

File Name
TONGUE Pt. 14/91

CENPP-PL-CH (1105-2-10A)

14 January 1991

MEMORANDUM FOR RECORD

Subject: North Tongue Point Sediment Quality, August, 1990.

1. North Tongue Point was sampled on August 14, 1990 with seven stations sampled using a modified Gray-O'Hara 0.096 m² box corer. The full column of material collected in the box corer was subsampled using a 2.25 inch acid rinsed core tube. The tubes were capped and transported to the NPD Troutdale Laboratory where the sample was again subsampled for both physical and chemical analyses.
2. The physical analyses including "Dredge Test Analysis" were performed by NPD Troutdale Laboratory, a copy of the results is attached. Percent fines ranged from a low of 15.5% (TP-S-3) to a high of 67.8% (TP-S-4), Volatile solids ranged from 1.5% (TP-S-3) to 5.6% (TP-S-6), percent sand ranged from 79.8% (TP-S-3) to 25.9% (TP-S-4).
3. The chemical subsamples were forwarded to Battelle Pacific Northwest Marine Sciences Laboratory for chemical analyses which included heavy metals, pesticides/PCBs and PAHs. Metal concentrations are typical for uncontaminated sediments in the Columbia River. The only pesticide detected was B-BHC in sample TP-S-4 and was at the detection limit (3.4 ppb) for this analysis. The detection limits for PAHs were one to two orders of magnitude below the normally requested 50-200. PAHs were detected in all sediment samples with total PAHs ranging from 9.8 ppb (TP-S-3) to 320.1 ppb (TP-S-8). All concentrations are well below established levels of concern.
4. The chemical results indicate little or no contamination of these sediments and the dredged material is considered suitable for unconfined in-water disposal. As this data was collected as part of the Tongue Point Monitoring Program and will be incorporated into the larger monitoring report a separate Sediment Quality Evaluation Report will not be prepared at this time unless so requested.

CF: CARRUBBA

Mark D. Siipola
Civil Engineer



DEPARTMENT OF THE ARMY

NORTH PACIFIC DIVISION MATERIALS LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

CENPD-EN-G-L (1110-1-8100c)

5 Sep 90

MEMORANDUM FOR Commander, Portland District, ATTN: CENPP-PL-CH

SUBJECT: W.O.#90-SH-135, Report of Sediment Test Results

Project: TONGUE POINT MONITORING PROGRAM
Intended Use: --
Source of Material: Tongue Point, Oregon
Submitted by: CENPP-PL-CH (Jim Britton)
Date Sampled: 14 Aug 90 Date Received: 15 Aug 90
Method of Test or Specification: ASTM, EM 1110-2-1906
Reference: a) DA Form 2544, Order No. E86-90-0152, Change Order R-1, dated 7 Nov 89.
b) NPD Form 303, Sample Transmittal, dated 15 Aug 90.

1. Enclosed are:

a. Enclosure 1, one summary sheet, "Results of Dredge Test Analysis," with results for seven sediment samples.

b. Enclosure 2, a-g, seven gradation analysis summary sheets.

2. This completes all work requested to date.

Timothy J. Seeman

Enclosures

For JAMES A. PAXTON
Director

Copies Furnished: CENPD-EN-G

Entered in Lab

9-12-90

TONGUE POINT MONITORING

Results of Dredge Test Analysis

<u>CENPF Sample No.</u>	<u>Resuspended Density,gms/L</u>	<u>Void Ratio</u>	<u>Volatile Solids,%</u>	<u>Specific Gravity</u>	<u>Particle Roundness Grading</u>
TP-S-1	1567	1.873	3.7	2.63	subangular to subround
TP-S-2	1686	1.416	1.9	2.66	angular to subangular
TP-S-3	1706	1.365	1.5	2.67	subangular to subround
TP-S-4	1479	2.289	5.3	2.57	angular to subangular
TP-S-5	1589	1.816	2.7	2.66	angular to subangular
TP-S-6	1501	2.186	5.6	2.60	angular to subangular
TP-S-8	1625	1.635	2.6	2.65	angular to subangular

TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-1 Depth: -- Lab No.: 13530

Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	66. gr.	20.0	33.0	0.0442	50.3
2.5 In.	0.00	100.0		20.0	25.0	0.0270	38.3
1.25 In.	0.00	100.0		20.0	18.0	0.0155	27.8
5/8 In.	0.00	100.0		20.0	8.0	0.0067	12.8
5/16 In.	0.00	100.0		20.0	5.0	0.0048	8.3
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	0.00	100.0					
No. 60	0.20	99.7					
No. 120	1.20	98.2					
No. 230	24.20	63.3					
Pan	66.00	0.0					

$\bar{x} = .049$

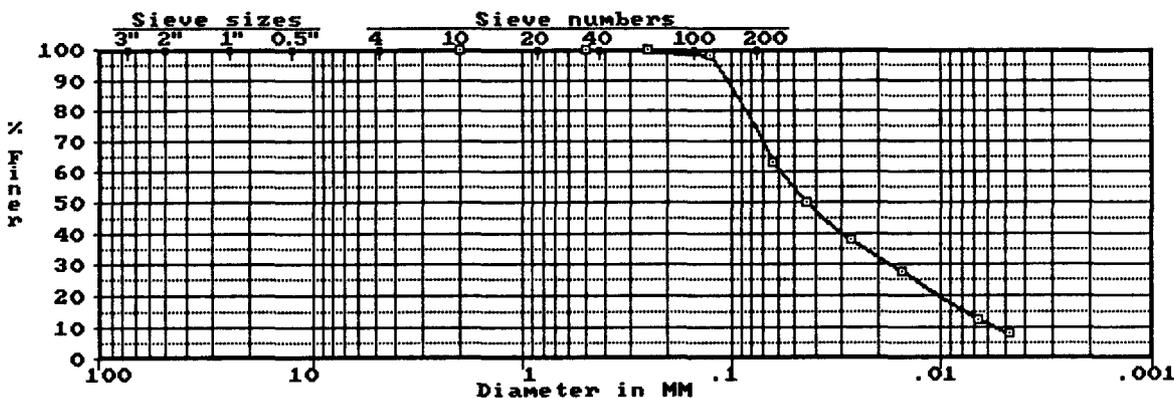
D85: .094 D60: .058 D50: .044 D30: .018 D15: .0077 D10: .0055 mm

Cu: 10.6 Cc: 0.97

Gravel: 0.0% Sand: 26.9% Fines: 73.1%

Comments

- SAMPLED ON 8-14-90
 - BOX CORE SAMPLER USED
 - VOLATILE SOLIDS = 3.7%
- Cannot classify soil without knowing type of fines.



Entered in Base
on 9-12-90

TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-2 Depth: -- Lab No.: 13531

----- 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	78.60	0.0
No. 18	0.00	100.0
No. 35	0.00	100.0
No. 60	0.40	99.5
No. 120	12.50	84.1
No. 230	46.00	41.5
Pan	78.60	0.0

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

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	24.5	0.0470	31.5
3	20.0	15.5	0.0287	20.2
10	20.0	11.5	0.0161	15.1
100	20.0	7.1	0.0067	9.6
200	20.0	5.5	0.0048	7.6

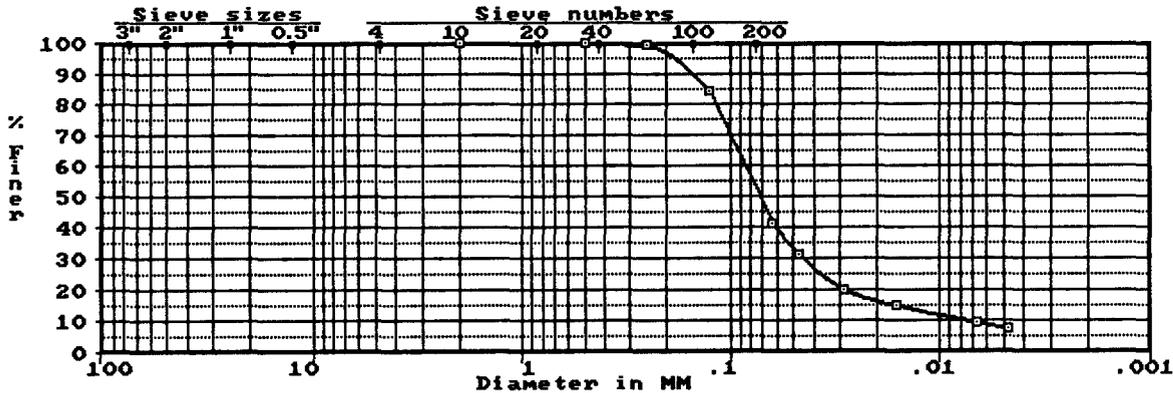
Sample Weight: 78.6 gr. Start Time: 0000

$\bar{x} = .073$

D85: 0.13 D60: .085 D50: .072 D30: .045 D15: .016 D10: .0072 mm
 Cu: 11.7 Cc: 3.24
 Gravel: 0.0% Sand: 47.6% Fines: 52.4%

----- Comments -----

- SAMPLED ON 8-14-90
 - BOX CORE SAMPLER USED
 - VOLATILE SOLIDS = 1.9%
- Cannot classify soil without knowing type of fines.



TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-3 Depth: -- Lab No.: 13532

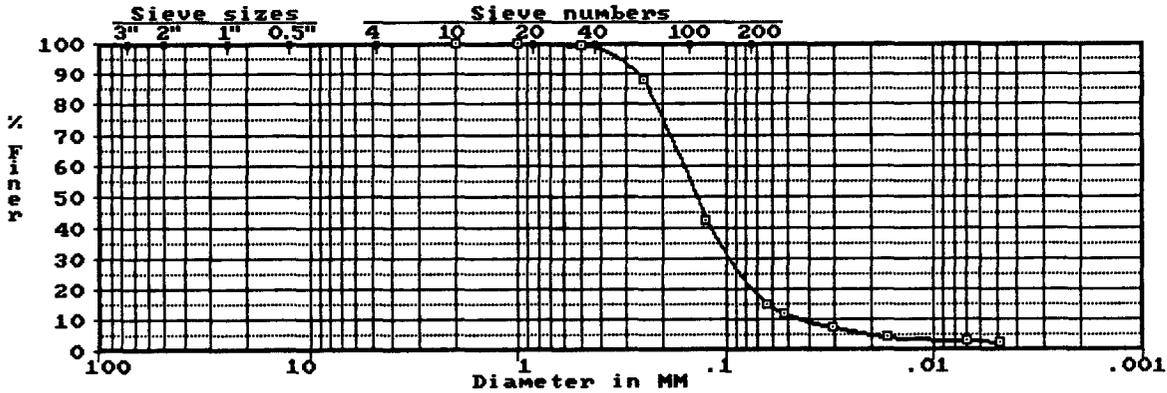
Sieve Analysis			Hydrometer Analysis					
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight: 46. gr.	Temp (C)	Hydrometer Reading	Diameter in mm	Start Time: 0000	Percent Finer
5 In.	0.00	100.0	1	20.0	5.1	0.0527		12.1
2.5 In.	0.00	100.0	3	20.0	3.1	0.0307		7.7
1.25 In.	0.00	100.0	10	20.0	1.5	0.0170		4.3
5/8 In.	0.00	100.0	100	20.0	1.0	0.0069		3.2
5/16 In.	0.00	100.0	200	20.0	0.7	0.0049		2.6
No. 5	0.00	100.0						
No. 10	0.00	100.0						
Pan	46.00	0.0						
No. 18	0.00	100.0						
No. 35	0.20	99.6						
No. 60	5.40	88.3						
No. 120	26.30	42.8						
No. 230	39.00	15.2						
Pan	46.00	0.0						

$\bar{x} = .147$

D85: 0.24 D60: 0.16 D50: 0.14 D30: .097 D15: .062 D10: .043 mm
 Cu: 3.70 Cc: 1.35
 Gravel: 0.0% Sand: 79.8% Fines: 20.2%

Comments

- SAMPLED ON 8-14-90
 - BOX CORE SAMPLER USED
 - VOLATILE SOLIDS = 1.5%
- Cannot classify soil without knowing type of fines.



TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-4 Depth: -- Lab No.: 13533

Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	1	20.0	33.5	0.0441	56.4
2.5 In.	0.00	100.0	3	20.0	25.0	0.0270	42.3
1.25 In.	0.00	100.0	10	20.0	16.5	0.0156	28.2
5/8 In.	0.00	100.0	100	20.0	7.1	0.0067	12.6
5/16 In.	0.00	100.0	200	20.0	5.1	0.0048	9.3
No. 5	0.00	100.0					
No. 10	0.00	100.0					
Pan	59.70	0.0					
No. 18	0.00	100.0					
No. 35	0.10	99.8					
No. 60	1.40	97.7					
No. 120	6.00	89.9					
No. 230	19.20	67.8					
Pan	59.70	0.0					

$\bar{x} = .051$

D85: 0.11 D60: .049 D50: .036 D30: .017 D15: .0080 D10: .0053 mm

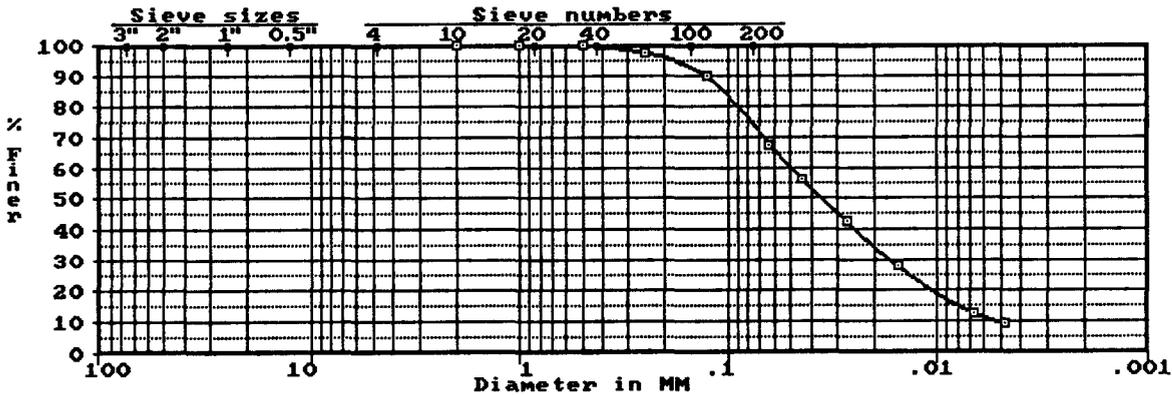
Cu: 9.41 Cc: 1.09

Gravel: 0.0% Sand: 25.9% Fines: 74.1%

Comments

- SAMPLED ON 8-14-90
- BOX CORE SAMPLER USED
- VOLATILE SOLIDS = 5.3%

Cannot classify soil without knowing type of fines.



TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-5 Depth: -- Lab No.: 13534

Sieve Analysis			Hydrometer Analysis					
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight	Temp (C)	Hydrometer Reading	Diameter in mm	Start Time	Percent Finer
5 In.	0.00	100.0	104.7 gr.	20.0	25.0	0.0468	0000	24.1
2.5 In.	0.00	100.0		20.0	10.0	0.0296		9.9
1.25 In.	0.00	100.0		20.0	5.0	0.0167		5.2
5/8 In.	0.00	100.0		20.0	2.0	0.0069		2.4
5/16 In.	0.00	100.0		20.0	1.5	0.0049		1.9
No. 5	0.00	100.0	Time					
No. 10	0.00	100.0						
Pan	104.70	0.0						
No. 18	0.00	100.0						
No. 35	0.10	99.9						
No. 60	1.60	98.5						
No. 120	12.70	87.9						
No. 230	55.90	46.6						
Pan	104.70	0.0						

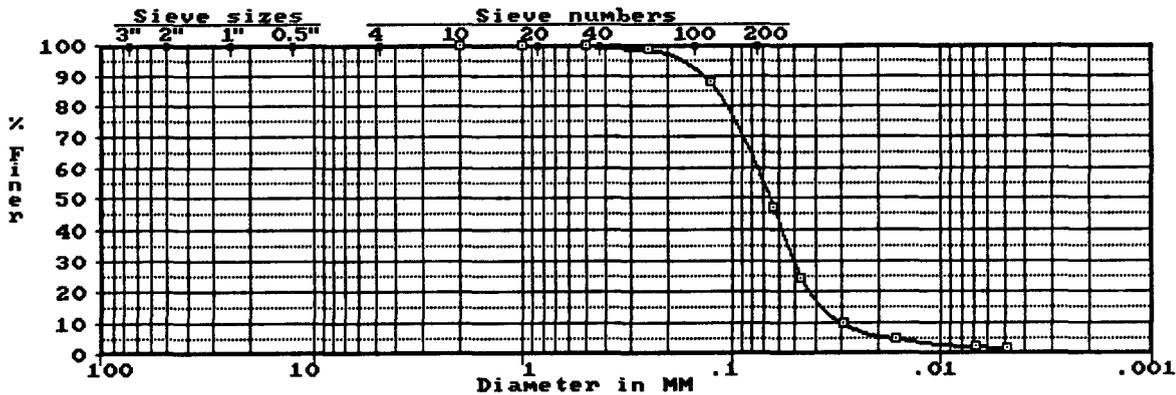
$\bar{X} = .074$

D85: 0.12 D60: .076 D50: .066 D30: .051 D15: .037 D10: .030 mm
 Cu: 2.54 Cc: 1.14
 Gravel: 0.0% Sand: 40.7% Fines: 59.3%

Comments

- SAMPLED ON 8-14-90
- BOX CORE SAMPLER USED
- VOLATILE SOLIDS = 2.7%

Cannot classify soil without knowing type of fines.



TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-6 Depth: -- Lab No.: 13535

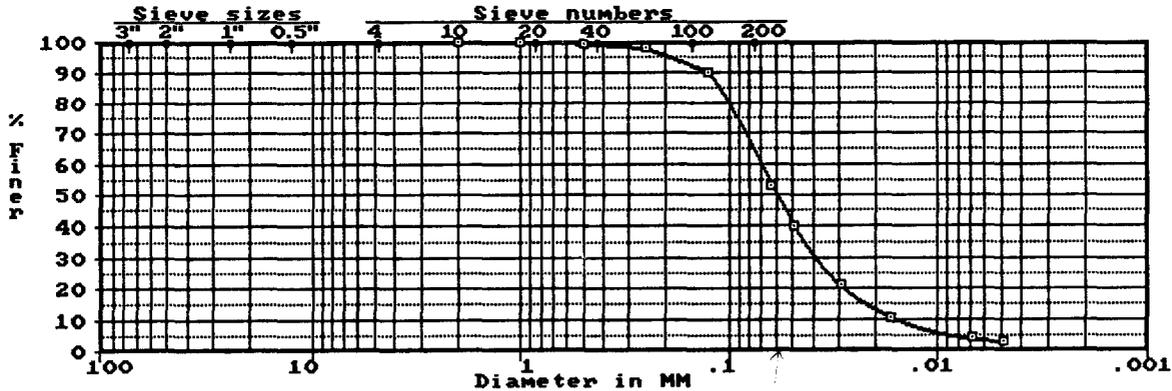
Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	48.6 gr.	20.0	19.0	0.0487	39.7
2.5 In.	0.00	100.0		20.0	9.8	0.0297	21.0
1.25 In.	0.00	100.0		20.0	4.8	0.0167	10.8
5/8 In.	0.00	100.0		20.0	1.5	0.0069	4.1
5/16 In.	0.00	100.0		20.0	1.0	0.0049	3.1
No. 5	0.00	100.0					
No. 10	0.00	100.0					
Pan	48.60	0.0					
No. 18	0.00	100.0					
No. 35	0.20	99.6					
No. 60	0.90	98.1					
No. 120	4.70	90.3					
No. 230	22.70	53.3					
Pan	48.60	0.0					

$\bar{X} = .064$

D85: 0.11 D60: .070 D50: .059 D30: .039 D15: .022 D10: .016 mm
 Cu: 4.49 Cc: 1.38
 Gravel: 0.0% Sand: 36.0% Fines: 64.0%

Comments

- SAMPLED ON 8-14-90
 - BOX CORE SAMPLER USED
 - VOLATILE SOLIDS = 5.6%
- Cannot classify soil without knowing type of fines.



TONGUE POINT MONITORING (90-SH-135)

Boring: -- Sample: TP-S-8 Depth: -- Lab No.: 13536

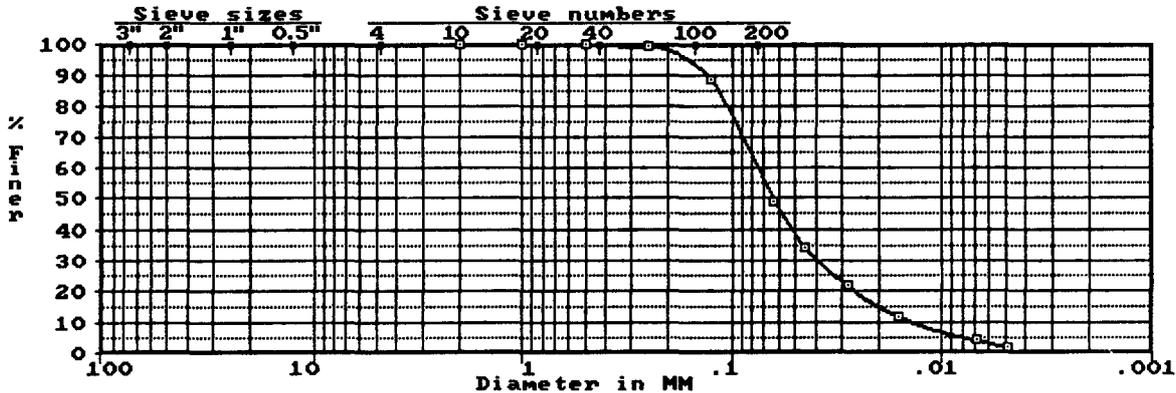
Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	87.5 gr.	20.0	30.1	0.0452	34.6
2.5 In.	0.00	100.0		20.0	18.6	0.0282	21.6
1.25 In.	0.00	100.0		20.0	10.1	0.0162	12.0
5/8 In.	0.00	100.0		20.0	3.2	0.0069	4.2
5/16 In.	0.00	100.0		20.0	1.2	0.0049	1.9
No. 5	0.00	100.0	Time				
No. 10	0.00	100.0					
Pan	87.50	0.0					
No. 18	0.00	100.0					
No. 35	0.10	99.9					
No. 60	0.40	99.5					
No. 120	9.60	89.0					
No. 230	44.70	48.9					
Pan	87.50	0.0					

$\bar{X} = .068$

D85: 0.12 D60: .075 D50: .064 D30: .039 D15: .020 D10: .014 mm
 Cu: 5.50 Cc: 1.49
 Gravel: 0.0% Sand: 40.2% Fines: 59.8%

Comments

- SAMPLED ON 8-14-90
 - BOX CORE SAMPLER USED
 - VOLATILE SOLIDS = 2.6%
- Cannot classify soil without knowing type of fines.



December 14, 1990

Mr. Mark Siipola
U.S. Army Corps of Engineers
Portland District
319 S.W. Pine
CENPP-PL-CH
Portland, Oregon 97208-2946

Dear Mark:

The following is a summary of the results of chemical analyses of six Tongue Point sediment samples. Samples were received on August 16, 1990 by Battelle. Samples were subsequently split for the requested chemical analyses including metals, PCBs, Chlorinated Pesticides and Polynuclear Aromatic Hydrocarbons (PAHs). All parameters were analyzed at Twin City Testing in St. Paul, Minnesota. All results are presented on a dry-weight basis. Specific units are defined on the data tables.

ANALYTICAL METHODS

The following methods were used to analyze the sediments described above:

Metals - Sediments were digested according to EPA Method 3020 or 3050 listed in EPA Test Methods for Evaluating Solid Wastes, SW-846. Method 3020 digests were screened for all metals using EPA Method 6010, Inductively Coupled Argon Plasma Spectrometer Method (ICAP). Chromium, copper, nickel and zinc were subsequently quantified using ICAP. Arsenic and antimony were also run using ICAP, but were analyzed using the hydride procedure according to EPA Contract Laboratory Procedure Method 200.62-C-CLP (Special Analytical Services). This procedure was modified by Twin City Testing to work with a Thermo Jarrel Ash ICAP Spectrometer. Method 3050 digests were analyzed for the remaining metals using Graphite Furnace Atomic Absorption Spectrometer (GFAA). Specific EPA methods for these metals include Method 7760 for silver, Method 5131 for cadmium, Method 7421 for lead, and Method 7471 for mercury.

PCBs/Pesticides - Sediment samples were extracted according to EPA Method 3540 using methylene chloride, followed by an alumina and copper clean-up. PCBs and chlorinated pesticides were analyzed using Gas Chromatography/Electron Capture Detection (GC/ECD) according to Method 8080 listed in EPA Test Methods for Evaluating Solid Wastes, SW-846. All positive identifications were confirmed using a second dissimilar column.

PAHs - Sediment samples were extracted according to EPA Method 3540 using Mr. methylene chloride. Extracts were analyzed for PAHs using EPA Method 8270 listed in EPA Test Methods for Evaluating Solid Wastes, SW 846. Data were acquired using Gas Chromatography/Mass Spectrometry (GC/MS) in the selected ion recording (SIR) mode.

QUALITY CONTROL

Quality control data includes method blanks, surrogate recoveries, duplicate analyses and matrix spike recoveries. Blanks, duplicates and surrogate recovery data are included on the data tables. Matrix spike data are presented in separate tables.

In general, data quality was acceptable. Holding times for organic extraction were exceeded by seven days due to equipment failure at the laboratory. Samples were frozen during this period and this extension should not effect sample integrity.

PCB/Pesticides - Surrogate recoveries and Matrix Spike recoveries for PCB/Pesticide data were all within control limits.

PAHs - Surrogate recoveries for PAHs were all within control limits. It should be noted, however, that the initial surrogates, added prior to extraction, were found to be at a concentration too high for accurate quantitation by GC/MS in the SIR mode. After speaking with the lab, Battelle recommended adding the lower level surrogates after extraction (but prior to concentration of the extracts). Based on the recoveries of the matrix spikes, these surrogates are found to reflect the quality of the PAH data.

Duplicate PAH analyses of one sample indicated good reproducibility of results.

Metals - Overall, metals data is acceptable. Silver recovery in the matrix spike was low. This was most likely due to the presence of chloride (saltwater), which causes a negative bias in the determination of silver content by the method used. Antimony recovery was also low and was thought to be caused by matrix interferences in association with hydride formation in the method. These may indicate that the values reported for silver and antimony may be biased low.

RESULTS

Metals - Metals data in general were not elevated above concentrations expected in the marine environment. Concentrations of all samples were similar.

Mark Siipola
December 14, 1990
Page 3

PCB/Pesticides - No PCB Aroclors were detected.

The only pesticide detected was B-BHC. This compound was detected in only one sample, TP-S-4, at the detection limit.

PAHs - PAHs were detected in all sediment samples. Concentrations generally ranged from approximately 1 to 50 ug/Kg. Concentrations of lower molecular weight hydrocarbons ranged from approximately 0.5 to 35 ug/kg. Higher concentrations were generally observed for the higher molecular weight PAH compounds, where concentrations ranged from approximately 5 to 83 mg/kg.

If you have any questions regarding the data presented in this letter or any other issues, please call.

Sincerely,



Eric A. Crecelius
Technical Group Leader
Marine Chemistry

Lisa Lefkowitz
Research Scientist

Enclosures

SEDIMENT DATA

12/13/90

Project: TONGUE POINT
Sponsor: Portland COE

SEDIMENT METAL DATA

(Concentrations in mg/kg DRY WT.)

SPONSOR Code	LAB Code	% MOISTURE	Ag	As	Cd	Cr	Cu	Hg
TP-S-1,2(Comp.)	212-1,2/214374	26.9 ?	0.171 U	2.7	0.36	17.8	3.3	0.33
TP-S-3	212-3 / 214375	29.90%	0.179 U	4.1	0.17	25.7	11.4	0.024
TP-S-4	212-4 / 214376	40.70%	0.211	4.6	0.74	23.7	15.5	0.108
TP-S-5	212-5 / 214377	29.80%	0.178	3.1	0.4	21.3	9.2	0.031
TP-S-6	212-6 / 214378	31.4 ?	0.183	4.7	0.45	48.2	24.8	0.055
TP-S-8	212-7 / 214379	38.50%	0.204	5.2	0.94	21.2	17.9	0.106

STANDARD REFERENCE MATERIAL:

MSL-2704		0.15	17	2	72	74	0.21
Certified value:		NC	23.4 (+/- 0.8)	3.45 (+/- 0.22)	135 (+/- 5)	98.6 (+/- 5)	1.44 (+/- 0.07)

SPONSOR Code	LAB Code	% MOISTURE	Ni	Pb	Sb	Zn
TP-S-1,2(Comp.)	212-1,2/214374	26.9 ?	13	8.2	0.18	71.2
TP-S-3	212-3 / 214375	29.90%	18.6	5.3	0.14 U	65.8
TP-S-4	212-4 / 214376	40.70%	16.9	5.2	0.17 U	121.7
TP-S-5	212-5 / 214377	29.80%	17	5.8	0.14 U	59.6
TP-S-6	212-6 / 214378	31.4 ?	39.4	5.4	0.15 U	68.6
TP-S-8	212-7 / 214379	38.50%	15.6	6	0.16 U	104.3

STANDARD REFERENCE MATERIAL:

MSL-2704		30	110	0.41	320
Certified value:		44.1 (+/- 3.0)	161 (+/- 17)	3.79 (+/- 0.15)	438 (+/- 12)

U indicates analyte not detected at detection limit shown.

NA indicates analyte was not analyzed.

NC indicates analyte was not certified.

12/13/90

SEDIMENT DATA

Project: TONGUE POINT
Sponsor: Portland COE

SEDIMENT PCB DATA

(Concentrations in ug/kg Dry Wt.)

Sponsor Code :
TCT Code :
Battelle Code :

TP-S-1,2	TP-S-3	TP-S-4	TP-S-5	TP-S-6	TP-S-8	METHOD BLANK I	METHOD BLANK II
214374	214375	214376	214377	214378	214379		
212-1,2	212-3	212-4	212-5	212-6	212-7		

PCBS	TP-S-1,2	TP-S-3	TP-S-4	TP-S-5	TP-S-6	TP-S-8	METHOD BLANK I	METHOD BLANK II
AROCLOR 1016	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
AROCLOR 1221	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
AROCLOR 1232	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
AROCLOR 1242	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
AROCLOR 1248	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
AROCLOR 1254	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
AROCLOR 1260	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U

SEDIMENT PESTICIDE DATA

Sponsor Code :
TCT Code :
Battelle Code :

TP-S-1,2	TP-S-3	TP-S-4	TP-S-5	TP-S-6	TP-S-8	METHOD BLANK I	METHOD BLANK II
214374	214375	214376	214377	214378	214379		
212-1,2	212-3	212-4	212-5	212-6	212-7		

PESTICIDES	TP-S-1,2	TP-S-3	TP-S-4	TP-S-5	TP-S-6	TP-S-8	METHOD BLANK I	METHOD BLANK II
ALDRIN	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
A-BHC	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
B-BHC	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
D-BHC	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
CHLORDANE	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
4,4'DDD	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
4,4'DDE	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
4,4'DDT	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
DIELDRIN	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	6.2
ENDOSULFAN I	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
ENDOSULFAN II	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
EDOSULFAN SULFATE	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
ENDRIN	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
ENDRIN ALDEHYDE	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
HEPTACHLOR	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
HEPTACHLOR EPOXIDE	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
LINDANE (G-BHC)	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
TOXAPHENE	27.4 U	28.6 U	33.8 U	28.4 U	29.2 U	32.6 U	20 U	20 U
METHOXYCHLOR	5.5 U	7.8 U	4.7 U	5.7 U	5.8 U	6.5 U	4 U	4 U
ENRIN KETONE	2.7 U	2.9 U	3.4 U	2.8 U	2.9 U	3.3 U	2 U	2 U
SURROGATE RECOVERY (DBC):	74%	75%	104%	111%	94%	100%	120%	**

** Sample inadvertently not spiked with DBC

12/13/90

SEDIMENT DATA

Project: TONGUE POINT
Sponsor: Portland COE

SEDIMENT PAH DATA

(Concentration in ug/Kg Dry Wt.)

Sponsor Code :
TCT Code :
Battelle Code :

TP-S-1,2	TP-S-3	TP-S-4	TP-S-5	212TP-S-6	TP-S-8	TP-S-8 REP	METHOD BLANK
214374	214375	214376	214377	214378	214379	214379 REP	
212-1,2	212-3	212-4	212-5	212-6	212-7	212-7	

NAPHTHALENE	2.85 U	2.99 U	3.46 U	3.02 U	5.7	8.8	7.4	5.9	6.4
ACENAPHTHYLENE	0.42 U	0.44 U	1.7	0.45 U	1.5	2.6	2.1	1.6	0.35 U
ACENAPHTHENE	1.07 U	1.11 U	1.9	1.14 U	1.8	9.8	7.0	4.2	0.89 U
FLUORENE	0.86 U	0.9 U	3.9	0.91 U	2.8	10.4	7.1	5.7	0.71 U
PHENANTHRENE	3.5	1.22 U	21.6	4.4	10.8	35.2	27.3	27.4	0.966
ANTHRACENE	0.69	0.53 U	3.4	0.7	1.6	5.5	5.0	4.5	0.41 U
FLUORANTENE	5.2	1.9	47.8	12.8	27.2	68	55.6	43.2	0.59 U
PYRENE	4.8	2.3	52.6	17.2	28.5	69.8	57.7	47.6	0.44 U
BENZO[A]ANTHRACENE	6	1.7	28.9	6.5	26.3	37.2	27.1	20.9	0.41 U
CHRYSENE	8.6	2.1	49.2	9.2	29.6	59	48.2	27.4	0.35 U
BENZOFUORANTHENES*	9.9	2.3	67.9	14.3	44.1	83.1	62.9	42.7	0.44 U
BENZO[A]PYRENE	3.6	0.9	32.1	8.5	21.5	41.1	31.8	22.5	0.35 U
INDENO[1,2,3-cd]PYRENE	3.3	1.1	22.6	6.8	11	31.6	25.6	19.6	0.56 U
DIBENZ[a,h]ANTHRACENE	0.7	0.41 U	4.4	1.3	2.8	5.4	4.3	3.1	0.32 U
BENZO[g,h,i]PERYLENE	5.3	1.7	40.6	14.1	20.4	54.3	44.7	35.4	0.28 U
<i>total</i>	54.59	14.0	329.6	95.8	235.6	526.8	316.7		
SURROGATE RECOVERY:									
D10-FLOURENE	110%	109%	119%	129%	126%	110%	112%	132%	
D10-ANTHRACENE	85%	88%	78%	81%	80%	83%	98%	79%	
D10-PYRENE	60%	50%	73%	77%	75%	71%	87%	72%	

* All benzofluoranthene isomers (b,j,and k) are quantified together.

Handwritten notes and calculations at the bottom of the page, including a circled value of 449.5 and other numerical data.



Pacific Northwest Division
Marine Sciences Laboratory
439 West Sequim Bay Road
Sequim, Washington 98382
(206) 683-4151

October 26, 1990

Mr. Mark Siipola
U.S. Army Corps of Engineers
Portland District
319 SW Pine
CENPP-PL-CH
Portland, OR 97208-2946

Dear Mark:

Recently Pacific Northwest Laboratory (Battelle-Northwest) conducted chemical analyses of sediment samples from the Portland District dredging project (Tongue Point) collected by your organization. Battelle received, in good condition, on August 16, 1990, seven sediment samples from the COE. Sediment samples have been analyzed for metals (As, Cd, Cr, Cu, Pb, Hg, and Zn), oil and grease, TOC, pesticides, PCBs, and PAHs, using the following methods.

Metal - By U.S. EPA (1986) Method 3020 and 3050, which includes acid digestion followed by atomic absorption and inductively coupled plasma.

Pesticides and PCBs - By U.S. EPA (1986) Method 8080, which includes solvent extraction and quantification by GC-ECD.

PAH - By U.S. EPA (1986) Method 8270, which includes solvent extraction and quantification by GC-MS with selective ion monitoring.

For quality control, samples extracted for PAH were spiked with deuterated surrogates. The surrogate recoveries were in the acceptable range of 50%-129%. A certified reference sediment HS-5, was analyzed and the results (Table 4) indicate recoveries of approximately 50% for most compounds.

The PCB-Pesticide extraction procedure included a surrogate which had recoveries in the range of 90% to 110%.

The chemical results indicate little or no contamination of these sediments. The concentrations of metals are typical for non-urban sediments in the Columbia River. The concentrations of PAH are usually in the range of 3 to 50 $\mu\text{g}/\text{kg}$. Because the GC-MS method was used with selective ion monitoring, the detection limits were much improved compared to previous sediment surveys at Tongue Point. The PAH data indicate stations TP-S-6 and TP-S-8 contain the highest PAH levels of the seven stations.

Mr. Mark Siipola
October 26, 1990
Page 2

The PCB-Pesticide analyses are being repeated because of poor peak resolution on the GC. These data should be available in two weeks.

Sincerely,



Eric A. Crecelius
Senior Research Scientist

:at

Enclosures

TABLE 1

PERCENT MOISTURE RESULTS

<u>Sample</u> <u>Identification</u>		<u>Percent</u> <u>Moisture</u>
TP-S-1+2	214374	26.9%
TP-S-3	214375	29.9%
TP-S-4	214376	40.7%
TP-S-5	214377	29.8%
TP-S-6	214378	31.4%
TP-S-8	214379	38.5%



National Research
Council Canada

Conseil national
de recherches Canada

Marine Analytical
Chemistry Standards
Program

Programme de standards
de chimie analytique
marine

HS-3, HS-4, HS-5, HS-6

Marine Sediment Reference Materials for Polycyclic Aromatic Hydrocarbons

HS-3, HS-4, HS-5, and HS-6 are four natural marine sediment research materials for determination of polycyclic aromatic hydrocarbons (PAH).

The samples were prepared from sediments collected from four harbours in Nova Scotia. Environments at these sites reflect varying degrees of commercial and industrial activity. The suite of samples covers a range of values of concentrations of 16 PAH designated as priority pollutants by the United States Environmental Protection Agency. Reliable values for the concentrations of these PAH are shown in the table below.

The materials have been freeze dried, sieved to pass a No. 120 (125 μm) sieve, homogenized in a modified cement mixer, then subsampled into solvent-rinsed pint-sized steel cans. Each can contains about 200 grams of material.

To order these materials, or for further technical information, contact:

Marine Analytical Chemistry Standards Program
National Research Council of Canada
Atlantic Research Laboratory
1411 Oxford Street
Halifax, Nova Scotia, Canada B3H 3Z1
Telephone (902) 426-8280
Facsimile (902) 426-9413
Telex 019-21653

Determinations were carried out on HS-3, HS-4, HS-5 and HS-6 using capillary column gas chromatography with flame ionization and mass spectrometric detection and using high performance liquid chromatography with ultraviolet absorption, fluorescence and mass spectrometric detection. Results obtained are in the table below. The uncertainties represent 90% confidence intervals for the pools of from 22 to 40 determinations of each compound. Homogeneity tests and determinations of PAH in these materials were carried out using 35 gram subsamples of sediments.

TABLE 2

METALS ANALYSIS RESULTS

<u>Parameter</u>	TP-S-1+2 214374 (mg/kg)	TP-S-3 214375 (mg/kg)	<u>Date Analyzed</u>	<u>Method Number</u>	<u>LDL (mg/kg)</u>
Arsenic	2.0	2.9	10/8/90	6010	0.10
Cadmium	0.26	0.12	9/26/90	7131	0.050
Chromium	13	18	9/18/90	6010	0.50
Copper	2.4	8.0	9/18/90	6010	0.50
Mercury	0.024	0.017	9/20/90	7471	0.0080
Nickel	9.5	13	9/18/90	6010	0.50
Lead	6.0	3.7	9/18/90	7421	0.15
Zinc	52	46	9/18/90	6010	0.50

mg/kg is equal to parts-per-million (ppm).

ND - Not Detected
 LDL - Lower Detectable Limit

TABLE 2, Continued

<u>Parameter</u>	METALS ANALYSIS RESULTS				<u>Date Analyzed</u>	<u>Method Number</u>	<u>LDL (mg/kg)</u>
	<u>TP-S-4</u> <u>214376</u> <u>(mg/kg)</u>	<u>TP-S-5</u> <u>214377</u> <u>(mg/kg)</u>	<u>TP-S-6</u> <u>214378</u> <u>(mg/kg)</u>	<u>TP-S-8</u> <u>214379</u> <u>(mg/kg)</u>			
Arsenic	2.7	2.2	3.2	3.2	10/8/90	6010	0.10
Cadmium	0.44	0.28	0.31	0.58	9/26/90	7131	0.050
Chromium	14	15	33	13	9/18/90	6010	0.50
Copper	9.2	6.5	17	11	9/18/90	6010	0.50
Mercury	0.064	0.022	0.038	0.065	9/20/90	7471	0.0080
Nickel	10	12	27	9.5	9/18/90	6010	0.50
Lead	3.1	4.1	3.7	3.7	9/18/90	7421	0.15
Zinc	72	42	47	64	9/18/90	6010	0.50

mg/kg is equal to parts-per-million (ppm).

ND - Not Detected
LDL - Lower Detectable Limit

TABLE 3

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID: MSL-212-1 & Date Extracted: 09/18/90
 - Filename: 0283L SA3 Analysis Date: 10/10/90
 Date Received: 09/04/90 Extraction Wt: 15.35 grams
 Extraction Vol: 1.05 ml

COMPOUNDS	ng/gram (PPB)	MDL
Naphthalene	ND	2.08
Acenaphthylene	ND	0.31
Acenaphthene	ND	0.78
Fluorene	ND	0.63
Phenanthrene	2.5	0.85
Anthracene	0.5	0.36
Fluoranthene	3.8	0.52
Pyrene	3.5	0.39
Benz[a]anthracene	4.4	0.36
Chrysene	6.3	0.31
Benzofluoranthenes *	7.2	0.39
Benzo[a]pyrene	2.6	0.31
Indeno[1,2,3-cd]pyrene	2.4	0.50
Dibenz[a,h]anthracene	0.5	0.29
Benzo[ghi]perylene	+ 3.9	0.25
	<u>37.6</u>	
Surrogate Recovery:		
D10-Fluorene	110 %	
D10-Anthracene	85 %	
D10-Pyrene	60 %	

ND = Not Detected
 ALR = Above Linear Range (Reported values are estimates.)
 MDL = Method Detection Limit

* = All benzofluoranthene isomers (b,j & k) are quantified together.

TP-S-3

TABLE 3, CONTINUED

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID: MSL-212-3	Date Extracted: 09/18/90
Filename: 0283L SA4	Analysis Date: 10/06/90
Date Received: 09/04/90	Extraction Wt: 15.3 grams
	Extraction Vol: 1.05 ml

COMPOUNDS	ng/gram (PPB)	MDL
Naphthalene	ND	2.09
Acenaphthylene	ND	0.31
Acenaphthene	ND	0.78
Fluorene	ND	0.63
Phenanthrene	ND	0.85
Anthracene	ND	0.37
Fluoranthene	1.3	0.52
Pyrene	1.6	0.39
Benz[a]anthracene	1.2	0.37
Chrysene	1.5	0.31
Benzofluoranthenes *	1.6	0.39
Benzo[a]pyrene	0.6	0.31
Indeno[1,2,3-cd]pyrene	0.8	0.50
Dibenz[a,h]anthracene	ND	0.29
Benzo[ghi]perylene	+ 1.2	0.25
	to. 9.7	
Surrogate Recovery:		
D10-Fluorene	109 %	
D10-Anthracene	88 %	
D10-Pyrene	50 %	

ND = Not Detected
ALR = Above Linear Range (Reported values are estimates.)
MDL = Method Detection Limit

* = All benzofluoranthene isomers (b,j & k) are quantified together.

TABLE 3, CONTINUED

TP-S-5

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID: MSL-212-5 Date Extracted: 09/18/90
 Analysis Date: 10/06/90
 Filename: 0278K SA14 Extraction Wt: 15.05 grams
 Date Received: 09/04/90 Extraction Vol: 1.05 ml

COMPOUNDS	ng/gram (PPB)	MDL
Naphthalene	ND	2.13
Acenaphthylene	ND	0.32
Acenaphthene	ND	0.80
Fluorene	ND	0.64
Phenanthrene	3.1	0.86
Anthracene	0.5	0.37
Fluoranthene	9.0	0.53
Pyrene	12.1	0.40
Benz[a]anthracene	4.6	0.37
Chrysene	6.5	0.32
Benzofluoranthenes *	10.1	0.40
Benzo[a]pyrene	6.0	0.32
Indeno[1,2,3-cd]pyrene	4.8	0.50
Dibenz[a,h]anthracene	0.9	0.29
Benzo[ghi]perylene	+ 9.9	0.25
	tot. 675	
Surrogate Recovery:		
D10-Fluorene	129 %	
D10-Anthracene	81 %	
D10-Pyrene	77 %	

ND = Not Detected
 ALR = Above Linear Range (Reported values are estimates.)
 MDL = Method Detection Limit

* = All benzofluoranthene isomers (b,j & k) are quantified together

TP-S-6

TABLE 3, CONTINUED

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID:	MSL-212-6	Date Extracted:	09/18/90
Filename:	0278K SA15	Analysis Date:	10/06/90
Date Received:	09/04/90	Extraction Wt:	13.35 grams
		Extraction Vol:	1.05 ml

COMPOUNDS	ng/gram (PPB)	MDL
Naphthalene	3.9	2.40
Acenaphthylene	1.0	0.36
Acenaphthene	1.2	0.90
Fluorene	1.9	0.72
Phenanthrene	7.4	0.97
Anthracene	1.1	0.42
Fluoranthene	18.6	0.60
Pyrene	19.5	0.45
Benz[a]anthracene	18.0	0.42
Chrysene	20.3	0.36
Benzofluoranthenes *	30.2	0.45
Benzo[a]pyrene	14.7	0.36
Indeno[1,2,3-cd]pyrene	7.5	0.57
Dibenz[a,h]anthracene	1.9	0.33
Benzo[ghi]perylene	+ 14.0	0.28
	<u>tot 161.2</u>	
Surrogate Recovery:		
D10-Fluorene	126 %	
D10-Anthracene	80 %	
D10-Pyrene	75 %	

ND = Not Detected
ALR = Above Linear Range (Reported values are estimates.)
MDL = Method Detection Limit

* = All benzofluoranthene isomers (b,j & k) are quantified together.

TP-S-8

TABLE 3, CONTINUED

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID: MSL-212-7 Date Extracted: 10/04/90
 Analysis Date: 10/06/90
 Filename: 0278K SA19 Extraction Wt: 13 grams
 Date Received: 09/04/90 Extraction Vol: 1.05 ml

COMPOUNDS	ng/gram (PPB)	MDL
Naphthalene	5.4	2.46
Acenaphthylene	1.6	0.37
Acenaphthene	6.0	0.92
Fluorene	6.4	0.74
Phenanthrene	21.6	1.00
Anthracene	3.4	0.43
Fluoranthene	41.7	0.62
Pyrene	42.8	0.46
Benz[a]anthracene	22.8	0.43
Chrysene	36.2	0.37
Benzofluoranthenes *	51.0	0.46
Benzo[a]pyrene	25.2	0.37
Indeno[1,2,3-cd]pyrene	19.4	0.58
Dibenz[a,h]anthracene	3.3	0.34
Benzo[ghi]perylene	+ 33.3	0.29
	+ 320.1	
Surrogate Recovery:		
D10-Fluorene	110 %	
D10-Anthracene	83 %	
D10-Pyrene	71 %	

ND = Not Detected
 ALR = Above Linear Range (Reported values are estimates.)
 MDL = Method Detection Limit

* = All benzofluoranthene isomers (b,j & k) are quantified together

TABLE 3, CONTINUED

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID: Lab. Method Blank Date Extracted: 09/18/90
 Analysis Date: 10/06/90
 Filename: 0278K SA7 Extraction Wt: 13.55 grams
 Date Received: Extraction Vol: 1.05 ml

COMPOUNDS	ng/gram (PPB)	MDL
Naphthalene	6.4	2.36
Acenaphthylene	ND	0.35
Acenaphthene	ND	0.89
Fluorene	ND	0.71
Phenanthrene	ND	0.96
Anthracene	ND	0.41
Fluoranthene	ND	0.59
Pyrene	ND	0.44
Benz[a]anthracene	ND	0.41
Chrysene	ND	0.35
Benzofluoranthenes *	ND	0.44
Benzo[a]pyrene	ND	0.35
Indeno[1,2,3-cd]pyrene	ND	0.56
Dibenz[a,h]anthracene	ND	0.32
Benzo[ghi]perylene	ND	0.28
Surrogate Recovery:		
D10-Fluorene	132 %	
D10-Anthracene	79 %	
D10-Pyrene	72 %	

ND = Not Detected
 ALR = Above Linear Range (Reported values are estimates.)
 MDL = Method Detection Limit

* = All benzofluoranthene isomers (b,j & k) are quantified together.

Certified Reference
Sediment HS-5

SIR/PAH Analysis Results
Client...BATTELLE NW

Client ID: HC5-C
Filename: 0283L SA5
Date Received: 09/04/90

Date Extracted: 09/18/90
Analysis Date: 10/10/90
Extraction Wt: 0.13 grams
Extraction Vol: 1.05 ml

COMPOUNDS	ng/gram (PPB)	Certified Value	MDL	% Recov.
<i>most val</i> Naphthalene	110	250	25.0	0.44
Acenaphthylene	32	<150	3.7	0.21
Acenaphthene	66	230	9.2	0.29
Fluorene	170	400	7.4	0.43
Phenanthrene	3800	5,200	100	0.73
Anthracene	71	380	4.3	0.19
Fluoranthene	5100	8,400	62	0.61
Pyrene	2400	5,800	46	0.41
Benz[a]anthracene	1500	2,900	43	0.52
Chrysene	2400	2,800	37	0.86
Benzofluoranthenes *	2500	3,000	46	0.82
Benzo[a]pyrene	620	1,700	3.7	0.36
Indeno[1,2,3-cd]pyrene	450	1,300	5.8	0.35
Dibenz[a,h]anthracene	110	200	3.4	0.55
Benzo[ghi]perylene	520	1,300	2.9	0.40
Surrogate Recovery:				<i>Σ recov. 0.48</i>
D10-Fluorene	118 %			<i>G_{n-1} = 0.21</i>
D10-Anthracene	87 %			<i>range = 0.17 - 0.86</i>
D10-Pyrene	82 %			<i>deviations = 0.0423</i>
				<i>SEM = 0.05</i>

ND = Not Detected
ALR = Above Linear Range (Reported values are estimates.)
MDL = Method Detection Limit

* = All benzofluoranthene isomers (b, j & k) are quantified together