,7,8-PnCDF*	1.56	1.57	1.64	1.60	1.57	1.32-1.78
2,3,4,7,8-PnCDF*	1.57	1.56	1.60	1.58	1.59	1.32-1.78
1,2,3,7,8-PnCDD*	1.57	1.56	1.58	1.58	1.60	1.32-1.78
1,2,3,4,7,8-HxCDF*	0.54	0.55	0.53	0.55	0.55	0.43-0.59
1,2,3,6,7,8-HxCDF*	0.52	0.55	0.54	0.53	0.54	0.43-0.59
1,2,3,7,8,9-HxCDF*	0.54	0.54	0.54	0.55	0.54	0.43-0.59
2,3,4,6,7,8-HxCDF*	0.53	0.55	0.53	0.55	0.54	0.43-0.59
1,2,3,4,7,8-HxCDD*	1.24	1.20	1.29	1.25	1.25	1.05-1.43
1,2,3,6,7,8-HxCDD*	1.27	1.24	1.32	1.27	1.27	1.05-1.43
1,2,3,4,6,7,8-HpCDF*	0.46	0.45	0.47	0.46	0.45	0.37-0.51
1,2,3,4,7,8,9-HpCDF*	0.46	0.44	0.46	0.47	0.44	0.37-0.51
1,2,3,4,6,7,8-HpCDD*	1.08	1.05	1.04	1.04	1.07	0.88-1.20
OCDD*	0.92	0.93	0.91	0.88	0.92	0.76-1.02

* = C13 Labeled Isomer

TABLE #6 -A
HRGC/HRMS Analyses VG70-VSE
HRGC/HRMS Initial Calibration (6-15-90) Summary of Isotope Ratios

Isomer TCT Std #	LOW CS-1	CS-2	CS-3	CS-4	HIGH CS-5	Limits
2,3,7,8-TCDF	0.81	0.83	0.78	0.79	0.82	0.65-0.89
2,3,7,8-TCDD	0.84	0.74	0.81	0.78	0.75	0.65-0.89
1,2,3,7,8-PnCDF	1.67	1.56	1.61	1.65	1.56	1.32-1.78
2,3,4,7,8-PnCDF	1.68	1.57	1.59	1.61	1.55	1.32-1.78
1,2,3,7,8-PnCDD	1.66	1.64	1.53	1.50	1.53	1.32-1.78
1,2,3,4,7,8-HxCDF	1.24	1.23	1.28	1.22	1.21	1.05-1.43
1,2,3,6,7,8-HxCDF	1.16	1.15	1.34	1.21	1.20	1.05-1.43
1,2,3,7,8,9-HxCDF	1.18	1.13	1.31	1.16	1.23	1.05-1.43
2,3,4,6,7,8-HxCDF	1.13	1.18	1.27	1.20	1.19	1.05-1.43
1,2,3,4,7,8-HxCDD	1.27	1.33	1.27	1.26	1.27	1.05-1.43
1,2,3,6,7,8-HxCDD	1.32	1.37	1.32	1.31	1.31	1.05-1.43
1,2,3,7,8,9-HxCDD	1.25	1.35	1.28	1.29	1.28	1.05-1.43
1,2,3,4,6,7,8-HpCDF	1.07	1.01	1.06	1.05	1.03	0.88-1.20
1,2,3,4,7,7,8-HpCDF	1.04	1.01	1.06	1.06	1.02	0.88-1.20
1,2,3,4,6,7,8-HpCDD	1.09	1.00	1.07	1.05	1.04	0.88-1.20
OCDF	0.93	0.95	0.90	0.95	0.90	0.76-1.02
OCDD	0.91	0.91	0.90	0.90	0.89	0.76-1.02
1234-TCDD-REC	0.80	0.82	0.80	0.79	0.79	0.65-0.89
123789-HxCDD-REC	1.31	1.29	1.20	1.31	1.32	1.05-1.43
2,3,7,8-TCDF*	0.81	0.80	0.82	0.77	0.77	0.65-0.89
2,3,7,8-TCDD*	0.78	0.79	0.78	0.79	0.78	0.65-0.89
2,3,7,8,-TCDD-Cl37	****	****	****	****	****	*********
1,2,3,7,8-PnCDF*	1.63	1.59	1.66	1.70	1.54	1.32-1.78
2,3,4,7,8-PnCDF*	1.60	1.60	1.64	1.73	1.53	1.32-1.78
1,2,3,7,8-PnCDD*	1.56	1.58	1.61	1.59	1.60	1.32-1.78
1,2,3,4,7,8-HxCDF*	0.57	0.53	0.57	0.51	0.59	0.43-0.59
1,2,3,6,7,8-HxCDF*	0.57	0.53	0.59	0.53	0.59	0.43-0.59
1,2,3,7,8,9-HxCDF*	0.55	0.52	0.58	0.52	0.59	0.43-0.59
2,3,4,6,7,8-HxCDF*	0.57	0.52	0.57	0.53	0.58	0.43-0.59
1,2,3,4,7,8-HxCDD*	1.26	1.27	1.20	1.31	1.28	1.05-1.43
1,2,3,6,7,8-HxCDD*	1.31	1.33	1.23	1.31	1.33	1.05-1.43
1,2,3,4,6,7,8-HpCDF*	0.46	0.46	0.45	0.46	0.45	0.37-0.51
1,2,3,4,7,8,9-HpCDF*	0.45	0.45	0.46	0.45	0.45	0.37-0.51
1,2,3,4,6,7,8-HpCDD*	1.05	1.05	1.07	1.06	1.04	0.88-1.20
OCDD*	0.90	0.92	0.93	0.91	0.92	0.76-1.02

* = C13 Labeled Isomer

APPENDIX A

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 2
Sample ID (TCT#).....190672
Analysis Date.....5-21-90
Filename.....V00521K
Analyst.....BB
Sample Amount.....0.0053 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	1.40	-----	2378-TCDF-C13....	2.00	59
TOTAL TCDF	6.00	-----	2378-TCDD-C13....	2.00	61
			12378-PeCDF-C13..	2.00	60
2378-TCDD	nd	0.46	23478-PeCDF-C13..	2.00	38
TOTAL TCDD	2.00	-----	12378-PeCDD-C13..	2.00	58
			123478-HxCDF-C13.	2.00	67
12378-PeCDF	0.23	-----	123678-HxCDF-C13.	2.00	75
23478-PeCDF	nd	0.66	123789-HxCDF-C13.	2.00	55
TOTAL PeCDF	12.00	-----	234678-HxCDF-C13.	2.00	50
			123478-HxCDD-C13.	2.00	67
12378-PeCDD	1.50	-----	123678-HxCDD-C13.	2.00	68
TOTAL PeCDD	2.50	-----	1234678-HpCDF-C13	2.00	47
			1234789-HpCDF-C13	2.00	44
123478-HxCDF	1.50	-----	1234678-HpCDD-C13	2.00	41
123678-HxCDF	nd	11.00	OCDD-C13.....	4.00	32
123789-HxCDF	1.40	-----			
234678-HxCDF	nd	0.41	1234-TCDD-C13....	2.00	na
TOTAL HxCDF	48.00	-----	123789-HxCDD-C13.	2.00	na
123478-HxCDD	2.20	-----	2378-TCDD-Cl37...	0.80	75
123678-HxCDD	11.00	-----			
123789-HxCDD	4.00	-----			
TOTAL HxCDD	55.00	-----			
1234678-HpCDF	15.00	-----			
1234789-HpCDF	1.10	-----			
TOTAL HpCDF	16.00	-----			
1234678-HpCDD	240.00	-----			
TOTAL HpCDD	630.00	-----			
OCDF	34.00	-----	Total 2378-TCDD Equivalence =	6.9 ng/kg	
OCDD	1400.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 3
Sample ID (TCT#).....190673
Analysis Date.....5-21-90
Filename.....V00521L
Analyst.....BB
Sample Amount.....0.0071 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	0.95	-----
TOTAL TCDF	6.60	-----
2378-TCDD	nd	0.84
TOTAL TCDD	0.98	-----
12378-PeCDF	0.36	-----
23478-PeCDF	0.52	-----
TOTAL PeCDF	14.00	-----
12378-PeCDD	1.90	-----
TOTAL PeCDD	1.90	-----
123478-HxCDF	nd	7.90
123678-HxCDF	1.30	-----
123789-HxCDF	1.80	-----
234678-HxCDF	0.20	-----
TOTAL HxCDF	71.00	-----
123478-HxCDD	3.50	-----
123678-HxCDD	19.00	-----
123789-HxCDD	7.30	-----
TOTAL HxCDD	72.00	-----
1234678-HpCDF	29.00	-----
1234789-HpCDF	1.30	-----
TOTAL HpCDF	30.00	-----
1234678-HpCDD	380.00	-----
TOTAL HpCDD	770.00	-----
OCDF	51.00	-----
OCDD	2300.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	73
2378-TCDD-C13....	2.00	81
12378-PeCDF-C13..	2.00	79
23478-PeCDF-C13..	2.00	74
12378-PeCDD-C13..	2.00	78
123478-HxCDF-C13.	2.00	78
123678-HxCDF-C13.	2.00	71
123789-HxCDF-C13.	2.00	63
234678-HxCDF-C13.	2.00	68
123478-HxCDD-C13.	2.00	72
123678-HxCDD-C13.	2.00	71
1234678-HpCDF-C13	2.00	51
1234789-HpCDF-C13	2.00	60
1234678-HpCDD-C13	2.00	42
OCDD-C13.....	4.00	58
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	103

Total 2378-TCDD Equivalence = 11 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 6
Sample ID (TCT#).....190674
Analysis Date.....5-21-90
Filename.....V00521M
Analyst.....BB
Sample Amount.....0.0083 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	0.61	-----
TOTAL TCDF	1.40	-----
2378-TCDD	nd	0.41
TOTAL TCDD	1.30	-----
12378-PeCDF	nd	0.36
23478-PeCDF	0.17	-----
TOTAL PeCDF	2.30	-----
12378-PeCDD	nd	0.59
TOTAL PeCDD	nd	-----
123478-HxCDF	0.41	-----
123678-HxCDF	0.81	-----
123789-HxCDF	0.60	-----
234678-HxCDF	nd	0.52
TOTAL HxCDF	9.20	-----
123478-HxCDD	0.47	-----
123678-HxCDD	1.50	-----
123789-HxCDD	1.00	-----
TOTAL HxCDD	8.10	-----
1234678-HpCDF	2.80	-----
1234789-HpCDF	0.46	-----
TOTAL HpCDF	8.30	-----
1234678-HpCDD	27.00	-----
TOTAL HpCDD	59.00	-----
OCDF	7.20	-----
OCDD	180.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	65
2378-TCDD-C13....	2.00	70
12378-PeCDF-C13..	2.00	63
23478-PeCDF-C13..	2.00	60
12378-PeCDD-C13..	2.00	60
123478-HxCDF-C13.	2.00	44
123678-HxCDF-C13.	2.00	58
123789-HxCDF-C13.	2.00	43
234678-HxCDF-C13.	2.00	47
123478-HxCDD-C13.	2.00	49
123678-HxCDD-C13.	2.00	54
1234678-HpCDF-C13	2.00	38
1234789-HpCDF-C13	2.00	46
1234678-HpCDD-C13	2.00	36
OCDD-C13.....	4.00	42
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	75

Total 2378-TCDD Equivalence = 1.1 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 8
Sample ID (TCT#).....190675
Analysis Date.....5-21-90
Filename.....V00521N
Analyst.....BB
Sample Amount.....0.0070 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.97	-----	2378-TCDF-C13....	2.00	75
TOTAL TCDF	4.40	-----	2378-TCDD-C13....	2.00	82
			12378-PeCDF-C13..	2.00	77
2378-TCDD	nd	0.36	23478-PeCDF-C13..	2.00	72
TOTAL TCDD	2.40	-----	12378-PeCDD-C13..	2.00	71
			123478-HxCDF-C13.	2.00	59
12378-PeCDF	nd	0.53	123678-HxCDF-C13.	2.00	67
23478-PeCDF	0.31	-----	123789-HxCDF-C13.	2.00	54
TOTAL PeCDF	4.90	-----	234678-HxCDF-C13.	2.00	60
			123478-HxCDD-C13.	2.00	62
12378-PeCDD	0.62	-----	123678-HxCDD-C13.	2.00	65
TOTAL PeCDD	1.10	-----	1234678-HpCDF-C13	2.00	47
			1234789-HpCDF-C13	2.00	54
123478-HxCDF	0.79	-----	1234678-HpCDD-C13	2.00	44
123678-HxCDF	1.00	-----	OCDD-C13.....	4.00	45
123789-HxCDF	0.86	-----			
234678-HxCDF	nd	0.29	1234-TCDD-C13....	2.00	na
TOTAL HxCDF	15.00	-----	123789-HxCDD-C13.	2.00	na
123478-HxCDD	nd	0.89	2378-TCDD-C137...	0.80	84
123678-HxCDD	3.10	-----			
123789-HxCDD	1.80	-----			
TOTAL HxCDD	20.00	-----			
1234678-HpCDF	6.20	-----			
1234789-HpCDF	nd	0.96			
TOTAL HpCDF	10.00	-----			
1234678-HpCDD	58.00	-----			
TOTAL HpCDD	130.00	-----			
OCDF	21.00	-----	Total 2378-TCDD Equivalence =	2.4 ng/kg	
OCDD	390.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 9
Sample ID (TCT#).....190677
Analysis Date.....5-24-90
Filename.....V00524M
Analyst.....BB
Sample Amount.....0.0057 kg
ICAL Date.....5-11-90
CCAL Filename.....V00524A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	1.30	-----
TOTAL TCDF	7.30	-----
2378-TCDD	0.38	-----
TOTAL TCDD	6.40	-----
12378-PeCDF	nd	0.46
23478-PeCDF	0.52	-----
TOTAL PeCDF	7.30	-----
12378-PeCDD	1.20	-----
TOTAL PeCDD	1.20	-----
123478-HxCDF	nd	15.00
123678-HxCDF	nd	0.45
123789-HxCDF	0.70	-----
234678-HxCDF	nd	0.16
TOTAL HxCDF	19.00	-----
123478-HxCDD	0.97	-----
123678-HxCDD	3.90	-----
123789-HxCDD	2.70	-----
TOTAL HxCDD	25.00	-----
1234678-HpCDF	11.00	-----
1234789-HpCDF	0.77	-----
TOTAL HpCDF	40.00	-----
1234678-HpCDD	85.00	-----
TOTAL HpCDD	220.00	-----
OCDF	32.00	-----
OCDD	620.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	78
2378-TCDD-C13....	2.00	78
12378-PeCDF-C13..	2.00	61
23478-PeCDF-C13..	2.00	58
12378-PeCDD-C13..	2.00	56
123478-HxCDF-C13.	2.00	58
123678-HxCDF-C13.	2.00	65
123789-HxCDF-C13.	2.00	51
234678-HxCDF-C13.	2.00	55
123478-HxCDD-C13.	2.00	64
123678-HxCDD-C13.	2.00	54
1234678-HpCDF-C13	2.00	43
1234789-HpCDF-C13	2.00	53
1234678-HpCDD-C13	2.00	46
OCDD-C13.....	4.00	45
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	89

Total 2378-TCDD Equivalence = 3.9 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 12
Sample ID (TCT#).....190678
Analysis Date.....5-25-90
Filename.....V00525D
Analyst.....BB
Sample Amount.....0.0069 kg
ICAL Date.....5-11-90
CCAL Filename.....V00525A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	1.50	-----
TOTAL TCDF	11.00	-----
2378-TCDD	nd	1.90
TOTAL TCDD	3.60	-----
12378-PeCDF	0.44	-----
23478-PeCDF	0.51	-----
TOTAL PeCDF	8.40	-----
12378-PeCDD	nd	0.83
TOTAL PeCDD	1.90	-----
123478-HxCDF	1.10	-----
123678-HxCDF	nd	3.70
123789-HxCDF	0.99	-----
234678-HxCDF	0.44	-----
TOTAL HxCDF	21.00	-----
123478-HxCDD	0.74	-----
123678-HxCDD	3.20	-----
123789-HxCDD	2.10	-----
TOTAL HxCDD	29.00	-----
1234678-HpCDF	12.00	-----
1234789-HpCDF	1.30	-----
TOTAL HpCDF	46.00	-----
1234678-HpCDD	72.00	-----
TOTAL HpCDD	160.00	-----
OCDF	43.00	-----
OCDD	550.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	70
2378-TCDD-C13....	2.00	69
12378-PeCDF-C13..	2.00	70
23478-PeCDF-C13..	2.00	71
12378-PeCDD-C13..	2.00	66
123478-HxCDF-C13.	2.00	59
123678-HxCDF-C13.	2.00	68
123789-HxCDF-C13.	2.00	51
234678-HxCDF-C13.	2.00	51
123478-HxCDD-C13.	2.00	60
123678-HxCDD-C13.	2.00	56
1234678-HpCDF-C13	2.00	46
1234789-HpCDF-C13	2.00	46
1234678-HpCDD-C13	2.00	40
OCDD-C13.....	4.00	32
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	72

Total 2378-TCDD Equivalence = 2.8 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 13
Sample ID (TCT#).....190679
Analysis Date.....5-25-90
Filename.....V00525E
Analyst.....BB
Sample Amount.....0.0095 kg
ICAL Date.....5-11-90
CCAL Filename.....V00525A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	0.59	-----
TOTAL TCDF	4.40	-----
2378-TCDD	0.29	-----
TOTAL TCDD	7.70	-----
12378-PeCDF	0.18	-----
23478-PeCDF	nd	0.21
TOTAL PeCDF	1.40	-----
12378-PeCDD	0.35	-----
TOTAL PeCDD	2.30	-----
123478-HxCDF	0.32	-----
123678-HxCDF	0.39	-----
123789-HxCDF	0.45	-----
234678-HxCDF	nd	0.33
TOTAL HxCDF	3.90	-----
123478-HxCDD	0.32	-----
123678-HxCDD	0.78	-----
123789-HxCDD	0.55	-----
TOTAL HxCDD	7.20	-----
1234678-HpCDF	1.60	-----
1234789-HpCDF	nd	0.72
TOTAL HpCDF	5.00	-----
1234678-HpCDD	13.00	-----
TOTAL HpCDD	28.00	-----
OCDF	4.70	-----
OCDD	130.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	53
2378-TCDD-C13....	2.00	53
12378-PeCDF-C13..	2.00	62
23478-PeCDF-C13..	2.00	58
12378-PeCDD-C13..	2.00	54
123478-HxCDF-C13.	2.00	60
123678-HxCDF-C13.	2.00	61
123789-HxCDF-C13.	2.00	55
234678-HxCDF-C13.	2.00	53
123478-HxCDD-C13.	2.00	47
123678-HxCDD-C13.	2.00	61
1234678-HpCDF-C13	2.00	50
1234789-HpCDF-C13	2.00	53
1234678-HpCDD-C13	2.00	51
OCDD-C13.....	4.00	47
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	76

Total 2378-TCDD Equivalence = 1.2 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 14
Sample ID (TCT#).....190680
Analysis Date.....5-25-90
Filename.....V00525F
Analyst.....BB
Sample Amount.....0.0081 kg
ICAL Date.....5-11-90
CCAL Filename.....V00525A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	0.52	-----
TOTAL TCDF	3.20	-----
2378-TCDD	nd	0.64
TOTAL TCDD	1.60	-----
12378-PeCDF	0.29	-----
23478-PeCDF	0.28	-----
TOTAL PeCDF	2.60	-----
12378-PeCDD	0.51	-----
TOTAL PeCDD	1.80	-----
123478-HxCDF	0.61	-----
123678-HxCDF	0.55	-----
123789-HxCDF	0.64	-----
234678-HxCDF	nd	0.24
TOTAL HxCDF	6.60	-----
123478-HxCDD	0.86	-----
123678-HxCDD	0.86	-----
123789-HxCDD	1.10	-----
TOTAL HxCDD	13.00	-----
1234678-HpCDF	3.40	-----
1234789-HpCDF	nd	0.58
TOTAL HpCDF	3.40	-----
1234678-HpCDD	23.00	-----
TOTAL HpCDD	54.00	-----
OCDF	10.00	-----
OCDD	200.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	79
2378-TCDD-C13....	2.00	74
12378-PeCDF-C13..	2.00	70
23478-PeCDF-C13..	2.00	67
12378-PeCDD-C13..	2.00	62
123478-HxCDF-C13.	2.00	58
123678-HxCDF-C13.	2.00	69
123789-HxCDF-C13.	2.00	55
234678-HxCDF-C13.	2.00	64
123478-HxCDD-C13.	2.00	54
123678-HxCDD-C13.	2.00	64
1234678-HpCDF-C13	2.00	62
1234789-HpCDF-C13	2.00	67
1234678-HpCDD-C13	2.00	53
OCDD-C13.....	4.00	66
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	78

Total 2378-TCDD Equivalence = 1.4 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client...BATTELLE

Sample ID (TCT#).....METHOD BLANK 4-30-90
Analysis Date.....5-9-90
Filename.....V00509F
Analyst.....BB
Sample Amount.....0.0101 kg
ICAL Date.....5-11-90
CCAL Filename.....V00509D

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg
2378-TCDF	nd	0.42
TOTAL TCDF	0.19	-----
2378-TCDD	nd	0.14
TOTAL TCDD	0.66	-----
12378-PeCDF	0.15	-----
23478-PeCDF	nd	0.32
TOTAL PeCDF	0.83	-----
12378-PeCDD	nd	0.18
TOTAL PeCDD	0.46	-----
123478-HxCDF	nd	0.20
123678-HxCDF	nd	0.29
123789-HxCDF	nd	0.41
234678-HxCDF	nd	0.21
TOTAL HxCDF	nd	-----
123478-HxCDD	nd	0.18
123678-HxCDD	nd	0.25
123789-HxCDD	nd	0.16
TOTAL HxCDD	nd	-----
1234678-HpCDF	nd	0.27
1234789-HpCDF	nd	0.31
TOTAL HpCDF	nd	-----
1234678-HpCDD	3.10	-----
TOTAL HpCDD	5.50	-----
OCDF	1.20	-----
OCDD	43.00	-----

INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	55
2378-TCDD-C13....	2.00	65
12378-PeCDF-C13..	2.00	31
23478-PeCDF-C13..	2.00	43
12378-PeCDD-C13..	2.00	41
123478-HxCDF-C13.	2.00	89
123678-HxCDF-C13.	2.00	84
123789-HxCDF-C13.	2.00	77
234678-HxCDF-C13.	2.00	72
123478-HxCDD-C13.	2.00	79
123678-HxCDD-C13.	2.00	75
1234678-HpCDF-C13	2.00	89
1234789-HpCDF-C13	2.00	95
1234678-HpCDD-C13	2.00	84
OCDD-C13.....	4.00	82
1234-TCDD-C13....	2.00	na
123789-HxCDD-C13.	2.00	na
2378-TCDD-C137...	0.80	69

Total 2378-TCDD Equivalence = 0.089 ng/kg

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#).....YQ-EPA 14 SPIKE
Sample ID (TCT#).....190680-MS
Analysis Date.....6-19-90
Filename.....V00619F
Analyst.....BB
Sample Amount.....0.0066 kg
ICAL Date.....6-15-90
CCAL Filename.....V00619C

NATIVE ISOMERS	Qs (NG)	Qm (NG)	% REC.
2378-TCDF	0.80	0.82	103
TOTAL TCDF	0.80	0.82	103
2378-TCDD	0.80	0.87	109
TOTAL TCDD	0.80	0.87	109
12378-PeCDF	4.00	3.50	88
23478-PeCDF	4.00	3.50	88
TOTAL PeCDF	8.00	7.00	88
12378-PeCDD	4.00	3.70	93
TOTAL PeCDD	4.00	3.70	93
123478-HxCDF	4.00	3.00	75
123678-HxCDF	4.00	3.90	98
123789-HxCDF	4.00	3.40	85
234678-HxCDF	4.00	3.50	88
TOTAL HxCDF	16.00	14.00	88
123478-HxCDD	4.00	3.10	78
123678-HxCDD	4.00	3.60	90
123789-HxCDD	4.00	3.10	78
TOTAL HxCDD	12.00	9.80	82
1234678-HpCDF	4.00	3.40	85
1234789-HpCDF	4.00	3.60	90
TOTAL HpCDF	8.00	7.00	88
1234678-HpCDD	4.00	3.30	83
TOTAL HpCDD	4.00	3.30	83
OCDF	8.00	8.20	103
OCDD	8.00	8.00	100

INTERNAL STANDARD	ng's ADDED	PERCENT RECOVERY
2378-TCDF-C13....	2.00	11
2378-TCDD-C13....	2.00	24
12378-PeCDF-C13..	2.00	51
23478-PeCDF-C13..	2.00	73
12378-PeCDD-C13..	2.00	69
123478-HxCDF-C13.	2.00	66
123678-HxCDF-C13.	2.00	26
123789-HxCDF-C13.	2.00	71
234678-HxCDF-C13.	2.00	74
123478-HxCDD-C13.	2.00	74
123678-HxCDD-C13.	2.00	67
1234678-HpCDF-C13	2.00	37
1234789-HpCDF-C13	2.00	54
1234678-HpCDD-C13	2.00	39
OCDD-C13.....	4.00	31
1234-TCDD-C13....	2.00	XX
123789-HxCDD-C13.	2.00	XX
2378-TCDD-C137...	0.80	26

Qs= Quantity spiked.
Qm= Quantity measured.
%REC.= Percent recovered.

TCT Invoice Number....4410 90-4452

****
TWIN CITY TESTING CORPORATION
* PCDF/PCDD ANALYSIS RESULTS *
****
Client....BATTELLE

Sample ID (Client's#).....YQ-EPA 14 SPIKE DUP
Sample ID (TCT#).....190680-MSD
Analysis Date.....6-19-90
Filename.....V00619F
Analyst.....BB
Sample Amount.....0.0063 kg
ICAL Date.....6-15-90
CCAL Filename.....V00619C

NATIVE ISOMERS	Qs (NG)	Qm (NG)	% REC.	INTERNAL STANDARD	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.80	0.77	96	2378-TCDF-C13....	2.00	30
TOTAL TCDF	0.80	0.77	96	2378-TCDD-C13....	2.00	38
				12378-PeCDF-C13..	2.00	56
2378-TCDD	0.80	0.79	99	23478-PeCDF-C13..	2.00	111
TOTAL TCDD	0.80	0.79	99	12378-PeCDD-C13..	2.00	94
				123478-HxCDF-C13.	2.00	43
12378-PeCDF	4.00	3.90	98	123678-HxCDF-C13.	2.00	27
23478-PeCDF	4.00	3.80	95	123789-HxCDF-C13.	2.00	61
TOTAL PeCDF	8.00	7.70	96	234678-HxCDF-C13.	2.00	57
				123478-HxCDD-C13.	2.00	85
12378-PeCDD	4.00	4.20	105	123678-HxCDD-C13.	2.00	67
TOTAL PeCDD	4.00	4.20	105	1234678-HpCDF-C13	2.00	23
				1234789-HpCDF-C13	2.00	38
123478-HxCDF	4.00	3.50	88	1234678-HpCDD-C13	2.00	25
123678-HxCDF	4.00	3.80	95	OCDD-C13.....	4.00	21
123789-HxCDF	4.00	3.50	88			
234678-HxCDF	4.00	3.60	90	1234-TCDD-C13....	2.00	XX
TOTAL HxCDF	16.00	14.00	88	123789-HxCDD-C13.	2.00	XX
123478-HxCDD	4.00	2.90	73	2378-TCDD-C137...	0.80	36
123678-HxCDD	4.00	3.70	93			
123789-HxCDD	4.00	2.30	58			
TOTAL HxCDD	12.00	8.90	74			
1234678-HpCDF	4.00	3.60	90			
1234789-HpCDF	4.00	3.80	95			
TOTAL HpCDF	8.00	7.40	93			
1234678-HpCDD	4.00	3.60	90			
TOTAL HpCDD	4.00	3.60	90			
OCDF	8.00	9.20	115			
OCDD	8.00	8.00	100			

Qs= Quantity spiked.
Qm= Quantity measured.
%REC.= Percent recovered.

TCT Invoice Number....4410 90-4452

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: Method Blank
Description:
Sampled: / /
Received: / /
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	0.1 mg/kg-dry	U	SWN	GFA
7440-43-9	Cadmium	0.02 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	0.5 mg/kg-dry	U	SWN	ICP
7440-50-8	Copper	0.2 mg/kg-dry	U	SWN	ICP
7439-92-1	Lead	0.1 mg/kg-dry	U	SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry	U	SCM	CVA
7440-02-0	Nickel	1 mg/kg-dry	U	SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	0.5 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 10
Description: Laboratory Duplicate
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	10.9 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.136 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	27.8 mg/kg-dry		SWN	ICP
7440-50-8	Copper	8.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	3.94 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.04 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	19 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	43.7 mg/kg-dry		SWN	ICP

Client: Battelle

Client's sample ID: YQ-EPA 10

ARI sample ID: 6130 KDUP

Units: mg/kg-dry

Analyte	Meth	Original Sample	Matrix Duplicate	RPD	Control Limit	Q
Arsenic	GFA	8.1	10.9	29.5	± 20 %	*
Cadmium	GFA	0.14	0.136	2.9	± 20 %	
Chromium	ICP	29.4	27.8	5.6	± 20 %	
Copper	ICP	9.4	8.2	13.6	± 20 %	
Lead	GFA	5.23	3.94	28.1	± 20 %	*
Mercury	CVA	0.02	0.04	66.7	± 0.02	L
Nickel	ICP	20	19	5.1	± 20 %	
Silver	ICP	0.4	0.4	0.0	± 20 %	
Zinc	ICP	44.2	43.7	1.1	± 20 %	

RPD = Relative percent difference

'Q' codes: '*' = control limit not met
'L' = RPD not valid, alternate limit = ± detection limit

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: 1646 STD
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	16.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.200 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	36.9 mg/kg-dry		SWN	ICP
7440-50-8	Copper	15.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	20 mg/kg-dry		SWN	ICP
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	22 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	105 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 L MS
Matrix: Soil

Sample No.: YQ-EPA-11
Matrix Spike
QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910
VTSR: 04/18/90

Data Release Authorized: Peter M Eigler
DATA PREPARED: MAC:C (05/14/90) cpg

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 22.9 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	-
76-44-8	Heptachlor	-
309-00-2	Aldrin	-
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	-
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	-
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	-
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	**74%**

Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

SOIL PESTICIDE MATRIX SPIKE RECOVERY

ARI Job No: 6130 L
Sample No: YQ-EPA-11

Client: Battelle
Project: BOA-37PR-121909

COMPOUND	SPIKE ADDED (µg/kg)	SAMPLE CONC. (µg/kg)	MS CONC. (µg/kg)	MS % REC	QC LIMITS REC
Lindane	17.5	0	15.1	86	46-127
Heptachlor	17.5	0	15.4	88	35-130
Aldrin	17.5	0	11.0	63	34-132
Dieldrin	43.7	0	31.9	73	31-134
Endrin	43.7	0	35.8	82	42-139
4,4'-DDT	43.7	0	28.4	65	23-134

Spike Recovery: 0 out of 6 outside limits

Asterisked values outside QC Limits

Comments:

FORM III PEST-1

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130LMS
Matrix: Soils/Sediments

Sample No: **YQ - EPA11**
Matrix Spike
QC Report No: 6130 - Battelle
Project No: Batch No 9 &10
VTSR: 04/18/90

Date Release Authorized: [signature]
Report prepared 05/17/90 MAC:B

Sample Wt: 22.9 gm (Dry Weight)
Date extracted: 04/27/90 Percent Moisture: 27.6%
Analyzed (FINN 2): 05/15/90 pH: 7.2
GPC Clean-up: NO (1 of 2) Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number		µg/Kg
108-95-2	Phenol	-	83-32-9	Acenaphthene	-
111-44-4	bis(2-Chloroethyl)Ether	87U	51-28-5	2,4-Dinitrophenol	870U
95-57-8	2-Chlorophenol	-	100-02-7	4-Nitrophenol	-
541-73-1	1,3-Dichlorobenzene	87U	132-64-9	Dibenzofuran	87U
106-46-7	1,4-Dichlorobenzene	-	121-14-2	2,4-Dinitrotoluene	-
100-51-6	Benzyl Alcohol	440U	606-20-2	2,6-Dinitrotoluene	440U
95-50-1	1,2-Dichlorobenzene	87U	84-66-2	Diethylphthalate	87U
95-48-7	2-Methylphenol	87U	7005-72-3	4-Chlorophenyl-phenylether	87U
108-60-1	bis(2-chloroisopropyl)Ether	87U	86-73-7	Fluorene	87U
106-44-5	4-Methylphenol	87U	100-01-6	4-Nitroaniline	440U
621-64-7	N-Nitroso-Di-n-Propylamine	-	534-52-1	4,6-Dinitro-2-Methylphenol	870U
67-72-1	Hexachloroethane	170U	86-30-6	N-Nitrosodiphenylamine(1)	87U
98-95-3	Nitrobenzene	87U	101-55-3	4-Bromophenyl-phenylether	87U
78-59-1	Isophorone	87U	118-74-1	Hexachlorobenzene	87U
88-75-5	2-Nitrophenol	440U	87-86-5	Pentachlorophenol	-
105-67-9	2,4-Dimethylphenol	170U	85-01-8	Phenanthrene	87U
65-85-0	Benzoic Acid	870U	120-12-7	Anthracene	87U
111-91-1	bis(2-Chloroethoxy)Methane	87U	84-74-2	Di-n-Butylphthalate	87U
120-83-2	2,4-Dichlorophenol	260U	206-44-0	Fluoranthene	87U
120-82-1	1,2,4-Trichlorobenzene	-	129-00-0	Pyrene	-
91-20-3	Naphthalene	87U	85-68-7	Butylbenzylphthalate	87U
106-47-8	4-Chloroaniline	260U	91-94-1	3,3'-Dichlorobenzidine	440U
87-68-3	Hexachlorobutadiene	170U	56-55-3	Benzo(a)Anthracene	87U
59-50-7	4-Chloro-3-Methylphenol	-	117-81-7	bis(2-Ethylhexyl)Phthalate	87U
91-57-6	2-Methylnaphthalene	87U	218-01-9	Chrysene	87U
77-47-4	Hexachlorocyclopentadiene	440U	117-84-0	Di-n-Octyl Phthalate	87U
88-06-2	2,4,6-Trichlorophenol	440U	205-99-2	Benzo(b)Fluoranthene	87U
95-95-4	2,4,5-Trichlorophenol	440U	207-08-9	Benzo(k)Fluoranthene	87U
91-58-7	2-Chloronaphthalene	87U	50-32-8	Benzo(a)Pyrene	87U
88-74-4	2-Nitroaniline	440U	193-39-5	Indeno(1,2,3-cd)Pyrene	87U
131-11-3	Dimethyl Phthalate	87U	53-70-3	Dibenz(a,h)Anthracene	87U
208-96-8	Acenaphthylene	87U	191-24-2	Benzo(ghi)Perylene	87U
99-09-2	3-Nitroaniline	440U			

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	67.5%
2-Fluorobiphenyl	82.5%
d14-p-Terphenyl	83.4%

***Acid surrogate recoveries**

d5-Phenol	73.3%
2-Fluorophenol	67.0%
2,4,6-Tribromophenol	81.8%

SOIL SEMIVOLATILE MATRIX SPIKE RECOVERY

ARI Job No: 6130

Client: Battelle
Project: Batch 9&10

Sample No: YQ-EPA11

COMPOUND	SPIKE ADDED (µg/Kg)	SAMPLE CONC (µg/Kg)	MS CONC (µg/Kg)	MS % REC	QC LIMITS REC
Phenol	8700	0	6100	70.1	26-90
2-Chlorophenol	8700	0	6500	74.7	25-102
1,4-Dichlorobenzene	4400	0	2200	50.0	28-104
N-Nitroso-Di-n-Propylamine	4400	0	2500	56.8	41-126
1,2,4-Trichlorobenzene	4400	0	2900	65.9	38-107
4-Chloro-3-Methylphenol	8700	0	7700	88.5	26-103
Acenaphthene	4400	0	3600	81.8	31-137
4-Nitrophenol	8700	0	7500	86.2	11-114
2,4-Dinitrotoluene	4400	0	3900	88.6	28-89
Pentachlorophenol	8700	0	1900	21.8	17-109
Pyrene	4400	0	3900	88.6	35-142

Spike Recovery: 0 out of 11 outside limits

Asterisked values outside QC Limits

Comments: 22.9 gm dry weight sample size

FORM III SV-2