Submitted to:

Port of Portland
700 Northeast Multnomah
PO Box 3529
Portland, Oregon 97208

Prepared by:

Fishman Environmental Services

January 31, 1995

WEST HAYDEN ISLAND
DEVELOPMENT PROGRAM

TECHNICAL REPORT

AQUATIC BIOLOGY INVESTIGATIONS

Aquatic Biology Investigations
Port of Portland
January 31, 1995

INTRODUCTION

The primary purpose of the aquatic biology investigations conducted in the near shore areas around West Hayden Island (WHI) was to characterize the sediments and the benthic invertebrate communities inhabiting these areas. These investigations also establish a baseline to determine the impact of future alterations on these near shore areas since stresses in the riverine environment can result in changes in density of individuals, number of taxa or shifts in community composition. Information on benthic invertebrate communities is also helpful in determining the relative importance of a specific area in terms of productivity and the long term impacts of environmental changes.

METHODS AND MATERIALS

Benthic Macroinvertebrates

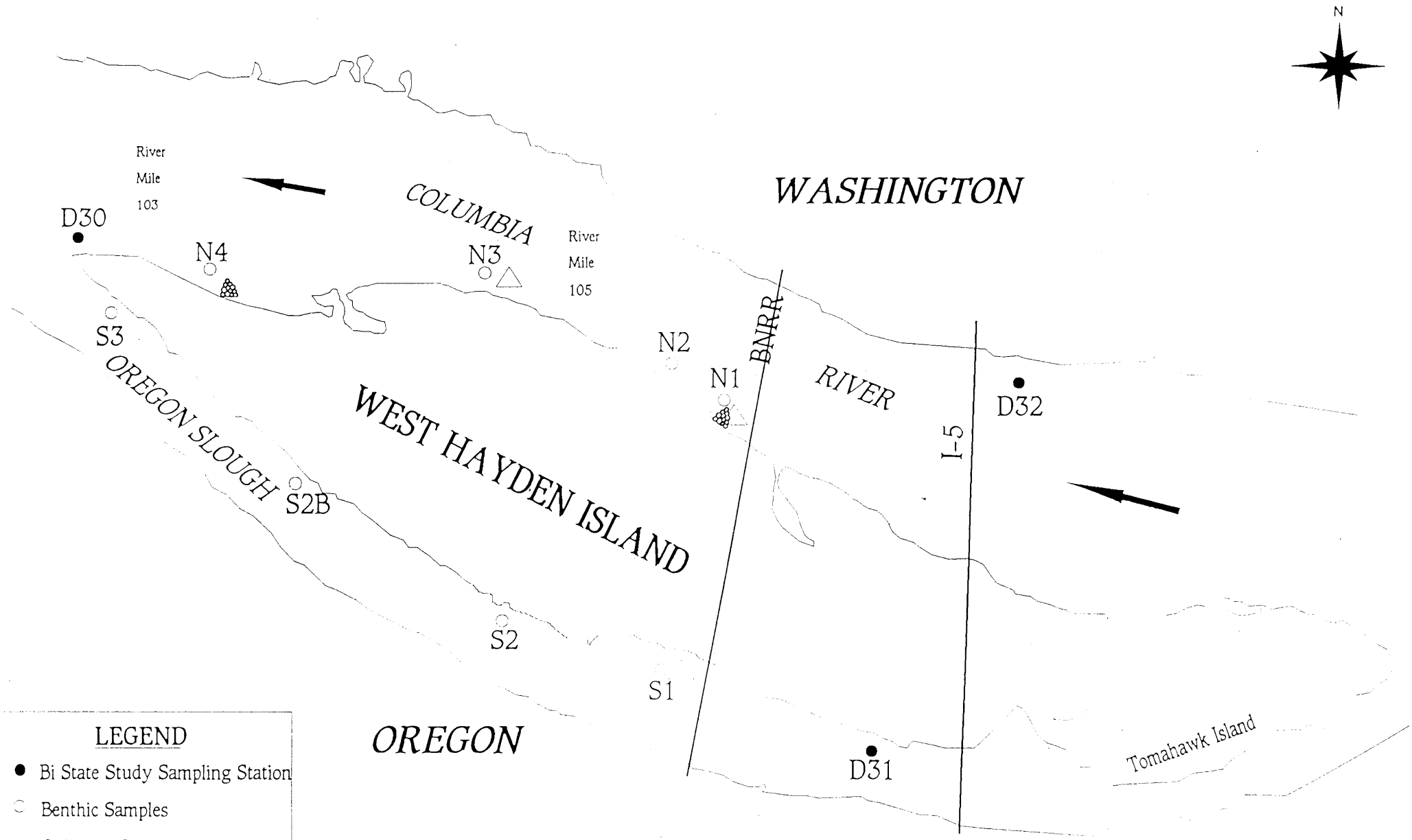
The near-shore areas of WHI were sampled to characterize the biotic community inhabiting these areas. The benthic invertebrate community was sampled on September 26, 1994. Sediments were retrieved using a small Ponar dredge (0.0523 m^2) in coarse sand or gravelly sediments while a small Ekman dredge (0.0232 m^2) was used in the finer sand and silty sediments. A total of 24 benthic samples was collected from eight stations. Samples were taken in water depths of 1.5, 3 and 6 meters. All benthic invertebrate samples were sieved through a No.35 (0.5 mm opening) screen to remove fine grained sediments. The remaining coarse sand, gravel, organic material and invertebrates were transferred to a sample container. Contents of the sample jars were preserved with a buffered 10% formalin solution and labeled with the appropriate sample location and depth. Sample locations are shown in Figure 1.

Benthic invertebrate samples were sent to Howard Jones, Marine Taxonomic Services, Ltd., for analysis. Most were identified to the genus level or the species level when possible.

Epibenthic tows were made using a Wildco bottom sled with 1000 μm mesh size. The sled was towed across the bottom at a low rate of speed to capture epibenthic organisms.

Sediment Characteristics

Columbia River stage at the time of the trip was extremely low (0.1 ft at Vancouver gage) which was the lowest recorded stage reading of the summer. Exposed sand and rocky shoals were observed along the north side of the island. The few exposed rocky areas were composed of > 50% cobble (2 in-9 in). Small boulders (>9 in), large gravel (1 in-2 in), and coarse sand were also present. The rocky shoal areas are shown in Figure 1.



PORT OF PORTLAND
PORTLAND, OREGON

Consultants in ecology and natural resource management

Pinkham Environmental Services
434 NW SIXTH Avenue * Suite 304
Portland, OR 97209-3600

XXXXXX
DESIGN NUMBER

XXXXXX
PROJECT NUMBER

DESIGN BY	XXX
DRAWN BY	XXX
CHECKED BY	XXX
DATE	XXX
SCALE	XXX

W. Hayden Island
Ecological Investigations
Task 3: Aquatic Biology

SUBMITTED BY

FIGURE NO. 1

NO	DATE	BY	REVISIONS	CKD	APPV'D	NO	DATE	BY	REVISIONS	CKD	APPV'D

Sediments characteristic of near shore conditions on the north shoreline of WHI were collected using an Ekman dredge except at Station N1 where a Ponar dredge was used due to the presence of some larger-sized substrates. Samples were collected in a water depth of 3 meters at three stations for grain size analysis.

Sediment samples were sent to Columbia Analytical Services for particle size determination utilizing the Puget Sound Estuary Program Protocol.

RESULTS

Benthic Macroinvertebrates

The most abundant taxa encountered on the north side of WHI were *Corbicula fluminea*, the Asian clam, and *Corophium salmonis*, a brackish water amphipod. *Corophium salmonis*, Oligochaete worms and Chironomidae (midge fly) larvae were the most abundant taxa in samples taken on the south side of the island.

Densities of benthic invertebrates were converted to numbers per square meter to allow comparison with data from other studies. Summary tables of number of taxa per sample and densities per m^2 are shown in Table 1. Densities from this study are compared to results from other sites (D and E Stations) in the Lower Columbia sampled for the Columbia River Bi-State Study in the table below. Bi-State Study samples were collected during September 1991.

STATION	LOCATION	SAMPLE DEPTH	NUMBER PER M^2	NUMBER OF TAXA	SEDIMENT TYPE
S3	South WHI	10ft(3m)	1,853	6	Fine-grain
N4	North WHI	10ft(3m)	1,207	3	Coarse-grain
D30	RM 103	5.4m	17,550	13	Fine-grain
E11	RM 104	12.0m	12,367	12	Fine-grain
D32	RM 108	5.5m	3,500	9	Coarse-grain

A list of taxa collected during this study and sampling results from individual stations are presented in the appendix to this report.

No organisms were captured with the epibenthic sled.

TABLE 1. Number of taxa and abundance of benthic invertebrates at W. Hayden Island stations. September 26, 1994

STATION	1.5 M Depth Taxa per Sample	3 M Depth Taxa per Sample	6 M Depth Taxa per Sample	Mean No. Taxa Per Station
N1	4	7	4	5
N2	1	4	2	2
N3	4	4	3	4
N4	4	3	2	3
S1	6	3	3	4
S2	6	3	NS	5
S2B	5	3	3	4
S3	2	6	3	4

NS = No sample collected

STATION	1.5 M Depth		3 M Depth		6 M Depth		Mean No. Individuals Per Station
	Number per Sample	Number per Sq Meter	Number per Sample	Number per Sq Meter	Number per Sample	Number per Sq Meter	
N1	12	229	80	1530	24	459	739
N2	1	43	10	431	13	249	241
N3	16	690	9	388	3	129	402
N4	9	388	28	1207	2	86	560
S1	23	991	4	172	4	172	445
S2	25	1078	11	474	NS	NS	776
S2B	46	1983	15	647	4	172	934
S3	7	302	43	1853	19	819	991

Sediments

Sediment sampling sites were selected to characterize the different substrates present in the shallow water areas along the edges of WHI. Station N1 would be considered a coarse-grained sediment area (<20% of particles <125μm) and is typical of the north shoreline of WHI. N3 is an example of a fine-grained sediment area (>20% particles <125μm). It is important to note that the fine-grained substrates at N3 were encountered in an area sheltered by a coarse-grained sandy shoal and that the vast majority of the north shoreline of WHI consists of coarse-grained sediments similar to N1. Sediments on the south side of WHI were generally silty or fine sand; only very small amounts of coarse materials were encountered. Station S1 is typical of sediments encountered along the south side of WHI.

Three locations near WHI were sampled for sediments and benthic invertebrates during the Bi-State Program (Tetra Tech 1993); one just downstream from the west end of the island (Station D30), one in Oregon Slough east of the railroad bridge (Station D31), and one on the Washington side upstream from the Interstate Bridge (Station D32). Stations D30 and D31 were considered depositional, or fine-grained sites; station D32 is a non-depositional site. Fine-grained sediment sites were defined as stations with >20% fines (<100μm diameter grain size). Sediment samples were analyzed for grain size, total organic carbon (TOC), metals, and organic compounds.

The results of sediment analyses, expressed in terms of percentage of total weight, are presented in the following table. Analytical reports further defining the composition of individual samples are included in the appendix.

DESCRIPTION	PARTICLE SIZE	Station N1	Station N3	Station S1
Gravel	>2000μm	23.5%	0.47%	0.03%
Very Coarse Sand	1000-2000μm	13.9%	1.12%	0.18%
Coarse Sand	500-1000μm	23.1%	1.97%	0.75%
Medium Sand	250-500μm	15.9%	3.54%	16.3%
Fine Sand	125-250μm	14.5%	19.3%	68.4%
Very Fine Sand	62.5-125μm	9.26%	48.7%	14.3%
Silt	3.9-62.6μm	2.04%	23.1%	1.55%
Clay	<3.9μm	0.65%	2.15%	0.47%

DISCUSSION

This study found the benthic environment and invertebrate fauna to be representative of the lower Columbia River. Benthic infauna richness and abundance appear to be a function of sediment grain size. Species richness is generally low (6-13 taxa).

Benthic Macroinvertebrates

In general, North Portland Harbor (Oregon Slough) on the south side of WHI, is a lower energy environment than the north side of the island. Fine-grained substrates are more prevalent and supported a greater abundance of individuals and greater taxa richness than the coarse-grained sediments that characterize the north side of the island. This pattern was also observed in the Bi-State study. Results of the Bi-State study generally indicated that coarse-grained substrates supported fewer taxa and exhibited lower total abundance than the fine-grained substrates.

Comparison of benthic stations in closest proximity to each other (Bi-State station D30 and WHI station S3) indicates that sediment textures were similar (fine-grained). These stations were sampled at approximately the same time of year, however, there are wide differences in abundance and numbers of taxa between the studies. Densities of benthic organisms and number of taxa were generally lower in the 1994 WHI samples than in the Bi-State study results. Several factors may contribute to these differences. Most important is the dynamic nature of sediments and conditions in the river. Shoreline areas are subject to deposition, resuspension and scouring from changes in flow as well as from daily tidal influences and wind and wake disturbance. Other factors that need to be considered when comparing these data are sampling methodology and equipment.

Sediments

Comparison of WHI sediment results with Bi-State study results indicates that similarities exist between sediment found in the area. Generally, the finer sediments are found in side-channels and backwaters while the coarser sediments are found adjacent to the navigation channel in the more dynamic areas.

APPENDIX

HAYDEN ISLAND, PORTLAND OREGON
FISHMAN ENVIRONMENTAL SERVICES
BY MARINE TAXONOMIC SERVICES, LTD.
NOVEMBER, 1994

PROJECT 471N

TAXON	N1-5'	N1-10'	N1-20'	N2-5'	N2-10'	N2-20'
POLYCHAETA						
Oligochaeta sp. Indet.		6				
MOLLUSCA						
Corbicula fluminea	8	20	7	1	4	2
Gastropoda sp. indet.	2		1			
CRUSTACEA						
Corophium salmonis	1	35	15		5	11
Corophium sp. Indet.	1				1	
Ianiropsis sp. Indet.						
MISCELLANEOUS						
Chironomidae sp. Indet.		10				
Hexagenia sp. Indet.		1				
Nematoda sp. Indet.		3				
Nemertinea sp. Indet.		5	1		1	
Polycentropus sp. Indet.						

TAXON	N3-5'	N3-10'	N3-20'	N4-5'	N4-10'	N4-20'
POLYCHAETA						
Oligochaeta sp. Indet.	4	1	1	1		
MOLLUSCA						
Corbicula fluminea	1	1	1	1	6	
Gastropoda sp. indet.						
CRUSTACEA						
Corophium salmonis	10		1	4	18	
Corophium sp. Indet.						1
Ianiropsis sp. Indet.						
MISCELLANEOUS						
Chironomidae sp. Indet.		6		3		1
Hexagenia sp. Indet.	1					
Nematoda sp. Indet.		1				
Nemertinea sp. Indet.					4	
Polycentropus sp. Indet.						

TAXON	S1-5'	S1-10'	S1-20'	S2-5'	S2-10'
POLYCHAETA					
Oligochaeta sp. Indet.	4			12	
MOLLUSCA					
Corbicula fluminea	2	1	1	8	2
Gastropoda sp. indet.					
CRUSTACEA					
Corophium salmonis	10	2	1	1	8
Corophium sp. Indet.			2	1	
Ianiropsis sp. Indet.					
MISCELLANEOUS					
Chironomidae sp. Indet.	5	1		2	
Hexagenia sp. Indet.	1				1
Nematoda sp. Indet.				1	
Nemertinea sp. Indet.	1				
Polycentropus sp. Indet.					

TAXON	S2B-5'	S2B-10'	S2B-20'	S3-5'	S3-10'	S3-20'
POLYCHAETA						
Oligochaeta sp. Indet.	24	5			8	9
MOLLUSCA						
Corbicula fluminea	5	2		2	6	2
Gastropoda sp. indet.						
CRUSTACEA						
Corophium salmonis			2	5	22	8
Corophium sp. Indet.	1					
Ianiropsis sp. Indet.					1	
MISCELLANEOUS						
Chironomidae sp. Indet.	14	8	1		4	
Hexagenia sp. Indet.						
Nematoda sp. Indet.	2		1			
Nemertinea sp. Indet.						
Polycentropus sp. Indet.					2	

HAYDEN ISLAND, PORTLAND OREGON
SPECIES CHECKLIST FOR
FISHMAN ENVIRONMENTAL SERVICES
BY MARINE TAXONOMIC SERVICES, LTD.
NOVEMBER, 1994

Phylum **Nemertea**
- Nemertea sp. Indeterminate

Phylum **Nematoda**
- Nematoda sp. Indeterminate

Phylum **Annelida**
- Class **Oligochaeta**
  - Oligochaeta sp. Indeterminate

Phylum **Mollusca**
- Class **Gastropoda**
  - Gastropoda sp. Indeterminate
- Class **Bivalvia**
  - Order **Veneroida**
    - Family **Corbiculidae**
      - Corbicula fluminea (Philippi, 1844)

Phylum **Arthropoda**
- Class **Insecta**
  - Order **Ephemeroptera**
    - Family **Ephemeridae**
      - Hexagenia sp. Indeterminate
  - Order **Trichoptera**
    - Family **Polycentropodidae**
      - Polycentropus sp. Indeterminate
  - Order **Diptera**
    - Family **Chironomidae**
      - Chironomidae sp. Indeterminate
- Subphylum **Crustacea**
  - Order **Isopoda**
    - Family **Janiridae**
      - Ianiropsis tridens Menzies, 1952
  - Order **Amphipoda**
    - Family **Corophiidae**
      - Corophium salmonis Stimpson, 1857
      - Corophium sp. Indeterminate

Analytical Report

Client: Portland, Port of
Project: W. Hayden Island/#471N
Sample Matrix Sediment

Date Collected: 9/26/94
Date Received: 10/18/94
Date Analyzed: 10/25/94
Service Request: K946462

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: N1 10ft
Lab Code: K946462-001

Sand Fraction: Dry Weight (Grams)	80.9430
Sand Fraction: Weight Recovered (Grams)	80.9289
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	18.9267	23.5
Very Coarse Sand	-1 to 0 Ø	11.2057	13.9
Coarse Sand	0 to 1 Ø	18.5492	23.1
Medium Sand	1 to 2 Ø	12.7660	15.9
Fine Sand	2 to 3 Ø	11.6982	14.5
Very Fine Sand	3 to 4 Ø	7.4529	9.26
Silt	4 to 8 Ø	1.6450	2.04
Clay	> 8 Ø	0.5250	0.65
	Total	82.7687	103

Approved By: Tracy L. Mauro Date: 11/3/94

6462_1.XLS \11/2/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Portland, Port of	**Date Collected:**	9/26/94
Project:	W. Hayden Island/#471N	**Date Received:**	10/18/94
Sample Matrix	Sediment	**Date Analyzed:**	10/25/94
		Service Request:	K946462

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: N3 10ft
Lab Code: K946462-002

Sand Fraction: Dry Weight (Grams)	59.0389
Sand Fraction: Weight Recovered (Grams)	59.3265
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.3332	0.47
Very Coarse Sand	-1 to 0 Ø	0.7940	1.12
Coarse Sand	0 to 1 Ø	1.4021	1.97
Medium Sand	1 to 2 Ø	2.5190	3.54
Fine Sand	2 to 3 Ø	13.7399	19.3
Very Fine Sand	3 to 4 Ø	34.5974	48.7
Silt	4 to 8 Ø	16.4400	23.1
Clay	> 8 Ø	1.5300	2.15
	Total	71.3556	100

Approved By: Tracy L. Davis Date: 11/3/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Portland, Port of
Project: W. Hayden Island/#471N
Sample Matrix Sediment

Date Collected: 9/26/94
Date Received: 10/18/94
Date Analyzed: 10/25/94
Service Request: K946462

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: S1 10ft
Lab Code: K946462-003

Sand Fraction: Dry Weight (Grams)	77.6590
Sand Fraction: Weight Recovered (Grams)	77.8244
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0207	0.03
Very Coarse Sand	-1 to 0 Ø	0.1409	0.18
Coarse Sand	0 to 1 Ø	0.5838	0.75
Medium Sand	1 to 2 Ø	12.6681	16.3
Fine Sand	2 to 3 Ø	53.0664	68.4
Very Fine Sand	3 to 4 Ø	11.0614	14.3
Silt	4 to 8 Ø	1.2050	1.55
Clay	> 8 Ø	0.3650	0.47
	Total	79.1113	102

Approved By: Tracy L. Mauro Date: 11/3/94

Columbia Analytical Services™

1317 South 13th Ave. • Kelso, WA 98626 • (206) 577-7222, FAX (206) 636-1068

Abbie

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

DATE 10/18/94 PAGE 1 OF 1

PROJECT NAME W. HAYDEN ISLAND # 471N

PROJECT MNGR DANIL HANCOCK

COMPANY/ADDRESS PORT OF PORTLAND

P.O. BOX 3529 700 NE Multnomah

PORTLAND OR 97208 PHONE (503) 731-7322

SAMPLERS SIGNATURE

ANALYSIS REQUESTED

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	Base Neu/Acid Organics GC/MS 625/8270	Volatile Organics GC/MS 624/8240	Halogenated or Aromatic Volatiles 601/8010 ☐ 602/8020 ☐	Pesticides/PCBs 608/8080	Total Petroleum Hydrocarbons EPA 418.1 ☐ Oregon 418.1 ☐	TPH-Gas-BTEX 5030/8015/8020 Gas ☐ BTEX ☐	TPH-8015 Modified Diesel ☐ Hydrocarbon Scan ☐	TPH-HCID	TCLP Metals ☐ VOA ☐ VOA ☐ Semi Pest/Herb ☐	Metals (total or dissolved) List Below	Cyanide	pH, Cond, Cl, SO_4, PO_4, F, Br NO_2, NO_3 (circle)	Nitr-N, COD, Total-P, TKN, TOC (circle)	Total Organic Halides (TOX) 8020	Grain Size		REMARKS
N1 10ft	9/26/94		K6462-1	SED.	1															✓		
N3 10ft	↓		-2	↓	1															✓		
S1 10ft	↓		-3	↓	1															✓		

RELINQUISHED BY:	RECEIVED BY:
Signature	D Storms
Steve Johnson	Signature D Storms
Printed Name	Printed Name
Fishman Env. Services	CAS
Firm	Firm
10/18 11:25	10/28/94 1430
Date/Time	Date/Time

RELINQUISHED BY:	RECEIVED BY:
Signature	Signature
Printed Name	Printed Name
Firm	Firm
Date/Time	Date/Time

TURNAROUND REQUIREMENTS:

___ 24 hr ___ 48 hr ___ 5 day

___ Standard (~ 10-15 working days)

___ Provide Verbal Preliminary Results

___ Provide FAX Preliminary Results

Requested Report Date ___

REPORT REQUIREMENTS

___ I. Routine Report

___ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)

___ III. Data Validation Report (includes All Raw Data)

___ IV. CLP Deliverable Report

INVOICE INFORMATION:

P.O. # ___

Bill to: ___

SAMPLE RECEIPT:

Shipping VIA: ___

Shipping #: ___

Condition: ___

Lab No: K94-1462

SPECIAL INSTRUCTIONS/COMMENTS:

DISTRIBUTION: WHITE - return to originator YELLOW - lab PINK - retained by originator

400-05