ENGINEERING DESIGN REPORT

FORMER MILL E/KOPPERS SITE REMEDIATION

EVERETT, WASHINGTON

Prepared for

Weyerhaeuser Company

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Prepared by

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Engineering Design Report
Former Mill E/Koppers Site Remediation
Everett, Washington

The material and data in this report were prepared under the supervision and direction of the undersigned.

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1 INTRODUCTION

1.1 Purpose

This engineering design report (EDR) presents the design for the final cleanup action for the Former Mill E/Koppers Facility located in Everett, Washington (see Figure 1-1). This EDR describes the objectives of the cleanup action required by the Washington Department of Ecology (Ecology), describes the design basis and criteria for the major components of the final cleanup action, and discusses construction and post-construction issues. Weyerhaeuser and Ecology are in the process of entering into a Consent Decree (CD), and in anticipation of the entry of the CD, Weyerhaeuser has developed this EDR in consultation with Ecology to meet the specific requirements of chapter 173-340-400(4)(a) of the Washington Administrative Code (WAC).

This EDR is one part of the design package. It is intended for use in conjunction with the construction plans, technical specifications, and construction quality assurance (CQA) plan which are included as appendices. The construction plans and specifications are detailed enough to provide a clear understanding of all elements of the cleanup action. Depending on the contracting mechanism and construction approach Weyerhaeuser selects for this project, supplemental engineering and a more detailed set of plans and specifications may be required.

The post-construction monitoring of the cleanup is described in the performance and compliance monitoring plan (PCMP), which is being submitted under separate cover.

1.2 Regulatory Requirements

1.2.1 Engineering Design Report

As noted above, this report has been prepared to comply with MTCA requirements for an EDR. The following table lists the specific requirements, as well as the section of this EDR where it is addressed.

	WAC 173-340-400(4)(a) Items	Engineering Design Report Section(s)
(i)	Cleanup goals, specific cleanup requirements	3.1
(ii)	General facility information	2
(iii)	Identification of who will own, operate, maintain CAP during and following construction	5.1
(iv)	Facility maps including existing site conditions and cleanup action	1.3
(v)	Characteristics, quantity, location of materials treated/managed	2, 3
(vi)	Final design and construction schedule	4.14
(vii)	A description and conceptual plan of action including diagrams	1.4, 3
(viii)	Engineering justification of design	3
(ix)	Design features for control of hazardous material spills and accidental discharges	4.13
(x)	Long-term safety of workers and local residents	5.2
(xi)	Method of management or disposal of hazardous materials	3.2
(xii)	Facility specific characteristics which may effect design	3
(xiii)	Description of construction testing	4.11
(xiv)	General description of compliance monitoring	5.3
(xv)	Health and safety	4.12
(xvi)	Any information not provided in the state remedial investigation/feasibility study needed to fulfill the requirements of the State Environmental Policy Act (SEPA)	See Note 1
(xvii)	Additional information to address the applicable state, federal and local requirements; property access	4.1
(xviii)	Other information required by Ecology	See Note 2

NOTE:
Supplemental information not contained in the RI/FS documents but needed to fulfill SEPA requirements is contained in the SEPA Environmental Checklist.
Additional information will be provided to Ecology upon request.

1.2.2 Construction Plans and Specifications

Appendices A through C provide the detailed construction plans, specifications and quality assurance procedures for the former Mill E/Koppers site remediation consistent with WAC 173-340-400(4)(b). The specific requirements of WAC 173-340-400(4)(b), as well as the location of the required items, are provided in the following table.

	WAC 173-340-400 (4)(b)	Location in EDR
(I)	General description of work to be performed	Section 1.4
(ii)	General location map and existing facility conditions map	Section 1.3
(iii)	A copy of any permits or approvals required	Section 4.1
(iv)	Detailed plans and procedural material specifications	Plans - Appendix A Specifications - Appendix B
(v)	Specific quality control tests	Appendix C
(vi)	Startup procedures	Section 1.5
(vii)	Additional information to address applicable state, federal and local requirements	Section 1.6
(viii)	Compliance monitoring plan	*
(ix)	Health and safety provisions	*
(x)	Other information as required by the Department of Ecology	**

* Will be submitted under a separate cover before construction.
** Will be submitted as required by the Department of Ecology upon review of the Engineering Design Report and the Construction Plans and Specifications.

1.3 Site Background

1.3.1 Site Description

The site is located on Weyerhaeuser property in Everett, Washington. The site is next to the Snohomish River, approximately 2 miles upstream from the river mouth at Port Gardner Bay. The site boundary encompasses 8.41 acres and includes areas that contain impacted environmental media and components of the final cleanup action.

Both the site and the adjacent Weyerhaeuser property have been used for industrial purposes since the early 1900s. The entire Weyerhaeuser property is zoned for continued industrial use (M-2, heavy manufacturing) by the City of Everett.

1.3.2 Site History

The site history is discussed in detail in the remedial investigation (RI) report (EMCON 1994). The main site activities are summarized as follows:

Wood Treating. The site was used as a lumber storage area from 1915 until American Lumber and Treating Co. (ALTC) constructed a wood-treatment facility on leased Weyerhaeuser property in 1948. Wood treatment at the facility continued until 1963, when the lease expired, and Weyerhaeuser began to use the site. The wood-treatment facility included two steel pressure retorts and aboveground and underground piping.

Wood treatment included the use of creosote, sometimes with a petroleum hydrocarbon carrier, Wolman salts (chromated copper arsenate [CCA]), and pentachlorophenol (PCP) with an oil carrier.

Maintenance. Beginning in 1963, Weyerhaeuser gradually converted the former wood-treatment facility into an equipment maintenance facility (the retorts and the aboveground storage tanks were removed). The maintenance facility operated from 1963 to 1984. The petroleum tanks and some petroleum-contaminated soil were removed in 1988.

Mill E Sawmill. Weyerhaeuser built a sawmill, named "Mill E," at the north end of the site in 1971. Mill E was designed to handle small-diameter logs (4 to 12 inches) and produce dimensional lumber. Mill E was shut down in 1984 and the building was demolished, except for the foundation, in 1988.

Post-1984 Activities. Since 1984, when both the vehicle maintenance and Mill E operations shut down, the site has been largely unused. The former wood-treating/maintenance building was used periodically for storage of miscellaneous equipment. The former wood-treating/maintenance building is referred to as the "building" in this report.

The site is not currently in use, and industrial operations at the Weyerhaeuser property have been discontinued.

1.3.3 Future Use

The site is expected to be transferred to a new owner in 1998. Property adjacent to the site will be used as an industrial park serving a variety of industrial uses. Future land use for the site will follow M-2 zoning ordinances and be consistent with the land uses of the adjacent property.

1.4 Remediation Plan Overview

This section provides a brief overview of the final cleanup action for the site. Ecology required this cleanup action based on their review of the information contained in the RI and feasibility study (FS) reports (EMCON 1994 and 1997a) and on subsequent series of review meetings. The results of these meetings are described in a series of technical memoranda, correspondence, and reports (EMCON, 1997b, c, d, e, f; Ecology 1997a, b, c; Weyerhaeuser, 1997).

As a result of these negotiations, Ecology required, and Weyerhaeuser agreed to focus on, a cleanup action alternative similar to FS Alternative 3 (cap plus vertical barrier), which includes the following major components:

- An approximately 1,600-foot-long vertical barrier wall installed around the portion of the site where nonaqueous-phase liquids (NAPL) or highly saturated soil contamination have been observed (see Drawing 3, Appendix A).
- Excavation and off-site disposal of up to 1,200 cubic yards (cy) of hot spot soil above the water table in the former blow pit area (see Drawing 2, Appendix A). All hot spot soil taken offsite will likely be managed as a F032, F034, or F035 listed dangerous waste[1]. The NAPL that collects on the water surface in the bottom of the excavation will be collected using adsorbents, or other measures as appropriate, and disposed as hazardous waste. Once the excavation is complete, it will be backfilled using imported soil.
- A low-permeability asphalt cap installed to cover the vertical barrier containment area to minimize infiltration of precipitation inside the vertical barrier wall and prevent direct contact with impacted soils (see Drawing 9, Appendix A).
- A soil cap placed over portions of the site outside the vertical barrier to prevent direct contact with impacted soil (see Drawing 9, Appendix A).
- Institutional controls (e.g., deed restrictions) to control exposure of future site workers to contaminants, as well as to maintain the integrity of the barrier wall and cap.
- Long-term monitoring and maintenance of the above items.

Ecology has determined this alternative will be protective of both human health and the environment, will contain the major sources of groundwater contamination, is consistent with the anticipated future industrial use of the site, and is cost-effective when compared with other alternatives that could achieve similar levels of protection and compliance with the cleanup standards.

1.5 Startup Procedures

The cleanup action has been designed to function with minimum long-term maintenance. No mechanical processes or operational procedures are involved in the startup or function

1 For purposes of this report, the term "dangerous waste" will be used to include Washington state dangerous wastes as defined pursuant to WAC 173-303 and federal hazardous wastes as defined by 40 CFR 261.

of the remediation system. The site completion plan, showing all remediation in place, is provided as Drawing 9 in Appendix A - Construction Plans.

1.6 Other Requirements

In addition to the requirements of WAC 173-340-400, the other state of Washington requirements that may apply to the design and construction of the remediation project include a Shoreline Management Act Permit (Ecology) and a Hydraulic Project Approval (Department of Fish and Wildlife)

Ecology may waive the administrative requirements of these permits for cleanup actions conducted under a CD. Local requirements for construction at the site (e.g., drainage and grading requirements, sewer specifications) were provided by the City of Everett. The cleanup action has been designed to be consistent with the City of Everett standard specifications and drainage ordinances.

Supplemental information not contained in the RI/FS documents, but needed to fulfill SEPA requirements, is contained in the SEPA Environmental Checklist which has been submitted to Ecology under separate cover.

2 SITE CONDITIONS

This section provides a brief overview of site conditions. For a more detailed description of site conditions, see the RI/FS reports (EMCON, 1994 and 1997a, respectively).

2.1 Surface Features

2.1.1 Existing Topography and Structures

The site is relatively flat and slopes gently west, away from the river. General surface elevations range from approximately 7 to 8.5 feet relative to the national geodetic vertical datum of 1929 (NGVD) (or approximately 13 to 14.5 feet above mean sea level). Structures remaining on the site include a bulkhead constructed to retain dredge fill, the 7,800-square-foot concrete foundation of the former wood-treatment building, the 21,000-square-foot concrete slab foundation of former Mill E, and a portion of the former narrow-gauge rail system. Approximately 14 percent of the site is covered with building foundations or asphalt pavement, with the remainder covered by crushed rock ballast and vegetated soil.

2.1.2 Drainage

The only surface water body near the site is the Snohomish River, which forms the eastern site boundary along the bulkhead. On-site surface water exists intermittently in small shallow pools during prolonged rainfall. Stormwater at the site generally infiltrates surface soil without runoff. A limited quantity of stormwater discharges through conveyance ditches and drains, along inferred connections, and out discharge points.

2.2 Subsurface Conditions

2.2.1 Site Geology

The geologic deposits underlying the site consist of man-made and dredge fill overlying natural estuarine and fluvial sediment. Fill materials and native fluvial and estuarine sediment encountered during the investigations are divided into the following geologic units, listed from youngest to oldest:

- Grade and mixed fill unit
- Upper sand unit (dredge fill)
- Upper silt unit (estuarine)
- Lower sand unit (fluvial)

Grade and Mixed Fill Units. Grade or mixed fill was encountered at the surface at most of the test pit and soil boring locations. One to 4 feet of grade fill material apparently was placed on the level site after 1974 to improve the working surface. The fill is composed of sandy gravel, asphalt, angular pebbles and boulders of crushed rock, wood debris, and bark.

Upper Sand Unit. The upper sand unit is composed of gray, brown, or black, fine-to-medium sand, with some coarse sand. Thin (less than 2 inches thick) lenses of coarse sand or silty fine sand, faint horizontal bedding, and a general coarsening of grain size (up to fine gravel) with increasing depth was seen in most soil borings, confirming a hydraulic emplacement of the dredge fill. The upper sand unit ranges from less than 1 to 10.5 feet thick, averaging 5 to 6 feet.

Upper Silt Unit. The silt unit is a former estuarine tideflat composed of stiff, low-plasticity to nonplastic, gray-brown to dark brown silt, with abundant wood fragments and organic matter in the upper layers of the unit. Lenses of fine sand, sandy silt, and silty sand, 0.1 to 0.2 feet thick, were encountered in most borings and were found at all depths in the unit. The average thickness is 8 feet and ranges from 1 to 17 feet. The thickest zone of silt appears to lie in a north-south orientation beneath the former wood treating building. The silt becomes thinner (e.g., 4 to 6 feet thick) east of the former wood treating building, toward the river. The thinnest portion of the upper silt unit is in the area of the former blow pit and in places along the river, where the silt appears to be less than 2 feet thick.

Lower Sand Unit. The lower sand unit is composed of medium to coarse sand, with some gravel and wood debris. It is coarser and denser than the upper sand unit and becomes finer-grained with depth. The lower sand unit is at least 63 feet thick, and it appears to become thicker toward the Snohomish River. The lower sand unit is interpreted to be fluvial sediment deposited by the Snohomish River and probably extends beneath the entire site.

2.2.2 Site Hydrostratigraphy

Local groundwater flow systems in the fluvial and estuarine sediments and in the man-made fill are influenced by surface topography and composition, precipitation patterns, underground utilities, and local surface water bodies. Four hydrostratigraphic units were identified; they correspond to the geologic units described above:

- **Grade Fill and Mixed Fill.** The grade and the mixed fill units were unsaturated in all areas during the period of the RI, but may be part of the capillary fringe in the wet season.

- **Upper Sand Aquifer.** The upper sand aquifer is the unconfined saturated portion of the upper sand geologic unit. The average water table depth is about 4 feet below ground surface (bgs). The water table fluctuates an average of 2.5 feet between seasonal maximum and minimum elevations. The saturated thickness ranges from approximately 2 to 7 feet.

  Groundwater flow in the upper sand aquifer is generally horizontal, perpendicular to the Snohomish River. Average groundwater elevations in the upper sand aquifer are 3 feet higher than in the lower sand aquifer, indicating the presence of a downward vertical gradient between the upper and the lower sand aquifers. A minor component of groundwater flows downward through the upper silt, primarily during low tide. Groundwater elevations in the upper sand aquifer are generally 3 feet higher than the average river elevation. Water elevations in the upper sand aquifer are not significantly influenced by tidal fluctuations.

- **Upper Silt Aquitard.** The upper silt unit is a low-permeability layer (i.e., aquitard) between the two sand aquifers. No monitoring wells have been installed to monitor water quality in the upper silt aquitard. Sand stringers interbedded in the silt may act as conduits for vertical flow into or through the silt layer.

- **Lower Sand Aquifer.** The lower sand unit is partially to completely confined, tidally influenced, and bounded above and below by low-permeability silt layers. Water elevations are influenced by tidal fluctuation of the Snohomish River. The horizontal groundwater gradient in the lower sand aquifer varies with the tide cycle. The average groundwater flow direction of the lower sand aquifer appears to be perpendicular to the Snohomish River shoreline in an easterly direction.

3 REMEDIATION SYSTEM DESIGN

This section describes the general design of the cleanup action. It also includes the assumptions and rationale for individual design elements. The construction plans and specifications provide the detailed design information of the cleanup action.

3.1 Cleanup and Performance Requirements

The primary requirement of cleanup actions taken under MTCA are to protect human health and the environment. The site-specific cleanup action objectives developed in the FS report are as follows:

- Prevent potential receptors (e.g., on-site workers) from contacting or ingesting soil with concentrations of hazardous substances exceeding actions levels.
- Prevent or minimize groundwater with concentrations of hazardous substances exceeding action levels from migrating to the Snohomish River.
- Prevent or minimize hazardous substances in soil from migrating to the groundwater.

The cleanup action described in this report has been developed to specifically address these objectives.

In addition, the design components meet minimum performance criteria outlined in Sections 3.2 through 3.4, as well as the following site-specific requirements or conditions:

- **Relationship to Current and Future Site Operations** – Weyerhaeuser is not currently conducting operations at the site, but expects to resume industrial use of the site after remediation has been completed. For design purposes it has been assumed that the future use of the site will be limited to general parking and limited vehicle traffic.
- **Probability of Flooding** – Consistent with the City of Everett building code for parking areas, the asphalt cap area will be regraded to be no greater than 1 foot below the 100-year floodplain elevation for the Snohomish River. The design 100-year floodplain elevation for the site is 9.0 feet NGVD; therefore, the

lowest finished grade elevation for the asphalt cap will be 8.0 ft-NGVD. For the remainder of the site (i.e., soil cap area), final grades will be at least 1 foot above existing grades.

- **Probability of Seismic Activity** – Each remediation system component (asphalt cap with geotextile, barrier wall, and soil cover) was designed such that it would remain flexible to ground movement while still maintaining its integrity during seismic activity.

- **Temperature Extremes** – The depth of frost penetration for the area is 6 inches, and the barrier wall is located a minimum of 2 feet below the final grades; therefore, the barrier wall will not be subject to extreme temperature changes. The asphalt cap will be constructed with a geotextile layer. This will provide some tensile strength to minimize cracking that may occur as a result of freeze-thaw of the cap system. The cap will also be underlain with open grade aggregate to preclude the formation of ice lenses directly below the asphalt. The soil used to bring the site to grade and as a soil cover will be well graded dredge sand. It is not subject to volume change or other detrimental behavior with respect to temperature extremes.

- **Local Planning and Development Issues** – The remediated site will be left at a relatively flat, featureless grade for future use.

Section 3.4 provides specific design conditions which are met by the components of the remediation system with respect to material compatibility with contaminated soil conditions, groundwater, and other site-specific factors.

3.2 Contaminated Materials Handling

3.2.1 Introduction

As described in the RI and FS reports (EMCON 1994, 1997a), the wood treating chemicals used at the site include creosote, pentachlorophenol, and Wolman salts (i.e., chromated copper arsenate). Wastewater, process residuals, preservative drippage, and spent formulations generated through the use of these chemicals at the site have been determined to be listed dangerous wastes with waste codes F032 (chlorophenolic wastes), F034 (creosote wastes), and F035 (arsenic and chrome wastes). Through application of USEPA's "contained-in" policy (57 FR 61497), environmental media such as soil and groundwater that comes into contact with listed dangerous waste must be managed as dangerous waste if they are generated (e.g., excavated soil or extracted groundwater). Solid waste and debris (e.g., concrete, wood waste) that contact listed waste will also need to be managed as a dangerous waste.

Many of the activities included in the cleanup action for the site may involve generating, handling, or managing environmental media, waste materials, or debris. Therefore, important aspects of implementing the cleanup action will be to:

- Correctly identify and characterize the solid and dangerous waste streams generated during construction.
- Minimize the generation of contaminated materials, especially those classified as dangerous waste.
- Manage contaminated materials that are generated in accordance with applicable federal and state requirements, including the federal RCRA and Washington state dangerous waste regulations.
- Assist Weyerhaeuser in complying with its requirements as a large quantity dangerous waste generator, including the recordkeeping, documentation, and other administrative requirements.

In order to address these contaminated materials handling issues, the technical specifications (Appendix B) require the contractor to prepare a contaminated materials handling plan (see below).

3.2.2 Waste Generation

For materials, including environmental media, to be subject to regulation as waste, they must first be generated. When a material is considered generated is determined on a case-by-case basis, but examples of "generation" may include excavation of soil, demolition of concrete, or extraction of NAPL or contaminated groundwater. Table 3-1 lists the construction activities, the waste materials that may be generated by that activity, and a determination as to the designation of the waste stream (i.e., solid or hazardous waste). This list is preliminary. It will be the responsibility of the contractor to confirm or modify this list to be consistent with specific construction approaches used to implement this design. When finalized, the list will be documented in the contaminated materials handling plan to be prepared by the contractor (as described in Section 3.2.3).

3.2.3 Contaminated Materials Handling Plan

The contractor selected to construct this cleanup action will be required to submit, as part of their bid, a contaminated materials handling plan (see Section 01110 of the technical specification in Appendix B). The plan will include, at a minimum, the following:

- Specific construction techniques that will minimize waste generation, especially the generation of dangerous waste.
- Decontamination procedures for equipment, vehicles, and personnel, including management of decontamination residuals.
- Procedures for managing the wastes that are generated in accordance with applicable regulations, including defining testing and characterization requirements.
- Procedures and facilities for temporary storage of dangerous wastes, including dangerous waste stored in drums (e.g., drill cuttings, personnel protective equipment) and tanks (e.g., decontamination residuals, contaminated stormwater).
- Procedures for complying with the recordkeeping, documentation, and inspection requirements for large quantity dangerous waste generators. Weyerhaeuser's Environmental Emergency Response Plan can be referenced for compliance with the preparedness and prevention and contingency plan requirements.
- Waste transportation and disposal practices for each waste or material type.

3.3 Hot Spot Soil Excavation and Product Removal

3.3.1 Site Preparation

Prior to commencing excavation of the hot spot area, several site preparation actions must be completed to facilitate: (1) the implementation of the excavation in a manner that will minimize the generation of dangerous wastes, and (2) the management of the generated dangerous waste that is consistent with applicable regulations and the contaminated materials handling plan. At a minimum, this site preparation will include:

- Construction of temporary truck access and egress roads over the existing contaminated soil so that trucks can both reach and leave the loading area without disturbing contaminated soil or becoming contaminated by this soil (see Drawing 2 in Appendix A).

- Construction of a soil loading area adjacent to the hot spot excavation area. This loading area will be lined with a geomembrane placed on a subgrade of imported fill. The subgrade will be sloped to direct dewatering liquids and contaminated rainfall to a lined sump where they will be pumped to a nearby accumulation tank. The geomembrane will be covered with crushed rock as necessary to protect it from truck and excavation equipment traffic (see Drawing 2).
- Construction of a decontamination area which includes a lined equipment and vehicle washing pad (as described in Section 4.3).

The contractor may propose alternate configurations and locations for the access and egress roads, soil loading area, and decontamination area which meet the design intent.

3.3.2 Implementation

The initial remediation step will be to excavate contaminated soil from the blow pit area or "hot spot" described in the FS (see Drawing 2, Appendix A). The primary excavation area is the area with the most heavily contaminated soils (shown on Drawing 2 of the construction plans). The most heavily contaminated soil is found in and around the blow pit area (see Figure 1-2) as represented by soil conditions in soil borings SB-15 and SB-23 and piezometers P-1 and P-2. The general location of these borings/piezometers and the approximate area around them form the basis for design of the primary contaminated soil excavation area.

Once the primary area has been excavated, the excavation will be expanded horizontally at the same depth until a volume of 1,200 cy has been reached. The excavation depth will be to the static groundwater table at the time of the excavation. Because the depth to groundwater is anticipated to be less than 5 feet, temporary excavation slopes will be maintained at their angle of repose. Any other excavation required for site grading, barrier wall installation, utility relocation, or other reasons will be in addition to the 1,200 cy of soil required for the hot spot excavation.

The product (i.e., NAPL) removal system will consist of absorbent pads and/or skimmer pumps as necessary to remove product that may accumulate in the excavation. All materials (soil and product) removed from the hot spot excavation will be managed as a dangerous waste in accordance with the applicable regulations and the contaminated materials handling plan described in Section 3.2.3.

3.3.3 Decommissioning of Facilities

After all excavation and product removal activities are complete, the contaminated portions of the haul road and the loading area (crushed rock and liner) will be removed and managed consistent with the contaminated materials handling plan. It is anticipated that the crushed rock and liner of the loading area and the road between the loading area and decontamination pad may require disposal as dangerous waste. The access road to the loading area and the exit road from the decontamination pad should be clean, and this material will be left on site and graded as needed to meet the final design grades.

3.4 Containment Design

The remediation containment will consist of three components: the barrier wall, asphalt cap, and the soil cap. The following section details the design of each of these components.

3.4.1 Barrier Wall

As a part of the site remediation, a low-permeability, vertical-barrier-wall system is required around the area where NAPL and high residual soil contamination have been observed. The proposed barrier alignment wall is shown in Drawing 3 of the construction plans. The barrier wall will be imbedded into the continuous, low-permeability silt layer. The top of the silt layer is generally 6 to 10 feet bgs.

Numerous types of vertical barrier wall systems were evaluated for the site (see Table 1 of the Design Basis Memorandum for details [EMCON, 1998]). The Gundwall™ barrier wall system was selected as the most feasible barrier wall alternative for conditions at this site. Gundwall is a prefabricated wall system constructed of panels of high-density-polyethylene (HDPE) sheets welded to interlocking connectors. A hydrophilic seal is inserted into the joint of the interlock system during installation; this seal swells when hydrated, forming a low-permeability connection between panels. The panels are individually vibrated into place with standard sheet pile vibratory installation equipment and connected using the interlock system. The vibratory installation equipment is fitted with a customized "blind" plate to physically vibrate the flexible HDPE sheet panels into place. The blind plate is then extracted, leaving the Gundwall barrier wall in place. The Gundwall barrier wall system was selected over other barrier wall alternatives for the following reasons:

- The HDPE wall material is chemically resistant to a wide variety of chemicals and combination of chemicals. Gundwall has worked well at several contaminated soil sites with contamination type and concentrations similar to the Former Mill E/Koppers site.

- With the use of hydrophilic seals within the vertical panel joints, the Gundwall system provides a reported installed permeability several orders of magnitude lower than permeabilities reported by other barrier wall systems.

- Gundwall installation for this site will be vibrated into place. The only trenching required will be through the 1.5 to 3 feet of dense fill which contains large angular rock which could otherwise damage the Gundwall during installation. This construction method requires significantly less handling of contaminated soils (and thus soil disposal costs) along the barrier wall alignment than barrier wall systems, which require trenching to the bottom of the wall. The soil excavated from the trench will be managed as dangerous waste consistent with the contaminated materials handling plan.

- The integrity of the Gundwall construction can be verified and documented with specific construction quality control and construction quality assurance procedures.

Design of the Gundwall barrier wall included the following:

1. Evaluating chemical compatibility of contaminated soil and groundwater with the Gundwall.

2. Evaluating expected installed permeability of the barrier system to demonstrate that the barrier system permeability is less than the surrounding soils.

3. Performing a Geoprobe investigation along the proposed barrier wall alignment to define the thickness and elevation of the silt layer.

4. Developing a detailed profile along the proposed barrier wall alignment using the results of the Geoprobe investigation and surveyed ground surface elevations. With this profile, EMCON determined the top and maximum depth of the barrier wall with respect to the ground surface, the bottom of the trench through the dense fill, the top of the silt layer, the bottom of the silt layer, and the location of the existing utilities. Depending on the thickness of the silt layer, the Gundwall will be installed to a minimum depth of 6 inches, and to a maximum depth of 2 feet, into the silt layer. Furthermore, the sheet wall will not be installed to within less than 1 foot of the bottom of the silt layer. The top of the Gundwall will be completed slightly above the bottom of the trench as shown in the plans.

5. Delineating utilities that have to be capped or rerouted and providing a design to accomplish this work.

6. Determining the final horizontal and vertical alignment of the barrier wall and showing it on the plan and profile drawings.

Design evaluation for the barrier wall material (items 1 and 2 above) is provided in Appendix D1 to this engineering report. The horizontal and vertical layout of the barrier wall is shown on Drawings 3 through 6 of the construction plans.

EMCON also determined the horizontal and vertical locations of the points where existing utilities will impact the proposed vertical barrier wall alignment. Utilities impacted by the design are shown on the construction plans. The city water lines will be re-routed around the proposed barrier wall as needed. The construction plans will also include a design for capping and abandoning fire protection lines, sanitary sewer lines, and underground electrical conduits that must be cut where the utility impacts the barrier wall system.

3.4.2 Asphalt Cap

An asphalt cap will be placed over the area surrounded by the barrier wall to minimize surface water infiltration into the contained soils and to prevent direct contact with contaminated soils. There will be some limited excavation at the southeast corner of the asphalt cap to facilitate stormwater drainage and lower the overall elevation of the cap (i.e., reduce fill requirements); this excavated soil will be managed as a dangerous waste consistent with the contaminated materials handling plan. With this one exception, there will be no regrading of existing site soil to achieve final grades for the asphalt cap.

The design section for the low-permeability asphalt cap will consist of the following elements (top to bottom):

- A 2-inch asphalt surface course
- A pavement overlay geotextile layer impregnated with tackcoat
- A 4-inch-thick, asphalt-treated base course
- A 4-inch-thick, crushed rock (¾-inch nominal) course

When impregnated with bitumen, the pavement overlay geotextile will act as a flexible membrane liner inside the asphalt cap. The overlay will significantly reduce stormwater infiltration into the contaminated soil below the cap. The maximum allowable axle-load capacity for this pavement section has been determined to be 7,100 pounds for a single axle and 13,000 pounds for a tandem axle using the American Association of Highway and Transportation Officials (AASHTO) flexible pavement design criteria.

Calculations documenting the allowable traffic on the asphalt cap are provided in Appendix D1.

3.4.3 Soil Cap

For areas outside of the barrier wall system, a minimum 1-foot vertical thickness of lightly compacted fill will be placed over the remediation area to provide a physical barrier preventing direct contact with the underlying contaminated soil. It is anticipated that regrading of existing contaminated soil will not be required and that all final grades will be achieved with imported fill. The soil cap surface will have a grade varying between zero and 0.5 percent, thickened as needed to eliminate low spots in the surface, and a minimum elevation of 8.0 feet NGVD (1 feet below the 100-year flood elevation of the Snohomish River). Fill will be placed directly on the subgrade in one or two loose lifts, roughly graded as shown on the plans, and compacted with at least one pass of compaction equipment. There will be no other compaction specification or density testing required for the soil cap. Fill will be added as required to achieve the minimum 1-foot thickness over the existing topography. Thickness will be confirmed by surveying at one point per 10,000 square feet of soil cap (100-foot grid). Once the soil cap is in place, it will be hydroseeded with appropriate grasses. The soil cap will consist of either dredged sand from nearby stockpiles or imported clean sandy fill. As such it will have a high infiltration capacity.. This high infiltration capacity will eliminate the need for surface water controls on the soil cap as discussed further in Section 3.5.

3.5 Site Drainage

The existing stormwater control system for the northern portion of the site and adjacent off-site property consists of a series of catch basins and storm drain pipes that collect water from paved areas and direct it to the existing point of discharge into the Snohomish River at the northeast corner of the site. Because of the high infiltration rate of the on-site sand, most of the stormwater infiltrates into the site soil, with little runoff. A stormwater ditch runs parallel to the west side of the site and collects a small amount of runoff, mostly from the area between the west fence line and the ditch itself. The ditch directs this runoff to a discharge point at the southeast end of the site.

The proposed soil and asphalt cap has divided the site into two areas:

- Impervious asphalt cap area
- Pervious soil cap area

Design flows for both areas have been calculated using the Soil Conservation Service (SCS) unit hydrograph method. The design storm is a 25-year, 24-hour storm type 1A event, which simulates a 2.5-inch rainfall occurrence. SCS curve numbers 98 and 72 were selected to represent the surface cover — asphalt paved cap and soil cap, respectively.

Stormwater from the asphalt cap will be managed as uncontaminated runoff. The asphalt cap has been sloped at a minimum 0.5 percent to facilitate drainage. The flow from the asphalt cap area will be collected outside the barrier wall by a perimeter swale system constructed as part of the cap. The collected runoff will be directed toward the southeast corner of the site and discharged into the Snohomish River.

Stormwater runoff from the soil cap will be negligible due to the high infiltration rate of the cap soils and the flat surface grades. The soil cap elevates the site to no greater than 1 foot below the 100-year flood elevation.

Drainage design calculations for both asphalt and soil cap are provided in Appendix D2.

4 REMEDIATION SYSTEM CONSTRUCTION

This section of the EDR describes the construction procedures for the remediation system in the general sequence the procedures will take place. Detailed specifications are presented in Appendix B.

4.1 Permits Required

The following permits will likely be required for construction of the final cleanup action:

Permit	Agency
Public Works Permit (grading and erosion control)	City of Everett
Shoreline Management Act Permit	City of Everett
Hydraulic Project Approval (HPA)	Washington Department of Fish and Wildlife
NPDES Stormwater Discharge Permit for Construction	Ecology

The Shorelines Management Act permit would typically be required for construction activities located within 200 feet of the Snohomish River, while the HPA would typically be required for work within the high water line; it is anticipated, however, that Ecology will waive the administrative requirements of these permits for cleanup actions conducted under a CD.

4.2 Contaminated Materials Handling

As described in Section 3.2, several components of the cleanup action will generate, handle, or manage environmental media, waste materials, or debris that needs to be correctly characterized and managed in accordance with applicable federal and state requirements of the federal RCRA and Washington state dangerous waste regulations. These contaminated materials handling issues are generally addressed in the technical specifications (Appendix B) related to each construction activity. The detailed construction procedures and administrative requirements (e.g., recordkeeping and documentation) will be included in a contaminated materials handling plan to be prepared by the contractor.

The overall intent of the contaminated material handling components of the technical specifications and the plan itself is to assist Weyerhaeuser in complying with its obligations as a large quantity dangerous waste generator.

4.3 Decontamination

During implementation of the cleanup action, construction equipment, vehicles, and personnel that come in contact with contaminated or potentially contaminated materials will be required to be decontaminated to prevent the tracking or transporting of contaminants off the site. Procedures for personnel decontamination will be provided in the health and safety plan to be prepared by the contractor prior to commencing construction.

For construction equipment and vehicles, decontamination procedures will consist of first removing loose soil from the equipment using brooms, shovels, or scrappers. During excavation of the hot spot area (see Section 4.5), removal of loose soil from trucks (including tires) and excavation equipment will occur in the lined loading area next to the excavation. The loading area will be lined with a geosynthetic clay liner (GCL) placed on a subgrade of imported fill. The subgrade will be sloped to direct dewatering liquids and rainfall that falls on the loading pad to a lined sump where they will be pumped to a nearby tank. The GCL will be covered with crushed rock as necessary to protect it from truck and excavation equipment traffic (see Drawing 2). The contractor may propose an alternate design which meets the design intent. For all other construction activities, removal of loose soil will be performed on the decontamination pad shown in Drawing 2 in Appendix A.

After the loose soil has been removed, residual soil will be removed in the decontamination pad using a pressure washer or steam cleaner. The decontamination pad will be located on the existing foundation of the former wood treating building and consist of a GCL draining to a sump for collection of washing liquids (see Drawing 2). The contractor may propose an alternate design which meets the design intent. Liquids generated during decontamination will be pumped to nearby tanks for temporary storage prior to disposal as a dangerous waste consistent with the contaminated materials handling plan. Solids (e.g., residual soil) generated during decontamination activities will also be considered dangerous wastes and will either be placed into trucks or be temporarily accumulated in drums or other suitable containers prior to final disposal. Both the liquid storage tanks and container accumulation areas will be located in an area with secondary containment next to the decontamination pad. This temporary accumulation area will also be lined and bermed to prevent any spills from migrating onto surrounding soils.

All decontamination residuals (e.g., washing fluids, soil, personnel protective equipment) and decontamination structures (e.g., decontamination pad, loading area, and the roadway in between these areas) will be removed after construction is complete and will be disposed of consistent with the contaminated materials handling plan. Decontamination equipment (e.g., tanks, drums, sump pumps) will be cleaned by triple rinsing and removed from the site after use.

4.4 Structures and Utilities

Before the site is regraded, all concrete structures such as retaining walls, wing walls, foundations from former mill buildings, and standpipes will be removed to the design grade, or will be completely excavated and removed from the site.

Structures on the site will be removed to a minimum of 18 inches below the proposed finished grade inside the asphalt cap area and will be completely removed outside the asphalt cap area. Concrete rubble and debris from the demolition will be managed consistent with the contaminated materials handling plan to be prepared by the contractor. In general, concrete and other above-ground structures will not be considered as a dangerous waste and may be stockpiled at a location to be determined by Weyerhaeuser for later use as fill. At- or below-grade concrete and other debris will generally be handled as dangerous waste. Demolition equipment and haul vehicles will be decontaminated in the designated area prior to leaving the site.

The site has numerous timber pile caps that extend through floor slabs. Care will be taken not to significantly disturb the piles during demolition, so that lateral movements of the pile will not disturb the underlying silt layer. Pile caps within 18 inches (vertical distance) of final design grade will be cut from the surrounding concrete. An excavation will be made around the pile cap, and the pile cap will be cut below grade, leaving it at least 18 inches below final grade. Excavated soil and the pile caps will be managed consistent with the contaminated materials handling plan.

EMCON has determined the horizontal and vertical location of points where existing utilities will impact the proposed vertical barrier wall installation. The sanitary sewer and city water lines will be capped 2 feet on either side of where they cross the proposed barrier wall.

The fire protection water line and underground electrical conduits will be cut, capped, and abandoned where the utility impacts the barrier wall system.

4.5 Hot Spot Soil Excavation and Disposal

4.5.1 Excavation

The following excavation locations and methods are shown on the engineering drawings or defined in the technical specifications:

- The approximate excavation area, truck loading areas, truck entrance, truck exit, and decontamination area will be constructed as shown on Drawing 2 in Appendix A. The general purpose of the truck entrance, loading area , and exit is to minimize the generation of dangerous waste by preventing trucks from contacting contaminated soil, thereby reducing decontamination requirements. Stormwater runoff from the loading area will be collected in a sump and managed as a dangerous waste consistent with the contaminated materials handling plan.

- Excavation will be done using standard construction equipment and the excavators will direct-load excavated soils into trucks. The excavation quantity will be measured in the truck using visual methods and the pre-measured truck capacity. Care will be taken to minimize spillage of soil onto the loading area and the truck to reduce the potential for generating excess waste and increasing decontamination requirements. If soil is spilled outside the truck onto the loading area, it will be immediately cleaned up and placed into the truck to prevent tracking of this contaminated soil across the site.

- Prior to leaving the site, the trucks will be decontaminated to remove loose soils from the tires and truck body. Decontamination activities will be performed in a lined, bermed area located on the foundation of the former treatment building. All decontamination residuals will be managed as a dangerous waste consistent with the contaminated materials handling plan.

- The depth of the excavation will be determined by the excavation depth at which seepage is first encountered (expected to be approximately 4 feet bgs). Excavation may then proceed horizontally; however, the excavation will not proceed below the observed seepage depth until the pit has been open not less than 24 hours (to allow the water level to stabilize). After the area has been open for the specified time period, excavation may continue downward until it is a maximum of 3 inches below the observed groundwater table.

- All site excavation is expected to be less than 5 feet deep; therefore, the excavation side-slopes will be as close to vertical as possible. No shoring or laying back of excavation slopes will be required for excavations less than 4 feet below existing grade. If a localized excavation depth exceeds 4 feet (e.g., utility line cutoff or removal of deep objects), a registered professional engineer in the state of Washington will review the situation and provide an excavation safety plan (if needed) with regard to stable excavation slopes or shoring and confined space.

- Floating product or NAPL encountered in the excavation will be removed for disposal as dangerous waste in accordance with the contaminated materials handling plan. NAPL removed with, and contained in, the contaminated soil will be direct-loaded into the trucks along with the contaminated soil and disposed of at an approved dangerous waste disposal facility. There must be no free liquids in the soil placed into the trucks; if soil removed from the excavation is determined to contain free liquids, it must be dewatered in the lined loading area prior to placement in the truck and the liquids managed as a dangerous waste consistent with the contaminated materials management plan.

  NAPL present on the surface of the groundwater in the excavation will be removed with skimmer pumps where the depth of NAPL in the excavation exceeds approximately ¼ inch. Recovered liquids will be drummed and sent to an approved dangerous waste disposal facility. Where NAPL in the excavation is less than ¼ inch deep, NAPL will be removed using absorbent pads or other material. NAPL removal will continue until absorption is no longer practical for removing the NAPL. Contaminated absorbent pads will be placed in the trucks with the contaminated soil. A sheen may be visible on the surface of the water after NAPL removal is complete.

4.5.2 Backfilling

The hot spot excavation will be backfilled to design grades using fill or other acceptable material available next to the site or trucked in from an off-site source. The fill will be placed in 12- to 18-inch-thick, loose, horizontal lifts. The lifts will be compacted to 95 percent of the maximum dry density, at a moisture content range of 2 percentage points below to 4 percentage points above the optimum moisture content defined by standard Proctor density (ASTM D698). The above compaction specifications may be modified to a relative index density (ASTM D4253) of 90 percent for general fill, if classification tests on the fill soils indicate that they contain less than 12 percent fines.

Backfilling will be observed and tested by an independent testing laboratory or a qualified engineer. In-place density and soil moisture tests for area fills which are accessible to compaction equipment will be taken at a minimum of one test per 10,000 square feet per 12-inch thickness of compacted fill, with a minimum of three tests per 12-inch thickness of compacted fill.

4.6 Barrier Wall Installation

The Gundwall barrier wall system will be installed by vibratory methods to the depths indicated on the construction plans. To avoid damage of the panels by sharp rocks, a narrow trench (1 foot minimum and 2 foot maximum width) in the upper fill unit will be excavated and the wall installed in the bottom centerline of the open trench. All soils excavated for this trench will be managed as a dangerous waste consistent with the contaminated materials handling plan. All panel joints will contain a hydrophilic seal along the entire length of the joint. The Gundwall panel width and exact depth will depend on the contractor, except that the depth must fall within the range specified on the barrier wall profile sheets (Drawings 4, 5, and 6 in Appendix A). Detailed specifications for the barrier wall installation are provided in Appendix B.

The backfill of the barrier wall trench will consist of select backfill in which 100 percent of the soil is finer than the US standard number 4 sieve. The barrier wall trench backfill will be placed in 12-inch maximum thickness loose lifts and compacted to a minimum of 90 percent and a maximum of 95 percent of the maximum dry density at a moisture content 2 percentage points below to 4 percentage points above the optimum moisture standard Proctor (ASTM D698). The barrier wall trench backfill will be observed by an independent testing laboratory or a qualified engineer to monitor for properly controlled backfill placement.

4.7 Utility Abandonment and Replacement

Several utilities cross the project site and will be plugged, abandoned, or both. The utility plugging and abandonment is shown on Drawing 2 of the construction plans and include the following:

- The active sanitary sewer (pressure and gravity) which crosses the site will be plugged outside of the final property boundary at sanitary sewer manhole number 1 (SSMH 1) located near the northeast corner of the site and sanitary sewer manhole number 3 (SSMH 3) southwest of the site. As a result, sanitary sewer manhole number 2 (SSMH 2) will be abandoned in place and filled over with the soil cover.

- The active fire-line and water lines to the existing building foundations will be plugged north of the site, outside of the final property boundary.

- Based on information provided by Weyerhaeuser, the fire line along the east side of the site is inactive and therefore will be abandoned without plugging.

At the point where the existing utilities cross the proposed barrier wall alignment, an access pit (minimum 5 foot by 5 foot in plan dimensions) will be excavated down to the plugged or abandoned utility. The utility pipe will then be removed such that there is a minimum 2-foot horizontal clearance between the cut pipe ends remaining in the ground and the barrier wall alignment. All soil excavated from these access pits will be managed as a dangerous waste consistent with the contaminated materials handling plan. The access pits will be backfilled with select fill material up to the bottom depth of the barrier wall trench. The select backfill will consist of a soil which 100 percent passes the US standard number 4 sieve. The access pit backfill will be placed in 12-inch maximum thickness loose lifts and compacted to a minimum of 90 percent and a maximum of 95 percent of the maximum dry density at a moisture content 2 percentage points below to 4 percentage points above the optimum moisture standard Proctor (ASTM D698). The independent testing laboratory or a qualified engineer will be on site while utility access pits are backfilled to monitor for properly controlled placement.

4.8 Site Grading

In general, the site grading will minimize the number of cuts required to reach the design grade. With the exception of the limited excavation at the southeast corner of the asphalt cap (i.e., less than 100 cy), the site will be brought to the design grade using imported fill. Where excavation is required, all soil from cut areas will be disposed of as dangerous waste consistent with the contaminated materials handling plan.

4.8.1 Asphalt Cap Grading Requirements

Grading beneath the asphalt cap will consist of the following:

- Compacted soil sloped at 0.5 to 1.0 percent below the asphalt cap. The compacted soil will be placed in 12- to 18-inch-thick, loose, horizontal lifts and compacted to 95 percent of the maximum dry density, at a moisture content range of 2 percentage points below to 4 percentage points above the optimum moisture content defined by standard Proctor density (ASTM D698). The above compaction specifications may be modified to a relative index density (ASTM D4253) of 90 percent for general fill and 95 percent for the upper 1 foot, if classification tests on the fill soils indicate that they contain less than 12 percent fines. Backfilling will be observed and tested by an independent testing laboratory or a qualified engineer.

- For undisturbed soils below the asphalt cap where no fill is required, the grade should be proof rolled to detect soft spots. If soft spots are detected, they should be removed and the soil managed as a dangerous waste consistent with the contaminated materials handling plan. The proof rolling should be performed using a heavy pneumatic-tired roller or loaded dump truck with a tire pressure exceeding 50 psi. The proof rolling of these areas should be observed by an independent testing laboratory or a qualified engineer. Excavated soft spots will be backfilled consistent with the compaction guidelines outlined above.

- In-place density and soil moisture tests for area fills accessible to compaction equipment will be taken at a minimum of one test per 10,000 square feet per 12-inch thickness of compacted fill, with a minimum of three tests per 12-inch thickness of compacted fill.

4.8.2 Soil Cap Grading Requirements

Grading beneath the soil cap will consist of the following:

- A minimum 1-foot vertical thickness of lightly compacted fill over the area identified for "soil cap," with a grade varying between zero and 0.5 percent. The soil cap will be thickened as needed to eliminate low spots in the surface. Fill will be placed directly on the subgrade in one or two loose lifts, roughly graded as shown on the plans, and compacted with at least one pass of compaction equipment. No grading or excavation of existing soil is anticipated to be required achieve final grades for the soil cap. There will be no other compaction specification or density testing required for the soil cap. Fill will be added as required to achieve the minimum 1-foot thickness over the existing topography. Thickness will be confirmed by surveying at one point per 10,000 square feet of soil cap (100-foot grid). Once the soil cap is in place, it will be hydroseeded with appropriate grasses.

4.9 Asphalt Cap Construction

The subgrade for the asphalt cap will first be prepared by removing all walls, floor slabs, or foundations which would be within 18 inches of the final asphalt cap grades. The asphalt subgrade will be brought to grade using select engineered fill with an intermediate fill slope no steeper than 3H:1V extending from the inside of the barrier wall to the maximum subgrade elevation below the asphalt cap. In order to minimize the overall cap elevation (and amount of fill required to achieve the design grades), a limited amount of soil will be excavated near the southeast corner of the cap area. Care will be taken during this excavation to minimize spillage of contaminated soil onto the surround soils; if spills do occur, they will be cleanup up immediately and the soil disposed of with the rest of the excavated soil. All concrete rubble, excavated soil, and other debris will be managed consistent with the contaminated materials handling plan.

The barrier wall will be tied into the asphalt cap by placing GCL down the side of the trench and then over the top flap of the barrier wall in the bottom of the trench. Bentonite chips may be used to form a seal between the GCL and the wall panels. Once the GCL is placed in the barrier wall trench, it will be backfilled to design grades using select fill (as described in Section 4.8). The rest of the GCL width will extend up the interim fill slope under the proposed asphalt cap. This interim fill slope will then be backfilled along the edge of the subgrade below the asphalt cap, leaving a below-grade GCL tie in between the asphalt cap and barrier wall.

The asphalt cap will be constructed over the area contained by the barrier wall using standard asphaltic concrete paving equipment. Specifications for materials and placement and graphic details of the subgrade fill, GCL, and asphalt pavement are provided with the construction drawings and specifications.

4.10 Drainage Controls and Site Restoration

Before any earthwork begins, a silt fence or other erosion control system will be installed across the discharge points along the site boundary to control erosion and sediment. Temporary straw bales will be placed around the existing drop structure inlets to further minimize potential sediment clogging of the existing stormwater control systems.

Site drainage will be constructed on the asphalt cap as shown in the engineering drawings. The soil cap area will be hydroseeded after construction to prevent erosion. The entire site will be constructed with stormwater controls consistent with the City of Everett Stormwater Management Manual, as shown on the construction plans.

4.11 Construction Testing

The construction quality assurance plan (CQA plan) is provided as Appendix C. Construction quality control (CQC) will be performed by the contractor, consistent with the requirements and provisions of the technical specifications (see Appendix B) and will include the necessary elements to insure that the provisions of the contaminated materials handling plan are being followed. The CQA plan provides a detailed description of the construction testing which will be used to demonstrate adequate construction quality for all components of the remediation system. This will include contaminated soil excavation, earthwork, barrier wall construction, barrier wall/asphalt cap tie in construction, asphalt cap construction, soil cap placement, and site restoration.

4.12 Health and Safety

A health and safety plan (HASP) for the site remediation will be prepared by the contractor before beginning work on the site. The plan will be prepared consistent with the health and safety requirements of Weyerhaeuser, Ecology (WAC 173-340-810), and the Occupational Safety and Health Act (29 CFR 1900). All workers on the site will be required to read and sign the HASP. A health and safety meeting will be conducted with the contractor, subcontractors, construction testing personnel, security personnel, and other applicable personnel before starting work at the site and on a weekly basis throughout the cleanup action. Visitors and observers will also receive health and safety information before entering the site.

4.13 Control of Spills and Accidental Discharges

Procedures to control spills are incorporated into the design and include use of lined soil excavation area, lined and bermed decontamination area, and an overall minimal amount of liquids handling. Materials most likely to be spilled include contaminated soil during excavation. If spilled, these soils will be managed consistent with the contaminated materials handling plan. Decontamination procedures are described in Section 4.3 of this report and also in Section 01120 of the technical specifications in Appendix B.

In the event of any accidental discharge, the response and cleanup actions will be consistent with Weyerhaeuser's Environmental Emergency Response Plan.

4.14 Construction Schedule

The remediation system construction is currently expected to take place during the summer and fall of 1998. The construction will likely require 10 to 14 weeks. After completion of the cleanup action, a construction report will be submitted to Ecology.

5 POST-CONSTRUCTION CONSIDERATIONS

5.1 Operation and Maintenance

Weyerhaeuser will operate and maintain the site remediation system. A detailed operations and maintenance (O&M) plan will be prepared by Weyerhaeuser based on as-built conditions, consistent with WAC 173-340-400 (4) (c). The O&M plan, consent decree, and/or the restrictive covenant for the site (WAC 173-340-440) will describe maintenance requirements.

5.2 Long-term Safety of Workers and Local Residents

The remediation of the Mill E/Koppers site was designed to be completed with a relatively featureless final topography and a vegetated soil cover over the existing surface. This design will allow long-term stability and minimize restrictions on the end-use of the site. When the cleanup action is completed, potential exposure pathways (e.g., direct contact, ingestion, inhalation of dust) will be eliminated and the site should not pose a threat to the safety of long-term workers that may use the site in the future. The nearest residents are approximately 1,500 feet away (uphill and across several sets of railroad tracks and Marine View Drive); the cleanup action of the site should not pose a short- or long-term safety threat to these residents.

5.3 Compliance Monitoring

A performance and compliance monitoring plan (PCMP) which details post-construction monitoring has been prepared for the site consistent with WAC 173-340-410. The PCMP is submitted under separate cover.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

REFERENCES

Ecology. 1997a. Letter (re: Ecology's comments on EMCON feasibility study for Former Mill E/Koppers Site) from Nadine Romero, Washington State Department of Ecology, to Stuart Triolo, Weyerhaeuser Company. May 8.

Ecology. 1997b. Letter (re: Ecology's recommendations on remediation alternatives proposed by Weyerhaeuser for Former Mill E/Koppers site) from Nadine Romero, Washington State Department of Ecology, to Stuart Triolo, Weyerhaeuser Company. July 14.

Ecology. 1997c. Letter (re: proposed cleanup action for Former Mill E/Koppers site) from Nadine Romero, Washington State Department of Ecology, to Stuart Triolo, Weyerhaeuser Company. October 13.

EMCON. 1994. Remedial investigation report for former Mill E/Koppers facility. Prepared for Weyerhaeuser Company by EMCON Northwest, Inc. May.

EMCON. 1997a. Feasibility study. Prepared for Weyerhaeuser Company by EMCON. February.

EMCON. 1997b. Letter to Ms. Nadine Romero of Ecology regarding response to preliminary comments on draft feasibility study. May 23.

EMCON. 1997c. Letter to Ms. Nadine Romero of Ecology regarding response to preliminary comments on draft feasibility study. June 3.

EMCON. 1997d. Substantial and disproportionate cost analysis. Prepared for Weyerhaeuser Company by EMCON. August.

EMCON. 1997e. Evaluation of mass removal enhancements to remedial alternative 4. Prepared for Weyerhaeuser Company by EMCON. September.

EMCON. 1997f. Letter (re: comparison of residual soil concentrations) to Nadine Romero. November 11.

EMCON. 1998. Design Basis Memorandum. Prepared for Weyerhaeuser Company by EMCON. January.

Weyerhaeuser. 1997. Letter (re: proposed cleanup action for Former Mill E/Koppers site) to Nadine Romero, Washington State Department of Ecology. September 29.

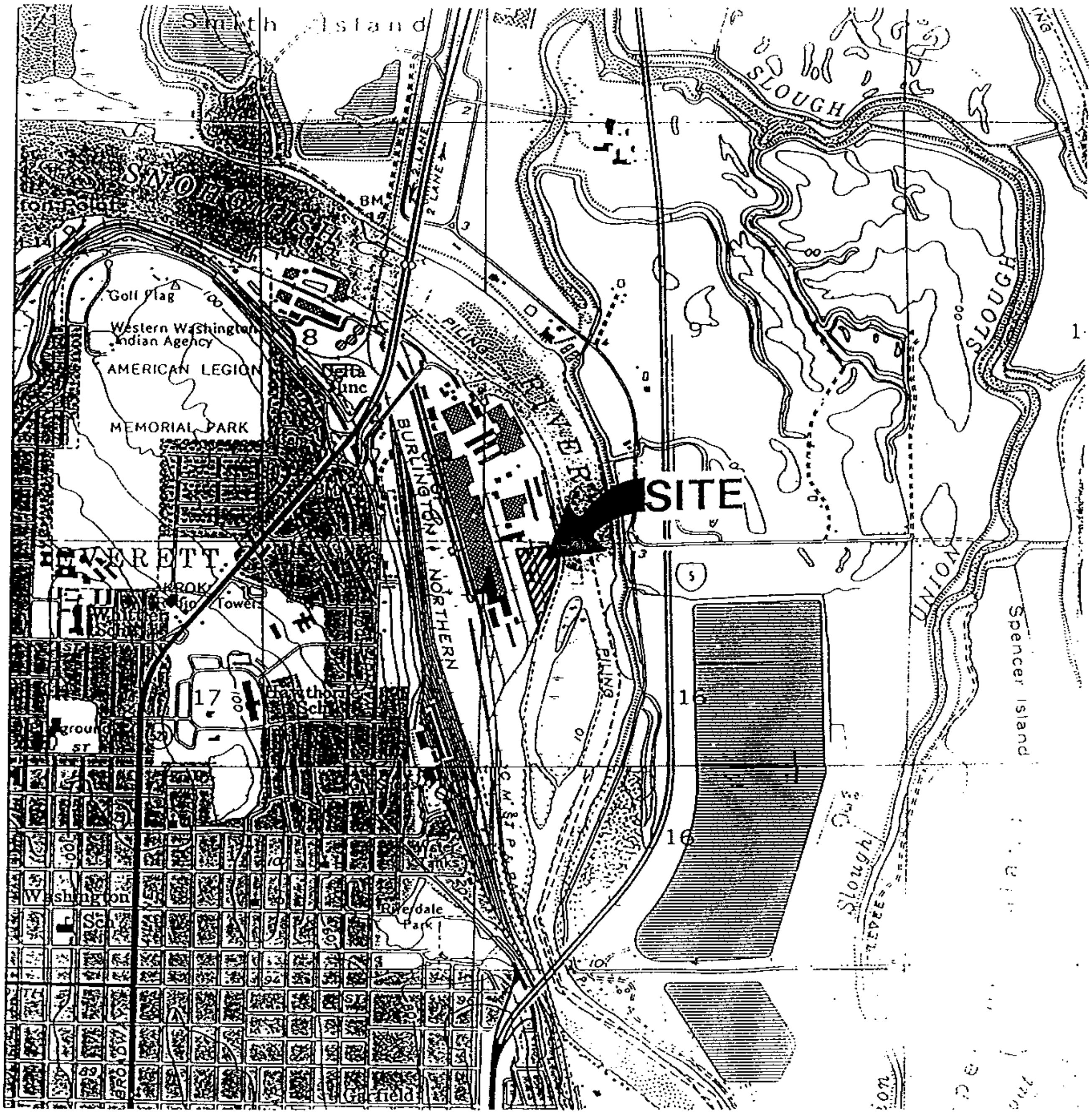
TABLES

Table 3-1

Construction Activities and Associated Waste Materials
Former Mill E/Koppers Site

Activity	Waste Material	Waste Designation
Excavation and loading of hot spot soils.	Soil, water from dewatering	Dangerous waste
Excavation of trench for barrier wall installation.	Soil	Dangerous waste
NAPL collection from hot spot soil excavation	NAPL, contaminated adsorbent material (pads, booms)	Dangerous waste
Demolition of concrete structures and foundations	Concrete debris	Above-ground portions of concrete will be managed as solid waste. At- or below-grade concrete will be managed as dangerous waste.
Utility abandonment for barrier wall crossing	Soil, groundwater	Dangerous waste
Well abandonment	Steel monuments, concrete, soil, plastic well casings.	Above-ground portions of steel monuments will be managed as solid waste. Remaining materials managed as dangerous waste.
Piezometer installation	Drill cuttings, development liquids	Dangerous waste
Equipment and vehicle decontamination	Soil, washwater	Dangerous waste
Personnel decontamination	Personnel protective equipment, washwater	Dangerous or solid waste depending on situation
Decommissioning of hot spot area loading area, temporary haul roads, decontamination area, and temporary dangerous waste storage areas.	Soil, crushed rock, geomembrane, decontamination liquids	All materials contacting contaminated soil or groundwater that cannot be decontaminated will be managed as dangerous waste. Equipment that can be decontaminated (e.g. tanks) will be removed from site. Uncontaminated crushed rock used on site as fill.
Stormwater runoff	Stormwater runoff	Runoff from areas managing dangerous wastes will be considered dangerous waste. Runoff from undisturbed areas or areas managing solid wastes will be managed consistent with the erosion and sediment control provisions of the Public Works Permit.

FIGURES



SOURCE: USGS 7.5 X 15 MINUTE QUADRANGLE, EVERETT, WASHINGTON

WASHINGTON

N

0 2000 4000

SCALE (ft)

EMCON

DATE 12/97
DWN. MLP
REV.
APPR.
PROJECT NO.
40141-037.116

Figure 1-1
WEYERHAEUSER COMPANY
FORMER MILL E/KOPPERS FACILITY
EVERETT, WASHINGTON

SITE LOCATION MAP