Project Status Report II Environmental Site Assessment Old Port Blakely Mill Bainbridge Island, Washington

September 1992

Port Blakely Tree Farms 500 Union Street, Suite 830 Seattle, WA 98101



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SEATTLE EVERETT KENNEWICK FAIRBANKS ANCHORAGE SAINT LOUIS

September 16, 1992

Port Blakely Tree Farms 500 Union Street, Suite 830 Seattle, Washington 98101 DRAFT REVISIONS

Attn: Mr. Charles Wilson

RE: PROJECT STATUS REPORT II: ENVIRONMENTAL SITE ASSESSMENT OLD PORT BLAKELY MILL SITE, BAINBRIDGE ISLAND, WASHINGTON

Shannon & Wilson, Inc. (S&W) has performed an environmental site assessment in the vicinity of the Old Port Blakely Mill Site, Port Blakely, Bainbridge Island, Washington as shown in Figures 1, 2, and 3. Groundwater, test pit soil samples, and former log pond sediment sampling locations are identified in Figure 3, Exploration Locations. Field services were rendered during April 3rd through July 14, 1992 as outlined in the proposed scope modifications section of S&W's Project Status Report, dated March 1991.

You will find the analytical results reported for selected soil, groundwater, and sediment samples in Tables 1 through 6 correlated to specific sampling areas immediately surrounding Port Blakely Harbor.

Upon your review, Shannon & Wilson, Inc. will address each comment or question and submit a final report.

At your convenience, please contact Kimberly Fenske or Frank Pita at (206) 632-8020.

Respectfully,

SHANNON & WILSON, INC.

Kimberly A. K. Fenske

Geoenvironmental Engineer

Frank W. Pita, P.E. P.G.

Vice President Environmental Services

Enclosure: Project Status Report II

EXECUTIVE SUMMARY

This report is a continuation of an environmental site assessment at Port Blakely Harbor, Bainbridge Island, Washington, which includes limited soil and groundwater sampling activities focused on the former mill site area. The purpose of this work was to assess levels of specific metals reported in S&W's March 1991, <u>Project Status Report</u>.

Four additional field activities were recommended in the "1991 report" to further assess metal concentration levels in groundwater and soil matrices in the immediate vicinity of the former mill site. These recommended activities are the subject of this report. State and federal regulatory levels are applied to the analytical results for illustrative comparisons and should not be construed as quantitative comparisons, or a statement of legally applicable standards.

The results indicate that the metal concentration levels in soil, sediment, and groundwater samples are below stringent cleanup levels promulgated by the state of Washington's Model Toxics Control Act (MTCA) and Sediment Quality Standards. Soil, groundwater, and sediment analytical results are listed in Tables 1, 2, and 5, respectively. The toxicity characteristic leachate procedure (TCLP) has been applied to soil samples from test pit nos. 1 and 10 with concentration level results below federal regulatory levels as listed in Table 4. Test pit and sediment samples reported in the "1991 report" are included for comparison in Table 3 entitled, Test Pit Soil Sample Comparisons and Table 6 entitled, Log Pond Sediment Comparisons.

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PROJECT STATUS REPORT II ENVIRONMENTAL SITE ASSESSMENT OLD MILL SITE, PORT BLAKELY HARBOR BAINBRIDGE ISLAND, WASHINGTON

1.0 INTRODUCTION

This report is a continuation of an environmental site assessment at Port Blakely Harbor, Bainbridge Island, Washington, which includes limited soil and groundwater sampling activities focused on the former mill site area. The purpose of this work was to assess levels of specific metals reported in S&W's March 1991, <u>Project Status Report</u>. The previous report will be referred to as the "1991 report" throughout the following discussions.

2.0 PROPERTY LOCATION

Port Blakely Harbor is located near the southeastern corner of Bainbridge Island, Washington, as illustrated in the Vicinity Map, Figure 1 and the Site and Exploration Plan, Figure 2. The property occupies approximately 1,060 acres encircling Port Blakely Harbor as delineated in Figure 1. Environmental site assessment activities were focused on the former millsite area primarily located northeast of the former log pond area or western end of Port Blakely Harbor.

3.0 ENVIRONMENTAL SITE ASSESSMENT

3.1 Project Status Report, March 1991

Shannon & Wilson's "1991 report" indicated that total metal levels were detected in soil and groundwater in the vicinity of the old mill site area and were detected higher than comparable Port Blakely sediments. At the time of the "1991 report", total petroleum hydrocarbons were not detected in any collected samples of soil or groundwater.

The "1991 report" proposed additional work to establish concentration levels of inorganic metals in the immediate mill site area and to determine if the detected levels of arsenic and lead (one sample) were an artifact or representative of general conditions. The present report, Project Status Report II coupled with "1991 report" data results, presents inorganic metal concentrations that have been identified in the former mill site area and Port Blakely Harbor sediments to aid in the assessment of inorganic metal concentration levels in the old mill site vicinity.

In addition, this Project Status Report II compares the sampled concentration levels to the most conservative, potentially applicable, regulatory standards in the state of Washington along with other risk-based standards. The regulations under the State Model Toxics Control Act (MTCA) provide three methods of determining cleanup standards. The Method "A" standards provide the most conservative cleanup level. The Method "A" level for arsenic is based on the Department of Ecology's identification of the background levels in the State Method "A" levels are used here for purposes of comparison to the states most stringent standard.

3.2 Project Status Report II: Field Screening Activities

The Project Status Report II's primary field objective consisted of determining if there was potential risk, as determined by the toxicity characteristic leachate procedure (TCLP), associated with the levels of contamination (i.e., arsenic and lead in groundwater samples) detected and reported in the "1991 report". Soil, groundwater, and sediment samples were taken as described in the four subsections below.

3.2.1 Metal Concentrations In Groundwater and Soil

Three groundwater samples were obtained from the former mill site area at the west coastal end of Port Blakely Harbor as indicated in Figure 3. Well points were driven to 10, 8, and 14-foot depths for wells designated, W1, W2, and W3, respectively. The total metal (unfiltered) analytical results reported for the three groundwater samples were compared to samples obtained for the "1991 report" and available regional (Kitsap county) information concerning the background concentration of metals in groundwater in the Port Blakely area. Analytical results and published Kitsap County data are collated in Table 2 entitled, Groundwater Sample Results, and are for illustrative comparisons.

The Kitsap County groundwater data for shallow wells were far below state and federal regulatory levels. The three groundwater samples collected from the former mill site area were below the state of Washington's MTCA cleanup levels for groundwater.

During field sampling, salt water was evident in the first two groundwater samples (T1198-WP001-100-GW-0 and T1198-WP002-101-GW-0 (W1 and W2)), but not apparent for the third sample designated, W3. Since arsenic is a naturally occurring constituent in freshwater and saltwater, a water sample (T1198-BG004-103-GW-0) from Port Blakely Harbor's former

log pond area was retrieved to serve as a relative metal concentration comparison for the three groundwater samples as listed in Table 3.

A soil sample (T1198-BG-012-SL-0, Table 1) was collected from test pit No. BG (Figure 3) upgradient from the historic mill site area to further assess metal concentration levels. As a comparison, total metal concentrations in the upgradient soil sample were below or equal (Cadmium, 2 ppm.) to the State of Washington's Model Toxic Control Act, Method "A" cleanup levels for soil.

Several pieces of "slag-like" material were discovered during a low tide interval in the former log pond area near the west end of Port Blakely Harbor. The historic use of foundry slag as ship ballast is inferred and its occasional presence may provide the source for the low levels of inorganic metals.

3.2.2 Old Mill Site Test Pit Soil Samples

Test pit soil samples were obtained in close proximity to previous test pit soil sample locations used for the "1991 report". Previous test pit locations were easily identifiable due to surface disturbances and backfill settlement depressions. Test pit locations closely correlated with previous test pit locations to adhere to an imposed protocol of consistent soil sampling approximately one foot above the quasi-static water level in the test pit. In S&W's opinion, this would enable the determination of appreciable change(s) in metal levels and toxicity characteristic leachate procedure results. Observational care was taken to locate the test pits outside the influence of the previous test pit disturbances, but close enough to observe similar undisturbed soil layers as illustrated in the field correlated Logs of Field Test Pits, Appendix A. The field test pit logs were produced during compilation of the "1991 report" and were used as field references.

Soil samples generally consisted of brown, gravelly, silty, fine to medium sand with intermittent debris of red brick fragments, sawdust, and burned wood material. Test pit soil samples were retrieved during a high interval tide cycle. During test pit excavation activities, a waiting period provided time for the water entering the pit bottom to reach a quasi-static level determined by observing water surface movement and periodically measuring the water surface from existing grade level of the test pit rim.

Two duplicate soil samples (T1198-TP1-004-SL-1 and T1198-TP10-011-SL-1) were submitted to the laboratory from Test Pit Nos. 1 and 10 for quality assurance and quality control (QA/QC). Soil samples were collected during a high tide interval approximately one foot above the water level encountered in the test pit.

3.2.3 <u>Toxicity Characteristic Leachate Procedure</u>

Two sample locations (test pit nos. 1 and 10) were chosen to provide a plausible north to south precipitation infiltration range to assess leaching characteristics utilizing the toxicity characteristic leachate procedure (TCLP). The same sampling protocol was utilized as described in the first paragraph of section 3.2.2: Old Mill Site Test Pit Soil Samples.

The TCLP was employed as an indicator for the potential leaching of low levels of contaminants and to determine if the soils pose a substantial presence or potential hazard to human health or the environment. Both samples tested below TCLP federal regulatory levels.

3.2.4 Former Log Pond Sediment Samples

Sediment samples were taken from the former log pond area and at locations along the northerly coastal edge of Port Blakely Harbor as designated and illustrated in Figure 3. Analytical results are collated in Table 5 listing sediment concentration levels for total metals.

The "1991 report" contained samples designated, PBTF-Sed 4a and PBTF-Sed 4b, which are included for comparison in Table 6. Sediments sampled were compared to sediment quality standards of the State of Washington Administrative Code 173-204 (Chapter 173-204 WAC), which while not applicable here, provides a basis of comparison. Sediment sample concentrations occurred below levels regulated by the Washington state sediment standards, widely recognized as the most stringent in the nation.

3.3 Discussion of Field Screening Results

Sources of trace metals are commonly associated with natural processes of chemical weathering, soil leaching, and human activities (Viessman, 1985). When illustratively compared, groundwater metal concentration levels were below state (MTCA) and most federal regulatory levels (except, Barium and Zinc) as shown in Table 2 entitled, Groundwater Sample Results. Copper and zinc regulatory concentrations are secondary standards (aesthetics concerns) recommended for contaminant levels within the interim drinking water standards of the EPA Office of Water

Supply (Viessman, 1985) and currently not included within the State of Washington's Model Toxics Control Act cleanup standards. Total metal analyses for shallow and deep wells on Bainbridge Island were obtained from the Public Utility District No. 1 of Kitsap County (Kitsap County, 1991) located in Poulsbo, Washington for a regional comparison. Kitsap county's groundwater metal concentration levels were below state and federal regulatory levels used in the comparison. It should be noted that this groundwater is not considered a drinking water source.

Table 3 lists test pit total metal concentrations for the sampling event and includes two preliminary soil sample concentrations (TP1-S1 and TP8-S2) previously reported in the "1991 report". Because the sampling was not from an identical test pit, a comparison is made for illustrative purposes, and must not be interpreted quantitatively. Based on these comparisons, the concentration levels of Arsenic, Cadmium, Chromium, Mercury, Selenium, Silver, Copper, Nickel, and Zinc have diminished. The concentration level reduction may be the combined result of different localized soil conditions, higher water solubilities, tidal "flushing", and/or error in test results. Lead concentrations decreased from the preliminary sample designated, TP8-S2, which may be the result of localized conditions produced by historic mill site operations. Barium tends to have a lower solubility in groundwater and this attribute may account for its fairly stable value. None of the regulated metals reported for the test pit soil samples exceeded the State of Washington's MTCA Method "A" cleanup levels for soil.

As indicated in Tables 4 and 5, all TCLP and sediment sample analytical results were well below the federal regulatory levels and State Sediment Quality Standards, respectively.

4.0 CONCLUSIONS

This report presents the results of the environmental site assessment, Project Status Report II, to identify inorganic metal concentration levels in the vicinity of the former mill site area in Port Blakely on Bainbridge Island, Washington. Concentrations of all test pit soil samples, TCLP results, and sediment samples were significantly below or equaled the most stringent state or federal regulatory standards. Groundwater metal concentration levels are low when illustratively compared to current regional, state, and federal regulatory levels.

5.0 <u>LIMITATIONS</u>

The findings we have presented within this Project Status Report II are based on limited research at the facility. They should not be construed as a definite statement regarding all conditions at the property. Shannon & Wilson, Inc. performed this work phase employing our best professional judgment to describe conditions at the property.

The data presented in this Project Status Report II should be considered representative at the time of our observations. Changes in the conditions of the property can occur with time from both natural processes and human activities. Due to such changes, our observations and recommendations applicable to this facility may need to be revised wholly or in part, due to changes beyond our control.

This Project Status Report II was prepared for the exclusive use of Port Blakely Tree Farms, Inc.

SHANNON & WILSON INC.

Kimberly A. L. Fenske

Geoenvironmental Engineer

EXPIRES 5/6/ 93

Frank W. Pita, P.E., P.G. Vice President - Environmental Services

KLF:FWP/klf

9-17-92/T1198-02.LTR/T1198-lkd/lkd

REFERENCES

Public Utility District No. 1 of Kitsap County, <u>Kitsap County Groundwater Management Plan</u> (<u>Draft</u>), dated April 1991.

Viessman, Warren, Jr., and Hammer, Mark J., Water Supply and Pollution Control, Fourth Edition, Harper and Row Publishers, 1985.

TABLE 1
PORT BLAKELY TREE FARM: PORT BLAKELY MILLSITE
TOTAL METALS (1)
TEST PIT SOIL RESULTS (2)

SAMPLE DESIGNATION	FIGURE 3 DESIGNATION	ARSENIC	BARIUM (ppm)	CADMIUM (ppm)	CHROMIUM (ppm)	LEAD (ppm)	MERCURY (ppm)	SELENIUM (ppm)	SILVER (ppm)	COPPER (ppm)	NICKEL (ppm)	ZINC (ppm)
T1198-TP1-003-SL-0	1	11	85	<1	12	55	<1	<1	<1	9	11 .	27
T1198-TP1-004-SL-1, (4)	1	9	45	<1	9	13	<1	1	<1	8	8	23
T1198-TP2-006-SL-0	2	5	26	<1	19	7	<1	<1	<1	34	16	34
T1198-TP3-002-SL-0	3	3	5	<1	2	120	<1	<1	<1	24	2.	13
T1198-TP4-005-SL-0	4	<1	1	<1	<1	18	<1	<1	<1	7	<1	19
T1198-TP5-009-SL-0	5	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
T1198-TP6-008-SL-0	6	<1	1	<1	<1	1	<1	<1	<1	2	1	5
T1198-TP7-007-SL-0	7	4	18	<1	14	7	<1	<1	<1	34	16	34
T1198-TP8-001-SL-0	8	6	300, (5)	<1	10	26	<1	<1	<1	55	10	60
T1198-TP10-010-SL-0	10	5	19	<1	27	7	<1	2	<1	51	26	35
T1198-TP10-011-SL-1, (4)	10	7	23	<1	30	8	<1	<1	<1	46	29	37
T1198-BG-012-SL-0	ВG	8	270, (5)	2, (6) (j)	49	10	<1	2	<1	84	25	51
Potential Regulatory Levels, (6)		20.0		2.0	100.0	250.0	1.0					<u> </u>

(5) The value reported exceeded the calibration range established for the sample.

⁽¹⁾ Total metal by inductively coupled plasma (ICP) method 6010.

⁽²⁾ As reported by Friedman and Bruya, Inc., Seattle, Washington.

⁽³⁾ Parts Per Million (ppm).

⁽⁴⁾ QA/QC duplicate.

⁽⁶⁾ Model Toxic Control Act dated February 1991, Method "A" soil cleanup levels; only for comparison purposes.

⁽j) Soil sample retrieved outside former mill site area; cleanup level based on plant protection.

TABLE 2
PORT BLAKELY TREE FARM: PORT BLAKELY MILLSITE
TOTAL METALS (1)
GROUNDWATER SAMPLE RESULTS (2)

SAMPLE DESIGNATION	FIGURE 3 DESIGNATION	ARSENIC (ppm) (3)	BARIUM (ppm)	CADMIUM (ppm)	CHROMIUM (ppm)	LEAD (ppm)	MERCURY (ppm)	SELENIUM (ppm)	SILVER (ppm)	COPPER (ppm)	NICKEL (ppm)	ZINC (ppm)
T1198-WP001-100-GW-0	W1	<2	3	<0.5	1	<0.5	<1	<1	<0.5	1	1	3
T1198-WP002-101-GW-0	W2	<2	3	<0.5	<0.5	<0.5	<1	<1	<0.5	1	<0.5	7.6
T1198-WP003-102-GW-0	WЗ	2	4	<0.5	1	<0.5	<1	<1	<0.5	1	0.5	2
T1198-BG004-103-GW-0	PORT BLAKELY	<2	<1	<0.5	<0.5	<0.5	<1	<1	<0.5	<0.5	<0.5	2
KITSAP COUNTY, (4)		0.00981	0.195	0.002	0.00872	0.010		0.00481	0.00781		•	0.00
POTENTIAL REGULATORY LEVELS (5) (6)		5.0, (5)	1.0, (6)	5.0 (5)	50.0, (5)	5,0, (5)	2.0, (5)	10.0, (8)	50.0, (8)	1, (6)		5, (8)

⁽¹⁾ Total metal by inductively coupled plasma (ICP) method 6010.

⁽²⁾ As reported by Friedman and Bruys, Inc., Seattle, Washington.

⁽³⁾ Parts Per Million (ppm)

⁽⁴⁾ Kituap County Groundwater Management Plan (Draft) dated April 1991, Appendix H - Shallow Wells.

⁽⁵⁾ Model Toxic Control Act dated February 1991, Method "A" for groundwater cleanup levels; only for comparison purposes.

⁽⁶⁾ Interim Drinking Water Standards of the EPA Office of Water Supply, EPA 570/9-76-003 (Viersman, p. 218-9); only for comparison purposes.

TABLE 3
PORT BLAKELY TREE FARM: PORT BLAKELY MILLSITE
TOTAL METALS (1)
TEST PIT SOIL SAMPLE COMPARISONS (2)

SAMPLE DESIGNATION	FIGURE 3 DESIGNATION	ARSENIC ppm, (3)	BARIUM (ppm)	CADMIUM (ppm)	CHROMIUM (ppm)	LEAD (ppm)	MERCURY (ppm)	SELENIUM (ppm)	SILVER (ppm)	COPPER (ppm)	NICKEL (ppm)	ZINC (ppm)
							<1	<1		9	11	27
T1198-TP1-003-SL-0, (6)	1	11	85	<1	12	55 49	2	18	3	26	21	75
TP1-S1, (7)	1	60	87	- 8	14	49		10				
T1198-TP1-004-SL-1, (5)	1	. 9	45	<1	9	13	<1	1	<1	8	8	23
T1198-TP2-006-SL-0	2	5	26	<1	19	7	<1	<1	<1	34	16	34
T1198-TP3-002-SL-0	3	3	5	<1	2	120	<1	<1	<1	24	2	13
T1198-TP4-005-SL-0	4	<1	1	<1	<1	18	<1	<1	<1	7	<1	19
T1198-TP5-009-SL-0	5	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
T1198-TP6-008-SL-0	6	<1	1	<1	<1	1	<1	<1	<1	. 2	1	5
T1198-TP7-007-SL-0	7	4	18	<1	14	7	<1	<1	<1	34	16	34
	8	6	300, (4)	<1	10	26	<1	<1	<1	55	10	60
T1198-TP8-001-SL-0, (6)	8	110	290	10	29	77	10	25	14	68	30	89
TP8-S2, (7) T1198-TP10-010-SL-0	10	5	19	<1	27	7	<1	2	<1	\$1	26	35
T1198-TP10-011-SL-1, (5)	10	7	23	<1	30	8	<1	<1	<1	46	29	37
T1198-BG-012-SL-0	BG	8	270, (4)	2	49	10	<1	2	<1	84	25	51
Potential Regulatory Levels, (8)	 	20.0	 	2.0	100.0	250.0	1.0					

(6) Sampled April 3, 1992.

⁽¹⁾ Total metal by inductively coupled plasma (ICP) method 6010.

⁽²⁾ As reported by Friedman and Bruya, Inc., Seattle, Washington.

⁽³⁾ Parts Per Million (ppm)

⁽⁴⁾ The value reported exceeded the calibration range established for the sample.

⁽⁵⁾ QA/QC duplicate.

⁽⁷⁾ Sampled October 2, 1990 from same location.

⁽⁸⁾ Model Toxic Control Act dated February 1991, Method "A" soil cleanup levels; only for comparison purposes.

TABLE 4
PORT BLAKELY TREE FARM: PORT BLAKELY MILLSITE
TOXICITY CHARACTERISTIC LEACHATE PROCEDURE (1)
TEST PIT SOIL RESULTS (2)

SAMPLE DESIGNATION	FIGURE 3 DESIGNATION	ARSENIC ppm, (3)	BARIUM (ppm)	CADMIUM (ppm)	CHROMIUM (ppm)	LEAD (ppm)	MERCURY (ppm)	SELENIUM (ppm)	SILVER (ppm)	COPPER (ppm)	NICKEL (ppm)	ZINC (ppm)
T1198-TP1-003-SL-0	1	<0.5	0.1	< 0.5	<0.5	0.1	<0.1	0.1	< 0.1	<0.5	<0.5	<0.5
T1198-TP10-010-SL-0	10	< 0.5	<0.5	<0.5	<0.5	< 0.5	< 0.1	<0.1	<0.1	< 0.5	<0,5	<0.5
Potential Regulatory Levels, (1)		5.0	100	1.0	5.0	5.0	0.2	1.0	5.0	8	a	a

⁽¹⁾ TCLP metals in accordance with 40 CFR ParT 261 et al., only for comparison purposes.

⁽²⁾ As reported by Friedman and Bruya, Inc., Seattle, Washington.

⁽³⁾ Parts Per Million (ppm)

a - Not a TCLP analyte.

TABLE 5
PORT BLAKELY TREE FARM: PORT BLAKELY MILLSITE
TOTAL METALS (1)
LOG POND SEDIMENT RESULTS (2)

SAMPLE DESIGNATION	FIGURE 3 DESIGNATION	ARSENIC ppm, (3)	BARIUM (ppm)	CADMIUM (ppm)	CHROMIUM (ppm)	LEAD (ppm)	MERCURY (ppm)	SELENIUM (ppm)	SILVER (ppm)	COPPER (ppm)	NICKEL (ppm)	ZINC (ppm)
T1198-LP-013-SL-0	13	6	7	<0.5	6	38	<1	<1	< 0.5	24	4	22
T1198-LP-014-SL-0	14	6	11	<0.5	11	41	<1	1	<0.5	27	8	37
T1198-LP-015-SL-0	15	6	9	<0.5	6	29	<1	<1	< 0.5	16	5	23
T1198-LP-016-SL-0	16	9	10	<0.5	5	41	<1	<1	< 0.5	31	5	15
T1198-L.P-017-SL-0	17	8	11	<0.5	7	11	<1	<1	< 0.5	9	8	25
T1198-LP-018-SL-0	18	9	8	<0.5	4	51	<1	<1	<0.5	21	3	25
T1198-LP-019-SL-0	19	5	10	<0.5	9	34	<1	<1	<0.5	44	8	37
T1198-LP-020-SL-0	20	5	12	<0.5	9	54	<1	<1	< 0.5	31	10	41
Potential Regulatory Levels, (5)		57.0		5.1	260	450	0.41	<u> </u>	6.1		1	410

(5) Sediment Management Standards, Table 1, Chapter 173-204 WAC, dated April 1991; only for comparison purposes.

⁽¹⁾ Total metal by inductively coupled plasma (ICP) method 6010.

⁽²⁾ As reported by Friedman and Bruya, Inc., Seattle, Washington.

⁽³⁾ Parts Per Million (ppm)

⁽⁴⁾ Comparison values.

TABLE 6
PORT BLAKELY TREE FARM: PORT BLAKELY MILLSITE
TOTAL METALS (1)
LOG POND SEDIMENT COMPARISONS (2)

SAMPLE DESIGNATION	FIGURE 3 DESIGNATION	ARSENIC ppm, (3)	BARIUM (ppm)	CADMIUM (ppm)	CHROMIUM (ppm)	LEAD (ppm)	MERCURY (ppm)	SELENIUM (ppm)	SILVER (ppm)	COPPER (ppm)	NICKEL, (ppm)	ZINC (ppm)
PBTF-Sed 4a, (4)		12, (a)	8.5	0.3	3.6	4.1	0.8, (a)	3.7	0.6	4.1, (a)	4.3	7.0, (
PBTF-Sed 4b, (4)		15, (a)	2.8	0.3	4.4	4.7	0.9, (a)	4.7	0.4	3.4, (a)	6.0	8.7, (
T1198-LP-013-SL-0	13	6	7	< 0.5	6	38	<1	<1	< 0.5	24	4	22
T1198-LP-014-SL-0	14	6	11	< 0.5	11	41	<1	1	< 0.5	27	8	37
T1198-LP-015-SL-0	15	6	9	< 0.5	6	29	<1	<1	<0.5	16	5	23
T1198-LP-016-SL-0	16	9	10	< 0.5	5	41	<1	<1	< 0.5	31	5	15
T1198-LP-017-SL-0	17	8	11	< 0.5	7	11	<1	<1	< 0.5	9	8	25
T1198-LP-018-SL-0	18	9	8	< 0.5	4	51	<1	<1	<0.5	21	3	25
T1198-LP-019-SL-0	19	\$	10	< 0.5	9	34	<1	<1	<0.5	44	8	37
T1198-LP-020-SL-0	20	5	12	<0.5	9	54	<1	<1	<0.5	31	10	41
otential Regulatory Levels, (5)		57,0		5.1	260	450	0.41		6.1			410

Note

⁽¹⁾ Total metal by inductively coupled plasma (ICP) method 6010.

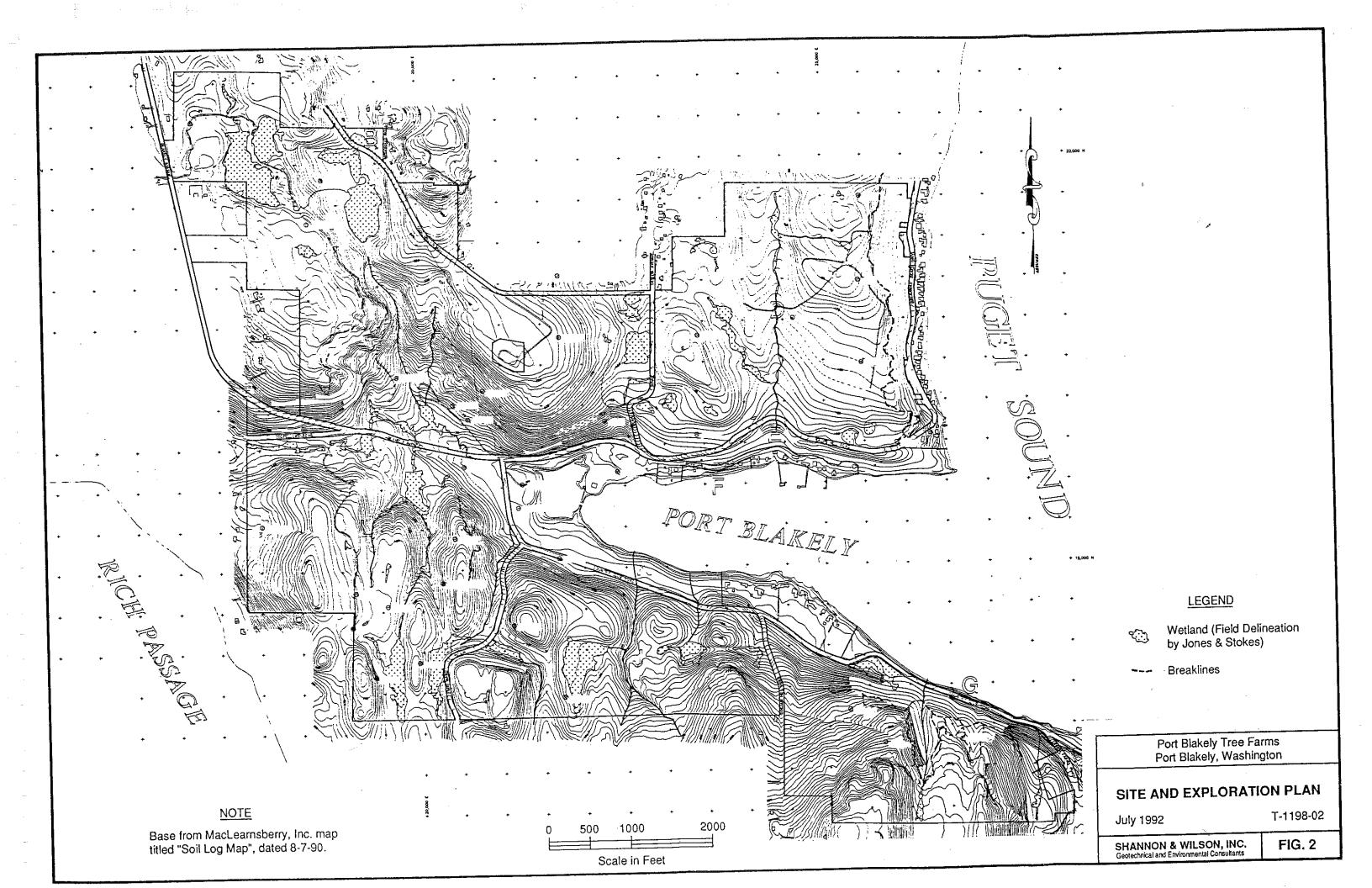
⁽²⁾ As reported by Friedman and Bruya, Inc., Seattle, Washington.

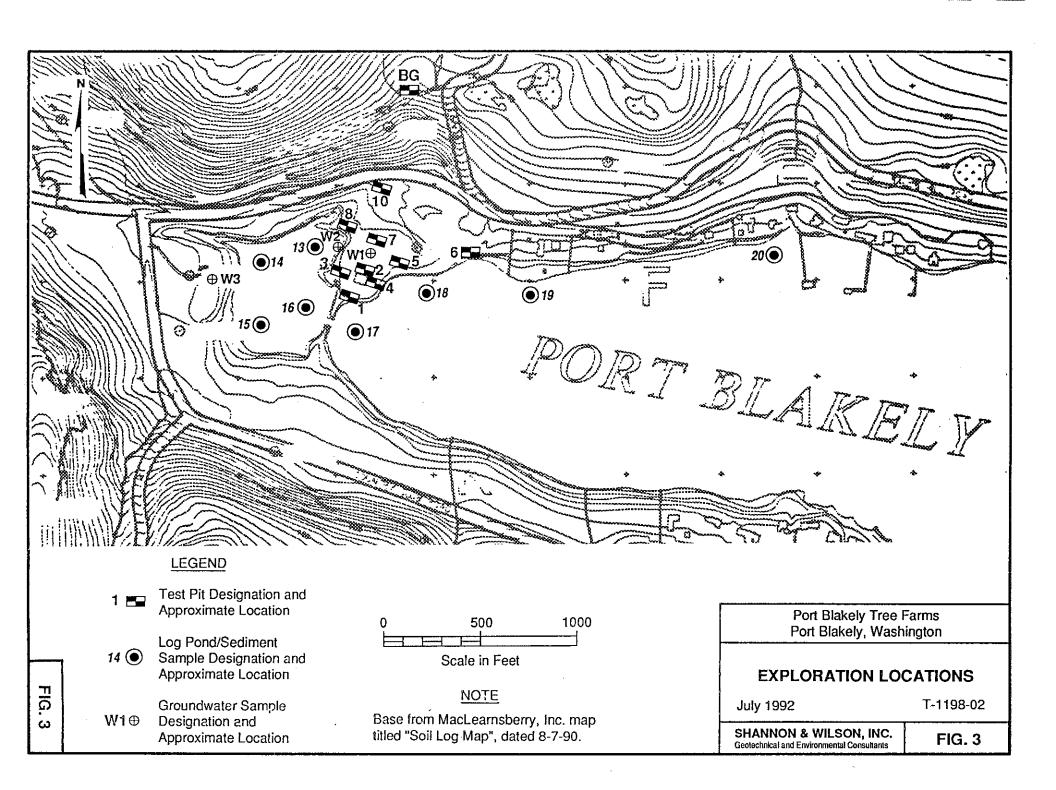
⁽³⁾ Parts Per Million (ppm)

⁽⁴⁾ Sampled October 2, 1990 from same approximate location.

⁽⁵⁾ Sediment Management Standards, Table 1, Chapter 173-204 WAC, dated April 1991; only for comparison purposes.

a: The analyte indicated was also found in the blank sample,





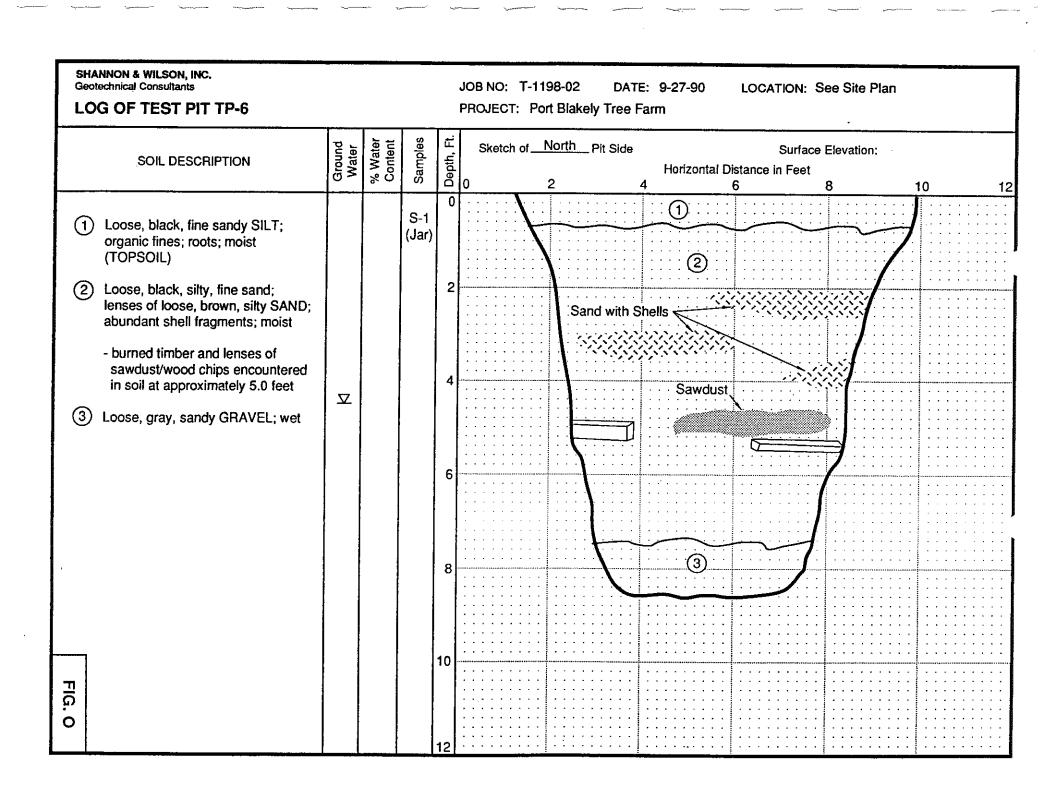
SHANNON & WILSON, INC.

APPENDIX A LOGS OF FIELD TEST PITS

SHANNON & WILSON, INC. JOB NO: T-1198-02 DATE: 9-27-90 LOCATION: See Site Plan Geotechnical Consultants **LOG OF TEST PIT TP-1** PROJECT: Port Blakely Tree Farm Samples Depth, Ft. % Water Content Ground Water Sketch of South Pit Side Surface Elevation: SOIL DESCRIPTION Horizontal Distance in Feet 1 Loose, brown silty, sandy GRAVEL; (2) Loose, black silty, sandy GRAVEL; S-1 abundant charcoal and burned (Jar) timbers; dry; trash includes wire mats and a metal pipe (3) Loose, black silty, sandy GRAVEL; abundant charcoal and burned timbers; moist; soil becomes sandier with depth Timbers Hard to Excavate - brief rotten egg odor at 6.5 feet - no reading on MSA FIG.

SHANNON & WILSON, INC. LOCATION: See Site Plan DATE: 9-27-90 JOB NO: T-1198-02 Geotechnical Consultants PROJECT: Port Blakely Tree Farm **LOG OF TEST PIT TP-2** Depth, Ft. Sketch of South Pit Side Surface Elevation: % Water Content Ground Water Horizontal Distance in Feet SOIL DESCRIPTION 1) Loose, dark brown, silty, medium SAND; dry (TOPSOIL) Red masonry brick mixed in with topsoil; grades into next layer; dry Sides Sloughing Very loose, brown, medium SAND Intensely with shell fragments; stratified layers of SAND with 5-12% shell fragments and layers of SAND Water Content Increases with >12% shell fragments; layers Slightly with Depth and are 1/2" to 3" thick; moist (BEACH **Shell Content Decreases** SANDS) NOTE: Ended test pit due to sides sloughing intensely. FIG.

SHANNON & WILSON, INC. LOCATION: See Site Plan DATE: 9-27-90 JOB NO: T-1198-02 Geotechnical Consultants PROJECT: Port Blakely Tree Farm **LOG OF TEST PIT TP-3** Depth, Ft. Samples Sketch of West Pit Side Surface Elevation: % Water Content Horizontal Distance in Feet SOIL DESCRIPTION 4 With Roots Loose, black SILT; abundant burned timbers; moist; roots in the top 0.5 feet - rotten egg odors at 3 and 4.5 feet - no readings on the MSA Loose, reddish-brown silty, sandy GRAVEL interspersed with loose, gray, silty, sandy GRAVEL; wet Lengthwise Timber at 4.5 Ft. (moved test pit 0.5 ft. west) (2) FIG.



LOCATION: See Site Plan SHANNON & WILSON, INC. Geotechnical Consultants DATE: 9-27-90 JOB NO: T-1198-02 PROJECT: Port Blakely Tree Farm **LOG OF TEST PIT TP-7** Depth, Ft. Surface Elevation: Sketch of South Pit Side Samples % Water Content Horizontal Distance in Feet SOIL DESCRIPTION Loose, black, fine sandy SILT; 2 organic fines; roots; moist S-1 (TOPSOIL) (Jar) Loose, brown, silty SAND, extremely abundant burned timbers; moist - slight rotten egg odor - no registered reading on MSA - lots of burned timbers and at least 4 pilings made excavation extremely difficult Loose, black, silty, sandy ∇ GRAVEL; wet FIG. 0

LOCATION: See Site Plan SHANNON & WILSON, INC. JOB NO: T-1198-02 DATE: 9-27-90 Geotechnical Consultants PROJECT: Port Blakely Tree Farm **LOG OF TEST PIT TP-8** Depth, Ft. Samples Sketch of North Pit Side % Water Content Surface Elevation: Horizontal Distance in Feet SOIL DESCRIPTION Loose, black, fine sandy SILT; ashes and organic fines; dry; roots to 2 feet (TOPSOIL) Roots Loose, brown, silty, fine SAND, moist S-1 Very loose, black, fine sandy SILT and clayey, fine sandy SILT; abundant charcoal; wet - some timbers at about 5.8 feet S-2 ∇ FIG.

SHANNON & WILSON, INC. Geotechnical Consultants JOB NO: T-1198-02 DATE: 9-27-90 LOCATION: See Site Plan **LOG OF TEST PIT TP-10** PROJECT: Port Blakely Tree Farm Depth, Ft. % Water Content Ground Water Sketch of West Pit Side Surface Elevation: SOIL DESCRIPTION Horizontal Distance in Feet 1 Loose, brown, silty SAND; roots; dry (TOPSOIL) (2) Medium, light brown, medium SAND; abundant shell fragments, trace of silt; moist (BEACH SAND) Medium, brown, silty, sandy **GRAVEL**; wet FIG. 0

SHANNON & WILSON, INC.

APPENDIX B <u>LABORATORY ANALYTICAL DOCUMENTATION</u>

ENVIRONMENTAL CHEMISTS

Andrew John Friedman James E. Bruya, Ph.D. (206) 285-8282

3008-B 16th Avenue West Seattle, WA 98119 FAX: (206) 283-5044

April 8, 1992

Kim Fenske, Project Leader Shannon & Wilson, Inc. P.O. Box C-30313 Seattle, WA 98103

Dear Ms Fenske:

Enclosed are the results of the analyses of the samples submitted on April 3, 1992 from Project T-1198-02.

Review of the quality assurance data showed that some of the matrix spike recovery results were unexpectedly low. The poor recoveries appear to be due to the presence of a high level of dissolved solids and/or high levels of interfering elements. Examination of the spike blank and continuing calibration results showed that they were still within the expected range. These results suggest that the low recoveries are the result of a matrix effect associated with the sample. If this is not satisfactory for your particular project, please contact me as soon as possible.

We appreciate this opportunity to be of service to you on this project. If you have any questions regarding this material, or if you just want to discuss any aspect of your projects, please do not hesitate to contact me.

Sincerely

Janet Sheldon, Chemist

JS/dp

Enclosures

ENVIRONMENTAL CHEMISTS

Date of Report: April 8, 1992 Date Submitted: April 3, 1992

Project: T-1198-02

RESULTS OF ANALYSES OF THE SOIL SAMPLES FOR TOTAL METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010 Results Reported as µg/g (ppm)

Sample #	T1198-TP8- 001-SL-0	T1198-TP3- 002-SL-0	T1198-TP1 003-SL-0	T1198-TP1- 004-SL-1
Analyte:			· · · · · · · · · · · · · · · · · · ·	<u></u>
Arsenic	6 ⁻	3	11	9 .
Barium	300 ve	5	85	45
Cadmium	<1	<1	<1	<1
Chromium	10	2	12	9
Lead	26	120	55	13
Mercury	<1	<1	<1	<1
Selenium	<1	<1	<1	1
Silver	<1	<1	<1	- <1
Copper	5 5	24 •	9	8
Nickel	10	2	11	8
Zinc	60	13	27	23

ve - The value reported exceeded the calibration range established
for the sample.

ENVIRONMENTAL CHEMISTS

Date of Report: April 8, 1992 Date Submitted: April 3, 1992 Project: T-1198-02

RESULTS OF ANALYSES OF THE SOIL SAMPLES FOR TOTAL METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010 Results Reported as µg/g (ppm)

Sample #	T1198-TP4- 005-SL-0	T1198-TP2- 006-SL-0	T1198-TP7- 007-SL-0	T1198-TP6- 008-SL-0
Analyte:				
Arsenic	<1 .	5	4	<1
Barium	1	26	18	1
Cadmium	<1	<1	<1	<1
Chromium	<1	19	14	<1
Lead	18	7	7	1
Mercury	<1	<1	<1	<1
Selenium	<1	<1	<1	<1
Silver	<1	<1	<1	<1
Copper	7	34 ·	34	2
Nickel	<1	16	16	1
Zinc	19	34	34	5

ENVIRONMENTAL CHEMISTS

Date of Report: April 8, 1992 Date Submitted: April 3, 1992

Project: T-1198-02

RESULTS OF ANALYSES OF THE SOIL SAMPLES FOR TOTAL METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010 Results Reported as µg/g (ppm)

Sample #	T1198-TP5- 009-SL-0	T1198-TP10- 010-SL-0	T1198-TP10- 011-SL-1	T1198-BG- 012-SL-0
Analyte:	•			<u></u>
Arsenic	<1 .	5	7	8
Barium	1	19	23	270 ve
Cadmium	<1	<1	<1	2
Chromium	<1	27	30	49
Lead	<1	7	8	10
Mercury	<1	<1	<1	<1
Selenium	<1	2	<1	2
Silver	<1	<1	<1	<1
Copper	<1	51 .	46	84
Nickel	<1	26	29	25
Zinc	<1	35	37	51

ve - The value reported exceeded the calibration range established for the sample.

ENVIRONMENTAL CHEMISTS

Date of Report: April 8, 1992 Date Submitted: April 3, 1992

Project: T-1198-02

RESULTS OF ANALYSES OF THE SOIL SAMPLES FOR TOTAL METALS BY INDUCTIVELY COUPLED PLASMA (ICP) METHOD 6010 Results Reported as µg/g (ppm) Ouality Assurance

Sample #	Method Blank	T1198-TP10-011-SL-1 (Duplicate)	T1198-BG8-012-SL-O
Analyte:	•		······································
Arsenic	<1	6	7
Barium	<1	22	290 ve
Cadmium	<1	<1	2
Chromium	<1	27	51
Lead	<1	7	11
Mercury	<1	<1	< 1
Selenium	<1	3	<1
Silver	<1	<1	<1
Copper	<1	54	88
Nickel	<1	26	26
Zinc	<1	36	5 5

ve - The value reported exceeded the calibration range established
for the sample.

SHANNON & WILSON, INC.

APPENDIX C
CHAIN-OF-CUSTODY FORMS

1111 10 11 11 11 Chruz-OH 77 Remarks/Matrix (4=45 Note Change Relinquished By: Dele: Laboratory -Date: Received By: Page . Affin'i Selent Son Analysis Parameters/Sample Container Description Printed Name: Printed Name: Company company: Signature Signature: X X) To d 4 4 9 b 4 4 (include preservative if used) N Ň Relinquished By: Date Date: Received By: Chain of Custody Record Date: 4-3-42 Printed Name: Printed Name Signature: Company: Signature: Company 0.00 x 00000 Date: 4-5-47 Relinquished By: 1, 50 CASTICAL FORMATION Time: 510 Thereta Time: MM PENSKE Received By: Printed Name: Date 1000 Company Printed Name > > > Signature: Company 39 Date Sampled 43 0940 433 2940 41399 4347 4 3 32 1050 413992 372 92 1203 4 372 Distribution: White - w/shipment - returned to Shannon & Wilson w/ Laboratory /eport Yellow - w/shipment - for consignee files
- Pink - Shannon & Wilson - Job File (1) 77 7 J 0855 Sample Receipt Total Number of Containers 21150 132 1025 Received Good Cond./Cold 1005 22 COC Seals/Intact? Y/N/NA E (aftach shipping bill, If any) 28384/85 12/63 80/20 63 68/88 16/06 66/86 Delivery Method: STANDARD 1118-TPS-009-SL-D 28400/01 36/46 16/95 5430 Fairbanks Street, Suite 3 Anchorage, AK 99518 (907) 561-2120 Shannon & Wilson, Inc. 400 N. 34th Sheet, Suhe 100 11500 Clive Bwd., Suhe 276 Seetife, WA 96103 St. Loufe, MO 63141 (208) 632-8020 (314) 872-8170 Lab No. (Cocto : HO42, HO43 198 nstructions 1198-TP6-008-51-0V J198-17P10-010-5L-b Project Number: _T-//9/8-02 **□** 7198-TP2-006-51-4 11198-TP1-003-51-4 0-12-100-80T-8P1/7 Contact: KIM FELISKE T1198-TP1-004-51-7 1198-707-007-SP11 TII98-TP3-002-SI-17198-TP4-005-56-C Project Information Requested Turn Around Time: Ongoing Project? Yes X 7 Sample Identify 2056 Hil Road Fairbanks, AK 99707 (907) 479-0800 Special instructions: الم الح Project Name: Sampler:

No. 10378

Page 2 of 2 Laboratory 中日工 Attn:			Seale De Constitution de la cons	Remarks/Matrix	140 × 11/2	7							Streture: Time		Printed Name: Date:	Company:	Received Rv. 9	ë	Printed Name: Date:	Company:
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Chain of Custody Record	Analys	\. ~ `	11									Relinquished By: 1,	Signature: Time: 1510	Printed Name: Dale: U = X-45	TENSKE	SHANNON! WILSON	Received By	015t :mm 1910	Printed Name:	Company
	6430 Feirberks Street, Suite 3 Anchorage, AK 99518 (907) 661-2120		Lab No. Time Sar	4 28404/65 1203 4	J 06/07 1252 4			/				330-02	COC Seals find and Value	_	1 -	(aftach shipping bill, if any)	Instructions (1)		14042, 14043)	white - Wahlpment - returned to Shannon & Wilson w/ Laboratory report Yellow - w/stripment - for consignee files Pink - Shennon & Wilson - Job File
400 N. 34th Street, Suite 100 11500 Olive Blvd., Suite 276 Sentite, WA 99103 St. Louis, MO 63141 (206) 632-8020 (314) 872-8170	2055 Hill Road 6430 F Felichenke, AK 99707 Archot (907) 479-0600 (907) 5		Sample Identify	TIM8-TP10-011-SL-	T1198-868-012-51-0						Displace Information		4	Contact: KIM FENSKE	Project?	Sampler: XH/TH	Requested Turn Around Time;	1	(COC#5: 140	

F-19-91/UR

WATER/SEDIMENTS m Page 1 of Laboratory 丰色 7-15-92 (8:55 Remarks/Matrix Relinquished By: ë G Date ettn: Received By Se de la Constitución de la cons Analysis Parameters/Sample Container Description (Include preservative if used) Primted Neme Printed Name Signature Company: Company: Signature Relinquished By: 2, Daile: Date: Received By Chain of Custody Record Date: 1-15-92 Printed Name. Date: 4-13 Phinted Name: Signature: Company: Signature: Time: OS 45 10 1 0 H SHANNED & WILSON Time: 8259 Vin Jenetha KIM FENSKE Relinquished By: sey monte Received By: they man FBI Printed Name Printed Name Signature: Company: Signature: 기부약기 7/14/92 17/14/92 Sampled COLXEDYRATIONS White - w/shipment - returned to Shennon & Wilson w/ Laboratory report Yellow - w/shipment - for consignee files Pink - Shennon & Wilson - Job File Sample Receipt Total Number of Containers 1140 1455 Received Good Cond, Cold 의보 80/ COC Seals/Intact? Y/N/NA Laver. (attach shipping bill, If eny) Delivery Method: T1198-WP001-100-04-0(3 1142 Shannon & Wilson, Inc. 5430 Fairbanks Street, Sulte 3 Anchorage, AK 99518 (907) 561-2120 17198-WPOOZ-101-64-6 (3/193, T1198-WP003-102-64-0(3/194, T1198-BG004-103-64-0(7/195-11500 Offee Blvd., Suite 276 St. Louis, MO 63141 (314) 672-8170 Lab No. 5 DAY Instructions CALL TH ABOVE REGULATIONS Ongoing Project? Yes [X] No Sampler: KIM FEAUSIVE Project Number: T- 1198-62 Contact: VIM FELLSKE Project Information Requested Turn Around Time: Sample Identity 400 N. 34th Street, Sulta Seettle, WA 96103 Special instructions: 2055 Hill Road Feirbenks, AK 99707 (907) 479-0800 Project Name: (208) 632-8020 Distribution:

7-75-E