CENPP-PL-CH 20 June 1990

TILLAMOOK BAY, FEDERAL NAVIGATION PROJECT
SEDIMENT EVALUATION, 1990

Abstract

Based on previous and current studies, and according to CENPP Tiered Testing Guidelines, sediment from the Federal project channel near Garibaldi Boat Basin is acceptable for unconfined in-water disposal.

Introduction

1. Tillamook Bay is located on the northern Oregon coast, approximately 75 miles west of Portland and 50 miles south of the mouth of the Columbia River. The Estuary is 3 miles wide and 6 miles long. It is supplied with freshwater by five rivers, draining an area of 533 square miles, and is the third largest estuary in the District.

2. The authorized project includes a channel 18 feet deep and 200 feet wide to a turning basin 18 feet deep and 500 feet wide in Miami Cove (see attachment 1). These dimensions are not required by present usage so an approach channel, 12 feet deep, 100 feet wide and approximately 1,200 feet long leads from deep water in the bay to the Garibaldi Boat Basin. From there an 8 feet deep, 75 feet wide and approximately 1,600 feet long channel, continues along the north edge of the turning basin to the Old Mill Marina. The Garibaldi Boat Basin access channel is maintained to 12 feet deep MLLW.

3. The channel in front of the Garibaldi Boat Basin, from river mile 3+00 to 3+26, is subjected to eddy currents from tidal action and the sediments transported downstream by the Miami River settle in the channel. Dredging of the inside channel is generally limited to this area. About 30,000 cy every 5 to 8 years will be dredged using a pipeline dredge, or clamshell and barge.

4. In December 1989 Public Notice was issued describing proposed dredging of sediment from the Federally authorized channel. Dredging of the Garibaldi Boat Basin portion of the channel, from river mile 3+00 to 3+26, is normally scheduled from 15 May to 30 July in a given year, subject to funding approval. Dredged material will be disposed at either the Kincheloe Point upland site or at an ocean disposal site 3.5 miles offshore from the mouth of Tillamook Bay.

5. The purpose of the present study was to sample and analyze sediments from the project area to satisfy provisions of section 404 of the Clean Water Act of 1977 and Section 103 of the Marine

Protection, Research and Sanctuaries Act of 1972 (Ocean Dumping Act).

Methods

6. On 22 March 1990 sediment samples were taken at 6 stations along that part of the channel fronting the Garibaldi Boat Basin (see attachment 2). Three of these samples (G-2,3,6), near the entrance to the boat basin, were taken by gravity core. The other three samples (G-1,4,5) were taken by ponar grab sampler because the bottom was hard and sandy and the gravity corer would not penetrate. Samples collected for physical analysis were stored in zip-lock plastic bags. To prevent contamination samples for chemical analysis were stored in acid rinsed I-Chem jars. The butyrate core liners of the gravity corer were also acid rinsed as were the stainless steel spatulas used to collect samples.

7. Physical analysis included the standard Dredge Test Analysis performed by the U.S. Army Corps of Engineers Materials Lab in Troutdale, Oregon. The test includes measures of, among others, volatile solids, median grain size and percent in each size category (ie. gravel, sand, fines etc.). Chemical analysis of the sediments was performed by Battelle, Pacific Northwest Division, Marine Research laboratory, Sequim, Washington. Total organic carbon, metals, pesticides, PCBs, and polynuclear hydrocarbons (PAHs) were measured. Samples were shipped on ice and cold stored until chemical analysis was performed. Quality control checks were made to insure acceptable analyses.

8. The current data, and any previously collected data, was examined according to CENPP Tiered Testing Guidelines in order to make recommendations regarding disposal options for the material. Section 404 of the Clean Water Act, the Ocean Dumping Act, EPA guidelines (40 CFR 230), and Portland District, Corps of Engineers' guidelines specify that sediment from dredge sites must be evaluated prior to dredging to determine if significant physical, chemical, or biological impacts will result from disposal operations. If sediment consists of 20 percent or more of fine-grained material, 1,000 ppm oil & grease and contains more than 5 percent volatile solids, or, there is reason to believe contamination is present, then chemical data is obtained to determine if harmful levels of contaminants exist.

Results/Discussion

9. The sediment samples from outside of the Garibaldi Boat Basin access channel (G-1,4,5) were predominately sandy material with increasing amounts of gravel the nearer the sample station was to the outlet of the Miami River, near the Old Mill Marina (attachment 3). The material has not changed significantly from that of previous sampling trips in 1980 and 1985. This material is similar to that at the proposed offshore dumping site which is about 96.9 to 99.5 percent sand. The percent volatile solids at

the dredge site (3.3 to 4.4 %) is close to that of the offshore disposal site (1.0 to 3.6 %).

10. The sediment samples (G-2,3,6) from inside the Garibaldi Boat Basin access channel were made up mostly of fine grained material (fines 50.3 to 71.5 %) with volatile solids ranging from 7.3 to 11.6 per cent. The total organic carbon content of the sediment ranged from 2.43 to 3.18 percent by weight.

11. No chemical analysis was performed on the three sediment samples (G-1,4,5) located outside of the Garibaldi Boat Basin access channel because the sediments were sandy material in a high energy area and there existed chemical data, from previous sampling trips, which indicated there was no reason to believe contamination was present. Also, samples G-4 and G-5 were outside the intended dredging area.

12. Samples G-2,3,6 from inside the boat basin were tested for metals, pesticides, PCBs and PAHs. Arsenic, copper and nickel were elevated but not above CENPP Tier Testing guidelines for restricting unconfined in-water disposal (attachment 3). The natural background concentration of these three metals is high in the Tillamook basin. PCBs were undetected but the detection limits (80 to 100 ppb) were higher than the CENPP preferred limit of 40 ppb. However, the reported detection limits were lower than CENPP level of concern for PCBs which is 400 to 500 ppb. Therefore, if PCBs were detected at the instrument's limit of 80 ppb, this level would still be below the 400 to 500 ppb CENPP concern level. Additionaly, two previous samples, taken in 1980 and 1985 from the same area, showed PCBs at 5 ppb - a figure far below the CENPP concern level. From the above it's reasonable to conclude that PCBs from the boat basin access channel part of the project, if present, are in the range of 5 to 80 ppb and are below levels of concern for resticting in-water disposal. Pesticides and PAHs were below detection limits. Percent recoveries were within acceptable limits for all for analyses.

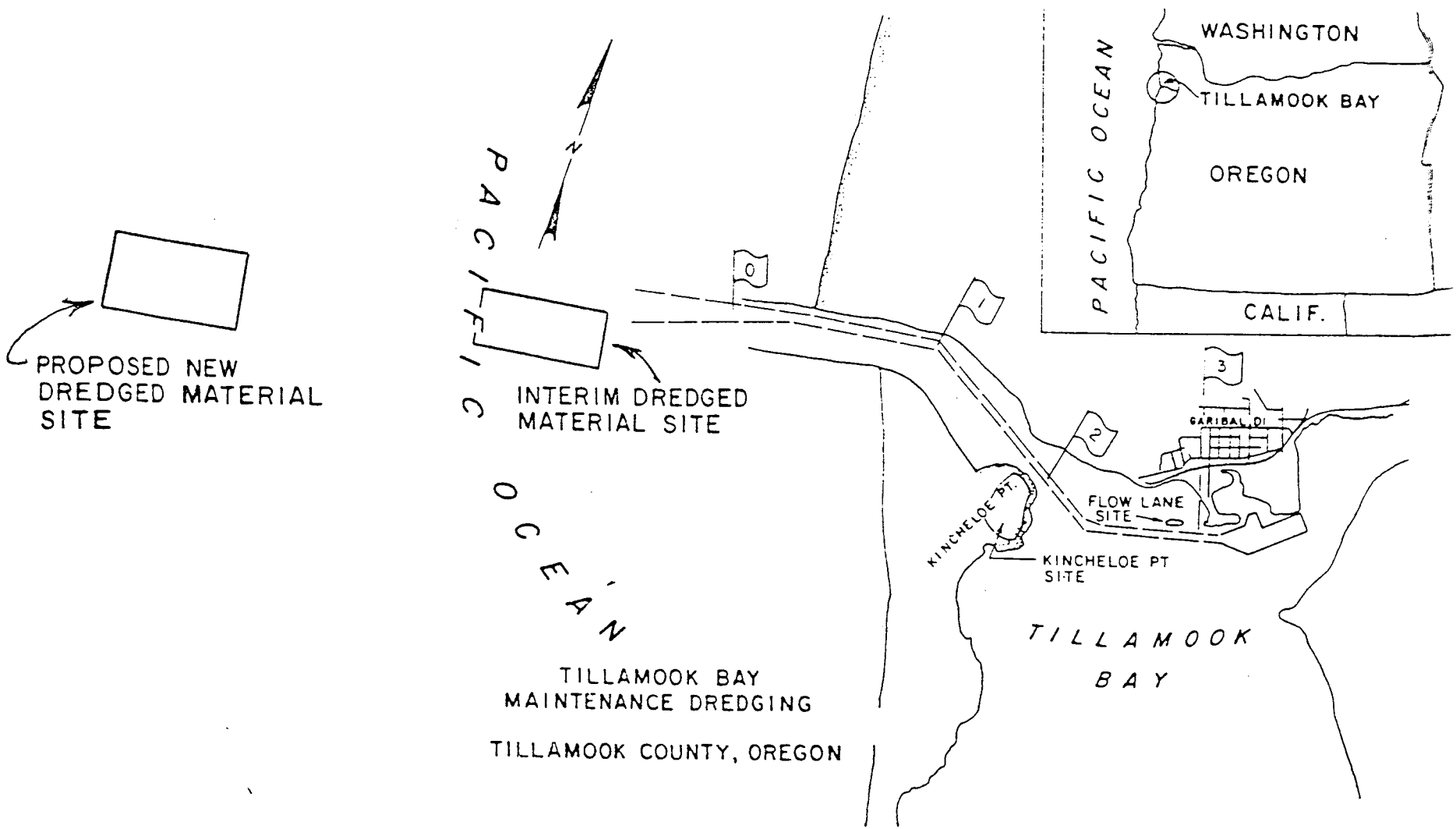
13. The material dredged from this project is to be placed at the new ocean disposal site off the mouth of Tillamook Bay. The volume of material is small and the area is not often dredged. Of the 30,000 cy to be dredged, about 12,000 cy of fine-grained sediment would come from the Garibaldi Boat Basin access channel. There is precedent for placing fine-grained material at offshore ocean disposal sites in Oregon. Two other offshore sites have been approved and used to dispose of fine-grained sediment - Coos Bay Site H and Site F at the mouth of the Columbia River. At these sites much larger volumes were deposited and monitoring of the sites continues.

14. Based on results from current and past studies of the project sediments, which include elutriate tests, there is no

reason to believe, according to CENP tiered Testing Guidelines, that contamination is present in the sediment, or, that a significant biological impact would result from ocean disposal. The volume of fine grained material to be placed offshore is small. For these reasons unconfined open water disposal is acceptable and monitoring of the Tillamook ODMDS will continue.

15. This sediment evaluation was completed by Jim Britton, CENPP-PL-CH, ext. 6465. Comprehensive sediment analytical data will be provided upon request.

ATTACHMENT 1.


PROPOSED NEW
DREDGED MATERIAL
SITE
N
PACIFIC OCEAN
INTERIM DREDGED
MATERIAL SITE
0
1
2
3
WASHINGTON
TILLAMOOK BAY
OREGON
PACIFIC OCEAN
CALIF.
GARIBALDI
KINCHELOE PT.
FLOW LANE
SITE
KINCHELOE PT
SITE
TILLAMOOK
BAY
TILLAMOOK BAY
MAINTENANCE DREDGING
TILLAMOOK COUNTY, OREGON

ATTACHMENT 2.

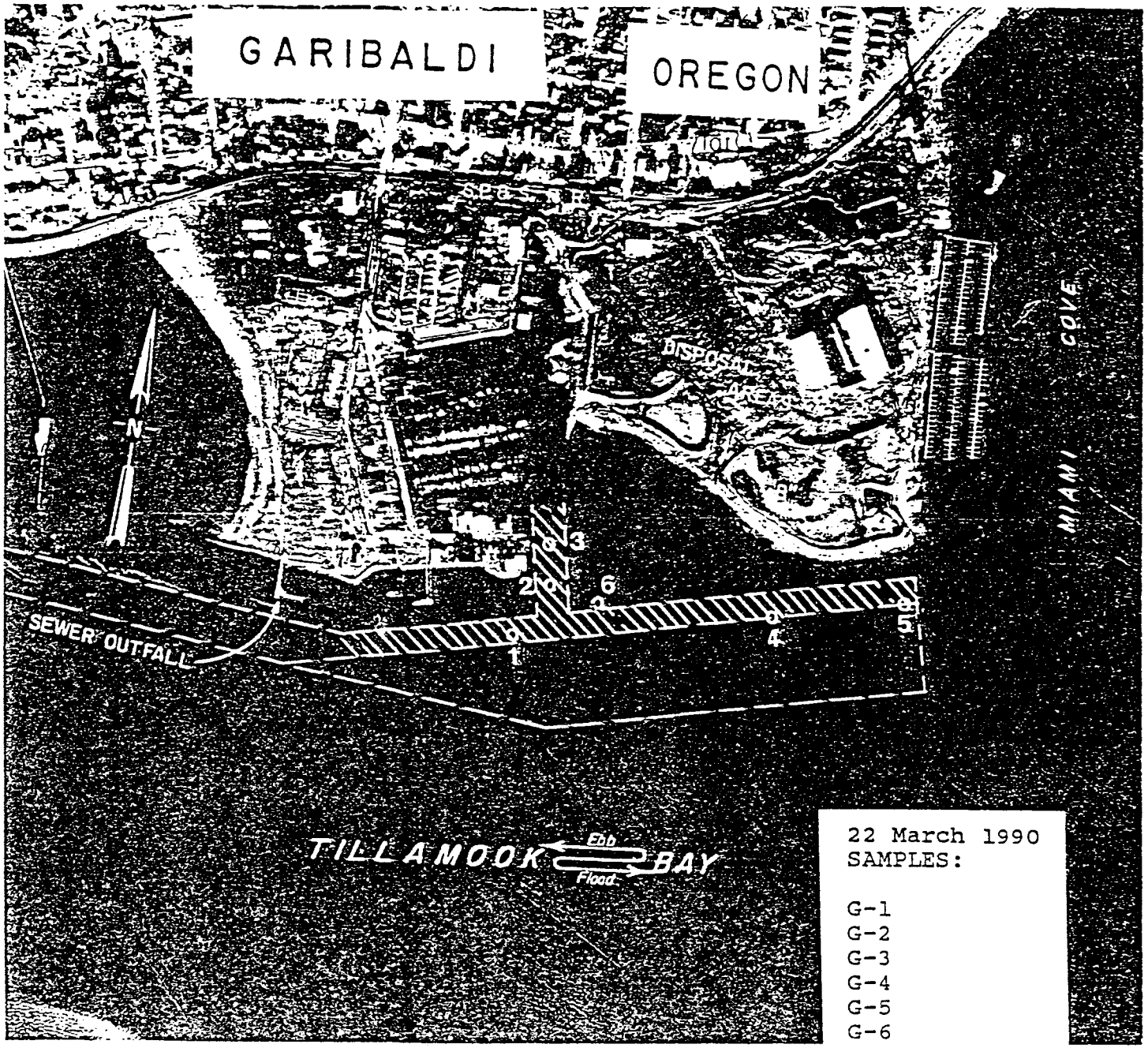


Figure 1. Aerial photograph of the Tillamook Bay Federal Navigation channel near Garibaldi, Oregon showing sampling sites and upland disposal sites (shaded area represents dredged portion of channel).

ATTACHMENT 3.

TILLAMOOK (GARIBALDI)
Results of Physical Analysis
of Sediment

Sample Site	Gravel	Sand	Fines	Volatile Solids
		(%)		%
Boat Basin				
G-2	0.0	28.5	71.5	11.6
G-3	0.4	26.9	72.6	9.0
G-6	0.0	49.7	50.3	7.3
Channel				
G-1	2.0	93.4	4.6	4.2
G-4	7.5	88.8	3.7	3.3
G-5	63.1	35.3	1.5	4.4

TILLAMOOK (GARIBALDI)
Results of Chemical Analysis
of Sediment

	Sample Site			CENPP Concern level
	G-2	G-3	G-6	
Metals		mg/kg-dry		
As	26.4	21.6	16.7	40.0
Ag	0.5	0.6	0.4	1.0
Cd	0.17	0.21	0.29	1.0
Cr	42.8	41.9	32.5	20-300
Cu	56.2	50.8	32.6	50.0
Hg	0.05	0.04	0.03	0.15
Ni	57.0	51.0	38.0	-
Pb	5.48	4.54	4.66	40.0
Zn	92.0	90.1	64.8	250
		ug/kg		
Pest.	nd	nd	nd	15-20
PCBs	nd	nd	nd	400-500
PAHs	nd	nd	nd	1500-2000

nd - non detected

CENPD-EN-G-L (90-S-171)

TILLAMOOK (GARIBALDI)

Results of Dredge Test Analysis

CENPP Sample No.	Resuspended Density,gms/L	Void Ratio	Volatile Solids,%	Specific Gravity	Particle Roundness Grading
G-1	1655	1.77	4.2	2.81	subangular to subround
G-2	1346	3.86	11.6	2.68	subangular to subround
G-3	1378	3.48	9.0	2.70	subangular to subround
G-4	1772	1.43	3.3	2.88	subround to rounded
G-5	1972	0.98	4.4	2.92	subangular to subround
G-6	1469	2.60	7.3	2.69	subangular to subround

Received : 22 Mar 90

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TILLAMOOK (GARIBALDI) (90-S-171

Boring: -- Sample: G-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.	11.00	98.9
No. 5	23.00	97.7
No. 10	29.00	97.2
Pan	1019.60	0.0
No. 18	0.60	96.6
No. 35	5.50	92.5
No. 60	58.30	47.8
No. 120	104.80	8.4
No. 230	110.80	3.3
Pan	114.70	0.0

No hydrometer analysis.

$\bar{X} = 0.28$

D85: 0.44 D60: 0.29 D50: 0.26 D30: 0.19 D15: 0.14 D10: 0.13 mm

Cu: 2.27 Cc: 0.95

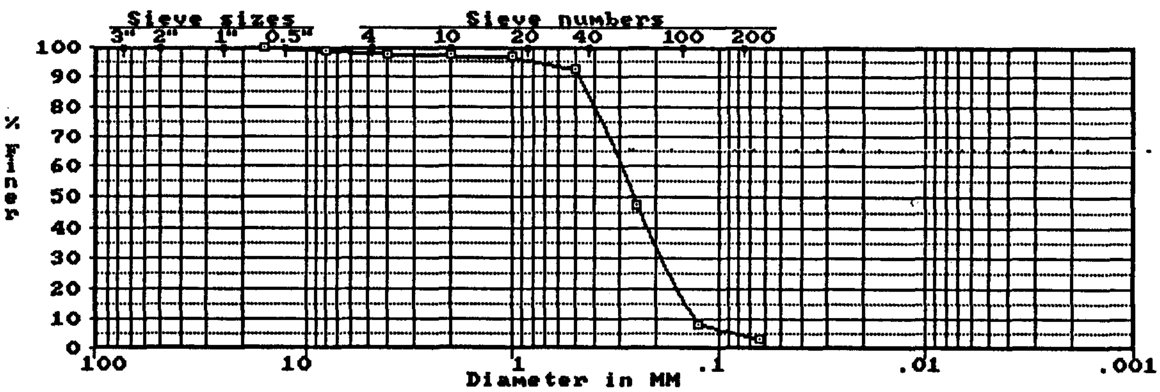
Gravel: 2.0% Sand: 93.4% Fines: 4.6%

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

SP Poorly graded SAND

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

- PONAR SAMPLE TAKEN IN CHANNEL



vol 4.2

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TILLAMOOK (GARIBALDI) (90-S-171

Boring: -- Sample: G-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	33.60	0.0
No. 18	0.00	100.0
No. 35	0.30	99.1
No. 60	1.00	97.0
No. 120	3.70	89.0
No. 230	11.80	64.9
Pan	33.60	0.0

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

Sample Weight:33.6 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	18.9	0.0487	57.2
3	20.0	14.9	0.0288	45.4
10	20.0	9.9	0.0162	30.6
100	20.0	5.9	0.0068	18.9
200	20.0	4.2	0.0048	13.8

x̄ = 0.050

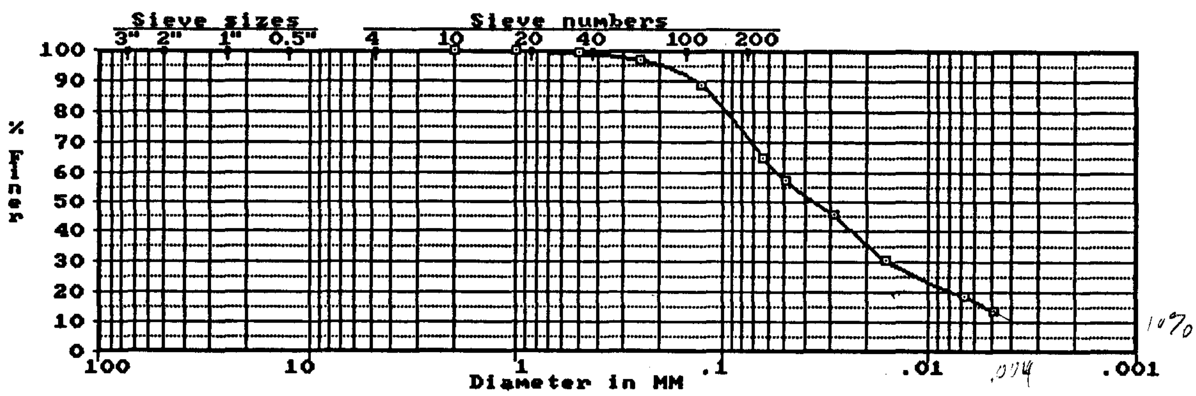
D85: 0.11 D60: .054 D50: .036 D30: .016 D15: .0052 mm

Gravel: 0.0% Sand: 28.5% Fines: 71.5%

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

- GRAVITY CORE SAMPLE TAKEN IN CHANNEL

Cannot classify soil without knowing type of fines.



% vol sol 11.6

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TILLAMOOK (GARIBALDI) (90-S-171

Boring: -- Sample: G-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.	1.10	99.8
No. 5	2.90	99.5
No. 10	4.90	99.1
Pan	572.10	0.0
No. 18	0.10	98.9
No. 35	0.20	98.7
No. 60	1.70	95.4
No. 120	4.10	90.2
No. 230	15.10	66.2
Pan	45.40	0.0

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

Sample Weight:45.4 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	26.9	0.0462	59.2
3	20.0	18.9	0.0281	41.9
10	20.0	12.9	0.0160	29.0
100	20.0	6.9	0.0067	16.0
200	20.0	5.2	0.0048	12.3

$\bar{x} = 0.050$

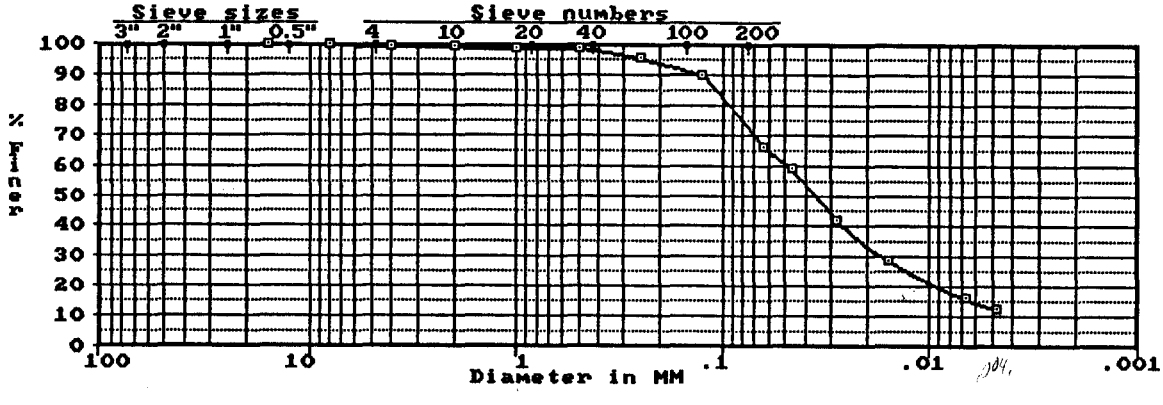
D85: 0.11 D60: .048 D50: .035 D30: .017 D15: .0062 mm

Gravel: 0.4% Sand: 26.9% Fines: 72.6%

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

- GRAVITY CORE SAMPLE TAKEN IN CHANNEL

Cannot classify soil without knowing type of fines.



5/8 Vol nd 9.0

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TILLAMOOK (GARIBALDI) (90-S-171

Boring: -- Sample: G-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.	5.40	98.9
5/16 In.	28.50	94.1
No. 5	37.90	92.2
No. 10	44.70	90.8
Pan	484.80	0.0
No. 18	2.00	88.7
No. 35	18.20	72.2
No. 60	69.20	20.0
No. 120	80.20	8.7
No. 230	86.10	2.7
Pan	88.70	0.0

No hydrometer analysis.

$\bar{X} = 0.43$

D85: 0.75 D60: 0.43 D50: 0.37 D30: 0.29 D15: 0.18 D10: 0.14 mm

Cu: 3.15 Cc: 1.42

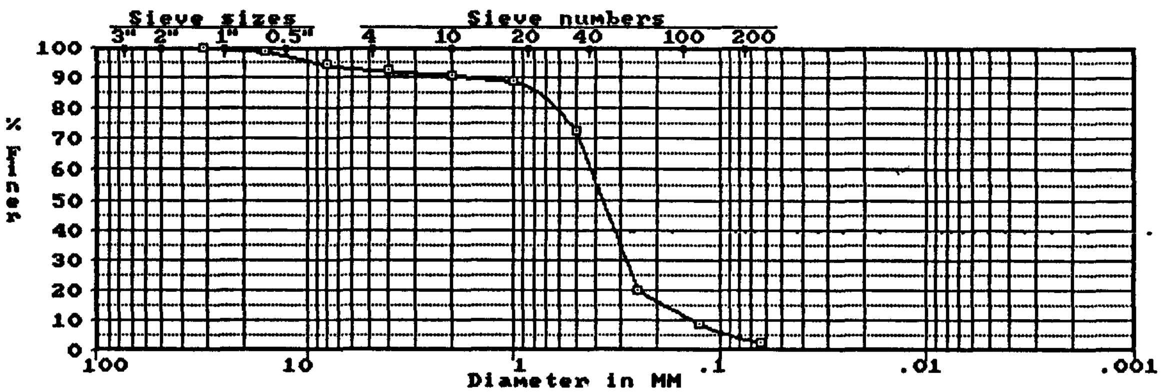
Gravel: 7.5% Sand: 88.8% Fines: 3.7%

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

SP Poorly graded SAND

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

- PONAR SAMPLE TAKEN IN CHANNEL



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TILLAMOOK (GARIBALDI) (90-S-171

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

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

No hydrometer 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.	7.80	97.9
5/16 In.	154.30	58.0
No. 5	251.00	31.6
No. 10	299.80	18.3
Pan	367.00	0.0
No. 18	8.40	13.4
No. 35	13.90	10.3
No. 60	21.30	6.0
No. 120	26.90	2.7
No. 230	29.20	1.4
Pan	31.60	0.0

$\bar{X} = 6.83$

D85: 12.4 D60: 8.24 D50: 6.71 D30: 3.76 D15: 1.37 D10: 0.48 mm

Cu: 17.3 Cc: 3.61

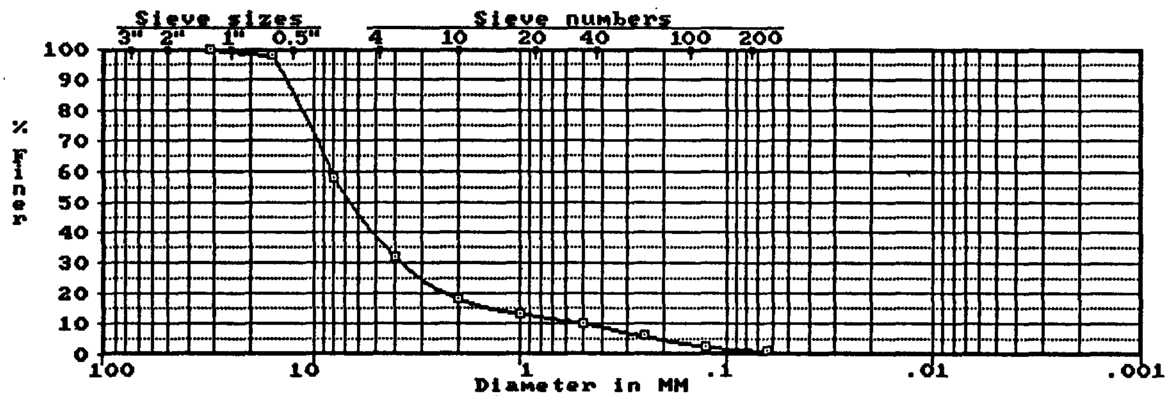
Gravel: 63.1% Sand: 35.3% Fines: 1.5%

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

GP Poorly graded GRAVEL with sand

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

- PONAR SAMPLE TAKEN IN CHANNEL



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TILLAMOOK (GARIBALDI) (90-S-171

Boring: -- Sample: G-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	52.70	0.0
No. 18	0.20	99.6
No. 35	0.70	98.7
No. 60	2.80	94.7
No. 120	16.20	69.3
No. 230	29.20	44.6
Pan	52.70	0.0

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

Sample Weight:52.7 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	19.9	0.0484	38.3
3	20.0	13.9	0.0290	27.1
10	20.0	9.9	0.0162	19.5
100	20.0	5.9	0.0068	12.0
200	20.0	4.0	0.0048	8.5

$\bar{x} = 0.091$

D85: 0.19 D60: .098 D50: .074 D30: .034 D15: .0098 D10: .0056 mm

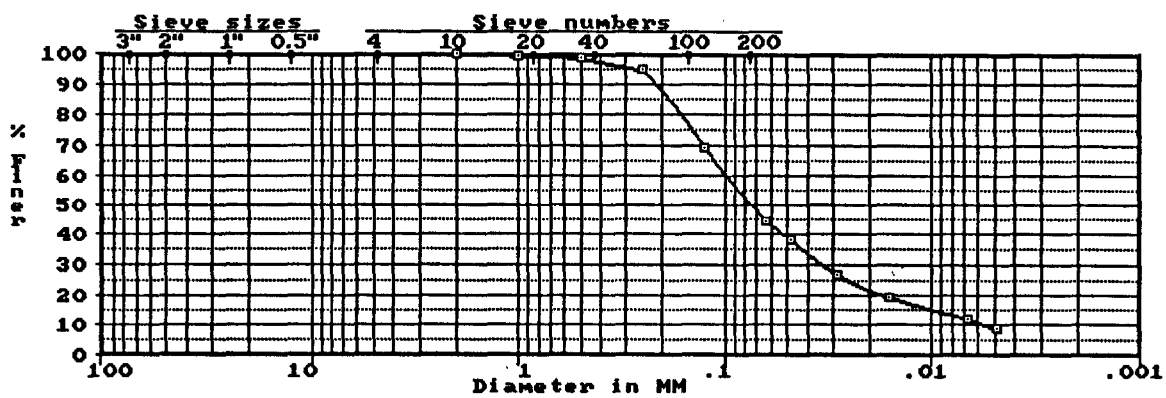
Cu: 17.7 Cc: 2.05

Gravel: 0.0% Sand: 49.7% Fines: 50.3%

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

- GRAVITY CORE SAMPLE TAKEN IN CHANNEL

Cannot classify soil without knowing type of fines.



[illegible handwriting]

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

			TOC* (weight %)			
2.18	G-2	5011-1*	3.47	3.16	3.08	3.00
2.70	G-3 Comp	5011-2*	2.64	2.95	2.78	2.83
2.03	G-6	5011-3*	2.67	2.35	2.18	2.50
	YQ-BC 10	5011-4*	0.26	0.24	0.26	
	YQ-BC 9	5011-5*	2.37	2.43	3.10	2.19

ID number: G-2
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

ANALYTICAL RESULTS

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	26.4 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.170 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	42.8 mg/kg-dry		SWN	ICP
7440-50-8	Copper	56.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	5.48 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.05 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	57 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.5 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	92.0 mg/kg-dry		SWN	ICP

ID number: G-3 COMP
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

ANALYTICAL RESULTS

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	21.6 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.21 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	41.9 mg/kg-dry		SWN	ICP
7440-50-8	Copper	50.8 mg/kg-dry		SWN	ICP
7439-92-1	Lead	4.54 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.04 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	51 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.6 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	90.1 mg/kg-dry		SWN	ICP

ID number: G-6
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

ANALYTICAL RESULTS

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	16.7 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.29 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	32.5 mg/kg-dry		SWN	ICP
7440-50-8	Copper	32.6 mg/kg-dry		SWN	ICP
7439-92-1	Lead	4.66 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	38 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	64.8 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Analytical
Chemists &
Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-8490
(206) 621-7523 (FAX)

Lab Sample ID: 6130C
Matrix: Soil

Sample No.: G-2

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910
VTSR: 04/18/90

Data Release Authorized:
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: 15.4 grams

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

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

* 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.

Consultants

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

Lab Sample ID: 6130D
Matrix: Soil

Sample No.: Comp G-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: 18.9 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)	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	85%

Data Qualifiers

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

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

Lab Sample ID: 6130E
Matrix: Soil

Sample No.: Comp G-6

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910
VTSR: 04/18/90

Data Release Authorized:
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: 18.6 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	85%

Data Qualifiers

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

ORGANICS ANALYSIS DATA SHEET- PNA by GC-FID

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

Lab Sample ID: 6130 C
Matrix: Soil

Sample No: G-2
QC Report No: 6130 - Battelle
Project: Batch No. 9 & 10
BOA-37 PR-121909 & PR121910
VTSR: 04/18/90

Date Extracted: 4/27/90
Date Analyzed: 5/15/90
Dry Weight: 15.4 grams

Data Release Authorized: _____
REPORT PREPARED: MAC:C - C.G.. (05/16/90)

Reported in ppb (µg/kg)

CAS Number		µg/kg
91-20-3	Naphthalene	60 U
208-96-8	Acenaphthylene	60 U
83-32-9	Acenaphthene	60 U
86-73-7	Fluorene	60 U
85-01-8	Phenanthrene	60 U
120-12-7	Anthracene	60 U
206-44-0	Fluoranthene	60 U
129-00-0	Pyrene	60 U
56-55-3	Benzo(a)Anthracene	60 U
218-01-9	Chrysene	60 U
205-99-2 / 207-08-9	Benzo(b)Fluoranthene & Benzo(k)Fluoranthene	120 U
50-32-8	Benzo(a)Pyrene	120 U
193-39-5	Indeno(1,2,3-cd)Pyrene	200 U
53-70-3	Dibenz(a,h)Anthracene	200 U
191-24-2	Benzo(ghi)Perylene	200 U

SURROGATE PERCENT RECOVERY

Terphenyl	90%

Data Qualifiers

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

NR — Indicates compound not reported due to dilution and/or matrix interference.

NA — Indicates compound not analyzed.

ORGANICS ANALYSIS DATA SHEET- PNA by GC-FID

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

Lab Sample ID: 6130 D
Matrix: Soil

Sample No: G-3 Comp.
QC Report No: 6130 - Battelle
Project: Batch No. 9 & 10
BOA-37 PR-121909 & PR121910
VTSR: 04/18/90

Date Extracted: 4/27/90
Date Analyzed: 5/15/90
Dry Weight: 18.9 grams

Data Release Authorized:
REPORT PREPARED: MAC:C - C.G.. (05/16/90)

Reported in ppb (µg/kg)

CAS Number		µg/kg
91-20-3	Naphthalene	60 U
208-96-8	Acenaphthylene	60 U
83-32-9	Acenaphthene	60 U
86-73-7	Fluorene	60 U
85-01-8	Phenanthrene	60 U
120-12-7	Anthracene	60 U
206-44-0	Fluoranthene	60 U
129-00-0	Pyrene	60 U
56-55-3	Benzo(a)Anthracene	60 U
218-01-9	Chrysene	60 U
205-99-2 207-08-9	Benzo(b)Fluoranthene & Benzo(k)Fluoranthene	120 U
50-32-8	Benzo(a)Pyrene	120 U
193-39-5	Indeno(1,2,3-cd)Pyrene	200 U
53-70-3	Dibenz(a,h)Anthracene	200 U
191-24-2	Benzo(ghi)Perylene	200 U

SURROGATE PERCENT RECOVERY	
Terphenyl	64%

Data Qualifiers

U	Indicates compound was analyzed for but not detected at the given detection limit.
NR	Indicates compound not reported due to dilution and/or matrix interference.
NA	Indicates compound not analyzed.

ORGANICS ANALYSIS DATA SHEET- PNA by GC-FID

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

Lab Sample ID: 6130 E
Matrix: Soil

Sample No: G-6
QC Report No: 6130 - Battelle
Project: Batch No. 9 & 10
BOA-37 PR-121909 & PR121910
VTSR: 04/18/90

Date Extracted: 4/27/90
Date Analyzed: 5/15/90
Dry Weight: 18.6 grams

Data Release Authorized: _____
REPORT PREPARED: MAC:C - C.G.. (05/16/90)

Reported in ppb (µg/kg)

CAS Number		µg/kg
91-20-3	Naphthalene	60 U
208-96-8	Acenaphthylene	60 U
83-32-9	Acenaphthene	60 U
86-73-7	Fluorene	60 U
85-01-8	Phenanthrene	60 U
120-12-7	Anthracene	60 U
206-44-0	Fluoranthene	60 U
129-00-0	Pyrene	60 U
56-55-3	Benzo(a)Anthracene	60 U
218-01-9	Chrysene	60 U
205-99-2 207-08-9	Benzo(b)Fluoranthene & Benzo(k)Fluoranthene	120 U
50-32-8	Benzo(a)Pyrene	120 U
193-39-5	Indeno(1,2,3-cd)Pyrene	200 U
53-70-3	Dibenz(a,h)Anthracene	200 U
191-24-2	Benzo(ghi)Perylene	200 U

SURROGATE PERCENT RECOVERY	
Terphenyl	68%

Data Qualifiers

U	Indicates compound was analyzed for but not detected at the given detection limit.
NR	Indicates compound not reported due to dilution and/or matrix interference.
NA	Indicates compound not analyzed.