VOLUME IV:
INTERIM ACTION WORK PLAN—FINAL

FORMER RAYONIER PULP MILL SITE

Port Angeles, Washington

Prepared for

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CONTENTS

CONTENTS (CONTINUED)

CONTENTS (CONTINUED)

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

ARAR	applicable, relevant, and appropriate requirement
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene, and xylene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CLARC	Cleanup Levels and Risk Calculations
COC	contaminant of concern
cy	cubic yard
CZMA	Coastal Zone Management Act
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESI	expanded site investigation
FCR	Field Change Request
FOL	Field Operations Lead
GPS	Global Positioning System
HDPE	high density polyethylene
IAWP	Interim Action Work Plan
MLLW	mean lower low water
MTCA	Model Toxics Control Act
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
POTW	publicly owned treatment works
PPE	personal protective equipment
ppm	parts per million
QAPP	Quality Assurance Project Plan
QC	quality control
Rayonier	Rayonier, Inc.

ACRONYMS AND ABBREVIATIONS (continued)

RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
SHSP	Site Health and Safety Plan
SMA	Shoreline Management Act
SOP	Standard Operating Procedure
T/E	threatened and endangered
TCLP	Toxicity Characteristic Leachate Procedure
TPH-D	total petroleum hydrocarbons-diesel
TPH-HO	total petroleum hydrocarbons-heavy oil
Tribe	The Lower Elwha Klallam Tribe
TSCA	Toxic Substances Control Act
USC	United States Code
VOC	volatile organic compound
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WTPH-D	Washington total petroleum hydrocarbons – diesel

1. INTRODUCTION

1.1 BACKGROUND

This Interim Action Work Plan (IAWP) is prepared for the former Rayonier pulp mill site, located in Port Angeles, Washington, and owned by Rayonier, Inc. as part of an agreement among the Washington State Department of Ecology (Ecology), the Lower Elwha Klallam Tribe (the Tribe), and Rayonier, Inc. The former Rayonier pulp mill site, located at 700 North Ennis Street, occupies approximately 80 acres on the northern coast of Washington's Olympic Peninsula bordering on the Strait of Juan de Fuca (Figure 1-1). Until the Rayonier pulp mill was dismantled in 1997, it operated as a dissolving sulfite pulp mill that produced acetate, pulp for specialty paper, fluff, and viscose grade pulps.

Previous site investigations have been conducted at the former Rayonier pulp mill site which have provided data that characterized the soil conditions and the extent of chemical contamination at the mill site. Coupled with an understanding of past operations at the Rayonier site, these data were used to identify three sites at the mill for interim actions focused on soil and sediment remediation (Figure 1-2). For the IAWP, the three sites include:

1. Ennis Creek – Finishing Room Area (northern portion of creek)
2. Former Fuel Oil Tank No. 2 (southwest area of the site)
3. Former Machine Shop (in the former Engineering Building)

Ennis Creek and the Former Fuel Oil Tank No. 2 sites were selected because partial cleanup actions had been conducted at these locations. However, the previous actions did not completely remove all of the known or suspected contamination. The Machine Shop has been selected as the third interim action because oil contamination was noted on the ground after the Engineering Building was removed. This area is currently covered with plastic to prevent migration of contaminants and will remain that way until the interim action is implemented.

The IAWP is Volume IV of a four-volume set. Volumes I through III were developed for the Marine Environment Remedial Investigation (RI) and include the Marine RI Work Plan (Volume I), the Sampling and Analysis Plan (SAP) (Volume II), and the Quality Assurance Project Plan (QAPP) (Volume III).

1.2 PURPOSE

The purpose of this plan is to present the selected interim actions for the three locations on the former Rayonier pulp mill site that are known or suspected to have contamination that exceeds regulatory criteria. As stated in Washington State Model Toxics Control Act (MTCA) (Washington Administrative Code [WAC] 173-340-430), an interim action is distinguished from a cleanup action in that an interim action need not address the cleanup of the entire site. The cleanup action for the mill site will be an outcome of the remedial investigation/feasibility study (RI/FS) and will include addressing contamination in soils and groundwater across the mill site.

Three sites were selected at the former Rayonier pulp mill for interim actions to help expedite the cleanup of the site. It is the objective of the interim actions to achieve cleanup standards, as detailed in Section 3.

The three locations and the contaminants of concern include the following:

- Ennis Creek in the vicinity of the former Finishing Room (total petroleum hydrocarbons (TPH) and polychlorinated biphenyls (PCBs))
- Former Fuel Oil Tank No. 2 (TPH)
- Former Machine Shop (TPH, metals, PCBs, and solvents)

The selected interim action alternatives are based on data from previous investigations and remedial actions. The interim actions presented here are anticipated to be conducted during the summer of 2002, concurrent with RI activities.

1.3 WORK PLAN ORGANIZATION

The IAWP was prepared in accordance with Ecology's Guidance for Interim Actions (WAC 173-340-430). The organization of the IAWP is presented below:

- Section 1: Introduction – background, purpose, organization, and regulatory framework
- Section 2: Summary of Previous Investigations – description of previous investigations identifying affected media and contaminants of concern for each interim action
- Section 3: Cleanup Levels – cleanup levels for each contaminant of concern
- Section 4: Interim Actions – interim action objectives, alternatives, comparison of alternatives, and selected interim action

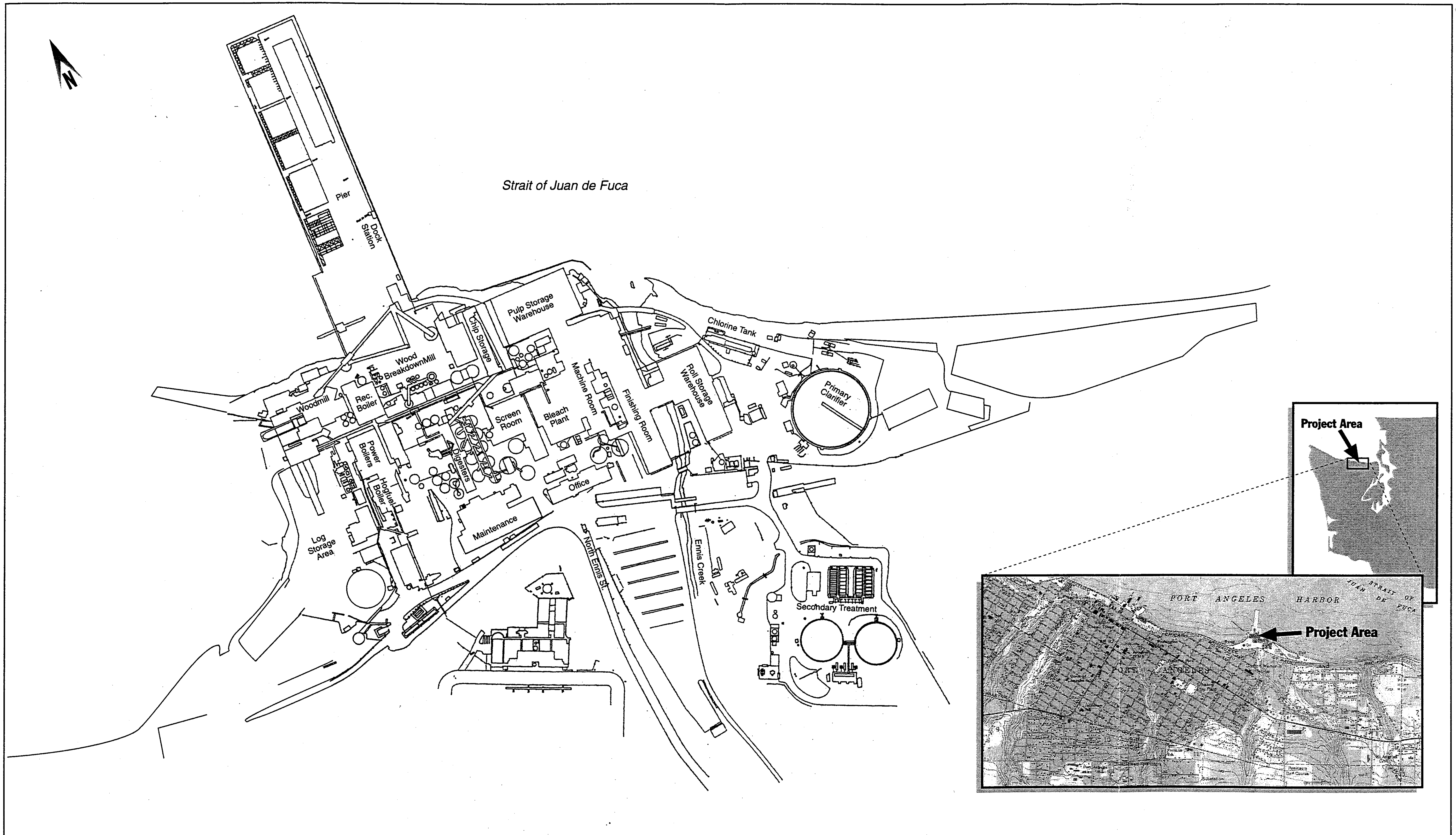

Figure 1-1. Former Rayonier Pulp Mill Vicinity Map

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Figure 1-2
Former Rayonier Pulp Mill
Interim Action Locations

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- Section 5: Sampling and Analysis – sampling locations and laboratory analysis, protocols and procedures, and data quality objectives
- Section 6: Documentation – site logbooks, photographs, sample logs
- Section 7: Reporting
- Section 8: Schedule
- Section 9: References

1.4 REGULATORY FRAMEWORK

Both U.S. Environmental Protection Agency (EPA) and Ecology have conducted routine regulatory compliance inspections at the former Rayonier pulp mill site. In 1997, EPA initiated a site assessment and hazard ranking scoring process for the former Rayonier pulp mill site to determine if the site should be recommended for the National Priorities List (NPL) under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). An expanded site investigation (ESI) was conducted in support of this effort (E&E 1998). Although the former Rayonier pulp mill site scored high enough to qualify for consideration to be listed on the NPL, EPA opted to defer the listing and allow a CERCLA protective cleanup to proceed under the direction of Ecology. EPA, Ecology, and the Tribe formally agreed to the deferral in a Deferral Agreement (EPA, Ecology, and the Tribe, 2000).

As a result of the Deferral Agreement, site evaluation and remediation at the former Rayonier pulp mill site is being conducted under MTCA and implementing regulations (WAC 173-340). MTCA requires that all cleanup activities, including interim actions, comply with applicable state and federal laws and regulations, including requirements that Ecology determines to be applicable or relevant and appropriate requirements (ARARs). Potential ARARs for the interim actions are summarized below.

- **MTCA (Chapter 70.105D, Revised Code of Washington [RCW]; Chapter 173-340 WAC).** MTCA is Washington State's contaminated site cleanup law. Through MTCA, Ecology established cleanup standards and regulations to protect citizens and the environment. MTCA cleanup standards for the interim actions are addressed in Section 3.
- **Toxic Substances Control Act (TSCA) (40 Code of Federal Regulations [CFR] Part 761).** TSCA establishes regulatory requirements for the disposal of PCBs and materials containing PCBs, including contaminated soil. Under TSCA, PCB

concentrations greater than 50 parts per million (ppm) must be disposed via specific means identified in TSCA.

- **Federal Archaeological Resources Protection Act (16 United States Code [USC] 470aa-ll; 43 CFR Part 7).** This federal statute and implementing regulations are applicable if any work along the shoreline (debris removal, excavation) should uncover evidence of archaeological resources (e.g., shell middens). The Tribe will be notified and closely involved if archaeological materials are identified. This work plan will be reviewed by an archaeologist before final publication.
- **Federal Endangered Species Act (ESA) (16 USC 1531 et seq.; 50 CFR Parts 17, 225, 402).** ESA protects fish, wildlife, and plants that are threatened or endangered (T/E) with extinction. T/E species that occur or may occur in the project area include Puget Sound chinook salmon, bull trout, and bald eagles. The requirements of the ESA apply to the interim actions that may affect or impact an ESA-listed T/E species or designated critical habitat.
- **Federal Coastal Zone Management Act (CZMA) (16 USC 1451, 1453).** The federal CZMA requires that federal agencies conducting activities affecting the coastal zone must ensure that the activities are consistent with the approved state CZM program. Under this definition of shoreline provided in 16 USC 1453, the beach and most of the project site are within the coastal zone.
- **Washington State Shoreline Management Act (Chapter RCW 90.58; Chapters 173-, 173-16, 173-22, and 173-27 WAC).** Washington State manages its coastal zones through the Shoreline Management Act (SMA). The substantive requirements of this statute and implementing regulations are applicable to construction activities along the shoreline (extending 200 feet). WAC 173-27-060 (1) discusses the applicability of RCW Chapter 90.58 to federal lands and agencies within the coastal counties, including Clallam County.
- **Washington State Solid Waste Management Act (Chapter 70.95 RCW; Chapter 173-351 WAC).** Requirements for handling, siting, storage, and disposal of solid waste are applicable to materials generated from project activities that are disposed of as waste.
- **State Sediment Management Standards (WAC 173-204).** The purpose of these standards is to reduce and ultimately eliminate adverse effects on biological resources and significant health threats to humans from surface sediment contamination. These

standards apply to marine, low salinity, and freshwater surface sediments in the vicinity of the site.

- **State Water Quality Standards for Surface Waters (WAC 173-201A) and the Water Pollution Control Act (RCW 90.48).** The purpose of these standards is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment, and the propagation and protection of fish, shellfish, and wildlife. Surface waters of the state of Washington includes lakes, rivers, ponds, streams, inland waters, saltwaters, and all other surface waters and water courses within the jurisdiction of the state of Washington. Port Angeles Harbor, the Strait of Juan de Fuca, and Ennis Creek are surface waters of the state of Washington.
- **Construction Projects in State Waters (RCW 77.55) and its Associated Hydraulic Code Rules (WAC 220-110).** These regulations provide for the protection for all fish life during the construction of hydraulic project(s) or performance of other work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. Remedial actions along Ennis Creek would be subject to these regulations.
- **State Environmental Policy Act (SEPA) (RCW 43-21C; WAC 197-11).** SEPA provides the framework for state agencies to consider the environmental consequences of a proposal before taking action. The proposed interim actions described in this work plan contain engineering controls and comply with other ARARs such that adverse impacts to the environment will be minimized.

In addition to the ARARs listed above, substantive requirements for the Ennis Creek – Finishing Room Area Interim Action are provided in Appendix B.

2. SUMMARY OF PREVIOUS INVESTIGATIONS

For the three interim actions, previous investigation results were evaluated to determine the affected media and contaminants of concern. This evaluation was based upon the primary focus for each interim action:

- **Ennis Creek – Finishing Room Area –** sampling of soils remaining between the sheetpile wall and Ennis Creek; sampling of sediments within Ennis Creek; removal of the steel sheetpiling and relocation of some of the protective riprap; removal of soils/sediments above the cleanup level established in the IAWP; removal of remaining concrete pipe supports; removal of groundwater monitoring wells and sumps in the Finishing Room area; replacing riprap along the north bridge; introduction of surface water flow into a portion of the previous Finishing Room area
- **Former Fuel Oil Tank No. 2 –** sampling soil in vicinity of former fuel oil tank No. 2; removal of soil above the groundwater table exceeding the cleanup level established in the IAWP; backfilling the excavation
- **Former Machine Shop –** sampling soil beneath the former machine shop; cleaning concrete supports; removal of soil above the groundwater table exceeding the cleanup level established in the IAWP; backfilling the excavated area

2.1 ENNIS CREEK —FINISHING ROOM AREA

Several interim actions have previously been completed in the area of the former Finishing Room, just west of Ennis Creek. A steel sheetpile wall and protective riprap installed between Ennis Creek and the previous Finishing Room remain in place.

A portion of the steel sheetpile wall and riprap to be removed is shown in Photo 1.

Photo 2 shows the riprap and pipe support along the western side of Ennis Creek. Several monitoring wells within the area of the former Finishing Room are also visible. A second pipe support on the eastern shore of Ennis Creek does not show in the photo, but will also be removed.

Photo 3 shows the riprap and pipe support along the western side of Ennis Creek. Some of the riprap and the pipe support will be removed during this interim action.

During a chemical safety audit in May 1989, personnel discovered an oil sheen on Ennis Creek. The sheen appeared to originate from riprap located on the west bank of Ennis Creek, next to the Finishing Room. Subsequent investigations conducted by Rayonier identified

Photo 1

Photo 2

Photo 3

concentrations of petroleum and PCBs in underlying shallow soils. The petroleum and PCBs came from past releases of hydraulic fluid from several pulp baling presses in the Finishing Room. Rayonier installed absorbent pads and containment structures to collect the leaking oil.

Oil-absorbent booms were also placed in Ennis Creek, and Rayonier installed a recovery system to intercept and collect oil migrating towards Ennis Creek (Foster Wheeler Environmental, 1997). A site characterization study, begun in October 1989, identified a free-phase oil plume approximately 65 by 160 feet under the eastern side of the Finishing Room and extending to Ennis Creek. Based on this study, Rayonier proposed an interim remedial action plan to mitigate oil seepage into Ennis Creek. Rayonier completed the former Rayonier pulp mill site investigation in the Finishing Room area in 1990 and began operating an oil recovery system in 1991, using three oil/water extraction wells.

In August 1990, Ecology notified Rayonier that the Finishing Room cleanup would take place under a MTCA consent decree. Rayonier and Ecology negotiated an agreed order to complete a feasibility study to determine what cleanup technologies would be most suitable for the type of contamination on the former Rayonier pulp mill site. In February 1992, Ecology issued a MTCA enforcement order to complete site cleanup. The enforcement order required the removal of contaminated soils, control of water runon and runoff to the Finishing Room area, and blocking of hydraulic oil migration towards Ennis Creek. In 1993, Rayonier excavated a 160-foot-long, 8-foot-wide, and 8-foot-deep trench along the western side of the sheet pile wall that bordered Ennis Creek (SECOR, 1993). Extraction pumps pumped groundwater through an oil/water separator and then routed the water through the former Rayonier pulp mill site's waste treatment system. The recovered hydraulic oil was discharged into a holding tank for off-site disposal.

During Rayonier's site investigation, soils beneath the Finishing Room were found to have concentrations of hydraulic oil up to 52,000 mg/kg and concentrations of PCBs up to 56 mg/kg (Ecology, 1992). In 1998, following removal of the Finishing Room building, Ecology and Rayonier signed an agreed order for the cleanup of affected soils and groundwater at the Finishing Room site. The agreed order included a work plan, prepared by SECOR, which called for removal of contaminated soils in the Finishing Room hydraulic area to meet MTCA Method B cleanup level requirements of 1,000 mg/kg of TPH and 10 mg/kg of PCBs. Contaminated soils in the load center transformer room area were to be removed to meet TSCA cleanup levels for PCBs (1 mg/kg).

Rayonier removed more than 8,300 tons of soil in the Finishing Room project area between September and December of 1998. An estimated 166,835 pounds of TPH and 27.17 pounds of PCBs were removed with the contaminated soils. Excavation soil samples were analyzed by an on-site mobile laboratory to confirm whether MTCA Method B and TSCA cleanup levels were being met. Statistical analysis of the confirmation soil sample data demonstrated compliance with the agreed order (SECOR, 1999). The confirmation samples collected after the 1998 Interim Action are presented in Figure 2-1 and Table 2-1. The area east of the sheetpiling was not addressed during the 1998 phase. Investigation and remediation activities in the Finishing Room area have been conducted in accordance with the provisions described in Enforcement Order DE 92TCI029 and Agreed Order DE 98SW-S288, issued to Rayonier by Ecology in 1992 and 1998, respectively. Four groundwater monitoring wells (FR-1, FR-2, FR-3, FR-4) were installed after the excavation and screened between 3 and 15 feet below ground surface (Figure 2-1). Pursuant to the requirements of the agreed order, quarterly sampling of groundwater from compliance wells FR-1, FR-2, FR-3, and FR-4, installed downgradient of the area, and surface water sampling from Ennis Creek have occurred. Results of groundwater and surface water sampling through the fourth quarter of 1999 indicated concentrations of TPH and PCBs above laboratory detection limits are no longer

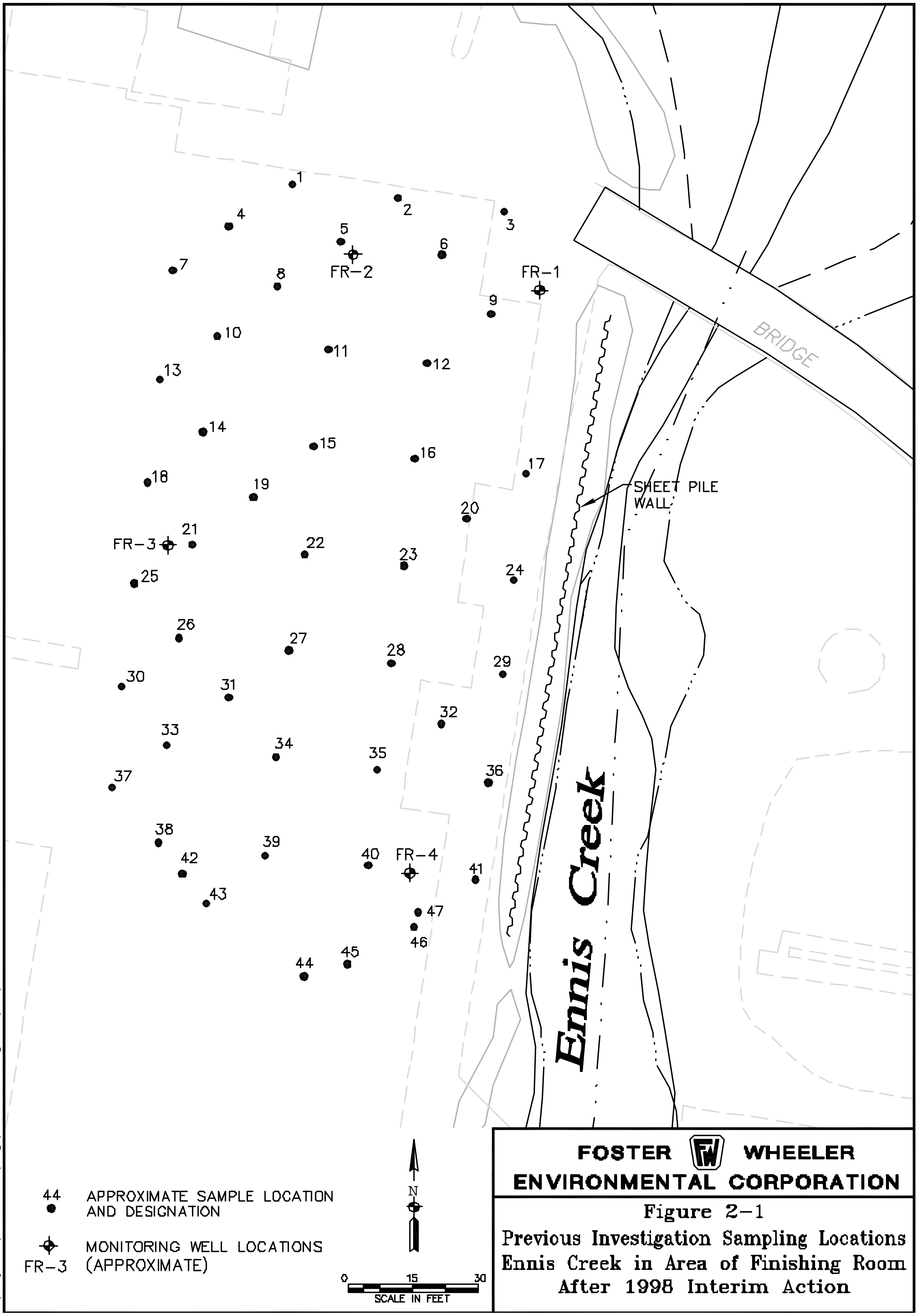

Figure 2-1
Previous Investigation Sampling Locations
Ennis Creek in Area of Finishing Room
After 1998 Interim Action

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Table 2-1. Concentrations of Detected Chemicals in Soil West of Ennis Creek (Finishing Room Area Following the 1998 Interim Action)

Sample Location	Sample ID[1/]	Date Collected	TPH as Heavy Oil (mg/kg)[2/]	PCBs (mg/kg)
1	North Wall-3	10/13/98	590	0.2
2	North Wall-2	10/13/98	ND	ND
3	North Wall-1	10/13/98	ND	ND
4	Comp 2-4	10/13/98	ND	ND
5	Comp 2-1-(2)	10/13/98	ND	ND
6	Comp 1-4-(2)	10/13/98	650	ND
7	West Wall-1	10/13/98	1050	NA
8	Comp 2-5	10/13/98	115	ND
9	Comp 1-5-(3)	10/13/98	800	ND
10	Comp 2-3-(2)	10/13/98	180	ND
11	Comp 2-2-(2)	10/13/98	65	ND
12	Comp 1-3-(2)	10/13/98	670	ND
13	West Wall-8	10/13/98	ND	ND
14	Comp 4-4-(1)	10/13/98	58	ND
15	Comp 4-1-(3)	10/13/98	ND	ND
16	Comp 3-4-(3)	10/13/98	220	ND
17	Comp 3-1-(3)	10/13/98	480	ND
18	West Wall-9	10/13/98	30	ND
19	Comp 4-5-(1)	10/13/98	150	ND
20	Comp 3-5-(3)	10/13/98	45	ND
21	Comp 4-3-(1)	10/13/98	ND	ND
22	Comp 4-2-(3)	10/13/98	300	ND
23	Comp 3-3-(2)	10/13/98	ND	ND
24	Comp 3-2-(2)	10/13/98	640	ND
25	West Wall-10	10/13/98	ND	ND
26	Comp 6-4-(1)	10/13/98	320	ND
27	Comp 6-1-(2)	10/13/98	230	ND
28	Comp 5-4-(1)	10/13/98	790	ND
29	Comp 5-1-(3)	10/13/98	670	0.27
30	West Wall-11	10/13/98	850	ND
31	Comp 6-5-(1)	10/13/98	ND	ND
32	Comp 5-5-(2)	10/13/98	1100	NA
33	Comp 6-3-(3)	10/13/98	ND	ND
34	Comp 6-2-(3)	10/13/98	ND	ND
35	Comp 5-3-(2)	10/13/98	410	0.06
36	Comp 5-2-(2)	10/13/98	420	ND
37	S-Wall-7	10/13/98	110	ND
38	Comp 8-4-(1)	10/13/98	71	ND
39	Comp 8-1-(1)	10/13/98	ND	ND
40	Comp 7-4-2	10/13/98	ND	ND
41	Comp 7-1-(2)	10/13/98	140	ND
42	S-Wall-11	10/13/98	120	ND
43	S-Wall-10	10/13/98	ND	ND
44	S-Wall-12	10/13/98	ND	ND
45	Comp 7-3-(a)	10/13/98	ND	ND
46	S-Wall-8	10/13/98	ND	ND
47	Comp 7-5-(2)	10/13/98	ND	ND
1998 Interim Action Cleanup Level			1,000	10
Proposed Interim Action Cleanup Level			2,000	1

Notes:

1/ All samples with a "Comp" designation were four-point composite samples distributed evenly in a grid over the excavation area.

2/ Samples were also analyzed for TPH as diesel. No TPH as diesel was detected at or above the method detection limits in the analyzed samples.

ND – Not detected at or above the method detection limit which is 40 mg/kg for TPH and 0.05 mg/kg for PCBs

NA – Not analyzed

Source: Finishing Room Project Area Interim Action Report, SECOR, 1999 present (Landau, 1999). This proposed interim action is intended to remove the sheet pile wall, soil, and riprap associated with the western stream bank of Ennis Creek.

2.1.1 Affected Media

Based upon previous studies performed in the Finishing Room/Ennis Creek Area, potentially affected media include the following:

- Soil – On the western bank of Ennis Creek, between the creek and sheetpile wall, and on the eastern bank of Ennis Creek
- Sediments – Within Ennis Creek (Note: This interim action will include sediments downstream to the south side of the bridge at the mouth of Ennis Creek. Any sediment investigation north of the bridge will occur during the RI of the off-shore areas.)
- Groundwater – East of the sheetpile wall
- Surface water – Potential release to Ennis Creek

2.1.2 Contaminants of Concern

Based upon previous investigations performed at the site, the contaminants of concern (COCs) could include the following values, which represent the range of COCs present in the Finishing Room area before the 1998 Interim Action:

- TPH – Potentially present in soils east of sheetpile wall
  - TPH (diesel) 64 to 12,000 ppm
  - TPH (oil) 89 to 23,600 ppm
- PCBs – Potentially present in soils east of sheetpile wall
  - PCBs 0.145 to 2.32 ppm

As shown in Table 2-1, the 1998 Interim Action reduced the COCs in the Finishing Room area to the following:

- TPH (diesel) ND
- TPH (oil) ND to 1,100 ppm
- PCBs ND to 0.27 ppm

2.2 FUEL OIL TANK NO. 2

Fuel Oil Tank No. 2 was purchased in 1944 and was used to store No. 6 fuel oil (Bunker C) until 1990. The tank, which was located on the west side of the mill property, was an above-ground, riveted-plate carbon steel tank without a formal tank pad. The tank had a capacity of 55,000 barrels (2.3 million gallons). The tank was demolished in 1993.

Subsurface investigations of the area underlying Fuel Oil Tank No. 2 were completed in 1989 and 1990 (Landau and Associates, 1990 and 1991). The scope of these investigations included the following:

- Drilling of 28 soil borings in and around the tank
- Excavation of a test pit near the pump sump
- Installation of groundwater monitoring wells in 13 of the soil borings
- Installation of a monitoring well under the test pit

Soil and groundwater samples were analyzed for TPH, PCBs, polynuclear aromatic hydrocarbons (PAHs), and aromatic volatile organics (benzene, ethylbenzene, toluene, and xylene [BTEX]). Figure 2-2 presents the sampling locations from previous investigations and Table 2-2 presents the analytical data from the sampling. The results of these studies are presented in Sections 2.2.1 and 2.2.2 below.

After the tank was dismantled in 1993, an interim action was conducted to remediate soil and groundwater beneath the former tank location. This action included the excavation, treatment, and replacement of approximately 1,500 cubic yards of soil under the tank and to the east of the tank near the pump sump. Because of limited accessibility, the area near the sump and associated pipe racks could not be excavated. A geomembrane barrier was placed on the west side of the pump sump before placing clean backfill in the tank area to prevent migration of TPH contamination into the remediated area.

Based on observations made during a site visit on 26 July 2001, petroleum may be seeping from the west sidewall of the hog fuel pile excavation at several locations. The location of the seeps and the stratigraphy indicate that this product may have traveled underneath the road from the tank toward the sludge building/hogfuel storage area.

2.2.1 Affected Media

During the 1989 and 1990 investigations, contamination was detected in both the soils and the groundwater beneath the former tank location. Some areas showed predominantly

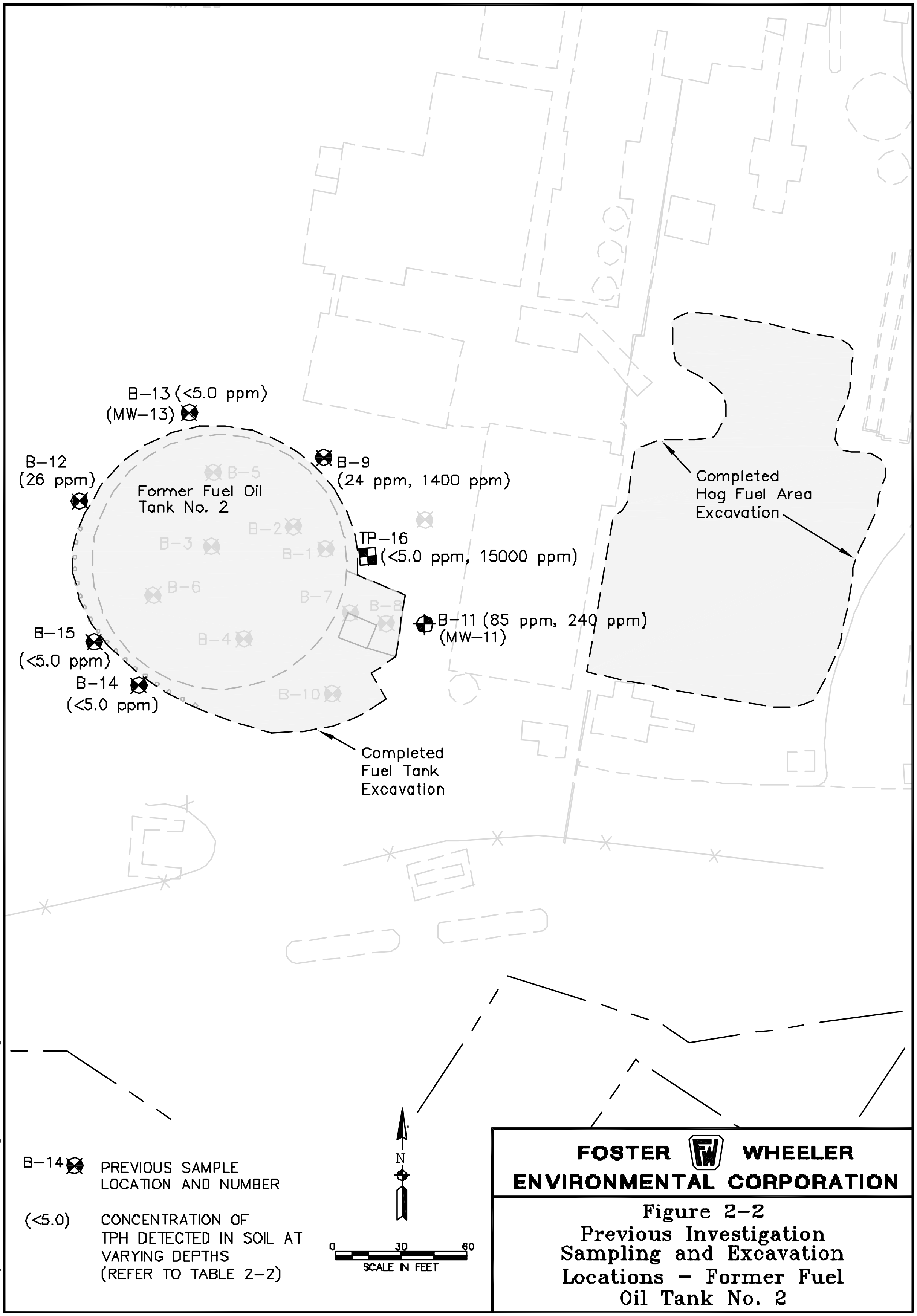

Figure 2-2
Previous Investigation
Sampling and Excavation
Locations - Former Fuel
Oil Tank No. 2

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Table 2-2. Concentrations of Detected Chemicals in Soil at Fuel Oil Tank No. 2[1/]

Sample Location	Sample Depth (ft. below surface)	TPH (Method 418.1[2/])	PAH (Method 8100)	PCBs (Method 8080)	Aromatic Volatile Organics (Method 8020): Benzene	Toluene	Ethyl Benzene	Xylene
Soil (mg/kg) ppm								
B-1[5/]	0-0.5	4700	—[3/]	—	—	—	—	—
B-1[5/]	5.2-5.4	20	—	—	—	—	—	—
B-2[5/]	4.1-4.2	68	—	—	—	—	—	—
B-3[5/]	4.4-4.6	110	ND[4/]	—	<0.05	<0.10	<0.10	<0.10
B-4[5/]	2.5-2.7	130	—	—	—	—	—	—
B-5[5/]	4.1-4.3	200	—	—	—	—	—	—
B-6[5/]	0-0.5	2600	—	—	—	—	—	—
B-6[5/]	4.0-4.5	99	—	—	—	—	—	—
B-7[5/]	4.5-4.7	27000	ND	<0.05	0.12	0.73	1.5	11
B-9	5.0	24	—	—	—	—	—	—
B-9	10.0	1400	—	—	—	—	—	—
B-10[5/]	7.5	12	—	—	—	—	—	—
B-11	2.5	85	—	—	—	—	—	—
B-11	7.5	240	—	—	—	—	—	—
B-12	7.5	26	—	—	—	—	—	—
B-13	7.5	<5.0	—	—	—	—	—	—
B-14	7.5	<5.0	—	—	—	—	—	—
B-15	7.5	<5.0	—	—	—	—	—	—
TP-16	3.0	<5.0	—	—	—	—	—	—
TP-16	7.5	15000	—	—	—	—	—	—
Cleanup Levels[6/]		TBD[7/]	0.137 ppm	1 ppm	1.82E+01	1.60E+04	8.00E+03	1.60E+05
Groundwater (ug/L) (ppb)								
MW-11	—	3800	ND	—	0.52	0.72	1.6	7.2
MW-13	—	570	ND	—	0.74	<0.30	<0.30	0.32

Notes

1/ This table summarizes applicable information from a North Creek Analytical report. Not included in this table are the laboratory analyses for the low, medium and high boiling point (BP) hydrocarbons obtained using EPA Method 8015.

2/ Total petroleum hydrocarbons (TPH) by the EPA Method 418.1 is reported as total recoverable petroleum hydrocarbons in the laboratory report. The standard analytical method was modified to include multiple silica gel cleanups until the percent difference in concentration in two successive analyses was less than 10 percent. This modification minimized the interference effect of non-petroleum organics on sample results.

3/ " " = Not analyzed.

4/ ND = Not detected.

5/ These soils were excavated during a previous interim action.

6/ Proposed cleanup levels are based on MTCA Method B for TPH, PAHs and BTEX, and Method A Unrestricted Land Use for PCBs.

7/ Cleanup level to be calculated in accordance with WAC 173-340-747.

Information obtained from Landau Associates, Inc., Soil and Ground Water Investigation, Fuel Tank No. 2 Project, Port Angeles Pulp Mill, October 22, 1990.

surface soil contamination, while others had contamination to depths approaching the groundwater interface. The soil contamination extended to the east of the tank towards the sludge building/hogfuel area; however, the horizontal extent of contamination could not be determined since the sludge building and the roadway between this building and the Fuel Oil Tank No. 2 were still in use at the time of the investigations.

2.2.2 Contaminants of Concern

Analytical results for soil samples collected were compared to MTCA Methods A and B levels (see Table 2-2). Because of the complexity of the site, Method B is the primary regulatory guidance for determining appropriate cleanup levels for this interim action. Soil at several locations beneath and to the east of the former tank location contained TPH as heavy oil. Most of the contaminated soil in the footprint of the fuel oil tank was removed during a previous investigation. However, there has been visual observations of the Bunker C fuel east of the former tank. One sample collected from previous investigations, which has not been excavated, contained 15,000 ppm total TPH, which is expected to be primarily Bunker C fuel (heavy oil). This level exceeds the MTCA Method A Unrestricted/Industrial soil cleanup level for TPH-heavy oils of 2,000 mg/kg.

2.3 MACHINE SHOP

The machine shop was located near the west end of the mill property inside the engineering building. The concrete block building had a wooden floor that was set on concrete supports at ground level. This facility contained machine tools such as lathes and milling machines that required heavy oil lubrication during operation. The building was constructed around 1941 and was demolished in mid-1999. At the time of demolition, oil staining was noted both on the wooden flooring and on the soils beneath the shop.

Soils and groundwater beneath the former machine shop have not been investigated for potential contamination; however, staining noted during the demolition of the building suggests that heavy oil from the shop operations leaked through the flooring to the soil below. Some of the concrete supports are also stained with oil. Following demolition of the shop building, the wooden flooring was tested for TPH as diesel and heavy oil and PCBs in preparation for disposal. Flooring materials from the Blacksmith Shop and Pipe Shop next to the machine shop were also tested for these constituents in preparation for disposal. Some of the space used by these facilities overlays the identified work area for the interim action at the Machine Shop. The results of that testing indicated that the flooring material in the shop contained diesel-range TPH and heavy oil; PCBs were not detected. Flooring materials from the Blacksmith Shop and the Pipe Shop (adjacent to the Machine Shop) contained both TPH and PCBs (specifically Aroclors 1254 and 1260) (Figure 2-3).

2.3.1 Affected Media

Based on visual and olfactory observations, both the soils beneath the former machine shop and the concrete support are potentially contaminated with petroleum. There are also particles of various metals on the surface of the soil. These particles would have come from the pipe threading and metal lathe operations.

2.3.2 Contaminants of Concern

Because of the complexity of the site, Method B is the primary regulatory guidance for determining appropriate cleanup levels for this interim action. Petroleum is the suspected primary contaminant beneath the former machine shop. The metal particles from the machine shop operations would have stayed on the surface of the soil and not been carried down into the subsurface soils. No samples have been taken of the soil beneath the flooring, although flooring samples were analyzed prior to disposal. The flooring samples from the Machine Shop, Blacksmith Shop, and Pipe Shop contained oil-range TPH. Samples collected from the Blacksmith Shop and Pipe Shop (adjacent to the Machine Shop) flooring contained PCBs (Aroclor 1254) (Table 2-3). In addition to TPH, there is also the potential that solvents may be present in the soils beneath the former Machine Shop. Rayonier personnel have no recollection of the use of solvents in this building, but they may have been used to clean oil from machined parts or milling equipment.

Therefore, the contaminants of potential concern in the soil beneath the Machine Shop could include TPH, PCBs, metals, and solvents.

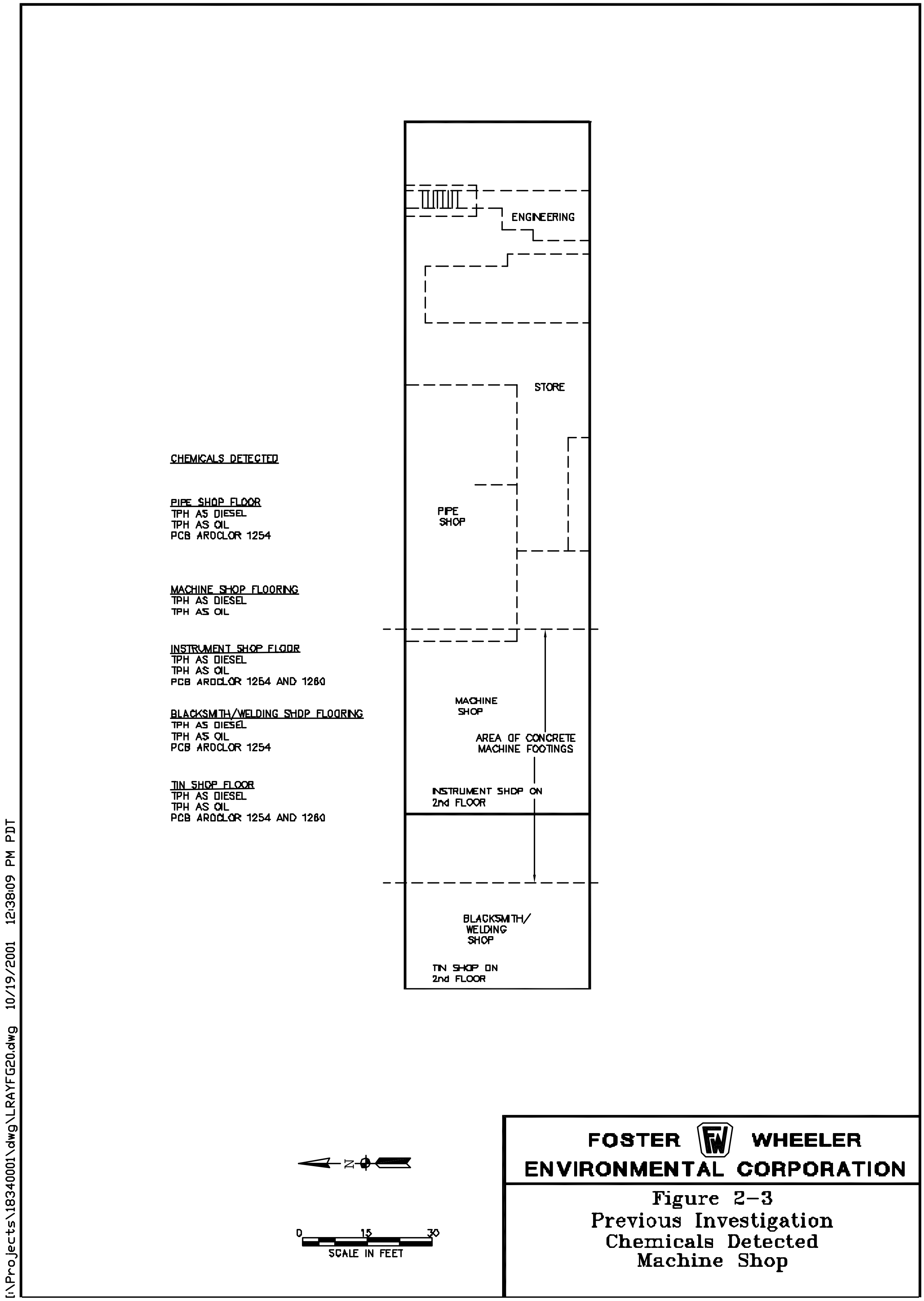

Figure 2-3
Previous Investigation
Chemicals Detected
Machine Shop

Table 2-3. Chemicals Detected in Flooring Materials during Previous Investigations (at the Machine Shop)

				PCB Aroclor								
Sample Location	**Sample ID**	**DRH**	**HORH**	**1016**	**1221**	**1232**	**1242**	**1248**	**1254**	**1260**	**1262**	**1268**
Welding Shop Floor	B904104-03	✓	✓									
Machine Shop Floor	B904104-04	✓	✓									
Tin Shop Floor	B904104-05	✓	✓						✓	✓		
Instrument Shop Floor	B904104-06	✓	✓						✓	✓		
Blacksmith Shop Floor	B904104-07	✓	✓						✓			
Pipe Shop Floor	B904104-08	✓	✓						✓			

Notes:
✓= Contaminant detected.
All samples were taken on 4/1/99.
DRH = Diesel Range Hydrocarbons (C12-C24)
HORH = Heavy Oil Range Hydrocarbons (C24-C40)
The tin shop and instrument shop are located on the second floor of the building.

3. CLEANUP LEVELS

The primary contaminants of concern for the interim actions include the following:

Chemical	Ennis Creek	Former Fuel Oil Tank No. 2	Machine Shop
TPH – diesel	X		X
TPH – heavy oil	X	X	X
PCBs	X		X
Metals			X
Solvents			X

As discussed in Section 1.4, the primary goals of the interim actions are guided by Washington State MTCA (WAC 173-340). MTCA contains cleanup standards and regulations to protect human health and the environment from past releases of hazardous substances. Potential exposure of humans and aquatic organisms inhabiting Ennis Creek to TPH and PCBs found in soil/sediment is a concern at the Finishing Room and the cleanup levels (Table 3-1) are therefore protective of both humans and aquatic biota. The primary concern at Fuel Oil Tank No. 2 and the Machine Shop is potential human exposure to contaminants found in soil and the cleanup levels (Table 3-2) are therefore protective of human exposure.

Table 3-1. Soil/sediment Cleanup Levels for the Finishing Room Interim Action[1/].

Chemical/Compound	Soil/Sediment Cleanup Level (mg/kg)
TPH – Diesel	100[2/]
TPH - Heavy Oil	200[3/]
PCBs	0.021[4/]

[1/] If concentrations of chemicals of concern in sediments of Ennis Creek are detected above the site-specific cleanup levels, cleanup will be initiated or confirmational bioassays will be performed. These cleanup levels are specific to the interim actions

[2/] Site-specific level derived to be protective of aquatic organisms and humans (Note: The MTCA Method A soil cleanup level and residual saturation screening level are 2000 mg/kg).

[3/] Site-specific level derived to be protective of aquatic organisms and humans (Note: The MTCA Method A soil cleanup level and residual saturation screening level are 2000 mg/kg).

[4/] Site-specific levels that are protective of aquatic organisms as determined using bioassays (Ecology 1997) and are protective of humans (MTCA Method B soil cleanup level for PCBs is 0.5 mg/kg).

Table 3-2. Soil Cleanup Levels for Fuel Oil Tank No. 2 and Machine Shop Interim Actions[1/, 2/]

Chemical/Compound	Soil Cleanup Levels (mg/kg)	Source
TPH-Diesel	2000	MTCA Residual Saturation Screening Level
TPH-Heavy Oil	2000	MTCA Residual Saturation Screening Level
PCBs	0.5	MTCA Method B
Arsenic	20	MTCA Method A
Barium	5600	MTCA Method B
Cadmium	80	MTCA Method B
Chromium	120000	MTCA Method B (as Cr III)
Lead	400[3/]	EPA Region 9 PRG
Mercury	24	MTCA Method B
Selenium	400	MTCA Method B
Silver	400	MTCA Method B
Acetone	8000	MTCA Method B
Benzene	18.2	MTCA Method B
Bromodichloromethane	16.1	MTCA Method B
Bromoform	127	MTCA Method B
2-Butanone	48000	MTCA Method B
Carbon Disulfide	800	MTCA Method B
Carbon Tetrachloride	7.69	MTCA Method B
Chlorobenzene	1600	MTCA Method B
Chlorodibromomethane	11.9	MTCA Method B
Chloroethane	NA	
Chloroform	164	MTCA Method B
Chloromethane	76.9	MTCA Method B
Dibromochloromethane	11.9	MTCA Method B
1,1-Dichloroethane	800	MTCA Method B
1,2-Dichloroethane	11	MTCA Method B
1,1-Dichloroethene	800	MTCA Method B
Cis-1,2-Dichloroethene	800	MTCA Method B
Trans-1,2-Dichloroethene	1600	MTCA Method B
1,2-Dichloropropane	14.7	MTCA Method B
Cis-1,3-Dichloropropene	5.56	MTCA Method B
Trans-1,3-Dichloropropene	5.56	MTCA Method B
Ethylbenzene	8000	MTCA Method B
2-Hexanone	48000	MTCA Method B
Methylene Chloride (Dichloromethane)	133	MTCA Method B
4-Methyl-2-Pentanone	6400	MTCA Method B
Styrene	33.3	MTCA Method B
1,1,2,2-Tetrachloroethane	5	MTCA Method B

Table 3-2. Soil Cleanup Levels for Fuel Oil Tank No. 2 and Machine Shop Interim Actions[1/, 2/] (continued)

Chemical/Compound	Soil Cleanup Levels (mg/kg)	Source
Tetrachloroethene	19.6	MTCA Method B
Toluene	16000	MTCA Method B
1,1,1-Trichloroethane	72000	MTCA Method B
1,1,2-Trichloroethane	17.5	MTCA Method B
Trichloroethene	90.9	MTCA Method B
Vinyl Acetate	80000	MTCA Method B
Vinyl Chloride	0.667	MTCA Method B
Xylenes (Total)	160000	MTCA Method B

[1/] Cleanup levels may be revised during the remedial investigation, which may necessitate further cleanup at these locations. The cleanup levels presented here are specific to the interim actions only.

[2/] Cleanup levels for volatile organic chemicals will be evaluated for assessment of the vapor inhalation pathway once the data are available.

[3/] EPA Region 9 preliminary remediation goal (http//www.epa.gov/region9/waste/sfund/prg/index.htm) based upon EPA's blood lead model that is protective of humans under residential land use.

NA – Not Available

4. INTERIM ACTIONS

4.1 ENNIS CREEK —FINISHING ROOM AREA

4.1.1 Interim Action Objectives

The objective of this interim action is to remove TPH and PCB contaminated soils/sediments above the cleanup levels protective of human health and the environment at the northern end of Ennis Creek near the previous Finishing Room. A steel sheetpile wall and protective riprap from a previous interim action are to be removed. Two existing concrete pipe supports, no longer in use, will also be removed. Ennis Creek will be allowed to expand into the area formerly blocked by the riprap and sheetpile wall. Riprap will be placed on the north bank in the Finishing Room area to prevent erosion of that wall when the sheetpile is removed, and the stream is allowed to enter the former Finishing Room area.

Soil sampling will be performed between the sheetpile wall and the west edge of the creek and analyzed for TPH and PCBs. Sediment sampling will be performed within Ennis Creek and analyzed for TPH and PCBs. Excavation will be based upon extent of soils and sediment exceeding the cleanup level established in Section 3.

4.1.2 Interim Action Alternatives

Two alternatives were evaluated for the Ennis Creek interim action. Both alternatives will include the following:

1. Performing soil and sediment sampling
2. Excavating contaminated soils and sediments
3. Removing steel sheetpiling
4. Removing/relocating riprap as necessary to remove contaminated soil and sediment and to accommodate inundation of a portion of the finishing room area
5. Removing concrete pipe rack supports from east and west shoreline of Ennis Creek and capping fiberglass pipe
6. Abandoning and removing existing monitoring wells within the Finishing Room area
7. Expanding Ennis Creek into the Finishing Room area

The two alternatives only differ in the disposal method of the contaminated soil/sediments.

Alternative 1—Dispose of Contaminated Soils and Sediment at Landfill

This alternative would require soil sampling on the west and east banks of Ennis Creek and sediment sampling within Ennis Creek. Samples would be analyzed for TPH and PCBs. Based on laboratory results, the extent of contamination exceeding the cleanup levels established in Section 3 would be delineated. If concentrations of chemicals of concern in sediments of Ennis Creek are detected above cleanup levels, cleanup will be initiated or confirmational bioassays will be performed. An excavation plan would then be developed based upon the extent of excavation required. These may include the use of sheetpiling or other methods to temporarily divert the creek to permit excavation and removal of contaminated sediments. The existing steel sheetpiling would be removed, and the existing riprap would be relocated to the nearby northern wall of the Finishing Room area. The pipe rack on both sides of the creek would be removed, and the fiberglass pipe would be capped below grade. A portion of the area previously occupied by the Finishing Room would be allowed to be inundated by Ennis Creek. In the Finishing Room area, the existing monitoring wells would be abandoned and removed. The contaminated soils and/or sediments would be disposed in an appropriately permitted and approved landfill facility.

Alternative 2—Treat Contaminated Soils and Sediment at Thermal Treatment Facility

The interim action activities for this alternative are identical to Alternative 1; however, the contaminated soil would be transported to a thermal treatment facility.

4.1.3 Comparison of Interim Action Alternatives

Both alternatives meet the objectives of the interim action; however, there are advantages and disadvantages to each alternative and they are presented below.

Alternative 1—Dispose of Contaminated Soils and Sediment at Landfill

The advantages of this alternative are that the contaminated soil and sediments could be excavated using standard construction equipment. There are permitted landfills locally and in the region that could accept TPH-contaminated soils. For non-TSCA PCB concentrations less than 50 ppm, a permitted Subtitle D landfill could be used for disposal, and for PCB concentrations greater than or equal to 50 ppm a permitted Subtitle C landfill could be used for disposal. No pretreatment, except possibly soil dewatering, is anticipated for this disposal alternative.

Disadvantages to this alternative include potentially large excavation and disposal volumes, the possibility of TPH and PCB concentrations requiring disposal at a Subtitle C landfill resulting in higher costs, and the potential for short-term impacts to Ennis Creek during implementation of the interim action.

Alternative 2—Treat Contaminated Soils and Sediment at Thermal Treatment Facility

This alternative is the same as Alternative 1, except for disposal of the excavated soil and sediment. As stated in Alternative 1, the contaminated soil and sediments can be excavated using standard construction equipment. TPH field test kits can potentially be used to confirm the excavation boundary during excavation, in addition to pre-excavation sampling.

Similar to Alternative 1, disadvantages to this alternative include potentially large excavation and treatment volumes. Soil and sediments would probably require pretreatment to reduce moisture content, transportation costs to the thermal facility in Tacoma would be high, and there is a potential for short-term impacts to Ennis Creek during implementation of the interim action. The primary disadvantage to this alternative is increased cost of treatment over landfill disposal. In addition, the thermal treatment facility can only accept soils with non-TSCA PCB concentrations below 50 ppm.

4.1.4 Selected Interim Action

The selected interim action for this site is Alternative 1, which includes the following activities**:**

1. Performing soil and sediment sampling
2. Excavating contaminated soils and sediments
3. Removing steel sheetpiling
4. Removing, washing if necessary and relocating some of the riprap adjacent to the sheetpile wall (Figure 4-2)
5. Removing concrete pipe rack supports and capping fiberglass pipe
6. Abandoning and removing existing monitoring wells within the Finishing Room area
7. Expanding Ennis Creek into the Finishing Room area (Figure 4-2)
8. Disposal of contaminated soils and/or sediments at an approved landfill facility

Alternatives 1 and 2 provide the same benefits; however, Alternative 1 is less expensive. Both provide for removal of soils and sediments containing levels of TPH or PCBs exceeding the cleanup level. Both will result in the removal of a pipe rack support, the sheetpiling, and some of the riprap, which currently border the west side of Ennis Creek. On the east side of Ennis Creek, a pipe rack support will also be removed, and large fiberglass pipes will be cut off below the ground surface and capped.

The specific tasks to be accomplished for the selected action are described below. Some project activities may involve work within shorelines and water. All activities will be closely coordinated with resource agencies. Regulatory requirements and any applicable permits will be identified and obtained before commencing project activities.

4.1.4.1 Characterization and Delineation Sampling

Soil and sediment sampling will be performed in the area east of the steel sheetpiling to determine horizontal and vertical extent of contamination by TPH and PCBs. The area to be sampled is bordered on the north by the bridge and extends upstream approximately 20 feet beyond the sheetpile wall.

All sampling will be performed in accordance with procedures detailed in Section 5, Sampling and Analysis. It is anticipated that sampling will be performed using hand-sampling equipment including shovels, grab samplers, and hand augers. Applicable permits and regulatory requirements will be identified and secured before starting sampling activities.

Sixteen shallow borings are planned for the site. These will be performed along four transects perpendicular to the existing sheetpile wall. These locations are shown on Figure 4-1. Four borings will be performed at each transect. These will be located approximately at the top of the berm, and at the western edge, centerline, and eastern edge of Ennis Creek. Additional borings may be performed depending upon field observations during sampling.

For the borings along the top of the berm and western edge of the creek, samples will be collected at depths of 0.5 and 1 feet and at 1 foot intervals thereafter to approximately 3 feet below the groundwater table. The boring samples along the centerline of the creek will be collected starting at the 0- to 1-foot interval, and at 1-foot intervals until 3 feet below groundwater. The boring samples along the eastern boundary will be collected to the top of the groundwater table. Soil/sediment samples will be analyzed for TPH and PCBs. Samples will be collected in accordance with procedures in Section 5. A waste profile will be established for the selected disposal facility based on the characterization and delineation sample results.

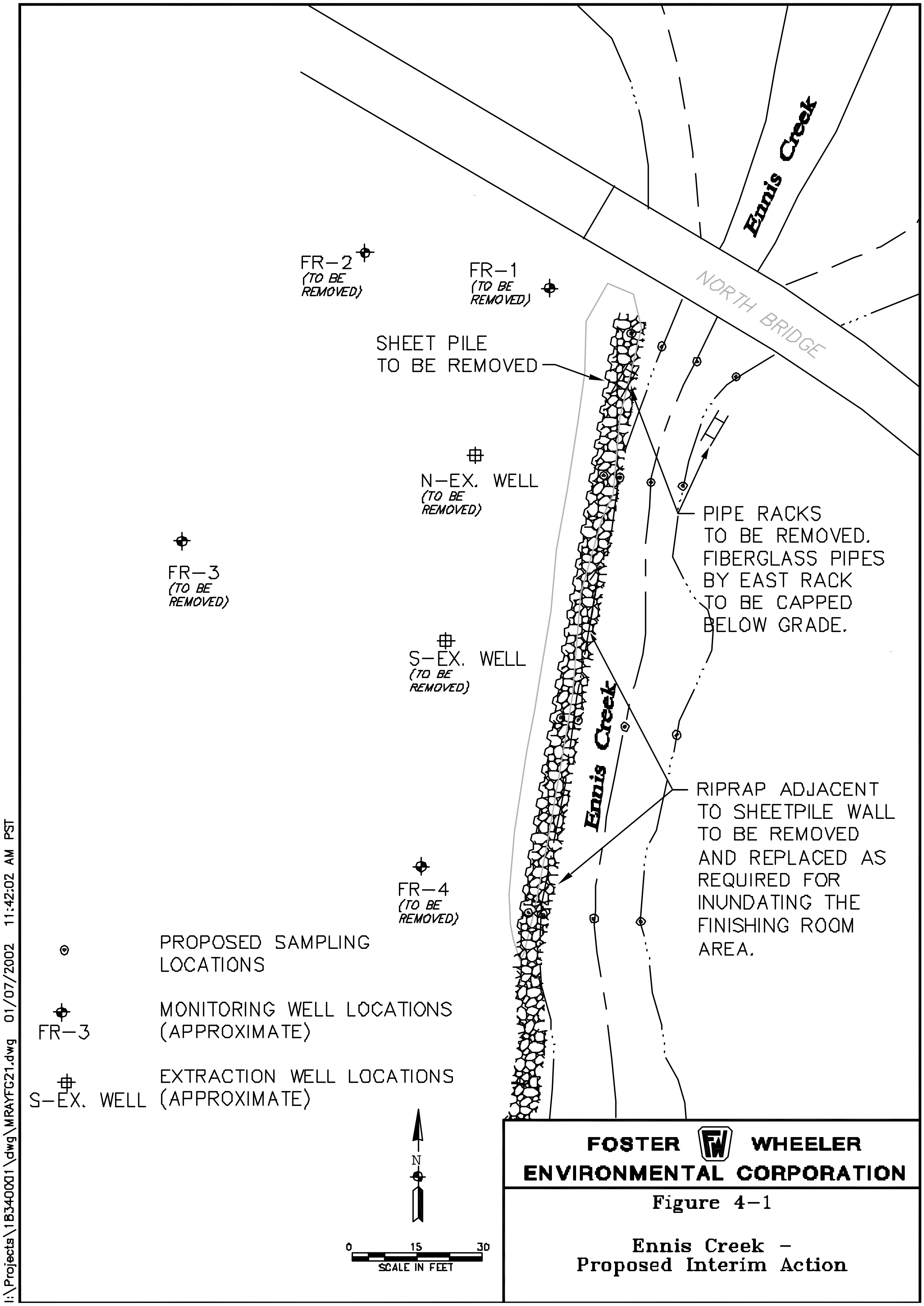

Figure 4-1

Ennis Creek – Proposed Interim Action

4.1.4.2 Mobilization and Setup

Mobilization and setup for this interim action will include the assembly and transport to the site of all equipment, supplies, and personnel needed for excavation, chemical screening, loading, and hauling of contaminated soil/sediments. It will also include identifying the landfill to be used for disposal of the contaminated soils/sediments and a source for backfill material to be used along the bank of Ennis Creek. When the excavated area below the Finishing Building was backfilled, extra fill material was brought in anticipation of using it as backfill for the sheetpile area. If necessary, based on sampling results, the existing on-site soil containment area will be prepared for use as a temporary storage and dewatering area.

Prework will include development of a schedule and preparation of a site layout showing the anticipated work zones; staging zones for haul trucks; and the proposed location of equipment including dewatering pumps and lines to the proposed water storage tanks. Prework will also include sampling of the bank soil and creek sediments. The prework will include the identification and location of all utilities in the work area. The utilities present will be located and marked in the field with color-coded paint to clearly indicate the location and type of utility. Utility plans for the site will also be reviewed by the contractor before intrusive activities. A review will be conducted to determine any applicable regulatory requirements and permits.

Initial site work will consist of setting up an exclusion zone, a decontamination zone and a clean zone for the project in accordance with the Site Health and Safety Plan. The exclusion zone will be large enough to enclose any anticipated or potential work zones. Once these areas are delineated, decontamination areas for equipment and personnel will be set up. Equipment decontamination will include steam-cleaning or another effective, approved method for removing heavy oil from the equipment. The decontamination area will be lined and bermed to contain decontamination water that will be pumped to a storage tank on site for analysis and, if necessary, any treatment before release. Depending upon the volume of water generated and the level of contaminants, the water may be sent to a publicly owned treatment works facility (POTW). If so, the POTW will be contacted, and appropriate permits will be obtained. Haul trucks for either soil or water will be staged outside of the exclusion zone, if possible to prevent contamination, and may be loaded from within the exclusion zone using a pump system for water or a loader or trackhoe for the soil. If the excavated material is saturated, the trucks will be lined to prevent the loss of contaminated runoff during hauling. In addition, the trucks will be covered at all times to avoid generating contaminated runoff.

4.1.4.3 Excavation of Contaminated Sediment and Soil

The horizontal and vertical extent of TPH and PCB contamination will be determined from the analytical results. An excavation plan will be prepared delineating areas and depths of required excavations. Depending upon excavation depth or location, shoring may be required. If all results are below required cleanup level, no soil or sediment excavation may be required beyond that associated with the removal of the sheetpiling and inundation of the finishing room area. For areas exceeding cleanup levels, soil or sediment excavation will be performed. If areas to be excavated do not include Ennis Creek, then a containment system such as ecology blocks will be placed east of the riprap to separate the creek water from the riprap and the soil that are to be removed. If areas to be excavated are within Ennis Creek, temporary relocation of the creek may be necessary. The substantive requirements of an HPA will be met including the requirement that all work will be conducted as allowed by the fish window.

4.1.4.4 Sheetpiling Removal

The existing steel sheetpiling will be removed using a vibratory hammer or other usual and accepted practice. Removal will be performed with minimal disturbance to Ennis Creek. Depending upon condition, the sheets may be stockpiled on site for potential reuse or disposed at a suitable facility after they have been brushed and, if necessary, washed.

4.1.4.5 Riprap Excavation

As required for the sampling along the bank, riprap material will be removed by an excavator with “thumb” or other suitable equipment. Excavation will be done using methods to minimize impact to Ennis Creek. These methods may include temporary relocation or diversion of Ennis Creek; installation of silt fence, filter fabric, or other filter media; performance of water quality monitoring to determine if excavation activities cause impacts above natural events. Excavated riprap material will be placed along the boundary of the finishing room inundation area (Figure 4-2) and along the southern side of the east and west bridge abutments to provide erosion protection from the expanded Ennis Creek. Riprap will be placed from 0 mean lower low water (MLLW) to the existing top of the slope.

4.1.4.6 Concrete Pipe Rack Removal

Existing concrete pipe rack supports will be removed from the east and west shorelines of Ennis Creek. The structures are no longer in use. The structures and all foundation elements will be removed. The fiberglass pipe associated with the east pipe rack will be cut off below grade and capped. No debris will be allowed to enter Ennis Creek during removal of these structures. The structures will be removed and debris stockpiled on site for future use, recycled, or disposed at an appropriately permitted and approved landfill.

4.1.4.7 Abandonment and Removal of Existing Groundwater Monitoring Wells

Four groundwater monitoring wells and two extraction sumps are present within the area of the former Finishing Room. The wells and sumps were established as part of the previous interim actions at the Finishing Room. The wells and sumps are to be abandoned and removed before removal of the riprap and sheetpiling. They will be abandoned in accordance with Washington State regulations (WAC 173-160). Monitoring well FR-1 is proposed as a sampling point for the RI. If it is deemed necessary for the groundwater RI, this well can be reinstalled.

4.1.4.8 Excavation Dewatering

The selected interim action does not address excavation of significant quantities of contaminated soil from below the groundwater table. During the removal of soil from the Finishing Room in the previous interim action, contaminated groundwater was found only at the soil and groundwater interphase. It is expected that the transport of oil from the Finishing Room area to the creek would also have occurred at this depth. Dewatering will be limited to pumping water from the excavation to an on-site tank for analysis and, if necessary, any treatment before release. Any water associated with temporary diversion of Ennis Creek will be returned directly to Ennis Creek. On-site tank capacity is available for storing and treating 600,000 gallons. If a significant volume of contaminated soil is determined to extend below the groundwater table, the use of a well-point dewatering system may be evaluated to determine whether areawide dewatering is warranted.

4.1.4.9 Backfilling

Backfilling operations will use excess clean material from the area west of the sheetpile that was backfilled. If necessary, to obtain additional backfill material, an outside source that has clean material will be used. The riprap that is on site will be reused after brushing or washing to remove dirt or other observable contaminants. Backfilling will be accomplished using the excavator or other suitable equipment. Material will be bucket-tamped into position whenever possible. Backfilling in areas within the planned inundation area of Ennis Creek will use material of proper gradation to protect against erosion. This may include construction of a buried riprap layer to protect the boundary of the inundation area. Details of the inundation area design will be finalized with the appropriate regulatory

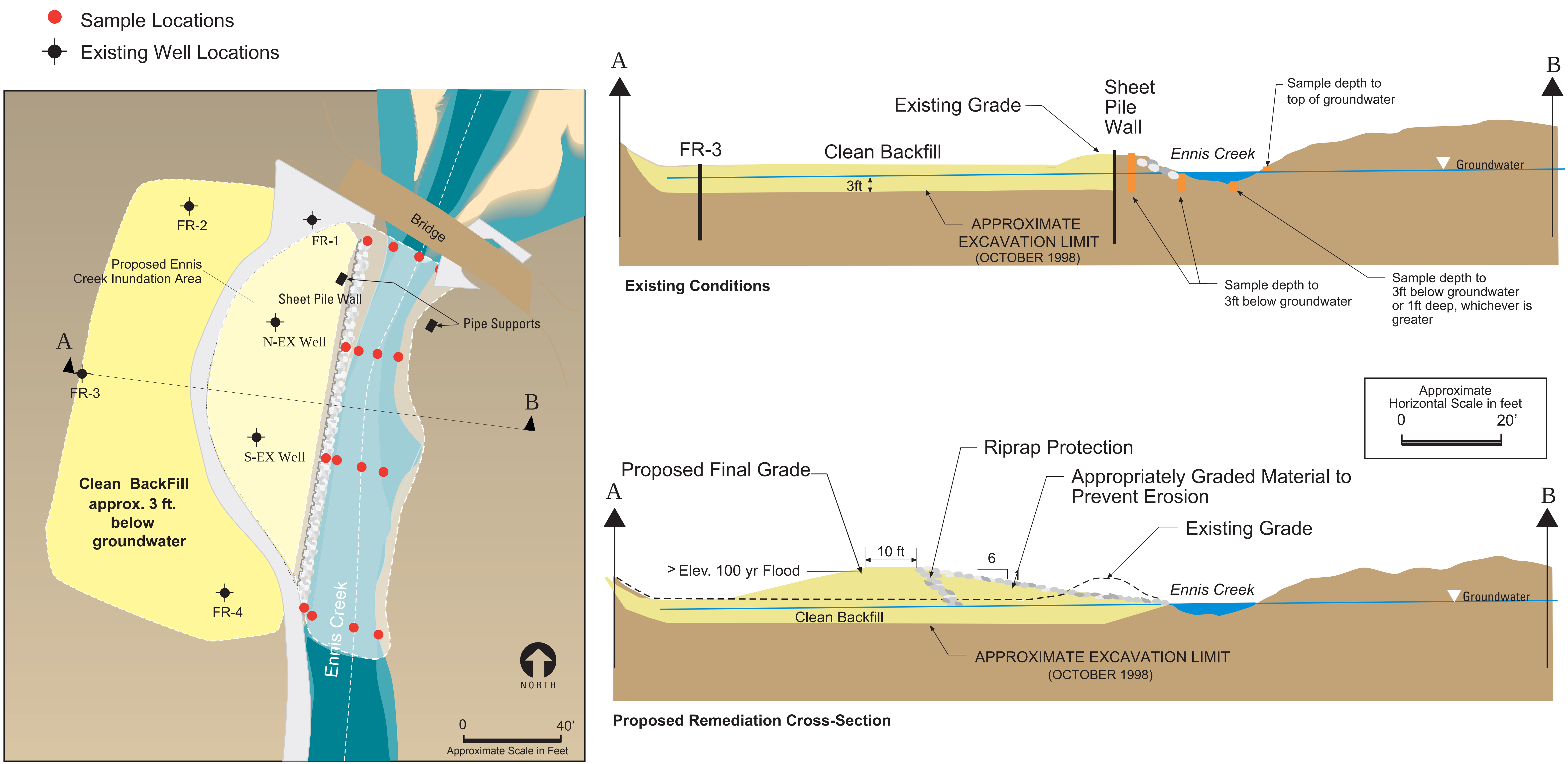

Figure 4-2

Ennis Creek-Finishing Room Area Remediation

agencies. Figure 4-2 presents a conceptual design for the Finishing Room remediation area along Ennis Creek.

4.1.4.10 Waste Handling

Potentially contaminated water generated during this interim action will be pumped to a pre-selected storage tank on site or will be containerized and hauled to the storage tank for testing and, if necessary, future treatment at a POTW facility or on-site treatment facility. The current on-site treatment system incorporates separation, solids filtration, and activated carbon. This water may include decontamination water from equipment washing and groundwater or surface water runoff removed from the excavation. If the water is treated on site, the criteria used for determining suitability for discharge of the treated water to the harbor are the State of Washington Water Quality Standards for Surface Waters that are protective of aquatic organisms (WAC 173-201A) and the MTCA surface water cleanup standards protective of humans that consume aquatic organisms (WAC 173-340). The criteria selected were the lowest of the marine, acute, and chronic criteria protective of aquatic life and human health criteria. Soils removed will be temporarily stored in a containment area located in the southeastern portion of the site. Stormwater control and BMPs will be implemented to minimize stormwater runoff, sedimentation, and erosion of stockpiled soil. This sealed blacktop area was designed specifically for the temporary storage of contaminated soils that were excavated during a previous project.

PPE that has been in contact with contaminated soils will be containerized for appropriate disposal. Ordinary trash that is not contaminated will be disposed of along with regular waste generated on the site.

4.2 FUEL OIL TANK NO. 2

4.2.1 Interim Action Objectives

The objective of the interim action is to remove TPH-contaminated soils above the groundwater table in the area between former Fuel Oil Tank No. 2 and the recently completed hog fuel pile excavation. The soil to be excavated will include TPH-contaminated soils exceeding the MTCA Method A cleanup level of 2,000 ppm. Excavation will be guided based on observation of visibly contaminated soil, the use of field test kits for TPH, and formal laboratory sampling.

4.2.2 Interim Action Alternatives

Alternative 1—Excavate Contaminated Soils and Dispose of by Landfilling

This alternative would involve the excavation of visibly contaminated soils primarily above the soil-groundwater interface and disposal of that soil at an appropriately permitted local or regional landfill. The excavation would be conducted using conventional equipment such as a backhoe or trackhoe and would proceed to the east of the former oil tank in a phased manner. Three small tank pads located in the roadway between the former tank and the former sludge building to the east would have to be removed, in addition to the wells to the east of the former tank. If possible, the sludge building foundation would be left in place. Confirmation sampling of the excavation bottom and sidewalls would be performed to determine whether cleanup levels were achieved.

Removing the TPH-contaminated soils will eliminate the potential migration of heavy oils, substantially eliminate oil-related compounds in the vadose zone, and prevent any migration of the material to groundwater.

Alternative 2—Excavate Contaminated Soils and Thermally Treat to Remove TPH

The excavation procedures for this alternative are identical to Alternative 1; however, the contaminated soil would be transported to a thermal treatment facility.

Alternative 3—Excavate Contaminated Soils and Dispose of by Incorporation in Asphalt

The excavation procedures for this alternative are identical to Alternative 1; however, the contaminated soil would be hauled to an appropriate facility for incorporation into asphalt. The closest facilities to the former Rayonier pulp mill that provide this service are located in the Seattle-Tacoma area.

4.2.3 Comparison of Interim Action Alternatives

All three alternatives meet the objectives of the interim action. The advantages and disadvantages to each alternative are presented below.

Alternative 1—Excavate Contaminated Soils and Dispose of by Landfilling

The advantage of this alternative is that the contaminated soil is removed easily from the ground by using standard construction equipment. The soil contamination can be seen, thereby allowing the extent of excavation to be determined visually. TPH field test kits can also be used to confirm the excavation boundary. The analytical methods for TPH are relatively quick and inexpensive to perform, expediting waste profiling for landfill disposal. There are permitted landfills locally and in the region that can accept TPH contaminated soils. No pretreatment is required for this disposal alternative.

Disadvantages to this alternative include the possibility of TPH concentrations exceeding the disposal facility's acceptance criteria and the liability associated with off-site disposal.

Alternative 2—Excavate Contaminated Soils and Thermally Treat to Remove TPH

The advantages for this alternative also include using standard construction equipment for soil removal. TPH field test kits can also be used to confirm the excavation boundary quickly during construction activities. Potential future liability is also minimized with this option because thermal treatment removes TPH from the soil. A certificate of destruction is obtained from the treatment facility to document treatment.

The primary disadvantage to this alternative is that transportation costs to the thermal facility in Tacoma would be higher than landfill disposal.

Alternative 3—Excavate Contaminated Soils and Dispose of by Incorporation in Asphalt

The advantages of this alternative are the same as Alternative 2, except that the TPH is not removed from the excavated soil. Instead the soil is reused by incorporating it into asphalt or as a base layer for roadways or other asphalt paving areas.

The disadvantages to this alternative are that the soil gradation may not be suitable for use in asphalt, and transportation costs would be high. This type of disposal option is also not very widely used unless a paving project is located at the site, providing an end use for the TPH-contaminated soil.

4.2.4 Selected Interim Action

The selected interim action for this site is Alternative 1 (excavate TPH-contaminated soil with landfill disposal). While all alternatives result in removal of the contaminated soil and substantial removal of the source for groundwater contamination, landfill disposal is typically less expensive than thermal treatment. If a portion of the excavated soil contains TPH concentrations exceeding the disposal facility's acceptance criteria, this limited soil volume could be evaluated for thermal treatment. The specific tasks to be accomplished for this action are described below.

4.2.4.1 Characterization Sampling

Characterization samples will be collected prior to mobilization to support waste profiling for the selected disposal facility. Based on historical analytical data, samples will be analyzed by method NWTPH-Dx (with the silica gel cleanup option). Based on the estimated volume of soil to be excavated (refer to Figure 4-3), approximately 10 discrete samples will be collected from the proposed excavation area to a depth of approximately 3 feet below ground surface.

4.2.4.2 Mobilization and Setup

Mobilization and setup for this interim action will include the assembly and transport to the site of all equipment, supplies, and personnel needed for excavation, chemical screening, loading, and hauling of the TPH-contaminated soil. It will also include identifying the landfill to be used for disposal of the TPH-contaminated soils and a source for backfill material to be used in the excavation.

Prework will include development of a schedule and preparation of a site layout showing the anticipated work zones, staging zones for haul trucks, and the proposed location of equipment including dewatering pumps and lines to the proposed water storage tanks.

Initial site work will consist of setting up an exclusion zone, a decontamination zone, and a clean zone for the project in accordance with the Site Health and Safety Plan. The exclusion zone should be large enough to enclose any anticipated or potential work zones. Once these areas are delineated, decontamination areas for equipment and personnel will be set up. Equipment decontamination will include steam cleaning or another effective, approved method for removing Bunker C from the equipment. The decontamination area will be lined and bermed to contain decontamination water that will be pumped to a storage tank on site. Haul trucks for either water or soil will be staged outside of the exclusion zone, if possible to prevent contamination, and may be loaded from within the exclusion zone using pumps for the water or a loader or trackhoe for the soil. If the excavated material is saturated, the trucks will be lined to prevent the loss of contaminated runoff during hauling. In addition, the trucks will be covered at all times to prevent contaminated runoff.

4.2.4.3 Excavation

Excavation will proceed using a trackhoe or other appropriate equipment. The first task will be to remove the three small concrete pads located east of former Fuel Oil Tank No. 2. The waste concrete will be stored on site and recycled. These pads are estimated to be

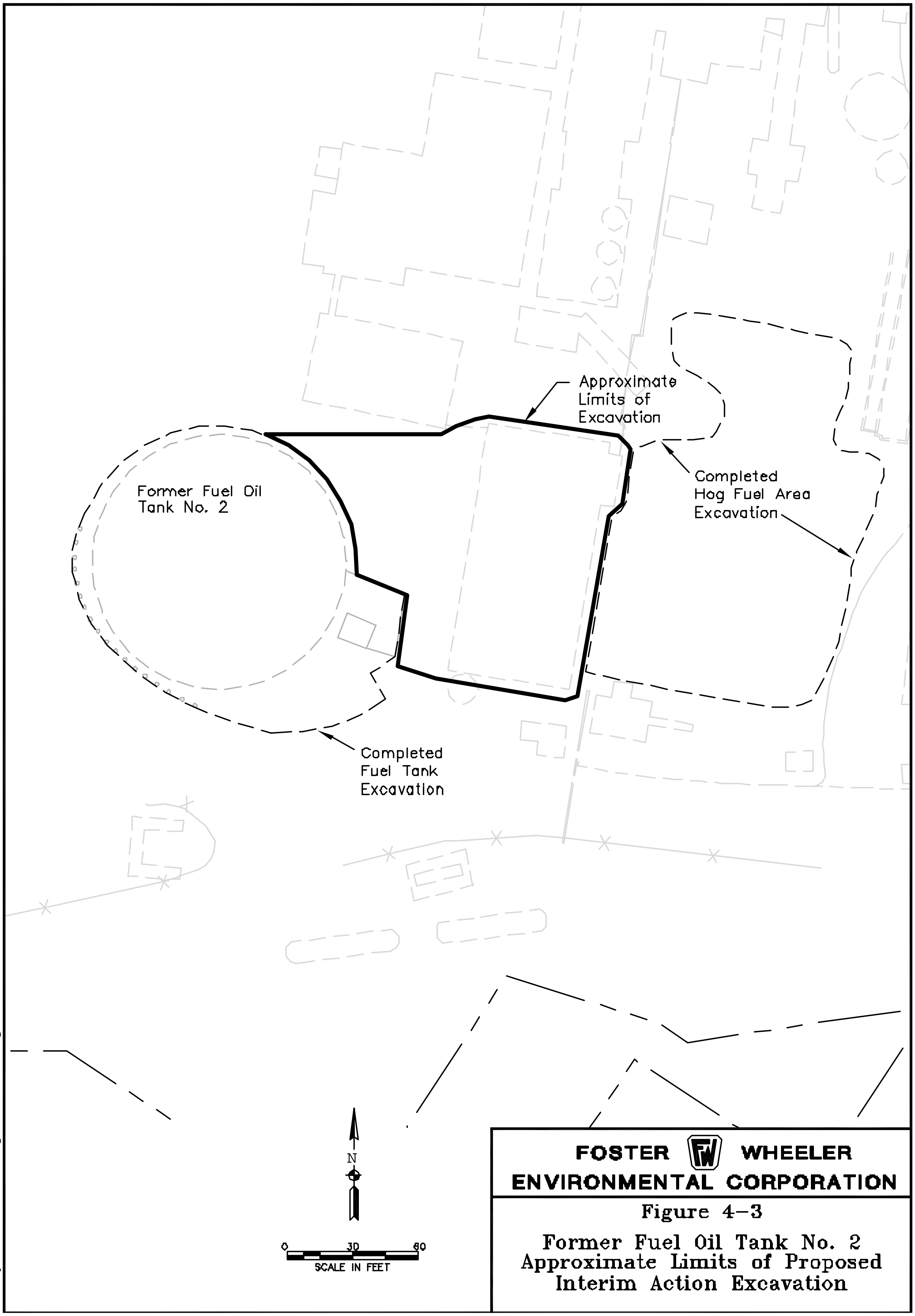

Figure 4–3

Former Fuel Oil Tank No. 2
Approximate Limits of Proposed
Interim Action Excavation

I:\Projects\18340001\dwg\LRAYFG15a.dwg 10/19/2001 08:52:15 AM PDT approximately 15 feet square and 1 foot thick. Based upon this estimate, their removal will generate about 25 cubic yards of material for recycling.

Following removal of the concrete pads, excavation will proceed east from the location of the former fuel tank towards the former sludge building. The 60-mil geomembrane placed at the eastern boundary of the clean backfill during the previous interim action will be used to identify the starting point for this soil removal. This geomembrane was placed approximately 60 feet from the center of the former tank. Every effort will be made to avoid the remaining segments of foundation from the sludge building; however, if it is necessary to remove any portion of the foundation to reach contaminated soil, the concrete removed will be stored on site. If the excavation is to be open for extended periods, the sidewalls will be sloped to meet Occupational Safety and Health Administration (OSHA) requirements for open excavations, and an access ramp will be provided for equipment and personnel.

The initial delineation of the extent of soil excavation will be based on visual observations of TPH-contaminated soil. After excavation of visibly contaminated soil is complete, field test kits (PetroFLAG™ or equivalent) will be used to determine whether additional soil requires excavation. Confirmation samples will be collected and sent to an approved analytical laboratory to ensure that remaining soils do not exceed the selected cleanup level. Confirmation samples will be collected from the excavation sidewalls every 25 lineal feet and from the excavation bottom on approximately a 50-foot grid. Additional sampling and analysis information is presented in Section 5.1.2.

The area which may require excavation is estimated to measure approximately 100 feet by 120 feet and encompasses the area between the east side of the former fuel oil tank and the east side of the former sludge building (the west side of the hog fuel pile). The estimated north-south extent is from the north end of the former sludge building to the south end. Depth to groundwater in this area ranges from 4 to 8 feet, giving an average depth of about 6 feet. Based upon the presumed extent of the TPH contamination, and assuming that the excavation will encompass the vadose zone, the estimated volume of material to be excavated is approximately 2,700 cubic yards (cy). Assuming that the contaminated soil is present in the area immediately above the soil/groundwater interface (approximately 2 feet thick) the volume of contaminated soil to be removed is about 900 cy. The remaining 1,800 cy of soil excavated material may be used for backfilling the excavation. Figure 4-3 shows the approximate horizontal limits of excavation.

In areas where work will be conducted below the soil/groundwater interface, quarry spalls or other approved armoring will be used to provide firm support for the excavation equipment and a firm foundation for backfill.

4.2.4.4 Excavation Dewatering

The selected interim action does not address excavation of significant quantities of contaminated soil from below the groundwater table. Dewatering will be limited to pumping water from the excavation to an on-site tank for analysis and, if necessary, any treatment before release. On-site tank capacity is available for storing and treating 600,000 gallons. If enough contaminated soil is determined to extend below the groundwater table, the use of a well-point dewatering system may be evaluated to determine whether areawide dewatering is warranted.

4.2.4.5 Backfilling

Backfilling operations will use clean material, either from another location at the former Rayonier pulp mill or from an outside source. Backfilling will be accomplished in 1- to 2-foot loose lifts and wheel rolled. The excavation will be backfilled to the pre-excavation grade. Stormwater best management practices (BMPs) will be implemented for stored backfill to minimize stormwater runoff, sedimentation, and erosion.

Standing water in the excavation will be removed before backfilling to allow placement of fill soils on an unsaturated surface. As previously indicated, quarry spalls or other approved base material will be placed in wet areas to provide a firm foundation for fill soils. Standing water in contaminated areas will be collected and managed as described below.

4.2.4.6 Waste Handling

Soils removed will be temporarily stored in a containment area located in the southeastern portion of the site. This sealed blacktop area was designed specifically for the temporary storage of contaminated soils that were excavated during a previous project. BMPs will be implemented for stockpiled soils to minimize stormwater runoff, sedimentation, and erosion.

Depending upon the volume of contaminated water generated during this interim action, the water will either be pumped to a preselected storage tank on site for future analysis and, if necessary, treatment at an on-site treatment facility or an approved POTW facility. The current on-site treatment system incorporates separation, solids filtration, and activated carbon. This water may include decontamination water from equipment washing, and groundwater or surface water runoff removed from the excavation. If the water is treated on site, the criteria used for determining suitability for discharge of the treated water to the harbor are the State of Washington Water Quality Standards for Surface Waters that are protective of aquatic organisms (WAC 173-201A) and the MTCA surface water cleanup standards protective of humans that consume aquatic organisms (WAC 173-340). The criteria selected were the lowest of the marine, acute, and chronic criteria protective of aquatic life and human health criteria.

Personal protective equipment (PPE) that has been in contact with contaminated soils will be containerized for appropriate disposal. Ordinary trash that is not contaminated will be disposed of along with regular waste generated on the site.

4.3 MACHINE SHOP

4.3.1 Interim Action Objectives

The objective of the interim action is to remove TPH-contaminated soils above the groundwater table in the area between the support piers under the former Machine Shop, and to clean residual petroleum from the surface of the support members. Soils to be excavated will include TPH-contaminated soils above the MTCA cleanup level of 2,000 ppm. Excavation will be guided based on observation of visibly contaminated soil, the use of field test kits for TPH, and formal laboratory sampling for petroleum, PCBs, metals, and VOCs (if supported by pre-excavation sampling). Petroleum removal on the concrete support material will be guided by visual observation of staining.

All interim action alternatives would involve pre-excavation sampling to determine whether PCBs, metals, or solvents are present that do not possess visual indicators for use in directing the excavation to remove contaminated soils.

4.3.2 Interim Action Alternatives

Alternative 1—Excavate Contaminated Soils and Dispose of by Landfilling; Sandblast Supports

This alternative would involve the excavation of visibly contaminated soils primarily above the soil-groundwater interface and disposal of that soil at a permitted local or regional landfill. The excavation would be conducted using conventional equipment such as a backhoe or trackhoe and would proceed in parallel with and between the piers that formerly supported the engineering shop. The concrete supports would be left in place.

Contaminated soil would be trucked to an appropriately permitted local or regional landfill. Confirmation sampling of the excavation bottom and sidewalls would be performed to determine whether cleanup levels were achieved. The concrete supports would be scraped and sandblasted to remove residual oil-related materials present. Any potentially contaminated sand generated during this process would be removed along with the excavated materials.

Removing the TPH-contaminated soils will eliminate the migration of heavy oils into the soil beneath the former shop and will substantially eliminate oil-related compounds present in the vadose zone and any migration of that material to groundwater. Cleaning the concrete material will serve the same function. Because the concrete support for the Machine Shop will not be removed, cleaning will eliminate the potential for leaching or seeping of oil-related materials from the concrete.

Alternative 2—Excavate Contaminated Soils and Thermally Treat to Remove TPH; Sandblast Concrete Supports

The excavation procedures for this alternative are identical to Alternative 1; however, the contaminated soil would be transported to a thermal treatment facility. The excavation would be backfilled with clean material from the site or imported. The concrete supports would be scraped and cleaned in the same manner outlined in Alternative 1 before backfilling of the excavation.

Alternative 3—Excavate Contaminated Soils and Dispose of them by Incorporation in Asphalt; Sandblast Concrete Supports

The excavation procedures for this alternative are identical to Alternative 1; however, the contaminated soil would be hauled to an appropriate facility for incorporation into asphalt. The closest facilities to the former Rayonier pulp mill that provide this service are located in the Seattle-Tacoma area. The concrete supports would be scraped and cleaned in the same manner outlined in Alternative 1, before backfilling the excavation.

4.3.3 Comparison of Interim Action Alternatives

All three alternatives meet the objectives of the interim action; however, there are advantages and disadvantages to each alternative, which are presented below.

Alternative 1—Excavate Contaminated Soils and Dispose of by Landfilling; Sandblast Concrete Supports

The advantage of this alternative is that the contaminated soil is removed easily from the ground by using standard construction equipment. The soil contamination can be seen visually, thereby directing the extent of excavation. TPH field test kits can also be used to confirm the excavation boundary. The analytical methods for TPH are relatively quick and inexpensive, which can help expedite waste profiling for landfill disposal. There are local and regional permitted landfills that can accept TPH-contaminated soils. No pretreatment is required for the disposal of petroleum-contaminated soils under this alternative. If PCBs or solvents are found to be present in the soils beneath the former Machine Shop, there may be additional requirements for excavation and testing in order to remove and dispose of the soil.

Disadvantages to this alternative include the possibility of TPH concentrations exceeding the disposal facility's acceptance criteria, and the potential liability for off-site disposal. In addition, if PCBs are detected the soil will have to be disposed of at an approved landfill facility that could be costly if the contaminant levels are high.

Alternative 2—Excavate Contaminated Soils and Thermally Treat to Remove TPH; Sandblast Concrete Supports

The advantages for this alternative also include using standard construction equipment for soil removal. TPH field test kits can also be used to confirm the excavation boundary quickly during construction activities. Potential future liability is also minimized with this option because thermal treatment removes TPH from the soil. A certificate of destruction is obtained from the treatment facility to document treatment.

The disadvantages to this alternative are that transportation costs could be high and thermal treatment is typically more expensive than landfill disposal. Also, if PCBs are detected in the soil greater than or equal to 50 ppm or solvents are found in the soils, thermal treatment may not be a viable alternative.

Alternative 3—Excavate Contaminated Soils and Dispose of by Incorporation in Asphalt; Sandblast Concrete Supports

The advantages of this alternative are the same as Alternative 2, except that the TPH is not removed from the excavated soil. Instead the soil is incorporated into asphalt (reused) or a base layer for roadways or other asphalt paving areas.

The disadvantages to this alternative are that the soil gradation may not be suitable for use in asphalt, and transportation costs could be high. This type of disposal option is also not very widely used unless a paving project is located at the site, providing a use for the TPH-contaminated soil that allows the client to retain possession of it. If PCBs or solvents are present in the soil, this alternative may not be feasible.

4.3.4 Selected Interim Action

The selected interim action for this site is Alternative 1 (excavate TPH-contaminated soil with landfill disposal; sandblast concrete supports). While all alternatives result in removal of the contaminated soil and substantial elimination of the source for groundwater contamination, landfill disposal typically is less expensive than thermal treatment. If a portion of the excavated soil contains TPH concentrations exceeding the disposal facility's acceptance criteria, this limited soil volume could be evaluated for thermal treatment. If PCBs, metals, or solvents are found to be present in the soil, it may become necessary to revise the selected landfill facility. The specific tasks to be accomplished for Interim Action Alternative 1 are described below.

4.3.4.1 Characterization Sampling

Characterization samples will be collected prior to mobilization to identify the contaminants present at the site and to support waste profiling for the selected disposal facility. Based on historical analytical data and historical activities in the Machine Shop area, samples will be analyzed for NWTPH-Dx, PCBs, volatile organic compounds (VOCs), and Resource Conservation and Recovery Act (RCRA) metals list. Based on the estimated volume of soil to be excavated (refer to Figure 4-4), approximately seven discrete samples will be collected from the excavation areas to a depth of approximately 3 feet below ground surface.

4.3.4.2 Mobilization and Setup

Mobilization and setup for this interim action will include assembly and transport to the site of all equipment, supplies, and personnel needed for excavation, chemical screening, loading, and hauling of the TPH-contaminated soil. In addition, mobilization and setup will include those resources needed for cleaning the concrete supports. This phase will also include identifying the landfill to be used for disposal of the TPH-contaminated soils and a source for backfill material to be used after the excavation.

Pre-work will include development of a schedule and preparation of a site layout showing the anticipated work zones, staging zones for haul trucks, and the proposed location of equipment. Pre-work activities will include sampling the soil in the excavation area to determine whether PCBs, metals, or solvents are present. Finally, the prework will include

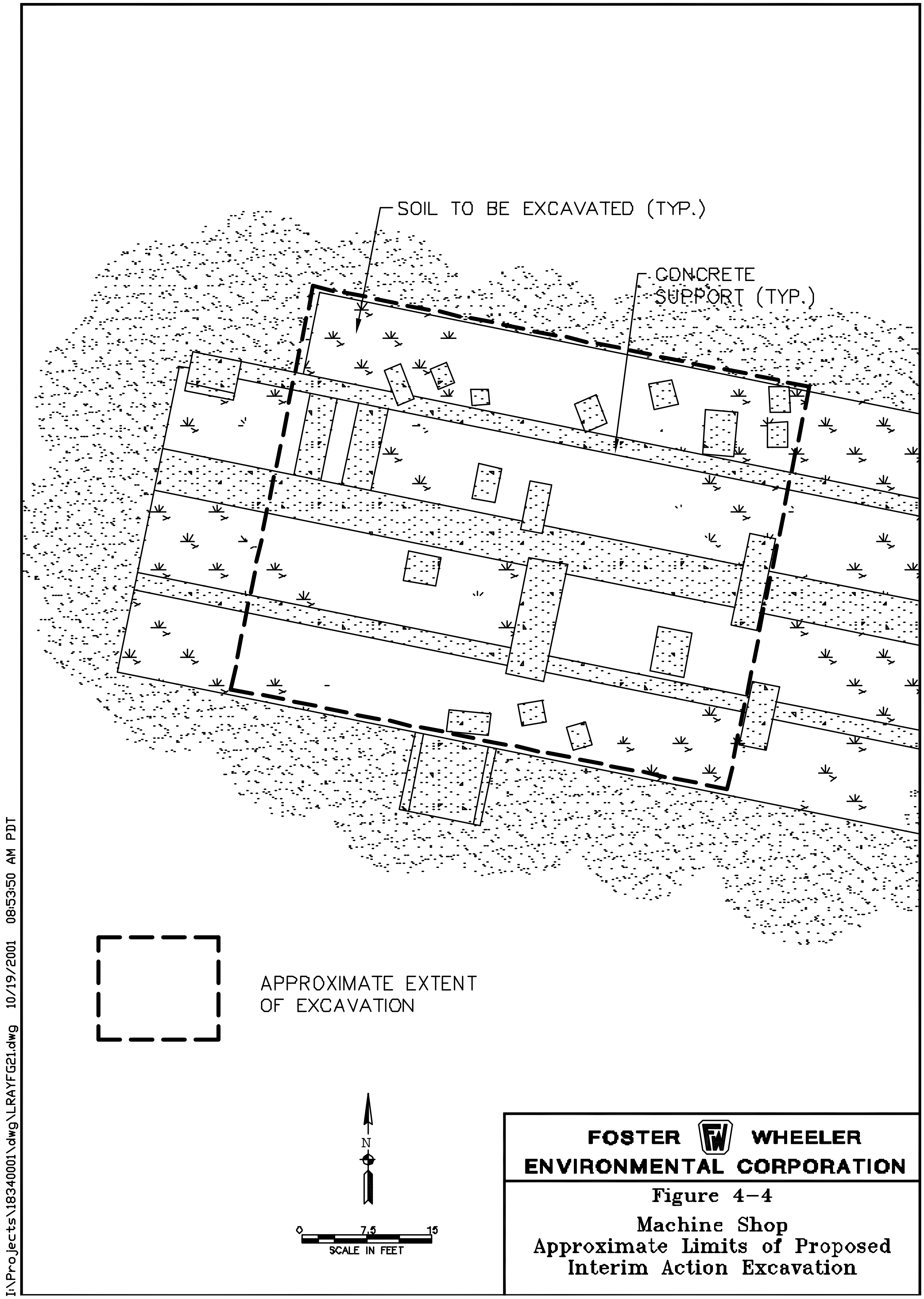

Figure 4-4
Machine Shop
Approximate Limits of Proposed Interim Action Excavation

identification and location of all utilities in the work area. There are two pipelines near this work site, including Rayonier's 10-inch fireline that provides water for fire suppression to the dock area and the City's pressurized sewer line. Rayonier also has underground power lines in this area. The contractor will use a private utility locator to determine the location of the lines as well as notifying the City. The utilities present will be located and marked in the field with color-coded paint to clearly indicate the location and type of utility. Utility plans for the site will also be reviewed by the contractor before starting the excavation work.

Initial site work will consist of setting up an exclusion zone, a decontamination zone, and a clean zone for the project in accordance with the Site Health and Safety Plan. The exclusion zone should be large enough to enclose any anticipated or potential work zones. Once these areas are delineated, decontamination areas for equipment and personnel should be set up. Equipment decontamination will include steam cleaning or another effective, approved method of removing oil from the equipment. The decontamination area will be lined and bermed to contain all decontamination water that will be pumped to a storage tank for analysis and, if necessary, treatment at a POTW facility or an on-site treatment system. The current on-site treatment system incorporates separation, solids filtration, and activated carbon. Haul trucks for either soil or water will be staged outside of the exclusion zone, if possible, to prevent contamination and may be loaded from within the exclusion zone using a pump system for water or a loader or trackhoe for the soil. If the excavated material is saturated, the soil will either be mixed with dry materials, or the trucks will be lined to prevent the loss of contaminated runoff during hauling. In addition, the trucks will be covered at all times to prevent contaminated runoff.

4.3.4.3 Excavation

The area that may require excavation is estimated to measure approximately 40 feet by 75 feet. It encompasses the area between the support piers under the former engineering shop. Depth to groundwater in this area ranges from 4 to 8 feet giving an average depth of about 6 feet. Based upon the assumed extent of the TPH contamination, and assuming that excavation will encompass the entire vadose zone, the estimated volume of material to be excavated is approximately 700 cubic yards. Figure 4-4 shows the approximate horizontal limits of excavation for the proposed interim action.

Excavation will proceed using a trackhoe or other appropriate equipment. The initial delineation and extent of soil excavation will be based on visual observations of TPH-contaminated soil. After excavation of visibly contaminated soil is complete, field test kits (PetroFLAG™ or equivalent) will be used to determine whether additional soil requires excavation. Confirmation soil samples will be collected from the excavation bottom and sidewalls and sent to an approved analytical laboratory to ensure that remaining soils do not exceed the selected cleanup level. Sidewalls along the outer perimeter of the excavation (interior to the dig, the sidewalls will be formed by concrete support piers) at intervals of 25 lineal feet. In the area between the support piers, the excavation bottom will also be sampled at 25-foot intervals. Excavation will continue at and around locations exceeding the specified cleanup level, followed by additional testing. Additional sampling and analysis information is presented in Section 5.1.3.

In areas where work will be conducted below the soil/groundwater interface, quarry spalls or other approved armoring will be used to provide firm support for field staff performing concrete cleaning activities and a firm foundation for backfill.

4.3.4.4 Excavation Dewatering

The selected interim action does not address excavation of significant quantities of contaminated soil from below the groundwater table. Dewatering will be limited to pumping water from the excavation to an on-site tank for analysis and, if necessary, treatment at a POTW or an on-site treatment facility. On-site tank capacity is available for storing and treating 600,000 gallons. If a significant volume of contaminated soil is determined to extend below the groundwater table, the use of a well-point dewatering system may be evaluated to determine whether areawide dewatering is warranted.

4.3.4.5 Concrete Support Cleaning

The concrete supports beneath the former engineering shop will be cleaned in a two-step process. First the concrete supports will be scraped to remove caked-on petroleum material. The concrete will then be sandblasted to remove petroleum near the surface of the concrete. Scrapings from the supports as well as sand generated from cleaning the supports will be disposed at the landfill identified for soil disposal along with the excavated soils, provided that they meet disposal criteria for the facility.

There are four major concrete support components (piers) to be cleaned. Each is 75 feet long with widths ranging from 14 inches to 5 feet. Assuming that the support extends at least 6 feet below ground surface and that excavation will proceed to that depth, approximately 4,500 square feet of concrete support will be exposed for potential cleaning.

4.3.4.6 Backfilling

Backfilling operations will use clean material, either from another location at the former Rayonier pulp mill or from an outside source. Backfilling will be accomplished in 1- to 2-foot loose lifts and bucket compacted. The excavation will be backfilled to the pre-excavation grade. Stormwater BMPs will be implemented for any stored backfill material to minimize runoff and erosion.

Standing water in the excavation will be removed before backfilling to allow placement of fill soils on an unsaturated surface. As previously indicated, quarry spalls or other approved base material will be placed in wet areas to provide a firm foundation for fill soils.

4.3.4.7 Waste Handling

Potentially contaminated water generated during this interim action will either be pumped or hauled to a preselected, on-site storage tank for analyses and, if necessary, treatment at a POTW facility or an on-site treatment facility. The current on-site treatment system incorporates separation, solids filtration, and activated carbon. If the water is treated on site, the criteria used for determining suitability for discharge of the treated water to the harbor are the State of Washington Water Quality Standards for Surface Waters that are protective of aquatic organisms (WAC 173-201A) and the MTCA surface water cleanup standards protective of humans that consume aquatic organisms (WAC 173-340). The criteria selected were the lowest of the marine, acute, and chronic criteria protective of aquatic life and human health criteria. This water may include decontamination water from equipment washing and groundwater or surface water runoff removed from the excavation.

Soils removed may be temporarily stored in a containment area located in the southeastern portion of the site. This sealed blacktop area was designed specifically for the temporary storage of contaminated soils that were excavated during a previous project. Stockpiled soils will be covered and contained while stored to minimize any runoff or introduction to the environment. Stormwater from the containment area is gathered, stored, tested and, if necessary, treated in a system incorporating separation, solids filtration and activated carbon.

PPE that has been in contact with contaminated soils will be containerized for appropriate disposal. Ordinary trash that is not contaminated will be disposed of along with regular solid waste generated on the site.

5. SAMPLING AND ANALYSIS

The objective of the soil investigation will be to collect surface and subsurface samples to adequately define the nature and extent of soil contamination and to identify those areas that exceed the selected cleanup level. Samples will be collected and analyzed from each of the areas to be addressed by interim removal actions, and will include characterization samples, confirmation samples, and field quality control/quality assurance samples. In addition to soil samples for the interim actions, wastewater samples will be collected if necessary. An on-site mobile laboratory may be used during the interim actions concurrent with other remedial action activities. Otherwise, the samples will be sent to an off-site laboratory with a 48-hour turnaround time for reporting results.

5.1 SAMPLING LOCATIONS AND LABORATORY ANALYSES

Table 5-1 summarizes the samples to be collected for each interim action and specifies the laboratory analyses to be conducted.

5.1.1 Ennis Creek Sampling

5.1.1.1 Characterization and Delineation Sampling

Sixteen borings will be performed to determine the horizontal and vertical extent of contamination east of the existing sheetpile wall. There will be 4 borings collected along 4 transects. The west bank borings will be sampled at depths of 0.5 feet, 1 foot, and 1 foot intervals thereafter to a final depth of 3 feet below the groundwater table. Three samples will be sent for analysis (0.5 ft, at the water table, and 3 ft below groundwater). The other samples will be archived for analysis if needed for further delineation of the excavation area. The borings along the west edge of Ennis Creek will also be sampled to a depth of 3 feet below groundwater at the same intervals. Two samples will be sent for analyses (at the groundwater table and 3 feet below groundwater). The other samples will be archived for analysis if needed for further delineation of the excavation area. The centerline borings will be sampled starting at the 0- to 1-foot interval, and at 1-foot intervals until 3 feet below groundwater, and are expected to have one sample/boring. The borings along the east edge of Ennis Creek will be sampled to the top of groundwater, which are expected to have 1 sample/boring. The field sampler will confirm that samples collected at the groundwater table are within the smear zone. Collected samples will be analyzed for NWTPH-Dx

Table 5-1. Summary of Samples to be Collected and Analytical Method

Location/ Area	Sample Type Type	Matrix Type	Samples: Est. No. Design	Est. No. Field QA/QC	Analytical Group	Sample Prep. Method	Analytical Protocol	DQO Level
Ennis Creek	Characterization	Soil/Sediment	12 (west bank) 8 (west edge) 4 (center) 4 (eastern edge)	3	PCBs TPH diesel/oils	3545A/3550B NWTPH-Dx	8082 (EPA) NWTPH-Dx (Ecology)	Definitive Definitive
	Confirmation	Soil/Sediment	1 for every 200 ft^2 of excavation 1 for every 200 ft^2 of excavation	10% 10%	TPH diesel/oils PCBs	NWTPH-Dx 3545A/3550B	NWTPH-Dx (Ecology) 8082 (EPA)	Definitive Definitive
Fuel Tank No. 2	Characterization	Soil	10[1/]	1	TPH diesel/oils	NWTPH-Dx	NWTPH-Dx (Ecology)	Definitive
	Confirmation	Soil	1 for every 50 lineal ft of sidewall and every 50 ft^2 of bottom of excavation	10%	TPH diesel/oils	NWTPH-Dx	NWTPH-Dx (Ecology)	Definitive
	Field Test Kits		To be field determined		TPH			Screening
Machine Shop	Characterization	Soil	7[1/]	1	PCBs	3545A/3550B	8082 (EPA)	Definitive
			7[1/]	1	VOCs	N/A	8260B (EPA)	Definitive
			7[1/]	1	TPH diesel/oils	NWTPH-Dx	NWTPH-Dx (Ecology)	Definitive
			7[1/]	1	RCRA Metals	3050B/3051/7471	7471 and 6020 (EPA)	Definitive
	Confirmation	Soil	1 for every 50 lineal ft of sidewall and every 50 ft^2 of bottom of excavation	10%	TPH diesel/oils PCBs VOCs RCRA Metals	NWTPH-Dx 3545A/3550B N/A 3050B/3051/7471	NWTPH-Dx (Ecology) 8082 (EPA) 8260B (EPA) 7471 and 6020 (EPA)	Definitive Definitive Definitive Definitive
	Field Test Kits		To be field determined		TPH			Screening

1/ Based on anticipated volume of soil to be excavated.

and PCBs. The analytical results of the delineation sampling will be used to characterize material to be excavated for disposal purposes.

5.1.1.2 Confirmation Samples

When excavation has reached the limits shown on the excavation plan and visual observation does not indicate obvious contamination, confirmation samples will be collected. Approximately 1 sample will be collected for each 200 square feet of excavated area and analyzed for NWTPH-Dx and PCBs.

In addition, two sediment samples will be collected from the deltaic deposits at the mouth of Ennis Creek (e.g., where sediment is medium- to fine-grained). These samples will be collected prior to commencement of the interim removal action, as well as after the action is complete to substantiate that an incidental release has not occurred during the interim action. The samples will be analyzed for TPH diesel, TPH heavy oils, and PCBs.

5.1.2 Fuel Oil Tank No. 2

Sampling will include collection of NWTPH-Dx samples for delineation of extent of contamination and waste profiling and confirmation samples for evaluating successful removal of soil exceeding the cleanup level.

5.1.2.1 Characterization Samples

Characterization samples will be collected prior to mobilization to support waste profiling for the selected disposal facility. Based on historical analytical data, samples will be analyzed by method NWTPH-Dx for TPH Diesel and TPH heavy oils. Sample frequency will be in accordance with Ecology Publication 91-30, Guidance for Remediation of Petroleum Contaminated Soils (Ecology, 1995). Based on the anticipated volume of soil to be excavated, approximately 10 characterization samples will be submitted for analysis.

5.1.2.2 Confirmation Samples

When field test kit results indicate an area may contain contaminants warranting removal, a confirmation soil sample will be collected and submitted to an approved analytical laboratory for analysis by method NWTPH-Dx for TPH Diesel and TPH heavy oils. Samples will be collected from excavation sidewalls every 50 lineal feet and from the excavation bottom on approximately a 50-foot grid.

5.1.3 Machine Shop

Sampling will include collection of characterization samples for contaminant identification and waste profiling and collection of confirmation samples for evaluating successful removal of soil with contaminants at levels exceeding the selected cleanup level.

5.1.3.1 Characterization Samples

Characterization samples will be collected prior to mobilization to identify the nature of contaminants present at the site. These samples will also support waste profiling for the selected disposal facility. Based on historical analytical data, samples will be analyzed by method NWTPH-Dx for TPH diesel and TPH heavy oils, PCBs (EPA Method 8082), VOCs (EPA Method 8260B), and RCRA metals. Sample frequency will be in accordance with Ecology Publication 91-30, Guidance for Remediation of Petroleum Contaminated Soils (Ecology, 1995). Based on the anticipated volume of soil to be excavated, approximately seven characterization samples will be submitted for analysis.

5.1.3.2 Confirmation Samples

When field test kit results indicate an area may contain contaminants warranting removal, a confirmation soil sample will be collected and submitted to an approved analytical laboratory for analysis by method NWTPH-Dx for TPH Diesel and TPH heavy oils. Samples will be collected from exterior excavation sidewalls (interior sidewalls are formed by concrete support piers) every 50 lineal feet and from the excavation bottom at approximately the same interval. Samples will also be analyzed for PCBs, VOCs, and RCRA metals, if deemed appropriate from the characterization samples.

5.1.4 Wastewater

Wastewater may be generated during the interim actions resulting from soil dewatering and equipment decontamination. Wastewater will be sampled for the contaminants of concern from the site of origin in accordance with Standard Operating Procedure (SOP) 10 – Wastewater Sampling (Appendix A). Depending on the volume of water generated during each interim action and the analytical results, water may be transported off site to an approved disposal facility or treated on site.

5.2 FIELD SAMPLING METHODS AND PROCEDURES

5.2.1 Sediment Sampling

Sediment sampling for Ennis Creek should be accomplished using a hand held coring device if possible. This will provide consistency in the sampling technique and samples. The procedures for use of this type of sampling equipment are provided in SOP 11. Decontamination procedures are presented in SOP 4. These procedures are applicable to most small hand held sampling devices and tools. If the characteristics of the sediments in the creek and along the banks are not acceptable for core sampling using a hand held device (too sandy, too rocky or too hard), alternative sampling devices may be used. These include the hand auger for bank samples and the small grab sampler for the creek bed. If the sediments are very consolidated, it may be necessary to use a vibrcore device to obtain samples. The procedures for using these alternative sampling devices are presented in SOPs 2, 12, and 14, respectively. SOP 13 presents the decontamination procedures for the small grab sampler since these are slightly different than those for other small sampling tools. All samples collected should be handled in accordance with procedures presented in SOP 6 and other specific information contained in individual operating SOPs.

5.2.2 Surface Soil Sampling

Surface soil samples on the mill site will be collected from discrete source areas as defined in Section 4 and SOPs 1 and 2 (Appendix A). EPA operationally defines surface soils as samples collected in the shallowest interval as practicable. For purposes of this investigation, this interval is assumed to be from 0.1 to 2.0 feet below ground surface (bgs).

Discrete surface soil samples will be collected using a shovel or hand auger, stainless steel spatula or knife, and spoon. Location of samples will be by hand-held Global Positioning System (GPS), following the general proposed sampling location point map as a guide. Exact locations will depend upon field observations and obvious nonsoil material, such as loose demolition debris, concrete waste, piping, or wood debris, which will be avoided unless specifically targeted by the plan. All proposed subsurface samples should be co-located with the corresponding surface soil sample.

The following general sampling procedures are to be followed for discrete surface soil sample collection:

- Visually inspect the potential area for an appropriate soil site, relatively free of debris or foreign objects.
- Locate exact sample location with GPS.

- Label appropriate glassware in accordance with sample numbering scheme.
- Use a shovel to dig a small hole at this location and expose a soil face; use a pick or pick-axe, if necessary, to assist.
- Remove any foreign debris.
- Use a stainless-steel spatula or knife to cut a clean soil face.
- Alternatively, soil can be collected from a surficial core from a hand auger, following SOP 2 (Appendix A). The core should be subsampled using a clean stainless-steel spoon.
- Place soil directly from stainless-steel spoon (or spatula) into sample containers. If collecting samples for VOCs, fill these jars first.
- Collect duplicate samples as required.
- Take care to collect an even amount of material from the entire face; avoid bias in samples.
- Secure container lids, place completed custody seals over lids of all jars with the exception of VOC samples.
- Place samples in iced cooler.
- Record sampling location in the field logbook.
- Photograph sample location.

Collect subsurface samples, as appropriate, following procedures described below.

- Fill in excavation back to original ground surface.
- Decontaminate sampling equipment in accordance with SOP 4, and change sampling gloves between each sampling location.
- Collect any decontamination wastewater and source water quality control (QC) samples as specified.

At certain areas and locations, the presence of asphalt, crushed rock, or concrete (foundations) may preclude the direct procedure described above. Based upon initial site inspection, if it is impractical to relocate the general position, special sampling equipment will be required. This may include a powered cutting auger or concrete coring device. Use of this equipment should be directed by the Field Operations Lead (FOL). Procedures for these operations are typically equipment specific, and will be incorporated into the plan as necessary. In no case should material (such as surface asphalt residue or concrete coring cuttings) be included in a collected sample that is not obviously a part of the in situ soil matrix.

5.2.3 Water Samples

If wastewater is generated from the interim actions, the water will be contained in a central location. The wastewater will be sampled in accordance with SOP 10. Specific laboratory analysis will be based upon the contaminants of concern from the site of origin.

5.2.4 Decontamination Procedures

Field equipment used during the sampling activities will be decontaminated before sample collection to minimize the potential for cross-contamination. Whenever possible, disposable sampling equipment will be used to minimize the need for decontaminating equipment. Prior to sample collection, all nondisposable field sampling equipment that will come in contact with the samples will be cleaned and decontaminated following SOP 4, Appendix A. Hand-held sampling equipment may include split spoons, pumps, bailers, sounding tapes, and other devices.

5.2.5 Investigation Derived Waste

All disposable sampling materials and PPE used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavy-weight garbage bags, 5-gallon buckets, or other appropriate containers. These containers will be removed from sampling areas daily and placed in a central storage location at the project site. At the end of the field program, disposable waste will be removed from the storage area and disposed according to regulations and standard practice.

5.2.6 Sample Designation

5.2.7 Sample Containers and Preservation

Required containers, preservation, and holding times for each anticipated analysis are listed in Table 5-2.

Table 5-2. Laboratory Analyses, Methods, Containers, Preservation, and Holding Time Requirements

Analysis	Method	Sample Container	Preservation	Holding Time
Soil Samples				
PCB Aroclors	8082	8 oz. glass	Cool to 4°C	Extract within 14 days, analyze within 40 days.
TPH	NWTPH Dx	8 oz. glass	Cool to 4°C	Extract within 14 days, analyze within 40 days.
RCRA Metals	6020/7471	8 oz. glass	Cool to 4 °C	28 days for mercury, 6 months for all others
VOCs	8260B	2 x 2 oz. glass	Cool to 4°C	14 days

1/ This procedure includes silica gel cleanup.

5.2.8 Sample Packaging and Shipping

All samples collected will be assigned individual numbers, and will be individually labeled, noted in the site logbook, and recorded on the chain-of-custody form (Sections 6.3 through 6.6). Labels for sample containers will be filled out completely with all appropriate information. Samples will then be packed for shipment to the laboratory according to the current U.S. Department of Transportation (DOT) and WAC 173-303-071(3)(1) requirements. Sample containers will be packed in coolers with a low-density packing material, such as vermiculite, and Blue Ice® (or equivalent). The coolers will be securely sealed.

All samples will be hand-delivered, couriered, or shipped for overnight delivery, if possible, to the contracted laboratory. Custody seals will be used on coolers unless hand-delivered.

Protocols and procedures for sample packaging and shipping are detailed in SOP 6, Appendix A.

Upon receipt at the laboratory, the custody seal will be broken and the condition of the samples will be recorded by the receiver. The chain-of-custody form will be signed. Custody forms will be used internally in the laboratory to track sample handling and final disposition.

5.2.9 Field Changes

Because of the potential for changes during field activities, modifications of the procedures outlined in this IAWP may be required. Modifications of procedure will be at the discretion of the FOL after consultation with the Technical Lead, Chemical QC Manager, or Project Manager. In the event that major modifications are required or warranted, every effort will be made to consult Ecology prior to implementation of the changes. Significant modifications will be documented with a Field Change Request (FCR) (Figure 5-1). If a field change is later found to be unacceptable, the action taken during the period of deviation will be evaluated to determine the significance of any departure from the established program practices and appropriate action taken.

The FCR forms will be numbered as follows, consecutively starting with the number FCR-IA-001 (__):

FCR	Type of form
IA	Interim Action
XXX	Consecutive number, starting with 001

Figure 5-1. Field Change Request Form

FOSTER WHEELER ENVIRONMENTAL CORPORATION

FIELD CHANGE REQUEST (FCR)

PROJECT NAME	PROJECT NO.	CHANGE REQUEST NO. FCR-
TO (Ecology Mgr.,Tribe Rep.,Rayonier PM):	LOCATION	DATE

RE:
___ Drawing No. ________________ Title ________________
___ Spec Section ________________ Title ________________
___ Other ________________

1. DESCRIPTION (Items involved, submit sketch, if applicable):

2. REASON FOR CHANGE

3. RECOMMENDED DISPOSITION (Submit sketch, if applicable):

_____ Minor Change _____ Major Change (Impacts Cost, Schedule or Technical)

3a. Will this change result in a contract cost or time change? _____ YES _____ NO

3b. Estimate of contract cost or time charge (if any) ____________

PREPARER (Signature)	DATE	PREPARER'S TITLE	SITE SUPERINTENDENT (Signature)	DATE

4. DISPOSITION

___ Not approved (give reason).
___ Considered minor change - approved per Recommended Disposition - Documents will not formally be revised, field to maintain as-built records.
___ Considered major change – Rayonier, Ecology, Tribe approval required via contract modification process.

1) FOSTER WHEELER ENVIRONMENTAL DESIGN MANAGER (Signature) (IF ENGINEERING RELATED)	DATE	2) FOSTER WHEELER ENVIRONMENTAL PROJECT MANAGER (Signature)	DATE
3) HEALTH AND SAFETY MANAGER (Signature) (IF HEALTH AND SAFETY RELATED) _____ Comments (attached) _____ No Comments	DATE	4) QC REVIEWER (Signature) _____ Comments (attached) _____ No Comments	DATE

Project Manager distributes to:

Foster Wheeler Design Manager Contracts Manager QA Manager Site Management Team Reps. FCR Preparer
QC Manager Site Superintendent Project Controls Supervisor Project Health and Safety Manager

REV: 3-13-96

(__) (EC) Ennis Creek

(FO2) Fuel Oil Tank No. 2

(MS) Machine Shop

5.3 QA/QC REQUIREMENTS

5.3.1 Data Quality Objectives

The QA objective for measurement data is to ensure that data of known and acceptable quality are provided. Data from laboratory analysis of site samples will be used for delineation, characterization, and confirmation. The analytical data quality objective (DQO) level for each chemical analysis for the interim actions are included in Table 5-1. Method-specific DQOs for laboratory and field analyses are presented in Table 5-3.

The QA objectives for analytical data are defined below:

1. **Precision:** Precision measures the reproducibility of measurements under a given set of conditions. Precision is expressed in terms of relative percent differences (RPDs). RPD is calculated as follows:

$$\mathrm{RPD} = \frac{(\mathrm{S} - \mathrm{D})}{[(\mathrm{S} + \mathrm{D})/2]} \, x \, 100$$

Where: S = Initial Sample Result
D = Duplicate Sample Result

The laboratory objective for precision is to equal or exceed the precision demonstrated for similar samples, and RPD will fall within the established control limits for the sample preparation methods (Table 5-3). In general, the matrix spike (initial sample result) and matrix duplicate (duplicate sample result) will be used to determine the precision, in accordance with typical laboratory SOPs.

2. **Accuracy:** Accuracy is a measure of the bias or error in a measurement. Examples of bias include contamination and errors made in sample collection, preservation, handling, and analysis. Accuracy will be assessed by the collection of field/trip blanks and in the laboratory by the use of known and

Table 5-3. Estimated Quantitation and QC Limits for Soils

	CAS Number	Estimated Quantitation Limits for Low Soils[1/] (mg/kg)	Project Specific QC Limits for Soils[2/]	
			RPD	**% R**
PCBs (GC) (EPA Method 8082)				
Aroclor-1016	12674-11-2	0.020	0-30	50-150
Aroclor-1221	11104-28-2	0.020	0-30	50-150
Aroclor-1232	11141-16-5	0.020	0-30	50-150
Aroclor-1242	53469-21-9	0.020	0-30	50-150
Aroclor-1248	12672-29-6	0.020	0-30	50-150
Aroclor-1254	11097-69-1	0.020	0-30	50-150
Aroclor-1260	11096-82-5	0.020	0-30	50-150
Metals (CVAA and ICP/MS) (EPA Methods 6020 and 7421)[3/]				
Arsenic	7440-38-2	NL (0.2)	0-20	75-125
Barium	7440-39-3	NL (0.2)	0-20	75-125
Cadmium	7440-43-9	NL (0.2 to 0.5)	0-20	75-125
Chromium	7440-47-3	NL (0.2)	0-20	75-125
Lead	7439-92-1	NL (1)	0-20	75-125
Mercury	7439-97-6	NL (0.05)	0-20	75-125
Selenium	7782-49-2	NL (1)	0-20	75-125
Silver	7440-22-4	NL (0.5)	0-20	75-125
TPH-Diesel Extended Range (GC) (NWTPH-Dx)				
Diesel Range (Jet Fuels through Diesel #2)	NA	25	0-30	50-150
Motor Oil Range (after Diesel #2)[5/]	NA	100	0-30	50-150
Volatiles (GC/MS) (EPA Method 8260B)[4/]				
Acetone	67-64-1	.005	0-30	70-130
Benzene	71-43-2	.005	0-30	70-130
Bromodichloromethane	75-27-4	.005	0-30	70-130
Bromoform	75-25-2	.005	0-30	70-130

Table 5-3. Estimated Quantitation and QC Limits for Soils (continued) Page 2 of 3

	CAS Number	Estimated Quantitation Limits for Low Soils[1/] (mg/kg)	Project Specific QC Limits for Soils[2/]	
			RPD	% R
Volatiles (GC/MS) (EPA Method 8260B)[4/]				
2-Butanone	78-93-3	.005	0-30	70-130
Carbon Disulfide	75-15-0	.005	0-30	70-130
Carbon Tetrachloride	56-23-5	.005	0-30	70-130
Chlorobenzene	108-90-7	.005	0-30	70-130
Chlorodibromomethane	124-48-1	.005	0-30	70-130
Chloroethane	75-00-3	.005	0-30	70-130
Chloroform	67-66-3	.005	0-30	70-130
Chloromethane	74-87-3	.005	0-30	70-130
Dibromochloromethane	124-48-1	.005	0-30	70-130
1,1-Dichloroethane	75-34-3	.005	0-30	70-130
1,2-Dichloroethane	107-06-2	.005	0-30	70-130
1,1-Dichloroethene	75-35-4	.005	0-30	70-130
Cis-1,2-Dichloroethene	156-59-2	.005	0-30	70-130
Trans-1,2-Dichloroethene	150-60-5	.005	0-30	70-130
1,2-Dichloropropane	78-87-8	.005	0-30	70-130
Cis-1,3-Dichloropropene	542-75-6	.005	0-30	70-130
Trans-1,3-Dichloropropene	542-75-6	.005	0-30	70-130
Ethylbenzene	100-41-4	.005	0-30	70-130
2-Hexanone	591-78-6	.005	0-30	70-130
Methylene Chloride (Dichloromethane)	75-09-2	.005	0-30	70-130
4-Methyl-2-Pentanone	108-10-1	.005	0-30	70-130
Styrene	100-42-5	.005	0-30	70-130
1,1,2,2-Tetrachloroethane	79-34-5	.005	0-30	70-130
Tetrachloroethene	127-18-4	.005	0-30	70-130
Toluene	108-88-3	.005	0-30	70-130
1,1,1-Trichloroethane	71-55-6	.005	0-30	70-130
1,1,2-Trichloroethane	79-00-5	.005	0-30	70-130
Trichloroethene	79-01-6	.005	0-30	70-130
Vinyl Acetate	108-05-4	.005	0-30	70-130

Table 5-3. Estimated Quantitation and QC Limits for Soils (continued) Page 3 of 3

	CAS Number	Estimated Quantitation Limits for Low Soils[1/] (mg/kg)	Project Specific QC Limits for Soils[2/]	
			RPD	% R
Volatiles (GC/MS) (EPA Method 8260B)[4/]				
Vinyl Chloride	75-01-4	.005	0-30	70-130
Xylenes (Total)	1330-20-7	.005	0-30	70-130

Sources: Semivolatiles, PCBs, Metals (EPA, 1996a); TPH (Ecology, 1997).
NL = A quantitation limit is not listed in the method.
[1/] Specific quantitation limits are matrix dependent. The quantitation limits listed herein are provided for guidance and may not be achievable. Quantitation limits listed for soil are based on wet weight. The quantitation limits calculated on a dry weight basis will be higher. "Low Soil" denotes a quantitation limit that is achievable in soil samples containing low concentrations of the respective analyte.
[2/] Project-specific QC limits are listed; the off-site laboratory will provide laboratory-specific guidelines developed from laboratory QC samples.
[3/] For metals, the EPA methods list estimated instrument detection limits (IDLs) for guidance. Quantitation limits are not specified by the EPA methods, and are a function of the specific instrument, matrix, and operating conditions, and must be determined by the laboratory. Estimated quantitation limits, as provided in parentheses in this table, are typical of those that a laboratory can achieve by Method 6020.
For cPAHs, the EPA method does not list quantitation limits for SIM. Estimated quantitation limits, as provided in parentheses in this table are typical of the limits that a laboratory can achieve by 8270C/SIM.
[4/] Other compounds than appear on this table may be analyzed by the laboratory because of the nature of the analytical method.
[5/] Motor oil range is the same as heavy oil range.

unknown QC samples and matrix spikes. Accuracy will be measured by the percent recovery based on matrix spikes or surrogate recoveries. Percent recovery is calculated as follows:

$$\text{Percent Recovery} = \frac{(\text{SSR} - \text{SR})}{\text{SA}} \, x \, 100$$

Where: SSR = spike sample result
SR = sample (unspiked) result
SA = spike added

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the analytical methods on similar samples, and will fall within the established control limits.

3. **Representativeness:** Representativeness is the degree to which the sample data accurately and precisely represent an environmental condition. Ensuring that sampling locations are selected properly and an adequate number of samples are collected will satisfy representativeness. Field replicates will be used to assess representativeness; results should be within one-half order of magnitude (factor of 5) or less for a typical analysis.

4. **Completeness:** Completeness is the percent of measurements that are judged to be valid. The completeness of the data means that all the required samples have been taken and requisite analyses performed to generate an adequate database to

successfully complete the remedial design studies. Completeness values will be 95 percent for demonstrated analytical techniques as described in Table 5-3. Completeness will be determined by comparing the number of analyses attempted against the number of subsequent data points judged to be usable for the designated purpose(s).

5. **Comparability:** Comparability expresses the confidence with which one data set can be compared with another. Comparability is achieved by ensuring the sampling method employed, the chain-of-custody methods responsible for the transfer of the samples to the analytical laboratories, and the analytical techniques implemented at the laboratories be performed as specified in this IAWP, including the DQO levels shown in Table 5-3.

5.3.2 Field QA/QC Samples

Field QA/QC samples will be used to evaluate the efficiency of field decontamination procedures, variability resulting from sample handling, and site heterogeneity. All field QC samples will be documented in the site logbook, and include:

- trip blanks
- source water blanks (field blanks)
- equipment rinsate blanks
- field duplicates

Trip blanks will be utilized at a rate of one per cooler of samples for analysis. Source water blanks and equipment rinsate blanks will be collected (as applicable) whenever a new water source is used. Blind field duplicates will be collected at a rate of 5 percent (one per 20 samples).

6. DOCUMENTATION

Six primary types of documentation will be used for this project: site logbooks, photographs, sample summary logs, sample labels, custody seals, and chain-of-custody forms. The site logbooks are vital for documenting all on-site activities. Photo documentation will be used to provide an accurate visual account of sampled materials, sample locations, and environmental conditions. Sampling information will be recorded on sample summary logs. Sample labels are used to provide essential information and identification for all samples collected during field activities. Custody seals are used on all sample shipment containers to detect any tampering which may have occurred during transport or shipment. The chain-of-custody forms are used to track sample custody, and document the proper handling and integrity of the samples. A description of each of these documentation methods is provided in the following sections.

6.1 SITE LOGBOOKS

Site logbooks will be used to document all field and sampling activities performed at the site. Entries to the logbooks will include the date, time, description of field activities performed, names of personnel, weather conditions, areas where photographs were taken (if applicable), and any other data pertinent to the project. The site logbooks will also contain all sample collection and identification information and (if appropriate) a drawing of each area sampled, along with the exact location (coordinates) of where the sample was taken. When samples are collected, the logbooks will include the date, time, sample location, sample identification number, sample matrix, sample collection method, analyses to be performed, any comments, and the sampler's name.

Each page of the site logbooks will be pre-numbered, dated, and signed by the author at the end of each day's activities. The logbooks should be sturdy, weatherproof, and bound to prevent the removal of pages. All writing will be done in waterproof, black permanent ink. No pages may be removed from the site logbooks for any reason. Blank pages must be marked "page intentionally left blank." Mistakes must be crossed out with a single line, initialed, and dated. If multiple logbooks are used, they will be numbered sequentially. Requirements for the site logbooks are detailed further in SOP 5, Appendix A.

6.2 PHOTOGRAPHS

Photographs will be utilized during the project to document field activities and to provide an accurate visual record of the material sampled. All photographs taken will be identified in the site logbooks (preferably in a separate section of the book that is set aside for that purpose). Photographic logs will contain the film roll number, photograph number, date, time, initials of the photographer, and a description of the image in the photograph. Developed photographic prints will be sequentially numbered and dated corresponding to the logbook descriptions.

6.3 SAMPLE SUMMARY LOGS

Sample summary logs will be maintained by the FOL and used to keep track of all phases of the sampling and analysis process for all individual samples (Figure 6-1). The summary logs will include the sample identification number, date of collection, sample delivery date, date analytical results are received, and laboratory identification number.

6.4 SAMPLE LABELS

Sample containers will be clearly labeled with waterproof black ink at the time of sampling. Sample labels (Figure 6-2) will include the following information:

- project name
- sampling date
- sampling time
- sample location
- sample identification number
- analysis to be performed
- preservation used, if any
- initials of sampler

The sample label will be attached to the sample container prior to, or just after, the container is filled and the lid secured. As an added measure of security, the finished label should be covered with clear packaging tape to protect the ink from moisture and to tightly secure the label to the sample container. Information on the sample label must match the information on the chain-of-custody form and in the site logbook.

Figure 6-1. Sample Summary Log

Sample ID #	Sampling Location	Sampling Date	Time	Analysis Requested	Date Shipped	Date Fax Results	Due Date Prelim.	Due Date Final	Date Received	Laboratory ID No.	Notes

Figure 6-2. Sample Container Label and Custody Seal

Client ____________________

Collection Date ____________ Time ____________

Sample Location ____________________

Sample I.D. ____________________

Sampler ____________________

Analysis	Lab No.

Preserved with: None Cool HNO_3 HCL H_2SO_4 NaOH Other ____________

CUSTODY SEAL

Date ____________________

Signature ____________________

Sample Container Label and Custody Seal

6.5 CUSTODY SEALS

Custody seals (Figure 6-2) will be used on sample shipping containers (coolers) that will either be shipped or sent by messenger to the laboratory. Custody seals will be attached to the lid and body of the coolers to detect any tampering during shipment. The custody seals will be signed and dated. Custody seals are not required for samples hand-delivered directly to the laboratory, unless the coolers are left unattended at any time.

6.6 CHAIN-OF-CUSTODY FORMS

The chain-of-custody form (example in Figure 6-3) is necessary to document sample collection and the analysis required for each sample. The history of each sample and its handling will be documented from its collection through all transfers of custody until it is transferred to the analytical laboratory. The custody record will be completed using waterproof ink. Any corrections will be made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures or whiteouts are not permitted.

When transferring possession of samples, the individuals relinquishing and receiving them will sign, date, and note the time on the form. This will document sample custody transfer from the sampler to the laboratory. Containers shipped by common carrier will have the chain-of-custody form enclosed in a watertight container (e.g., Ziploc® bag) and placed in the container prior to sealing.

Internal laboratory records will document custody of the sample from the time it is received through its final disposition. The chain-of-custody form will be filled out as each sample is taken and double-checked before the samples are delivered to the laboratory. At a minimum, the chain-of-custody form will have the following information:

- name of project
- name and signature of sampler
- sample identification numbers
- sampling date
- sampling time
- number and type of containers per sample
- sample matrix
- sample preservation, if any
- analyses requested

Figure 6-3

Chain of Custody Record

Request for Analysis

FOSTER WHEELER ENVIRONMENTAL CORPORATION
12100 NE 195th, Suite 200, Bothell, WA 98011
(425) 482-7600 • Fax (425) 482-7676

Page ______ of ______   Lab. Ref. No. ____________________

Project Name: ______	Sampling Date:	Analysis Laboratory:
Project Address: ______	Shipping Date:	Laboratory Contact: P.O. No.:
FW Project No.: ______	Shipping Ref.:	Reports to be Sent to:
		Address/Phone No.:

Sampler(s): *(printed name)*

Sampler(s): *(signature)*

Sample Disposal Instructions:
- ☐ Lab disposal
- ☐ Return to FWENC
- ☐ Hold for pickup (will call)

Special Instructions:

Sample prep. | ANALYSES REQUEST (circle appropriate method number) | REMARKS

SAMPLE IDENTIFICATION	TIME COL-LECTED	NO. OF CONTAINERS, SIZE & TYPE	PRES-ERV-ATIVE	MATRIX	SAMPLE TYPE Com-posite	SAMPLE TYPE Grab	Method Standard (EPA # ____)	TCLP (1311) ____, Other ____	CLP Data Pkg.; Other ____	Halogenated Volatiles 8010B, 8121, 601, 502.1, CLP	Aromatic Volatiles 8020A,8021B, 602, 502.2, 503.1, CLP	BETX Only 8020A, 602, CLP	GC/MS VOAs 8260B, 624, 524.1. 524.2, CLP	GC/MS SVOAs 8270C, 625, 525, CLP	Pesticides (Organochlorine) 8081A, 608, 505, CLP	PCBs 8082 (Aroclors, Full Congeners)	HPLC PNA/PAHs 8310,610	Organophosphorus Comps. (Pest. & Herbs) 8141A	Chlorinated Herbicides 8151A	Dioxins 8290, CLP, 1613	Nitroaromatics and Nitramines(Ordnance) 8330	TPH-HCID AK, NWHCID	TPH-Gx AK101, NWTPHGx	TPH-Dx AK102,103, NWTPHDx	TPH frac. NWVPH NWEPH AK101AA AK102AA	Lead 6010, 7420, 7421	Priority Poll. Metals (13) 6010B & 7000 Series, 6020 CLP	TCL Metals (23) 6010B & 7000 Series,6020, CLP	TCLP 1311 (metals, VOAs, SVOAs, Pest., Herb.)	Inorganic Anions (Cl, F, NO_3, NO_2, PO_4, SO_4) 300, ____	Total Organic Carbon (TOC) 9060, ____				REMARKS

Turnaround Time:
- ☐ Standard
- ☐ 1 Week
- ☐ 4 Work Day
- ☐ 3 Work Day
- ☐ 2 Work Day
- ☐ 24 Hour

Sample Receipt:
- Total # Containers Recvd.:________
- COC Seals Present? ____________
- COC Seals Intact? ______________
- Received Cold? ________________
- Received Intact? _______________
- Received Via: __________________

Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*	Relinquished by: *(signature)*
Date: Time:	Date: Time:	Date: Time:	Date: Time:
Received by: *(signature)*	Received by: *(signature)*	Received by: *(signature)*	Received by: *(signature)*
Date: Time:	Date: Time:	Date: Time:	Date: Time:

Copies of each chain-of-custody form will be given to the FOL for tracking the sampling and analysis process for all samples. The copies will be maintained by the FOL and kept in a binder on site.

6.7 SITE-SPECIFIC DOCUMENTATION

6.7.1 Ennis Creek

Documentation for this interim action will consist of the following:

- Field reports listing daily activities
- Boring logs
- Analytical laboratory results for characterization and confirmation samples
- A record of soil volumes removed
- Transport paperwork (bills of lading, waste profiles) for contaminated soil/sediments
- Certificates of disposal from the landfill facility
- A record of the volume of fill soil placed (including quarry spalls or rock)
- A drawing showing the work site and the area successfully restored

6.7.2 Fuel Oil Tank No. 2

Documentation for this interim action will consist of the following:

- Field reports listing daily activities
- A record of soil volumes removed
- Transport paperwork (bills of lading, waste profiles) for contaminated soil
- Certificates of disposal from the landfill facility
- Analytical laboratory results for characterization and confirmation samples
- A record of the volume of fill soil placed (including quarry spalls or rock)
- A drawing showing the work site and the area successfully excavated

6.7.3 Machine Shop

Documentation for this interim action will consist of the following:

- Field reports listing daily activities
- A record of soil volumes removed
- Transport paperwork (bills of lading, waste profiles) for contaminated soil
- Certificates of disposal from the landfill facility
- Analytical laboratory results for characterization and confirmation samples
- A record of the volume of fill soil placed (including quarry spalls or rock)
- A drawing showing the work site and the area successfully excavated

7. REPORTING

An Interim Action Report will be prepared to document completion of the three interim actions. The report will present the remedial actions performed at each site, and will include sample results, final excavation limits, quantities of soil removed, disposition of excavated soil, and any deviations from the IAWP. Appendices will include certificates of disposal, bills of lading, and laboratory analytical data sheets. This Interim Action Report will be a separate document from the Remedial Investigation Report.

8. SCHEDULE

It is anticipated that the interim actions will be conducted during summer 2002 concurrent with the Remedial Investigation activities. All field work will be done during the dry season for regulatory requirements at Ennis Creek and in an effort to minimize generation of wastewater. A detailed schedule of the interim actions will be developed upon approval of the IAWP.

9. REFERENCES

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APPENDIX A

STANDARD OPERATING PROCEDURES

SOP 1:	**Surface Soil Sampling**
SOP 2:	**Hand Auger Sampling**
SOP 3:	**Methanol Field Preservation**
SOP 4:	**Hand-held Sampling Equipment Decontamination**
SOP 5:	**Site Logbook**
SOP 6:	**Sample Packing and Shipping**
SOP 7:	**Utilities Clearance**
SOP 8:	**Field Instrument Calibration**
SOP 9:	**Investigation-Derived Waste Handling**
SOP 10:	**Wastewater Sampling**
SOP 11:	**Sediment Coring (Hand Held Device)**
SOP 12:	**Sediment Sampling with Small Grab Sampler (creek bed)**
SOP 13:	**Decontamination of a Small Grab Sampler**
SOP14:	**Vibracore Sampling**

STANDARD OPERATING PROCEDURE 1
Surface Soil Sampling

Required Equipment

- Interim Action Work Plan (IAWP)
- Indelible black-ink pens
- Site logbook
- Camera
- Stainless-steel or plastic bowls and spoons
- Sample containers
- Chain-of-custody forms, custody seals, sample labels
- Ziploc® bags
- Insulated cooler
- Decontamination equipment

Typical Procedures

1. Review IAWP for sample locations and analysis.
2. Record necessary data in site logbook.
3. Obtain photograph(s) of the material before sampling.
4. Move equipment and supplies to sampling location.
5. If soil sample is to be a discrete sample, collect soil using a clean/decontaminated stainless-steel (organic analyses) or plastic (inorganic analyses) spoon.
6. If soil sample is to be a composite, collect soil from all locations to be sampled into one stainless-steel (organic analyses) or plastic (inorganic analyses) bowl and homogenize the soil. (Volatiles samples should not be composited.)

   Note: If collecting volatile organic compound (VOC) samples, preserve samples in accordance with SOP 3 (Methanol Field Preservation).
7. Use stainless-steel or plastic spoon to transfer soil sample into sample container.
8. Label and manage sample containers in accordance with SOP 6 for shipping and handling of samples.

9. Decontaminate sampling equipment in accordance with SOP for decontamination (SOP 4).
10. Document activities in the site logbook (SOP 5).

STANDARD OPERATING PROCEDURE 2
Hand Auger Sampling

Required Equipment

- Interim Action Work Plan (IAWP)
- Indelible black-ink pens
- Site logbook
- Camera
- Hand auger, drive sampler, or equivalent
- Plastic sheeting
- Sample containers
- Sample labels
- Ziploc® bags
- Cooler
- Decontamination equipment

Typical Procedures

1. Review IAWP for sample locations and analysis.
2. Record necessary data in site logbook.
3. Obtain photograph(s) of the material before sampling.
4. Place plastic sheeting at sampling location to collect hand-auger cuttings.
5. Move equipment and supplies to sampling location.
6. Use hand auger/drive sampler to bore into subsurface soil.
7. Place hand-auger cuttings on the plastic sheeting.
8. Describe soils in the site logbook.
9. If soil sample is to be a discrete sample, collect soil using a clean/decontaminated stainless-steel (organic analyses) or plastic (inorganic analyses) spoon.
10. If soil sample is to be a composite, collect soil from all locations to be sampled into one stainless-steel (organic analyses) or plastic (inorganic analyses) bowl and homogenize the soil. (Volatiles samples should not be composited.)

Note: If collecting volatile organic compound (VOC) samples, preserve samples in accordance with SOP 3 (Methanol Field Preservation).

11. Label and manage sample containers in accordance with SOP 6 for shipping and handling of samples.
12. Backfill sampling hole with hand auger cuttings.
13. Decontaminate sampling equipment in accordance with SOP for decontamination (SOP 4).

Document activities in site logbook (SOP 5).

STANDARD OPERATING PROCEDURE 3
Methanol Field Preservation

Required Equipment

- Interim Action Work Plan (IAWP)
- Site logbook
- Indelible black-ink pens and markers
- Scale
- Pre-weighed sample containers
- 25-milliliter (ml) vials of methanol
- Insulated cooler(s), chain-of-custody seals, Ziploc® bags
- Sample labels and appropriate documentation

Typical Procedures

1. Place pre-weighed sample containers on scale.
2. Place 25 grams of soil into sample container.
3. Place 25 ml of methanol into jar.
4. Confirm that soil is completely saturated with methanol and that free methanol is present above the soil.
5. If no free methanol is present add an additional 25 ml of methanol to container.
6. Record amount of methanol used for each container on chain-of-custody form.
7. Place samples in Ziploc® bag.
8. Place samples in insulated cooler.
9. Record all information in field logbook.

Note: In order to achieve project-required detection limits, the ratio of methanol to soil may need to be adjusted.

STANDARD OPERATING PROCEDURE 4
Hand-held Sampling Equipment Decontamination

Required Equipment

- Tap water
- Deionized water
- Laboratory-grade detergent (i.e., Alconox® or equivalent)
- 5-gallon buckets, or other appropriate container
- Scrub brushes
- Plastic garbage can
- 4-foot length of 2-inch polyvinyl chloride (PVC)
- Methanol
- Dilute nitric acid (if metals analysis will be conducted)
- Hexane (if pesticide or polychlorinated biphenyl [PCB] analysis will be conducted)
- Plastic sheeting
- Sprayers (garden or hand)

Typical Procedure:

Preparation:

1. Set up decontamination area on plastic sheeting.
2. Set up "clean" area upwind of decontamination area for air drying of equipment.
3. Fill one 5-gallon "wash" bucket with detergent and tap water.
4. Fill spray bottles with tap water, deionized water, and applicable solvents.

Decontamination of Sampling Equipment:

1. Remove gross contamination from sampling equipment.
2. Wash equipment with tap water/detergent solution.
3. Rinse equipment twice with tap water.

Rinse equipment with the appropriate solvent or combination of solvents as listed below:

1. For sampling equipment used for metals analysis, rinse with dilute nitric acid (sprayer).
2. For sampling equipment used for PCB or pesticide analysis, rinse with hexane (sprayer).
3. For sampling equipment used for all other analyses, rinse with methanol (sprayer).
4. Rinse with deionized water (sprayer).
5. Air dry.
6. Place disposable items (sampling gloves, paper towels, etc.) in garbage bag.

Sample Pump Decontamination:

1. Place the pump in a first 5-gallon bucket containing tap water and a small amount of Alconox or equivalent. Place discharge hose into same bucket.
2. Standby with additional tap water.
3. Turn on system and pump water through the sampling system. Add more water as needed and pump for 3 minutes.
4. Place the pump into a second 5-gallon bucket of tap water and turn on system. Pump until the soapy water has filled the first bucket. Place the discharge hose into the second 5-gallon bucket of water and pump for 1 minute.
5. Turn off system and place the pump into the 4-foot section of 2-inch ID PVC fitted with an end cap. Pour organic-free water into the decontamination tube. Standby with additional water.
6. Turn on the pump and pull organic-free water through the system. Add more water until at least 3 liters of organic-free water are pulled through the system.
7. Remove the pump from the decontamination tube and place the pump in its holder on the Reel E-Z™ system.
8. Containerize solvent bearing solutions in accordance with the Waste Management Plan.
9. Document activities in the site logbook.

STANDARD OPERATING PROCEDURE 5
Site Logbook

Purpose

This guideline describes the process for keeping site logbook(s).

Scope

The site logbook is a controlled document which records all major on-site activities. At a minimum, the following activities/events should be recorded in the site logbook:

- Arrival/departure of site visitors.
- Arrival/departure of major site equipment (e.g., drill rigs).
- Sample and waste shipment information (i.e., shipping manifests, chain-of-custody form numbers, carrier, air bill numbers, time).
- A summary of activities and logsheet numbers.
- Start or completion time of individual activities.

The site logbook is initiated at the start of the first on-site activity (e.g., initial reconnaissance survey). Entries are made each day that on-site activities take place. The site logbook becomes part of the permanent project file. Because information contained in the site logbook may be admitted as evidence in legal proceedings, it is critical that this document be properly maintained.

Definitions

Site Logbook—The logbook is a bound notebook with consecutively numbered pages that cannot be removed. Upon entry of data, the logbook requires the signature at the bottom of each page of the person making the entry.

Responsibilities

The site logbook is issued by the Project Manager (or designee) to the appropriate site personnel for the direction of on-site activities (e.g., Reconnaissance Survey Team Leader, Sampling Team Leader). It is the responsibility of this person (or designee) to keep the site logbook current while in his or her possession, and return it to the Project Manager or turn it over to another field team. Following the completion of all fieldwork, the site logbook is returned to the Project Manager for inclusion in the permanent site files.

Guidelines

The cover of each site logbook shall contain the following information:

- Project name
- Responsible parties name
- Sequential book number
- Start date
- End date

Daily entries into the logbook may contain a variety of information. At the beginning of each day, the following information must be recorded:

- Date
- Start time
- Weather conditions
- All field personnel present
- Any visitors present

During the day, a summary of all site activities and level of personal protective equipment should be recorded in the logbook. The information need not duplicate anything recorded in other field notebooks (e.g., Site Health and Safety Officer's notebook, calibration logbook, etc.), but should summarize the contents of the other notebooks and refer to the page locations in these notebooks for detailed information.

If measurements are made at any location, the measurements and equipment used must either be recorded in the site logbook or reference must be made to the notebook and page number(s) on which they are recorded. All maintenance and calibration records for equipment should be traceable through field records to the person using the instrument and to the specific piece of instrumentation itself.

All entries should be made in black pen. No erasures are permitted. If an incorrect entry is made, the data should be crossed out with a single strike mark, and initialed and dated. At the completion of entries by any individual, the logbook must be signed.

Photographs

The record of photographs taken at a site for the purpose of project documentation must be recorded in the site logbook or a field notebook. When movies, slides, or photographs are taken of a site or any monitoring location, they are numbered to correspond to logbook entries. The name of the photographer, date, time, site location, site description, and weather conditions are entered in the logbook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. However, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook. If possible, such techniques should be avoided because they can adversely affect the admissibility of photographs as evidence. Chain-of-custody procedures depend upon the subject matter, type of film, and the processing methods. Film used for aerial photography, confidential information, or criminal investigations require chain-of-custody procedures. Adequate logbook notations and receipts may be used to account for routine film processing. Once processed, the slides of photographic prints shall be serially numbered and labeled according to the logbook descriptions.

STANDARD OPERATING PROCEDURE 6
Sample Packing and Shipping

Required Equipment

- Interim Action Work Plan (IAWP)
- Indelible black-ink pens
- Site logbook
- Ziploc® bags
- Coolers
- Blue Ice® (or equivalent)
- Strapping tape or duct tape
- Vermiculite (or equivalent)
- Sample Logs
- Sample labels
- Chain-of-custody forms
- Custody seals

Typical Procedures

Note: Before packing, all samples will be individually labeled and noted in the site logbook by Field Operations Lead (FOL) or designee. Labels will be completed with all required information. The samples will be assigned individual numbers. The sample numbers will be used to complete the chain-of-custody forms.

Samples to be hand-delivered to the laboratory:

- Attach sampling label and custody seals (if necessary) on each sample jar.
- Place each sample in a Ziploc® bag and align the label so it can be easily read. Seal the bag.
- Place individual samples into the cooler lined with a larger heavy duty plastic garbage bag so that each container is safely secured.
- Include three or more (sufficient) Blue Ice® packs (or equivalent) to maintain a low temperature environment (approximately 4°C or less). Blue Ice® packs should not be in contact with the sample containers.

- Complete a chain-of-custody form for the containers and seal in a Ziploc® bag. Place the chain-of-custody form in the cooler. Always transport the cooler with its accompanying chain-of-custody form together.

Samples to be shipped to the Laboratory:

- Place each sample in a Ziploc® bag and align the label so it can be easily read. Seal the bag.
- Place individual samples into the cooler so that each container has some clearance on all sides.
- Fill void space with vermiculite or equivalent low-density packing material.
- Cover the head space inside the cooler with frozen Blue Ice® packs (or equivalent).
- Place the chain-of-custody form in a sealed Ziploc® bag and place it in the cooler.
- Close and latch the cooler. Wrap the cooler and lid with at least two turns of strapping or duct tape. Affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.
- Label coolers with up arrows and information to comply with U.S. Department of Transportation (DOT) requirements.

The FOL or designee will notify the laboratory approximately when and how many samples will arrive. The samples must be kept under refrigeration (or packed with Blue Ice® or equivalent) between sampling and analysis processing. The sample containers will be checked on arrival at the laboratory for breakage.

STANDARD OPERATING PROCEDURE 7
Utilities Clearance

Required Equipment

- Interim Action Work Plan (IAWP)
- Site maps
- Utilities clearance forms
- Site logbook

Typical Procedures

- Review IAWP for sample locations.
- Locate subsurface soil sampling locations on site maps.
- Call to set up commercial utilities location.
- Obtain utilities clearance forms before utilities location.
- Escort utility personnel to locations requiring clearance and fill out utilities clearance forms as required.

Document activities in site logbook.

STANDARD OPERATING PROCEDURE 8
Field Instrument Calibration

Calibration Frequency for Field Equipment

Field equipment used for on-site measurements will be calibrated in accordance with the manufacturer's specification before and after field use each day, or at a frequency recommended by the equipment manufacturer or industry practice. If any screening or test device requiring calibration cannot immediately be removed from service, the Field Operations Lead (FOL) may extend the calibration cycle, providing a review of the equipment's history warrants the issuance of an extension. No equipment will be extended more than twice per calibration cycle, nor will the extension exceed one-half the prescribed calibration cycle.

All calibration information will be recorded in the site logbook. This includes the instrument's make, model, serial number, condition, and all adjustments made during calibration of the instrument.

STANDARD OPERATING PROCEDURE 9
Investigation-Derived Waste Handling

Required Equipment

- 55-gallon drums
- Paint markers
- Tools
- Ziploc® bag
- Drum labels

Solid Waste Handling

Solid wastes needing to be containerized will be placed in 55-gallon drums or other approved containers. Solid residues known to be from a contaminated area should not be combined with other residues.

After proper decontamination, protective clothing and used disposable sampling equipment should be drummed together and separated from other waste types. Protective clothing and disposable sampling equipment should be collected daily and placed in a dedicated drum for this waste type. Personal protective equipment that does not come in contact with contaminated media can be disposed of (except footwear) along with domestic waste. However, disposable footwear should always be containerized in drums for proper disposal.

All filled or partially filled drums must be properly closed, sealed, labeled, and staged before demobilization. If storage is anticipated in excess of 2 weeks, the drums should be covered with a wind/rain resistant cover, such as a plastic or polyethylene tarp.

STANDARD OPERATING PROCEDURE 10
Wastewater Sampling

Required Equipment

- Interim Action Work Plan (IAWP)
- Site logbook
- Indelible black-ink pens and markers
- Sample tags/labels and appropriate documentation
- Insulated cooler(s), chain-of-custody seals, Ziploc® bags
- Sample containers
- Disposable bailers
- Decontamination equipment

Typical Procedures

Wastewater Storage:

1. Place 55-gallon drums or Baker® tanks at an approved storage area.

Wastewater Sampling

Preparation:

1. Record necessary data in site logbook.
2. Prepare sampling equipment.
3. Move equipment and supplies to sampling location.

Procedure:

1. Slowly lower the bailer into the 55-gallon drum or other approved storage tank. Through the top, lower the bailer to a minimum of 2/3 depth into the tank and remove.
2. Collect volatile organic compound (VOC) samples first by filling the 40-ml vials. Check to ensure that no air bubbles are contained in the vials after capping.
3. Collect remaining samples in appropriate glassware from the bailer.
4. Label and manage sample containers in accordance with SOP 6.
5. Decontaminate all equipment in accordance with SOP 4.
6. Document activities in the site logbook.

Standard Operating Procedure 11
Sediment Coring (Hand Held Device)

Required Equipment:

- Interim Action Work Plan (IAWP)
- Field logbook
- Sample labels
- Sample logs
- Indelible black ink pens
- Camera
- Sample caps
- Ziploc® bags
- Unpowdered disposable gloves
- Cooler and Blue Ice®
- Stainless Steel Hand-Held Coring Device
- Decontamination equipment (SOP 4)
- Navigation Equipment

Typical Procedures:

Preparation:

1. Move sampling equipment and supplies to work station. Assemble and attach any tubing or sleeving required.
2. Record necessary data in field logbook including date, time, sampling station coordinates, water depth (if applicable), and penetration depth (if available).

Procedure:

1. Decontaminate coring device in accordance with SOP 4 or by rinsing with distilled/deionized water and using clean sampling sleeves, if applicable. Inspect the apparatus for tightness of bolts, etc.
2. Hold the coring apparatus over the sediment. Push the corer into the sediment by hand or using a drop hammer. After the core has penetrated the sediments to the maximum depth possible, retrieve the coring apparatus by raising slowly to prevent

loss of sediments. Carefully lift the coring apparatus to the workstation and place in a stable position. Don clean gloves and extrude sediment into a clean bucket or remove sampling sleeve. Material from different sampling intervals should be placed in separate containers to allow homogenization prior to placement of sediment in sample containers.

3. Record the physical characteristic of the core sediments in the field logbook This description should include:
   A. Gross characteristics of the sediment lenses such as texture, color, biological structures present (shells, tubes, macrophytes), debris present (wood chips, wood fiber, human artifacts), oily sheen present, and any other relevant features.
   B. Gross characteristics of the vertical sediment profile, such as changes in any of the characteristics noted above.
   C. Penetration depth of the core.
4. Photograph the sediment.
5. Continue the sampling process until sufficient sample is obtained for planned analysis.
6. When sufficient sediment is obtained, gently and thoroughly mix the sediment from each sampling interval with a stainless-steel spoon to ensure homogeneity and place aliquots in appropriate sample containers (typically glass jars provided by the laboratory).
7. Label the sample(s), place in a large Ziploc® bag (if possible), and place in a chilled cooler for preservation.
8. Record the sampling interval and other pertinent information in the field logbook and on other appropriate sampling forms.
9. Decontaminate the sampling apparatus.
10. Move to the next station and repeat the appropriate sampling steps above.

Standard Operating Procedure 12
Sediment Sampling with Small Grab Sampler (creek bed)

Required Equipment:

- Interim Action Work Plan (IAWP)
- Field logbook
- Sample labels
- Sample logs
- Indelible black ink pen
- Camera
- Sample containers
- Ziploc® bags
- Disposable gloves
- Petite Ponar or mini van Veen grab sampler with removable top doors
- Hydrowire (support cable), Shackles and Swivels
- Stainless-steel bucket or bowl
- Stainless-steel spoon or scoop
- Aluminum foil
- Decontamination supplies

Typical Procedures:

<u>Preparation:</u>

1. Move sampling equipment and supplies to work site.
2. Assemble sampler mechanism by attaching hydrowire (or support cable) to the sampler using shackles and a swivel connection to prevent twisting of the sampler.
3. Move to sampling location.
4. Record necessary data in field logbook including date, time, and sampling station coordinates or location description.

Procedure:

1. Decontaminate the sampler in accordance with the procedures in SOP 13.
2. Suspend the sampler over the water and remove the safety pin (van Veen only).
3. Lower the sampler to the sediment surface at rapid but controlled rate not to exceed 2 ft/second (i.e., controlled drop).
4. NOTE: The height from which the sampler is released and the drop rate should be adjusted to achieve the desired penetration while avoiding disturbance and loss of surface sediments.
5. Allow sufficient slack in the line to close the sampler.
6. Lift the sampler from the creek bed gently to avoid washout of sediments and secure the sampler in an upright position on the bank.
7. Once it has been retrieved, don a clean pair of unpowdered (no zinc) disposable gloves, open the sampler door(s) and transfer sediment that has not contacted the sampling equipment into a clean stainless-steel bucket or other sample collection container. Sediments will be collected vertically through the sample.
8. NOTE: Remove any unrepresentative material using a stainless-steel spoon and record this action in the field logbook. Unrepresentative material includes large pieces (greater than 2 inches in diameter) of wood/bark, large shell fragments, man-made artifacts, and rocks.
9. Record a physical description of the sample in the field logbook.
10. Photograph the sediment.
11. Cover the bucket (container) with aluminum foil and repeat the sampling process, if necessary, until sufficient sample is obtained.
12. NOTE: Excess sediment (and rejected samples) from the sampler should be carefully placed back into the water as far downstream from the sampling location as possible/practical.
13. When sufficient sample has been retrieved, gently mix the sample using a spoon.
14. Place the sample into appropriate laboratory prepared containers and follow the SOP 6 for sample shipping and handling.
15. Decontaminate the sampler (SOP 13) and move to the next sampling station.

Standard Operating Procedure 13
Decontamination of a Small Grab Sampler

Required Equipment:

- Interim Action Work Plan (IAWP)
- Field logbook
- Indelible black ink pens
- Source approved potable tap water
- Distilled water
- Laboratory-grade non-phosphate detergent (Liquinox or equivalent)
- Large plastic wash tub
- 5-gallon buckets
- Scrub brushes
- Garden sprayer(s) with wand and flow adjustment/hand sprayers (plastic body and tip)
- Hand sprayers
- Hose assembly and salt water pump
- Gloves and safety glasses

Typical Procedures:

Preparation:

1. Fill a bucket or tub with potable tap water and add detergent.
2. Fill a new/clean garden sprayer with distilled water.
3. If possible set up a hose assembly to provide ambient water for rinsing equipment.
4. NOTE: Prior to field work the MSDSs for all chemicals used in the sampling program should be reviewed as well as specific information in the HSP regarding these substances.

Decontamination of van Veen:

1. Don gloves and safety glasses prior to decontamination procedures. Staff should be wearing protective coveralls, Tyvek suits, or rain gear at all times in the exclusion zone.
2. Decontaminate spoons, buckets, Teflon® tubing, and other incidental sampling equipment (see SOP 4) prior to decontaminating the van Veen sampler.
3. After spoons and buckets have been decontaminated place the small grab sampler in a shallow wash pan that has been rinsed.
4. Remove excess sediment from the sampler.
5. Scrub the sampler
6. NOTE: The van Veen sampler tends to collect sediment and debris in the square corners at the top and in the screens and flaps. Check these areas carefully.
7. Rinse the sampler with ambient water while suspended over the wash pan using a garden sprayer.
8. If sticky or oily residue is observed, rinse with dilute nitric acid, deionized water, and isopropanol. Hexane will be available as a final backup rinse, if necessary.
9. Rinse equipment with deionized water while suspended over the wash pan.
10. Allow excess liquid on the equipment to evaporate if possible.
11. Document the decontamination procedures in the field logbook.
12. NOTE: All investigation derived waste including paper towels, disposable gloves, Tyvek suits, etc. should be placed in 5-gallon buckets with lids for transfer to 55-gallon drums or other appropriate containers in a central storage location on site.
13. Carry the clean sampler to the next sampling point and deploy in accordance with SOP 12.

Standard Operating Procedure 14
Vibracore Sampling

Required Equipment:

- Interim Action Work Plan (IAWP)
- Field logbook
- Sample labels
- Sample logs
- Indelible black ink pens
- Camera
- End caps for Vibracore sleeves
- Electrical tape, duct tape, aluminum foil
- Vibracore apparatus
- Sample shipping containers
- Ice
- H_2S monitor
- Tape measure

Operating Procedures:

1. The coring equipment is maneuvered over the approximate position for the core by the operator and the water depth and bottom slope are determined. The VCS base will be adjusted to the bottom slope if required.

2. The corer is suspended from a frame and lowered to the bottom.

3. After successful deployment, the penetration recording system and vibratory head are engaged and the desired penetration is obtained. Penetration versus time is recorded.

4. The core is extracted from the sediment and the VCS is recovered and stowed.

5. The core, with contained sediment, is removed from the driving head and transferred to a processing rack. (Note: Check H_2S in the work space prior to proceeding)

6. The distance from the top of the core to the end of the core tube is physically measured and the top of the core is marked on the outside of the tube using black indelible ink (large Sharpie®, etc.).

7. The tube is positioned in the rack to allow cutting at/near the top of the core and the tube is securely clamped to the rack.

8. The excess core tube is cut off using a tube cutter. Two personnel are required, one to operate the tube cutter and a second to hold onto the segment being removed.

9. The core is marked for cutting into desired segments, positioned in the core rack, and cut. As segments are removed, they are sealed, labeled, and stowed in a core storage box. This box is insulated and can be covered if segment length is less than four feet. Ice should be utilized for cooling.

10. Following the collection of each sample, the work area is washed down using a hose system or water in buckets. The equipment is then secured and moved to the next sampling site.

Core Acceptance Criteria:

- A continuous core sample will be collected to the designated coring depth or until refusal.
- The depth of core penetration will be measured and recorded.
- The core sample will be evaluated at the visible ends of the core tube to ensure that retrieved sediment core reached the required penetration depth. Sample recovery will be inspected relative to the following acceptance criteria:

    1. Overlying water is present and the surface is intact;

    2. Calculated compaction is not greater than 25 percent; and

    3. The core tube appears intact without obstruction or blocking.

APPENDIX B

SUBSTANTIVE REQUIREMENTS FOR INTERIM ACTION—ENNIS CREEK – FINISHING ROOM AREA

APPENDIX B

Substantive Requirements For Interim Action
Ennis Creek-Finishing Room Area, Former Rayonier Pulp Mill, Port Angeles, Washington, Ennis Creek, Tributary to Strait of Juan de Fuca, Clallam County

1. Work shall be accomplished per plans and specifications entitled: Rayonier Mill Site, Port Angeles, WA Existing and Proposed Conditions Pages 1 through 3, dated June 13, 2002, and Management Plans for the Remedial Investigation of the Marine Environment Volume IV Interim Actions Work Plan Addendum, and Plan Sheets for Stream Bypass: Endwall Station 0+18, and Headwall Station 2+75, submitted to the Washington Department of Fish and Wildlife, except as modified by these substantive requirements. A copy of these plans shall be available on site during construction.
2. A temporary bypass to divert flow around the work area shall be in place prior to initiation of other work in the wetted perimeter.
3. A sandbag revetment or similar device shall be installed at the bypass inlet to divert the entire flow through the bypass.
4. A sandbag revetment or similar device shall be installed at the downstream end of the bypass to prevent backwater from entering the work area.
5. The bypass shall be of sufficient size to pass all flows and debris for the duration of the project.
6. Prior to releasing the water flow from the project area, all bank protection or armoring shall be completed.
7. Upon completion of the project, all material used in the temporary bypass shall be removed from the site and the site returned to preproject or improved conditions.
8. All placement of the bank protection material as per the above referenced plans and specifications shall be part of the interim action plan. Bank protection material shall be removed in the future, if the location of the bank protection is in conflict with the future plans for the restoration of Ennis Creek as described in the Cooperative Agreement between the Lower Elwha Klallam Tribe and Rayonier Inc.
9. Placement of bank protection material waterward of the ordinary high water line shall be restricted to the minimum amount necessary to protect the toe of the bank or for installation of mitigation features approved by the Washington Department of Fish and Wildlife (WDFW).

10. Mitigation features approved by the WDFW include trees with rootwads attached that shall be installed and anchored to provide functional stable fish habitat, and the installation of beach logs which shall be distributed on the upper portion of the six-to-one slope.

11. Any reused rip rap bank protection material shall be free of contaminants.

12. The toe shall be installed to protect the integrity of bank protection material.

13. All waste material such as construction debris, silt, excess dirt or overburden, contaminated sediment or rip rap, and sheet piling, resulting from this project, shall be deposited above the limits of flood water in an approved upland disposal site.

14. Bank protection material shall be installed to withstand 100-year peak flows. Bank protection material shall be angular rock or large woody debris.

15. Bank protection material shall not constrict the flow and cause any appreciable increase (not to exceed 0.2 feet) in backwater elevation (calculated at the 100-year flood) or channel-wide scour, and shall be aligned to cause the least effect on the hydraulics of the stream.

16. The use of equipment below the ordinary high water line shall be limited to that necessary to gain position for work.

17. Equipment used for this project shall be free of external petroleum-based products while working around the stream. Accumulation of soils or debris shall be removed from the drive mechanisms (wheels, tires, tracks, etc.) and undercarriage of equipment prior to its working below the ordinary high water line. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities along the stream.

18. Equipment crossings of the stream are not authorized.

19. Every effort shall be taken during all phases of this project to ensure that sediment-laden water is not allowed to enter the stream.

20. If high flow conditions that may cause siltation are encountered during this project, work shall stop until the flow subsides.

21. Extreme care shall be taken to ensure that no petroleum products, hydraulic fluid, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into the stream.

22. Areas of excavated contaminated sediments shall be backfilled with the pit run reject identified on the project site. The project area may be topped with the small gravel reviewed as a sample on-site with Jack Anderson of Rayonier.

23. All disturbed areas shall be protected from erosion using vegetation or other means. The project area above the ordinary high water line shall be revegetated with the native plants provided in the recommendations of the Lower Elwha

Fisheries Office. Those recommendation include plantings of Hookers willow (*Salix hookeriana*) along the toe of the slope to provide some root stability and overhanging vegetation. The remainder of the slope shall be seeded with dune wild-rye (*Elmus mollis*), large-headed sedge (*Carex macrocephala*), sand-dune sedge (*C. pansa*), or Lyngby's sedge (*C. lyngbeyi*), and sea-shore lupine (*Lupinus littoralis*). All revegetation plantings shall be maintained as necessary for three years to ensure 80 percent survival.

ATTACHMENT 1

INTERIM ACTION WORK PLAN ADDENDUM

VOLUME IV:

INTERIM ACTION WORK PLAN ADDENDUM

FORMER RAYONIER PULP MILL SITE

Port Angeles, Washington

Prepared for

Rayonier, Inc.
Jacksonville, Florida

Prepared by

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION
12100 NE 195th Street
Bothell, WA 98011

June 24, 2002

CONTENTS

FIGURES

DRAWINGS

1. INTRODUCTION

An addendum to Volume IV - Interim Action Work Plan (IAWP) (Foster Wheeler Environmental, 2002) has been prepared to provide further details of the work to be performed along the Ennis Creek-Finishing Room Area. Since submittal for public review in February 2002, the final design has been completed and an approach has been reviewed with Department of Ecology (Ecology), the Lower Elwha Klallam Tribe (the Tribe), and Washington Department of Fish and Wildlife (WDFW). The details for the design are presented in Section 2, the sampling method is discussed in Section 3, and the approach for constructing a creek by-pass during excavation is presented in Section 4.

2. ENNIS CREEK DESIGN

A general design for the Ennis Creek – Finishing Room Area had been presented in the IAWP, Figure 4-2. This design showed an inundation of the creek into the area of the former finishing room. This design has been detailed further in Figures 1, 2, and 3 attached at the end of this addendum. Sheet 1 is the Title Sheet that shows the location map and site plan. Sheet 2 presents a plan view of the existing and proposed conditions, and Sheet 3 presents a cross-section of the creek design. As defined in the Ennis Creek Phase I Agreed Order, the final design for the creek shows the west bank at a 6:1 slope beginning at the centerline of the creek until it reaches a peak elevation of 12 feet. At the peak of the berm a buried riprap layer will be placed to protect the arc of the inundation area. The material used to backfill the previous interim action in this area was determined to be of an acceptable gradation. Additionally, imported material will meet gradation specifications of beach sand for the top one to two feet of surface material. Approximately six root-wads will be anchored with ecology blocks along the inundation area at an elevation of approximately 5 feet. The Tribe specified cedar trees for the root-wads and aged beach wood above the water line in the vegetated area. The Tribe has also specified planting Hooker's Willow (*Salix hookeriana*) along the toe of the slope to provide important root stability and overhanging vegetation. In addition, the remainder of the slope should be seeded with Dune Wildrye (*Elmus mollis*), large-headed sedge (*Carex macrocephala*), Sand dune sedge (*Carex pansa*) or Lyngby's sedge (*C. lyngbeyi*), and the sea-shore lupine (*Lupinus littoralis*).

3. DELINEATION SAMPLING

Soil and sediment sampling will be performed in the area east of the steel sheetpiling to determine horizontal and vertical extent of contamination by TPH and PCBs. The area to be sampled is bordered on the north by the bridge at the mouth of the creek and extends upstream approximately 70 feet south of the sheetpile wall.

Samples will be collected from approximately 16 locations to determine the horizontal and vertical extent of contamination east of the existing sheetpile wall. Further evaluation of the creek bed resulted in eliminating the use of a hand auger or vibracore system. The creek bed has very dense cobble that would make coring ineffective in collecting sufficient material for chemical analysis. Therefore, samples will be collected using a small rubber-tracked backhoe with a small bucket. The backhoe will be steam cleaned and thoroughly inspected to insure there are no hydraulic leaks, and the samples will be collected in an effort to minimize impact to the creek.

Due to this new approach for collecting samples, the sample locations presented in the IAWP are approximate and will be adjusted as needed to accommodate this sampling method. The west bank sample locations will be sampled at depth intervals of 0.0 to 0.5 foot, 0.5 to 1.0 foot, and 1 foot intervals thereafter to a final depth of 3 feet below the groundwater table (assumed to be the surface of Ennis Creek) or until refusal is encountered. Three samples will be sent for analysis (0.0 - 0.5 ft, from the interval which contains soil collected at the water table, and 2.0 – 3.0 ft below groundwater). The other samples will be archived for analysis if needed for further delineation of the excavation area. The sample locations along the west edge of Ennis Creek will also be sampled to a depth of 3 feet below groundwater (or to refusal) at the same intervals. Two samples will be sent for analyses (from the interval which contains soil collected at the groundwater table and 2.0 – 3.0 feet below groundwater). The other samples will be archived for analysis if needed for further delineation of the excavation area. The centerline sample locations will be sampled to a depth of 1 foot below the mud-line and are expected to have one sample per location. The sample locations along the east edge of Ennis Creek will be sampled to the top of groundwater (assumed to be the surface of Ennis Creek) or one foot below the mud-line (if collected within Ennis Creek) and are expected to have 1 sample per location.

The field sampler will confirm that samples collected at the groundwater table are within the smear zone. Collected samples will be analyzed for TPH and PCBs, as specified in Section 5 of the IAWP (Foster Wheeler Environmental, 2002). The analytical results of the delineation sampling will be used to characterize material to be excavated for disposal purposes.

Two additional sample locations have also been added in the alluvial fan area north of the bridge. Two surface sediment samples will be collected before and after the interim action. The samples will be collected using a Petite Ponar to analyze the top 10 centimeters of sediment.

4. CONSTRUCTION APPROACH

4.1 TEMPORARY CREEK BYPASS

A bypass pipe will run the length of the work area, approximately 280 feet, and will be used to temporarily bypass the creek (see Figure 1). The headwall will be installed at Station 2+75. Concrete ecology blocks will be used to create the main portion of the headwall and plastic and sandbags used to seal the headwall and bypass pipe (see Figure 2). Based upon stream flows, ecology blocks will be stacked two high and a bypass pipe of 24-inch to 36-inch diameter will be used. The height of the tides and the volume of the stream will influence a final decision as to the diameter of the pipe at the time of the work. The bypass pipe will run north along the East Side of the stream bank and discharge at Station 0+18, which is north of the existing bridge over Ennis Creek (see Figure 3).

At the north bridge location an endwall will be constructed to prevent water from flowing back up the stream during high tides. The endwall will be built in the same manner as the headwall. The stream bypass will remain until the clean soil is backfilled and graded in accordance with the design. The pipe, headwall and endwall will be removed and any disturbance to the stream will be regraded.

To help keep the extraneous stream bed water from entering the excavation area, a temporary sump will be built just north of the headwall and a 3-inch pump installed, which will pump water back into the stream above the headwall.

4.2 EXCAVATION DEWATERING

It will be necessary to collect the oily water while the contaminated soils are being excavated. Depending on the water flow, either a 3 or 4-inch diaphragm pump will move the water into an 18,000-gallon tank. The oily water will then be routed through an oil-water separator, where the floating oil will be removed and then contained in a 500-gallon tank. The cleaner water will be pumped with a 4-inch high head pump into Rayonier's onsite tanks for storage and testing. While only one tank is expected to be needed, Rayonier has three 140,000-gallon tanks available for storage. Absorbent pads will also be used in the sump and in the weir tank to reduce the oil in the water that is being sent to the storage tanks.

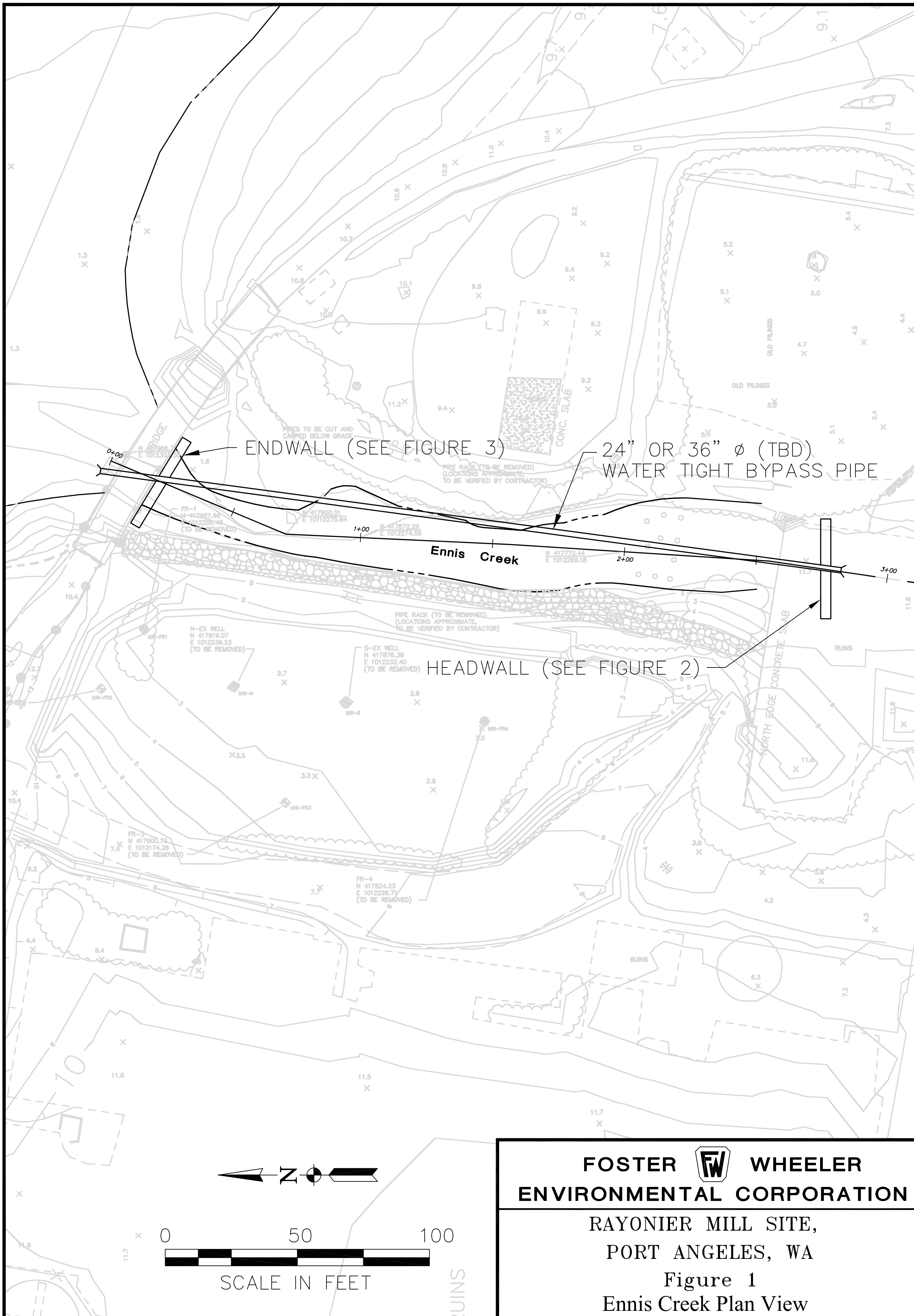
To reduce the potential for sloughing of soils and movement of contaminated water, it is beneficial to backfill the excavated area each day. Under this scenario, 40 to 50 feet of contaminated soils would be excavated and then backfilled daily. Prior to backfilling the area, the bottom of the excavation and side walls will be sampled as discussed in the IAWP Section 5.1.1.2. TPH field test kits may also be used to guide additional excavation beyond the boundary identified from the delineation sampling discussed in Section 3. PCB field test kits would not be used because the cleanup criterion is significantly lower than the minimum reporting limit for the kits. Should the TPH field test kit result be above the cleanup criteria, additional soil would be excavated from the creek bed. Should the TPH field test kit results be below the cleanup criteria, then confirmation samples would be collected and the area backfilled. The results will not be available until the site has been completely backfilled; however, the results will help Ecology determine whether the interim action can be considered a final action for this portion of the site.

4.3 BACKFILLING

Backfilling operations will use excess clean material from the area west of the sheetpile. If necessary, to obtain additional backfill material, an outside source that has clean material will be used. The riprap that is on site will be reused after brushing and/or washing to remove dirt or other observable contaminants. Backfilling will be accomplished using the excavator or other suitable equipment. Material will be bucket-tamped into position whenever possible. Backfilling in areas within the planned inundation area of Ennis Creek will use material of proper gradation to protect against erosion. This includes construction of a buried riprap layer to protect the boundary of the inundation area, anchoring root-wads, and planting native vegetation along the bank as shown in Sheets 2 and 3 and specified in Section 2.

5. REFERENCES

Foster Wheeler Environmental. 2002. Volume IV: Interim Action Work Plan, Foster Wheeler Environmental Corporation. Bothell, Washington. February 2002.



FOSTER WHEELER ENVIRONMENTAL CORPORATION

RAYONIER MILL SITE,
PORT ANGELES, WA

Figure 1
Ennis Creek Plan View

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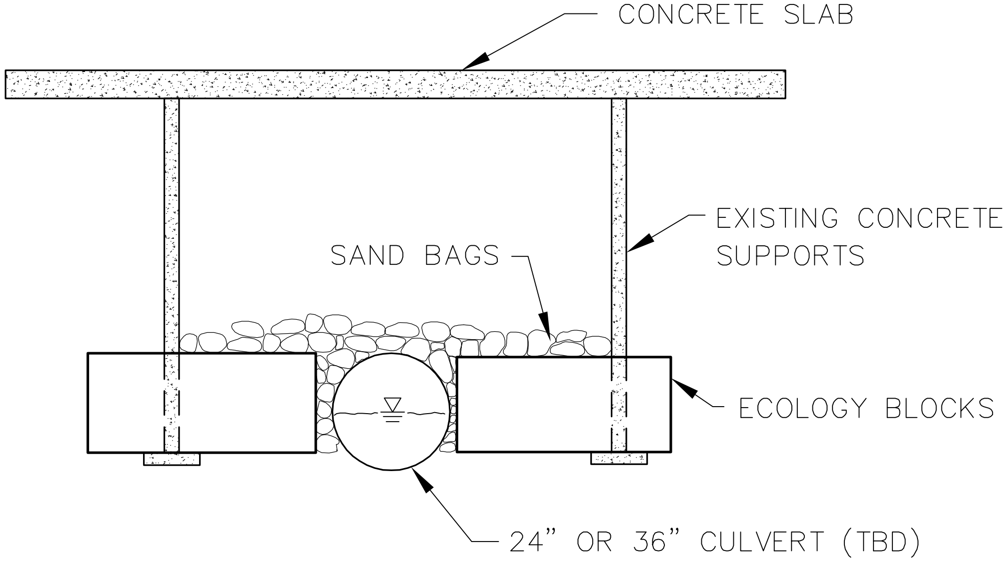
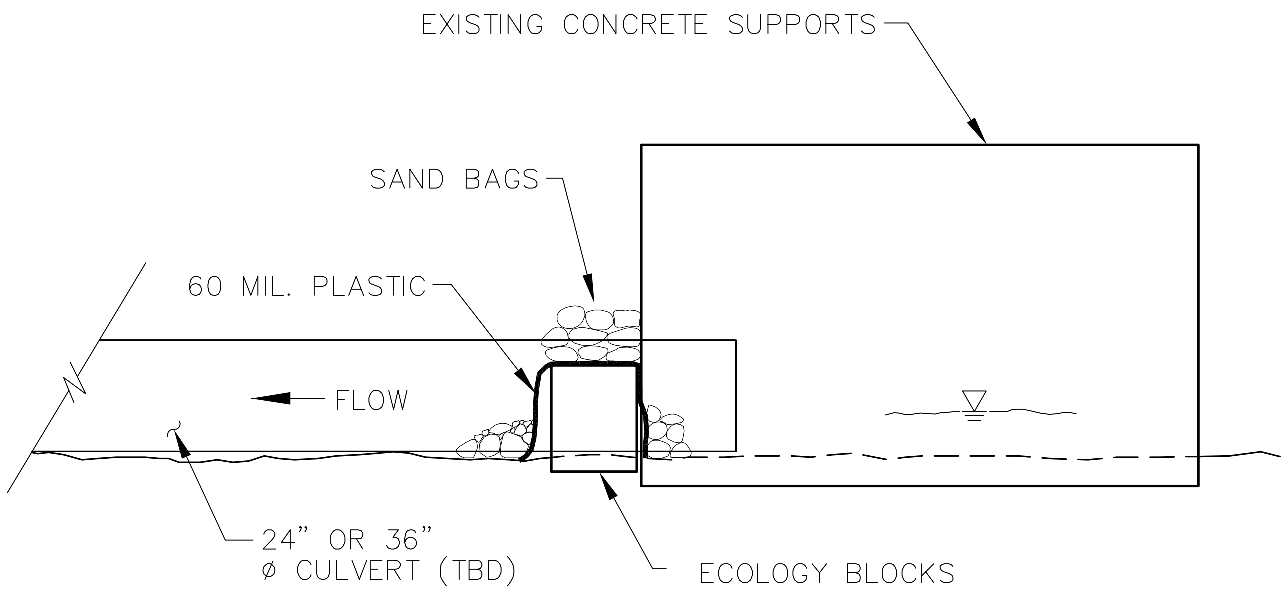


FRONT VIEW



SIDE VIEW

HEADWALL STA. 2+75

NTS

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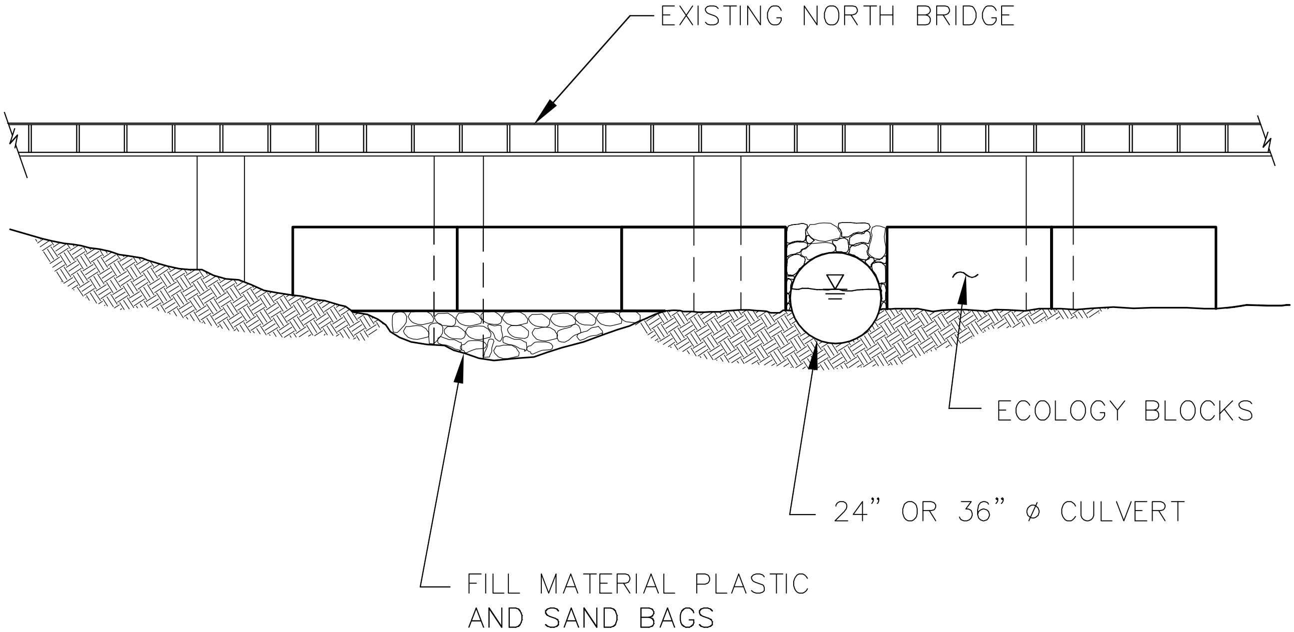
FOSTER WHEELER ENVIRONMENTAL CORPORATION

RAYONIER MILL SITE,
PORT ANGELES, WA
Figure 2
Headwall STA. 2+75



ENDWALL STA. 0+18

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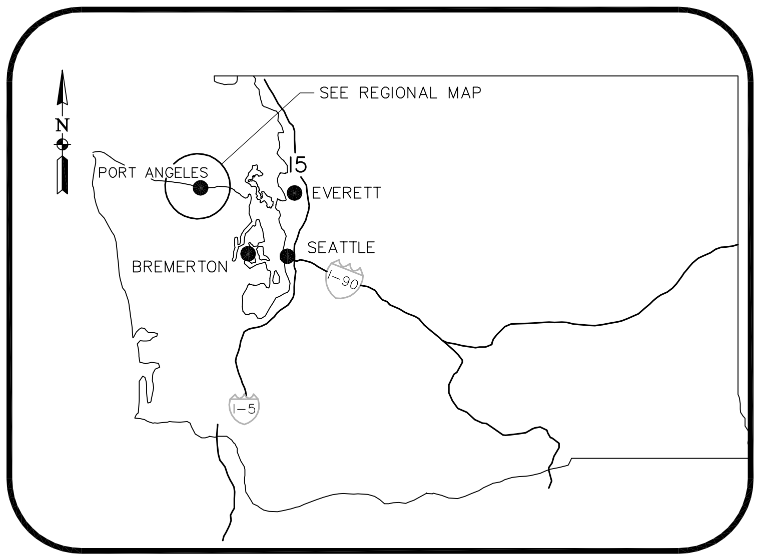
ENVIRONMENTAL CORPORATION

RAYONIER MILL SITE,
PORT ANGELES, WA
Figure 3
Endwall STA. 0+18

ENNIS CREEK - FINISHING ROOM AREA
PROPOSED INTERIM ACTION

DRAWING LIST



KEY MAP
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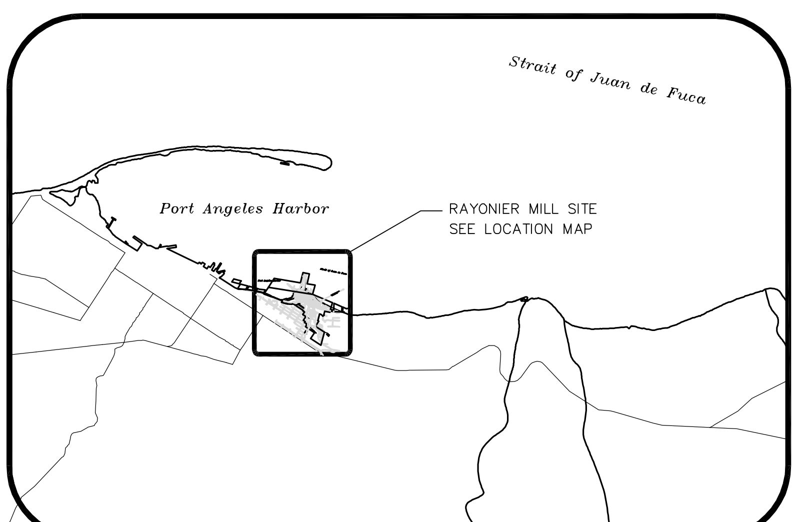

REGIONAL MAP
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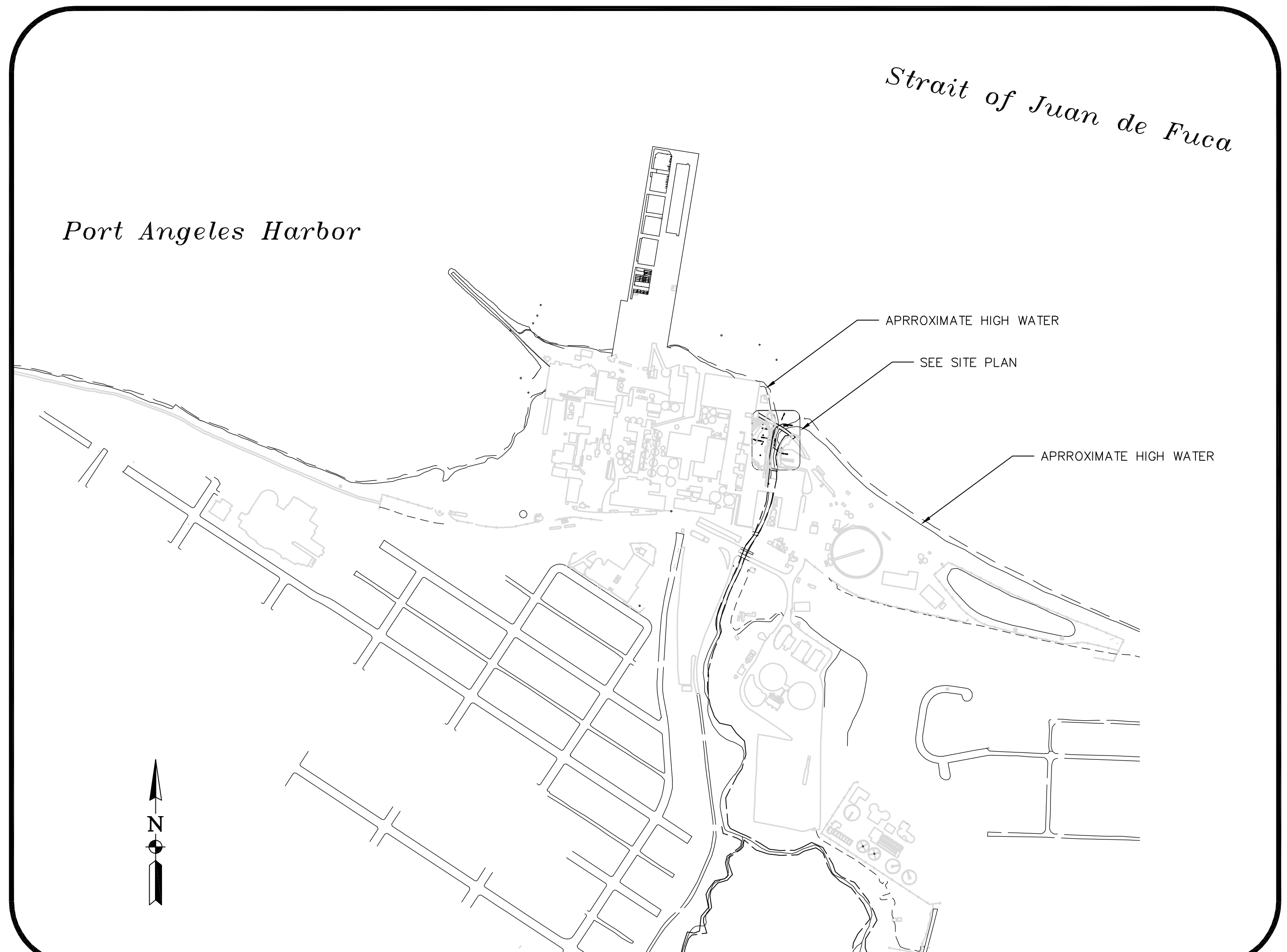

LOCATION MAP
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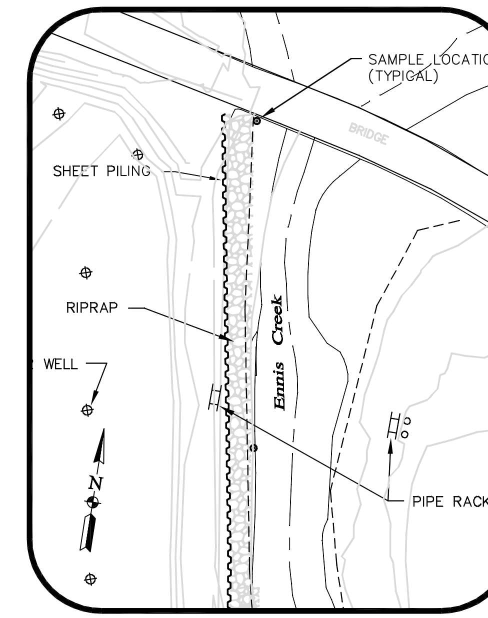

SITE PLAN
0 7.5 15
1"=15'

NOT FOR CONSTRUCTION

RAYONIER MILL SITE, PORT ANGELES, WA
TITLE SHEET
AND SITE LOCATION MAPS

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

SCALE: AS NOTED	APPROVED JLS	DATE: 6/17/02
DESIGNED: JGO DRAWN: KSK CHECKED: MS		18340002 1/3

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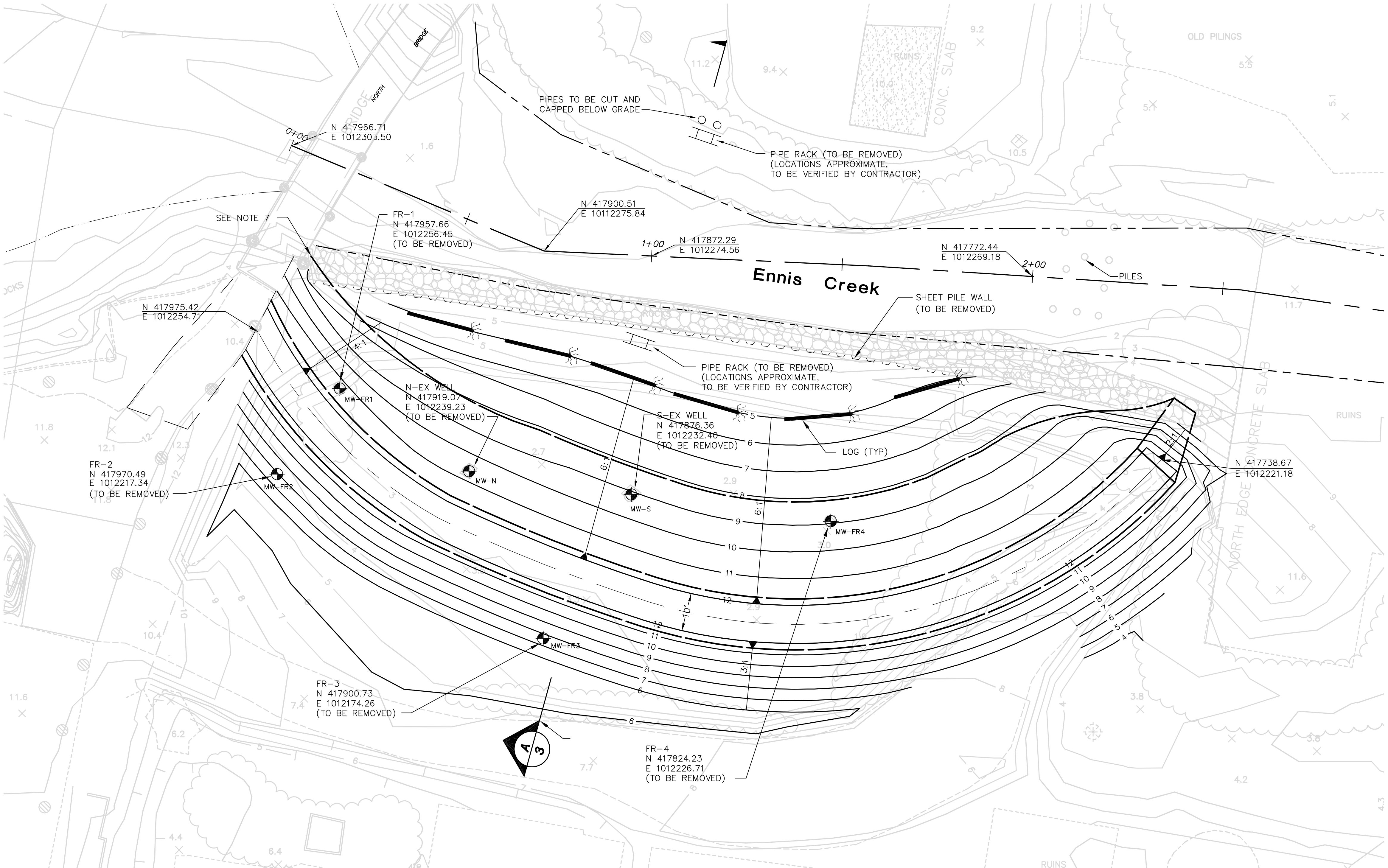

NOTES:

1. TOPOGRAPHIC SURVEY OF THE FORMER RAYONIER MILL SITE CONDUCTED BY NORTHWESTERN TERRITORIES INC., 10–3–00.
2. HORIZONTAL DATUM: WASHINGTON COORDINATE SYSTEM, NORTH ZONE, NAD 83(91).
3. VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM, NGVD 29.
4. REMOVE PIPE RACKS, SHEETPILE WALL, RIPRAP, MONITORING WELLS, AND FIBERGLASS PIPES ABOVE GRADE (TO BE CAPPED).
5. CONSTRUCT BERM AS SHOWN.
6. ENNIS CREEK MAY BE DIVERTED AT THE DISCRETION OF THE CONTRACTOR. (REFER TO WORK PLAN ADDENDUM FOR DETAILS).
7. BLEND RIPRAP WITH EXISTING STONES.

LEGEND

- CENTERLINE CREEK
- ORDINARY HIGH WATER
- DITCH
- EDGE OF PAVEMENT
- CENTERLINE BERM
- TOP AND BOTTOM OF RIPRAP
- FINAL GRADE CONTOURS
- 10 PROPOSED CONTOURS
- BRIDGE
- RIP-RAP
- SHEET PILE WALL
- CONCRETE PIPE RACKS
- FIBERGLASS PIPES
- WELL LOCATIONS

NOT FOR CONSTRUCTION

0 15 30
SCALE IN FEET

RAYONIER MILL SITE, PORT ANGELES, WA
EXISTING AND PROPOSED CONDITIONS

FOSTER WHEELER ENVIRONMENTAL CORPORATION

SCALE: AS NOTED	APPROVED JLS	DATE: 6/17/02
DESIGNED: JGO DRAWN: AEC CHECKED: MS		18340002

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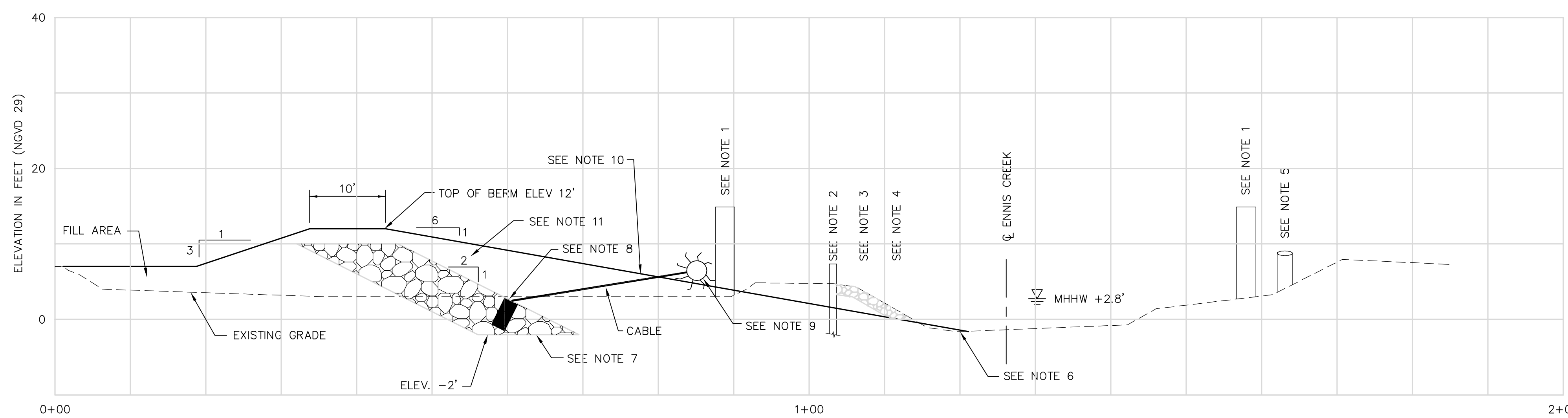

SECTION A/2

0 5 10 15 20
1"=20'
HORIZONTAL AND VERTICAL SCALE

NOTES:

1. CONCRETE PIPE RACK LOCATIONS APPROXIMATE; BOTTOM ELEVATION UNKNOWN.
2. SHEETPILE WALL LOCATION APPROXIMATE; BOTTOM ELEVATION UNKNOWN.
3. RIPRAP TO BE STOCKPILED, WASHED IF NECESSARY, AND REUSED BASED ON FINAL DESIGN.
4. SOIL AND SEDIMENT EXCAVATION EXTENTS TO BE DETERMINED BASED ON CHARACTERIZATION AND DELINEATION SAMPLING RESULTS. EXCAVATION PLAN TO BE VERIFIED BY SITE ENGINEER & CONTRACTOR.
5. FIBERGLASS PIPES TO BE CUT AND CAPPED BELOW GRADE.
6. TOE OF BERM TO COMMENCE 5 FEET WEST OF CENTERLINE WITH BEGINNING ELEVATION TO MATCH LOWEST POINT IN CREEK BED AT GIVEN LOCATION. FINAL DESIGN GRADE OF 6:1 (H:V) FROM ENNIS CREEK TO TOP OF BERM MAY BE VARIED AS NECESSARY PROVIDED BERM DESIGN ELEVATION REMAINS CONSTANT.
7. RIPRAP SIZE 18" TO 72" WITH HALF LARGER THAN 30", TOP AT ELEV. +10' CENTERED UNDER BERM, 6' THICK LAYER ON 2:1 SLOPE, BOTTOM ELEV. AT -2'. LARGER STONES AT BOTTOM.
8. APPROX. 6 ECOLOGY BLOCKS EMBEDDED WITH RIPRAP, EVENLY SPACED, TO ANCHOR LOGS.
9. PLACE APPROX. 6 LOGS WITH ROOT WADS AT ELEV. +5', EVENLY SPACED AND CONNECTED BY CABLE TO BURIED ECOLOGY BLOCKS.
10. FILL AND SURFACE PLANTINGS PER LOWER ELWHA KLALLAM TRIBE.
11. SLOPE OF RIPRAP MAY STEEPEN TO 1:1.5 AT ENDS.

LEGEND

———————	FINAL GRADE
– – – – – – –	EXISTING GRADE

NOT FOR CONSTRUCTION

RAYONIER MILL SITE, PORT ANGELES, WA

CROSS SECTION

FOSTER WHEELER ENVIRONMENTAL CORPORATION

SCALE: AS NOTED	APPROVED	DATE: 6/17/02
DESIGNED: JGO	JLS	18340002
DRAWN: AEC		
CHECKED: MS		3/3