EXPLANATION OF SIGNIFICANT DIFFERENCE
(OU3 – Final Groundwater)

DEQ
State of Oregon Department of Environmental Quality

EPA
United States Environmental Protection Agency

To The Record of Decision
for the

McCormick and Baxter Creosoting Company Superfund Site
Portland, Multnomah County, Oregon

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Prepared by:
Oregon Department of
Environmental Quality (DEQ)

Issued by:

Neil Mullane

Neil Mullane, Administrator
Northwest Region
Oregon Department of Environmental Quality

Date: 8/26/02

Concurred by:

Michael F. Gearheard, Director for
Office of Environmental Cleanup
U.S. Environmental Protection Agency

Date: 8/13/02

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I. INTRODUCTION

Site Name, Location, Physical Description and Land Use

The McCormick and Baxter Creosoting Company, Portland Plant Site (McCormick & Baxter Site or Site) is located at 6900 North Edgewater Street on the northeast bank of the Willamette River in Portland, Oregon (Figure 1). The Site is downstream of Swan Island and upstream of the St. John's Bridge. The Site covers approximately 43 acres of land and 15 acres of sediment in the Willamette River (Figures 2 and 3). The Site is currently vacant, except for groundwater treatment systems located in the Central Processing Area (CPA) and Former Waste Disposal Area (FWDA). A storage tank (part of the groundwater treatment system) is located in the Tank Farm Area (TFA), a shop building housing the treatment system is located in the CPA, and two office trailers are located in the parking lot north of the central processing area.

The Willamette River flows to the northwest in the vicinity of the site. The site is located in an area that was constructed by placement of dredged material in the early 1900s. The site is generally flat and lies between a 120-foot-high bluff near the northeastern border and a 20 foot-high bank along the Willamette River to the southwest. A sandy beach is exposed at the base of the bank, except during brief periods of high river stage (i.e., generally during late winter or early spring).

Land use at the site has been industrial since the 1940s, although the site has been vacant since 1991. The site is bordered to the northwest and southeast by inactive industrial properties, also located on the Willamette River. A residential area is located along the top of the 120-foot-high bluff to the northeast. The inactive industrial property to the northwest recently was purchased by the local government for conversion to a riverfront natural area (i.e., greenspace).

Between February 2000 and April 2001, an EPA-funded advisory committee known as the McCormick and Baxter Site Reuse Advisory Committee worked toward an agreement on reuse recommendations. Although the advisory committee's primary recommendation suggested that the site be used as a park and riverfront natural area, the committee did not reach consensus as to whether the use should be for an interim period or on a permanent basis. The City of Portland Bureau of Planning used the advisory committee's framework to finalize the recommendations, and supported a permanent park to accommodate active and passive recreation. On July 25, 2001, the Portland City Council adopted Resolution No. 36010, which endorsed the bureau's recommendations. The resolution further directed the Bureau of Planning to prepare a feasibility study to evaluate the costs and benefits of acquiring and developing the site as a park. In the course of the development, as stated in the resolution, the Council envisioned use of the site as a riparian buffer to enhance natural resource values while affording opportunities for environmental education.

Lead and Support Agencies

The Oregon Department of Environmental Quality (DEQ) is the lead agency for this Superfund Site and the United States Environmental Protection Agency (EPA) is the support agency.

Technical support is primarily provided by DEQ's contractor Ecology & Environment, Inc. (E&E). The primary team members include Kevin Parrett (the DEQ Project Manager), Alan Goodman (the EPA Remedial Project Manager), and John Montgomery (the E&E Project Manager).

Statutory Citation for an Explanation of Significant Difference

The Explanation of Significant Difference (ESD) describes the rationale for implementing the contingency groundwater remedy specified in the Record of Decision (ROD) for the McCormick & Baxter Site. Section 117(c) of CERCLA, 42 USC §9617(c), and the National Contingency Plan (NCP), 40 C.F.R. Section 300.435(c)(2)(i) require that an ESD be prepared when the differences in the remedial action significantly change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance or cost. It is EPA's policy to prepare an ESD prior to implementation of a contingency remedy (*Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, EPA 540-R098-031, 1999).

Date of Record of Decision

The ROD for the McCormick & Baxter Site was issued in March 1996. It was signed on March 29, 1996 by EPA and on April 4, 1996 by DEQ. A ROD Amendment was issued in March 1998 to allow off-site disposal of contaminated soil. EPA signed the ROD Amendment on March 17, 1998 and DEQ signed it on March 20, 1998.

The ROD specified the cleanup remedies for four operable units consisting of soil (OU1), interim groundwater (OU2), final groundwater (OU3) and sediment (OU4). This ESD addresses OU3 which is the final groundwater operable unit. The status of remedy implementation and performance for all four operable units is provided in the *First Five-Year Review Report* for the McCormick & Baxter Site dated September 2001.

Administrative Record

This ESD is supported by and, when issued, will become part of the Administrative Record file for this Site, in accordance with the NCP, Section 300.823(a)(2). The Administrative Record is available for review at DEQ's Northwest Regional Office located at 2020 Southwest Fourth Avenue (4th Floor) in Portland, Oregon. Key documents and reports are also available for review at the St. John's Community Library located at 7510 North Charleston Street in Portland, Oregon and at the North Portland Neighborhood Office located at 2209 N. Schofield in Portland, Oregon.

II. BACKGROUND

Circumstances Prompting a Change in the Selected Groundwater Remedy

The remedy selected in the ROD for the final groundwater operable unit includes a contingency for installing an impermeable subsurface barrier wall in the event that either i) oily chemical wastes called non-aqueous phase liquid (NAPL) cannot be reliably contained using hydraulic methods or ii) the barrier wall improves the overall cost-effectiveness of the groundwater remedy. DEQ and EPA have determined that NAPL has not been contained using groundwater/NAPL extraction and NAPL recovery measures employed to date. The basis for this conclusion is discussed in the following sections of this ESD.

The ROD also requires that placement of a sediment cap as the remedy for the sediment operable unit shall not occur until the selected groundwater remedy has been implemented and after DEQ and EPA have determined that adequate control of NAPL has occurred, to ensure that recontamination of the sediment will not occur. Since the sediment cap is under design now and tentatively planned for construction in late 2003, the groundwater remedy contingency barrier wall needs to proceed at this time to achieve NAPL control.

Summary of Site History and Groundwater Contamination

The McCormick & Baxter Creosoting Company operated between 1944 and 1991 and, treated wood products with creosote, pentachlorophenol, and inorganic (arsenic, copper, chromium and zinc) preservative solutions. Historically, process wastes were disposed of in several areas of the Site, including the FWDA. In addition, there were periodic spills and leaks of wood-treating chemicals in the TFA and CPA. Significant concentrations of wood-treating chemicals are now present in groundwater beneath the Site. The contamination is found in three different forms: contaminants dissolved in groundwater (aqueous phase), oily contaminants that are lighter than groundwater and therefore tend to float (LNAPL) and oily contaminants that are denser than groundwater and therefore tend to sink (DNAPL).

Two distinct NAPL plumes exist beneath the Site, one extending from the TFA into the Willamette River and one extending from the FWDA into the Willamette River and Willamette Cove, a shallow inlet located immediately downstream of the Burlington Northern Railroad bridge (see Figure 4). The plumes contain mobile LNAPL and DNAPL, as well as residual NAPL in soil. Mobile NAPL is present from approximately 20 to 80 feet below ground surface (bgs). Regional groundwater flow is toward the river. However, localized reversals of site groundwater gradients have been recorded (particularly in the FWDA) during seasonal high river stages and flood events.

DEQ conducted investigations at the Site between September 1990 and September 1992, and issued a proposed cleanup plan in January 1993. However, a final ROD was not issued at that time, due to the pending listing of the Site on EPA's National Priorities List (NPL or "Superfund List"). The Site was placed on the NPL on June 1, 1994. In the interim, DEQ implemented a

number of removal actions including plant demolition, sludge and contaminated soil removals, and initiated extraction of NAPL product (primarily creosote) from the groundwater aquifers.

DEQ issued a revised Feasibility Study in September 1995, and DEQ and EPA issued a Proposed Cleanup Plan in October 1995. The ROD was issued jointly by DEQ and EPA in April 1996.

Groundwater Remedial Action Objectives and Selected Remedy

The ROD specified the Remedial Action Objectives (RAOs) for groundwater and NAPL contamination at the Site as:

- Preventing human exposure to or ingestion of groundwater with contaminant concentrations in excess of Federal and State drinking water standards or protective levels;
- Minimizing further vertical migration of NAPL to the deep aquifer;
- Preventing groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations or in excess of water quality criteria for aquatic organisms;
- Minimizing NAPL discharges to the Willamette River beach and adjacent sediment to protect human health and the environment; and
- Removing mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and potential for discharge to Willamette River sediment.

Because of the extensive NAPL contamination, DEQ and EPA determined that it is not technically practicable to restore the groundwater aquifers under the Site to drinking water quality; therefore, site-specific groundwater contaminant concentration limits that are protective of the environment were developed and specified in the ROD. These protective alternate concentration limits (ACLs) were developed in accordance with CERCLA Section 121(d)(2)(B)(ii) for dissolved contaminants in groundwater discharging to the Willamette River. Section 121 provides that ACLs may be used at a Superfund Site when:

- There are known and projected points of entry of the contaminated groundwater into surface water;
- On the basis of measurements or projections, there is or will be no statistically significant increase of contaminants from the groundwater into surface water at the point of entry or at any point where there is reason to believe accumulation of constituents may occur downstream; and
- The remedial action includes enforceable measures that will preclude human exposure to the contaminated groundwater at any point between the facility boundary and all known and projected points of entry of the contaminated groundwater into surface water.

Dissolved-phase groundwater contamination in the shallow aquifer at the Site is associated with NAPL plumes migrating from the TFA and FWDA. The ROD specified groundwater ACLs for

total PAHs at 43 milligrams per liter (mg/L), PCP at 5 mg/L, dioxins/furans at 2 x 10^{-7} mg/L and arsenic, chromium, copper, and zinc at 1 mg/L each. These values were generally derived from aqueous solubility limits and groundwater/surface water dilution.

In order to achieve the RAOs, the final groundwater remedy consists of the following major elements:

- Enhancing NAPL recovery using pure-phase extraction and/or groundwater/NAPL extraction;
- Evaluation by pilot testing of innovative technologies, such as surfactant flushing, to increase the effectiveness and the rate of NAPL removal;
- Treatment of groundwater (wastewater) using methods such as dissolved air flotation, filtration, carbon absorption, extended aeration/packed bed bioreactor, or other biological treatment;
- Discharging of treated groundwater (wastewater) to the Willamette River in accordance with substantive NPDES requirements, or alternatively discharge to drainfields installed in major source areas for enhanced NAPL recovery if pilot testing is successful;
- Off-site treating and/or disposing of NAPL and other treatment residuals in accordance with applicable hazardous waste regulations;
- Monitoring to ensure that site-specific ACLs are met at compliance monitoring locations;
- *A contingency to install a vertical physical barrier in the event that:*
  - *The mobile NAPL cannot be reliably controlled using hydraulic methods; or*
  - *It improves the overall cost-effectiveness of the groundwater remedy*; and
- Installation of institutional controls that restrict groundwater use at the Site.

As discussed in the following sections of this document, hydraulic control of NAPL has not been established in the TFA and FWDA as evidenced by continued NAPL discharges into the Willamette River. Consequently, DEQ and EPA have concluded that implementation of the barrier wall contingency is necessary in order to achieve the RAOs established in the ROD and to meet the criteria provided in CERCLA for establishing ACLs at this Site.

III. BASIS FOR IMPLEMENTATION OF THE CONTINGENCY REMEDY

Subsequent Events and New Information Since Issuance of the ROD

The enhanced NAPL recovery system specified in the ROD was constructed through upgrades and enhancements to an interim groundwater treatment system initiated in 1994 and operating at the time the ROD was issued. The enhanced system consisted of total fluids extraction in the TFA and pure-phase NAPL extraction in the TFA and FWDA. Wells were pumped until visible oil was not present in the discharge, then allowed to recover before resumption of pumping.

A pilot-scale wastewater treatment system was installed at the Site in 1994 in an effort to separate NAPL and treat groundwater removed through total fluid extraction efforts in the TFA.

The NAPL/groundwater mix was conveyed to the pilot-scale wastewater treatment system and treated by dissolved air flotation (DAF). Treated wastewater was discharged to the Willamette River.

The total fluids extraction system and the DAF system were prone to shutdowns, required extensive technician oversight and was expensive to operate. To allow for continuous removal and to reduce costs and operator requirements, the total fluids extraction system was replaced in 1998 with a combination manual and automated skimming system. NAPL and wastewater generated by this system were treated utilizing an oil/water separator, an in-line anthracite/clay filter, two granular activated carbon (GAC) units, and a metals treatment unit.

By mid-2000, it became apparent that the volume of NAPL extracted by the automated skimming system was not significantly greater than the volume removed by the manual system and the automated skimmer system also was prone to malfunction. In addition, the operating cost of the automated skimming system was approximately twice as high the operating cost of the manual system. In September 2000, the automated NAPL extraction system in the FWDA and TFA was shutdown and replaced with a manual system. Currently, NAPL extraction at the Site includes manual LNAPL skimmers in select monitoring wells and manual LNAPL and DNAPL extraction using pneumatic pumps.

The total volume of NAPL extracted from groundwater during the five year period between 1996 and 2001 was 1,850 gallons. The cost to construct and operate the NAPL extraction system(s) during this period was approximately $1.5 million, excluding DEQ and EPA oversight costs. This corresponds to an average cost of approximately $800 per gallon of recovered NAPL.

Routine measurement of NAPL thickness, semiannual sampling of groundwater and inspections of historic NAPL seeps in the Willamette River and Willamette Cove continue to be conducted at the Site. These measurement, data and observations clearly indicate that efforts employed to date to contain NAPL by hydraulic methods have not succeeded in preventing the discharge of NAPL from the Site to the Willamette River and its sediment. For example:

- Several monitoring wells downgradient from the FWDA and TFA continue to show LNAPL thickness of several feet;
- NAPL seeps on the beach downgradient from the FWDA have been observed consistently during low river stages in late summer and early fall for the past several years;
- Extensive NAPL seeps have been observed in the Willamette Cove during the spring and summer of 2001, coinciding with a regional drought in which rainfall was 64 percent of normal between January 2001 and October 2001; and
- Groundwater flow gradients toward the river have been measured, as documented in past quarterly and semiannual reports, indicating that the FWDA and TFA are the primary sources of the NAPL seeps.

Based on these observations DEQ and EPA have concluded that hydraulic control of NAPL or groundwater has not been established in either the TFA or the FWDA.

Supporting Information

This ESD is based on information collected and developed since the ROD was issued in 1996. This information is contained in the Administrative Record for the McCormick & Baxter Site. The primary documents referenced in this ESD include:

- *Remedial Actions Semiannual Report*, prepared by E&E for the DEQ, through February 2002.
- *First Five-Year Review Report*, issued by DEQ with concurrence by EPA, September 2001.
- *Barrier Wall Focused Technology Evaluation*, prepared by E&E for the DEQ, September 2001.
- *Draft Groundwater Modeling Report*, prepared jointly by E&E and DEQ, August 2001.
- *Record of Decision*, issued by DEQ and EPA, March 1996.
- *Letter to DEQ and EPA from NOAA,* January 28, 2002.
- *Letter to DEQ and EPA from Confederated Tribes of Grand Ronde,* January 2002.
- *Letter to DEQ and EPA from NOAA,* May 2, 2002.
- *Letter from EPA to NOAA,* May 17, 2002.
- *Letter from EPA to Confederated Tribes of Grand Ronde,* May 17 2002.
- *Biological Assessment,* prepared by EPA, May 2002.

IV. DESCRIPTION OF THE SIGNIFICANT DIFFERENCE

Implementation of the Contingency Remedy for the Final Groundwater OU

The ROD identified a subsurface barrier wall as a contingency measure for the final groundwater operable unit at the McCormick & Baxter Site. Implementation of this contingency measure is to occur if either of the following two conditions are met:

- The mobile NAPL cannot be reliably controlled using hydraulic methods; or
- The barrier wall improves the overall cost-effectiveness of the groundwater remedy.

Based on the information provided in the previous section of this document, DEQ and EPA have concluded that mobile NAPL has not been controlled at the Site and implementation of the barrier wall contingency is justified.

Barrier Wall Alternatives Considered

In order to determine the best alignment and construction technique for the barrier wall, several alternatives were evaluated for their effectiveness, implementability and cost. The results of this evaluation are provided in the *Barrier Wall Focused Technology Evaluation* report. Four general alignments were considered in this evaluation and are shown in Figure 5. Alternative 1 is described as an "upland alignment" forming a partially encompassing (i.e., semi-circular) wall extending downgradient of the TFA and FWDA. Alternative 1 is located on the flat, upland

portion of the site and does not extend down the riverbank. Alternative 2 is described as a "partial riverfront" alignment. It is similar to Alternative 1 except that the segment of the wall downgradient of the FWDA extends down the riverbank and runs along the ordinary high water mark of the Willamette River then turns back up the riverbank prior to the TFA. Alternative 3 is described as an "in water" alignment extending under the railway bridge and into Willamette Cove. This alternative, as with alternatives 1 and 2, forms a semi-circle around the FWDA and TFA. Alternative 4 is described as a "fully encompassing" alignment. It is similar to Alternative 1 except that it completely encloses the FWDA and TFA in a fully circular wall.

The *Barrier Wall Focused Technology Evaluation* concluded that the alternatives are readily implementable, with the exception of the "in water" alignment (Alternative 3) extending into Willamette Cove. Although the "in water" alignment would capture more NAPL and further minimize the "wedge" of NAPL located outside the alignments of the other alternatives, the "in-water" alignment would require the wall to extend above the river level to at least the ordinary high-water mark in order to prevent LNAPL from flowing over the wall during periods of high river level. This wall extension would create a bulkhead within the Willamette River. This in-water bulkhead would result in a loss of flood conveyance of the Willamette River and subsequent impact upon the floodplain. An in-water bulkhead is also expected to have adverse impacts on aquatic and riparian habitat. Furthermore, extending an "in-water" barrier wall into Willamette Cove would require the wall to cross a City of Portland high pressure sewer main located adjacent to the FWDA and cross under the railway bridge also located adjacent to the FWDA. These circumstances present significant construction obstacles, making this wall alignment impractical.

The *Barrier Wall Focused Technology Evaluation* concluded that the "partial riverfront" alignment would capture more NAPL than the other readily implementable alternatives. Furthermore, the technology evaluation concluded that the "fully encompassing" alignment would provide additional benefits by minimizing the effects of groundwater flow through the FWDA and TFA and by eliminating concerns of potential NAPL migration around the perimeter of a partial wall alignment. The capital costs for the alternatives range from approximately $2 million to $5 million and were primarily influenced by the length of the wall and the extent of steel sheet pile that would be used versus less expensive bentonite-soil slurry construction. Additional construction costs and uncertainties were associated with the "in-water" alignment.

Selected Barrier Wall Alignment

The barrier wall alignment selected by DEQ and EPA is a modified combination of Alternatives 2 and 4. The selected alignment is a "complete riverfront" alignment with the downgradient segment located along the ordinary high-water mark of the Willamette River. The barrier wall also is a "fully encompassing" alignment constructed around the TFA and the FWDA. The barrier wall will be a subsurface installation with no part of it visible above the ground surface. The wall alignment is shown in Figures 6 and 7. This barrier wall alignment is preferred by DEQ and EPA because it achieves the best balance of human health and environmental risk reduction, through containment of mobile NAPL, in a cost-effective and readily implementable manner, as compared to other alignment alternatives. This fully encompassing, complete riverfront

alignment has several primary benefits over partially encompassing alignment alternatives. The fully encompassing alignment, in addition to capturing mobile NAPL, is expected to decrease the potential for adverse impacts to the river by reducing the quantity of groundwater passing through the primary NAPL source areas and discharging into the river. The fully encompassing alignment also eliminates potential NAPL migration around the perimeter of a partial wall alignment. The complete riverfront alignment contains more NAPL then other alternatives.

The total wall length will be approximately 3,645 linear feet. The depth of the wall will vary between 48 feet below ground surface (bgs) and 83 feet bgs to account for differences in topography and soil profile at the Site. The segment of wall around the TFA (approximately 1,175 linear feet) will be "keyed" into a silt layer aquitard (i.e., the bottom of the wall will physically extend a short distance into the aquitard) that underlies the shallow sand stratum. This segment will extend to a maximum depth of 73 feet bgs corresponding to 38 feet below Mean Sea Level (MSL). The segment of wall around the FWDA (approximately 1,115 linear feet) will be a "hanging" barrier because deeper soil in this area consists of interbedded sand and silt lenses with no continuous, competent aquitard to key into. The vertical hydraulic conductivity (K_v) of the silt aquitard is approximately 0.1 feet/day, whereas the K_v of the interbedded sand is approximately 2 feet/day (see *Draft Groundwater Modeling Report, August 2001*). The segment of the wall around the FWDA will extend to a maximum depth of 83 feet bgs (i.e., -48 feet MSL). The segment of the wall located upgradient of the TFA and FWDA (1,455 linear feet) will be keyed into the silt aquitard which occurs at a shallower depth in this area then in the TFA. The upgradient segment of the wall will extend to an approximate depth of 63 feet bgs (i.e., -28 feet MSL).

Although the barrier wall segment located downgradient of the FWDA does not key into a continuous, competent aquitard, this segment of the wall will be extended to such a depth that DNAPL migration toward the river will be substantially retarded. The -48 feet MSL depth of this segment of the barrier wall is below the river bottom within a distance of 400 feet. Beyond this near shore area, the general river depth drops to -50 feet MSL. Several deeper holes of -60 to -75 feet MSL are present beyond a distance of 700 feet from the barrier wall.

Selected Barrier Wall Construction

The barrier wall will be constructed using two common construction methods. Approximately 2,370 linear feet of wall will be constructed on relatively flat part of the site from soil-bentonite slurry. Interlocking steel sheet pile will be used in locations of the alignment where slurry construction is not feasible. Approximately 1,275 linear feet of sheet pile will be used along the riverbank, downgradient of the FWDA and TFA.

The soil-bentonite slurry wall will be constructed using a slurry trench method. In this method, soil along the wall alignment will be excavated with an extended-boom excavator. A treatability study has been performed to determine the amount of bentonite needed to achieve the desired permeability for the wall (i.e., 1×10^{-7} centimeters per second [cm/s]) and to determine whether contaminated soil could be used in the soil mixture. The treatability study concluded that a soil-bentonite slurry containing 5% bentonite achieved the desired permeability and that

contaminated soil could be used in the soil-bentonite slurry as long as the bentonite was hydrated for at least 24 hours prior to mixing. The treatability study is provided in the *Barrier Wall Focused Technology Evaluation*. The bentonite-water slurry mixture, 5% bentonite and 95% water by weight, will be maintained in the trench to prevent trench collapse during excavation. Excavated soil will be blended with a bentonite/water slurry to form a soil-bentonite backfill mixture with the consistency of high-slump concrete. Soil with visually observable contamination (i.e., NAPL blibs or blobs) will be segregated from cleaner soil and not mixed with bentonite. The soil-bentonite backfill material then will be placed back into the trench. Slurry mixing typically is accomplished in a high-speed mixing plant. A water source capable of delivering up to 70 gallons per minute (gpm) on demand will be needed. The current Site water supply is capable of delivering 400 to 600 gpm. Backfill mixing could be accomplished along the side of the trench or in a remote mixing area. The width of the wall will depend on the type of equipment used for trenching. Slurry trench walls constructed with excavators to these desired depths are generally 2.5 to 3 feet wide in order to accommodate the boom of the excavator during trenching. Most of the equipment needed to construct the wall is conventional earth-moving equipment, though a special extended-boom excavator would need to be mobilized from outside of the Portland area. The materials and labor required for the wall also can be obtained readily. With the exception of the sloping topography downgradient of the FWDA and TFA (to be constructed with steel sheet pile), the unobstructed conditions and relatively flat topography of the Site are conducive to the space requirements needed for trenching and backfill mixing.

Installation of a steel sheet pile wall typically is performed by a driven or vibratory method. Vibratory hammers likely will be used to drive the sheets part of the way, if not all of the way, to the desired depths. An impact hammer will be used to complete the sheet pile installation if vibratory methods are insufficient. The steel sheets are usually 4 feet wide with various patented interlocking joint types. The presence of gravel, rock or stiff silt/clay could limit the use of sheet pile construction at the Site. Based on a geotechnical investigation of the general wall alignment completed in 2000, these unfavorable conditions are not expected to be encountered. The results of the geotechnical investigation are provided in the *Barrier Wall Focused Technology Evaluation*.

Construction of a slurry wall may generate as much as 1,000 cubic yards of soils in excess of the amount needed to be blended with the bentonite slurry for backfill. Depending on the concentrations of contaminants in these excess soils, they may need to be managed in accordance with the soil remedy specified in the ROD and the ROD Amendment. The remedy for contaminated soil at the Site consists of excavation to a depth of four feet bgs and off-site disposal of soil with contaminant concentrations greater than the following *Action Levels*:

Arsenic:	300 mg/kg
Pentachlorophenol:	500 mg/kg
Carcinogenic PAHs:	100 mg/kg

Soil with concentrations above these *Action Levels* will require off-site disposal as a listed hazardous waste under the Resource Conservation and Recovery Act (RCRA). Due to Landfill Disposal Restrictions, pretreatment of these soils will be required prior to placement in a RCRA

landfill. Any pretreatment of the soils would be conducted off-site. The excess soils from barrier wall construction with contaminant concentrations below these *Action Levels* but posing an unacceptable risk will be placed on site and capped along with other lesser-contaminated soils in accordance with the ROD.

The barrier wall will require Operation and Maintenance (O&M) consisting of continued groundwater monitoring, periodic inspections of the wall's integrity and maintenance of any areas that have degraded beyond acceptable limits. Well gauging for NAPL is currently being conducted on a weekly basis and groundwater sampling for chemical analysis is being conducted semi-annually. It is anticipated that these periodic activities will continue at similar frequencies and that assessments of the wall's integrity will be conducted approximately every five years. The estimated cost to perform each five-year assessment is approximately $30,000 (present value). Maintenance of the barrier wall will be required if the inspections or groundwater monitoring indicate a potential breach in the wall. The cost to repair such a breach will depend on the extent and nature of the problem and could range from a few tens of thousands of dollars to several hundred thousand dollars. Although slurry walls and sheet piles have been extensively used in general construction for many decades, their use at NAPL-contaminated sites is relatively recent and their reliability beyond 20 or 30 years has been unproven. Given this limited history, the functional life of the barrier wall is assumed to be 30 years, at which time it may need to be replaced.

Barrier Wall Cost

The total capital cost associated with the barrier wall is estimated to be $3,948,000. Approximately $3,180,000 is estimated for direct capital costs consisting of monitoring well abandonment, contractor mobilization/demobilization, slurry/sheet pile construction, a contingency for off-site treatment and disposal of excess soil and a 20% general construction contingency. Approximately $768,000 is estimated for indirect capital costs consisting of treatability studies, performance bonds, engineering and design, license/utility connection/ costs, contractor reporting requirements, and construction oversight. Table 1 provides a breakdown of the cost estimate.

Applicable or Relevant and Appropriate Requirements (ARARs)

Cleanup or remedial actions must comply with applicable or relevant and appropriate requirements (ARARs) under Federal environmental laws and State environmental or facility siting laws. Identification of ARARs must be done on a site-specific and action-specific basis. Although the on-site portions of cleanup activities at CERCLA sites are exempt from permitting requirements, they must meet the substantive requirements of the ARARs. The ROD provides a detailed discussion of potential ARARs for a wide range of activities at the Site. Following is a preliminary identification of the significant ARARs for the barrier wall.

Resource Conservation and Recovery Act: The Resource Conservation and Recovery Act (RCRA) is applicable to hazardous waste sent off-site or managed on-site outside an Area of Contamination (AOC). RCRA requires that soil containing a hazardous waste be managed as a

hazardous waste in accordance with Treatment, Storage and Disposal (TSD) facility requirements (40 CFR 260 et seq.). However, these requirements do not apply to remediation wastes that are managed within an Area of Contamination (AOC). EPA's policy on AOC was recently summarized in the EPA Memorandum titled Management of Remediation Waste Under RCRA, Publication No. EP530-F-98-026, October 14, 1998. "In what is typically referred to as the area of contamination (AOC) policy, EPA interprets RCRA to allow certain discrete areas of generally dispersed contamination to be considered RCRA units (usually landfills). Because an AOC is equated to a RCRA land-based unit, consolidation and in situ treatment of hazardous waste within the AOC do not create a new point of hazardous waste generation for the purposes of RCRA. This interpretation allows wastes to be consolidated or treated in situ within an AOC without triggering land disposal restrictions or minimum technology requirements. The AOC interpretation may be applied to any hazardous remediation waste (including non-media wastes) that is in or on the land." The 1996 ROD established an AOC encompassing the entire McCormick and Baxter Site. This AOC provision allows contaminated soil to be excavated and consolidated anywhere within the McCormick & Baxter Site (but not in a separate unit such as a tank) without the activity constituting a new placement of the soil that would cause the soil to become regulated as a hazardous wastes (46 FR 8758). Therefore, excavation, consolidation, stockpiling, and sorting of soil and debris during construction of the barrier wall will not be subject to the Treatment, Storage and Disposal (TSD) facility requirements of RCRA as promulgated in CFR Part 264. However, any soil transported off site would need to comply with CFR Part 264. This ARAR is unchanged from the ROD.

Endangered Species Act: The Endangered Species Act (ESA) is applicable to the barrier wall construction. The ESA requires Federal agencies to consult or confer with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), prior to taking a Federal action. Consultation may occur when there is discretionary Federal involvement or control over the action, whether apparent (issuance of a new Federal permit), or less direct (State operation of a program with Federal oversight) (50 CFR §402.02; 50 CFR §402.10). The EPA, as the Federal action agency for the McCormick & Baxter Site, must determine whether a threatened or endangered species, or its critical habitat, will be affected by a proposed action. The ESA was identified as an ARAR in the 1996 ROD. Although no aquatic species were listed as threatened or endangered at that time, several anadromous fish species and associated critical habitat have since been listed as threatened.

The Federal listed species that fall within the action area of the McCormick & Baxter Site are:

- Lower Columbia River Chinook Salmon (Oncorhynchus tshawytscha)
- Upper Willamette River Chinook Salmon (Oncorhynchus tshawytscha)
- Lower Columbia River Steelhead (Oncorhynchus mykiss)
- Upper Willamette River Steelhead (Oncorhynchus mykiss)
- Columbia River Chum Salmon (Oncorhynchus keta)
- Bald Eagle (Haliaeetus leucocephalus)
- Golden Paintbrush (Castilleja levisecta)
- Water Howellia (Howellia aquatilis)
- Bradshaw's lomatium (Lomatium bradshawii)

- Nelson's checker-mallow (Sidalcea nelsoniana)
- Willamette daisy (Erigeron decumbens var. decumbens)
- Kincaid's lupine (Lupinus sulphureus var. kincaidii)

EPA prepared a Biological Assessment (BA) to evaluate the potential effects of the barrier wall on threatened or endangered species listed above. EPA concluded that the barrier wall "may effect, likely to adversely affect" Chinook salmon, steelhead salmon and chum salmon and "will not jeopardize" sea-run cutthroat trout and coho salmon which are candidate species for listing. The BA identifies reasonable and prudent measures which will be taken to minimize impacts to the protected species during construction activities. EPA initiated formal consultation with NMFS on the barrier wall BA on June 12, 2002, which is expected to be concluded with NMFS' issuance of a Biological Opinion.

EPA also concluded the barrier wall would either not adversely affect, have no effect or not jeopardize the remaining species listed above. The USFWS concurred with this determination in a letter dated July 11, 2002, and the USFWS noted that they have since withdrawn their proposal for listing cutthroat trout as endangered in the vicinity of the site.

The National Historic Preservation Act - Protection of Historic Properties: The National Historic Preservation Act (NHPA) is applicable to the barrier wall construction. The NHPA requires Federal agencies to take into account the effects of Federal undertakings on any historic properties listed on, or eligible for inclusion on, the National Register of Historic Places, and to avoid, minimize or mitigate any adverse effects on such properties (16 U.S.C.§ 470). The EPA, as the Federal action agency for the McCormick & Baxter Site, has a responsibility to determine whether CERCLA remedial actions could effect historic or cultural properties. EPA will identify any Indian tribes that might attach religious and cultural significance to the project area and invite them to be consulting parties. The goal of the consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigation and adverse effects on historic properties. Consultation also will respect tribal sovereignty and the government-to-government relationship between the Federal government and Indian tribes. EPA is required to provide a reasonable opportunity for the Advisory Council on Historic Preservation (ACHP) to comment on the action. The State Historic Preservation Office (SHPO) typically assists ACHP with their review and comment on the proposed action. The NHPA is an action-specific ARAR that was not identified as an ARAR in the 1996 ROD.

Executive Order 11988 – Floodplain Management: Executive Order (EO) 11988 is relevant and appropriate to the barrier wall. EO 11988 requires Federal agencies carrying out their responsibilities to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. The barrier wall will be located at or above the ordinary high-water mark for the Willamette River and therefore will avoid impacts on the floodplain.

Greenway Regulations, City of Portland Office of Planning and Development Review, and Oregon Removal-Fill Law: The City of Portland greenway regulations fall under the NCP definition of "to be considered" (TBCs). These greenway regulations are in effect along the

riparian zone of the Lower Willamette River to protect, conserve, enhance, and maintain the natural, scenic, historic, economic, and recreational qualities of lands along Portland's rivers. DEQ and EPA will coordinate with the City of Portland to identify substantive aspects of the Greenway Regulations which may be relevant to the barrier wall. These TBCs remain unchanged from the ROD.

Expected Outcomes Following Implementation of the Barrier Wall Contingency Remedy

The installation of the barrier wall is expected to meet the groundwater RAO of "minimizing NAPL discharges to the Willamette River beach and adjacent sediment to protect human health and the environment." The barrier wall will cut off the upgradient source of mobile NAPL at the Site and will prevent NAPL migration from the TFA and the FWDA toward the river. This effect should occur immediately following construction. However, the barrier wall will not contain the "wedge" of mobile NAPL that is present along the shoreline below the ordinary high-water mark of the river. It is expected that continued NAPL seepage from this "wedge" will continue for a short period of time following installation of the barrier wall. The barrier wall is expected to reduce the hydraulic head on NAPL within this "wedge", thus slowing the rate of NAPL discharge to the river. It is not possible to accurately estimate the volume of mobile NAPL residing outside the barrier wall. However, based on the NAPL distribution within the current network of monitoring wells, DEQ and EPA expect that the vast majority of mobile NAPL will be contained within the barrier wall.

In an attempt to minimize the size of this "wedge", the barrier wall will be located as close as possible to the river while staying above the ordinary high-water mark. The barrier wall also will be located as close as possible to Willamette Cove and the City of Portland high pressure sewer main between Willamette Cove and the FWDA.

Installation of the barrier wall is expected to retard but not completely prevent the vertical migration of NAPL to the deep groundwater aquifer. The barrier wall segment directly downgradient of the TFA will partially contain DNAPL because the bottom of the barrier wall will be tied into the existing confining unit at approximately -38 feet MSL. The containment is only partial because the DNAPL could migrate horizontally along the confining unit toward the FWDA. Because of the lack of a suitable continuous, confining unit in the FWDA, the barrier wall in this area of the site will have a limited effect on the ability of DNAPL to migrate downward to the deep aquifer. However, the barrier wall is expected to effectively block the migration of DNAPL toward the river because the barrier wall in the FWDA will be constructed to a depth which is below the river bottom for a distance of 400 feet and to a depth approximately equal to the river bottom for an additional 300 feet.

Groundwater modeling was conducted to determine the effects of the barrier wall on the aquifer during wet and dry times of the year, including a 100-year flood event similar to the winter of 1996. The modeling is presented in the *Draft Groundwater Modeling Report* (August 2001). Modeling for a fully encompassing barrier wall indicated that a stable water table with an accompanying small rise in head elevation would develop within the barrier wall and that

groundwater extraction would not be needed to prevent the encircled groundwater from overflowing the barrier wall.

The barrier wall is expected to facilitate the groundwater remedy in meeting the RAO of "removing mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and potential for discharge to the Willamette River." The barrier wall will contain and prevent substantial volumes of mobile NAPL from being released to the river sediments, and may create conditions (i.e., pools of NAPL behind the wall) which will facilitate NAPL recovery. The barrier wall also is expected to decrease the potential for adverse impacts to the river by reducing the quantity of groundwater passing through the primary NAPL source areas and discharging into the river.

Additional Measures to be Performed Following Construction of the Barrier Wall

Monitoring

DEQ and EPA will monitor the hydraulic and contaminant response to the barrier wall in order to assess the overall performance of the groundwater remedy. DEQ and EPA also will monitor NAPL thickness within the wall and the NAPL seep areas. New monitoring wells will be installed both inside and outside the barrier wall to measure NAPL thickness, contaminant concentration and hydraulic head. Monitoring results will be used to verify the primary assumptions used in developing the groundwater model (see *Draft Groundwater Modeling Report* (August 2001)) and to assess the performance of the barrier wall in achieving the groundwater cleanup objectives specified in the ROD.

Continued NAPL Recovery

Enhanced NAPL recovery with off-site NAPL treatment/disposal, as specified in the ROD, will continue following construction of the barrier wall. This component of the groundwater remedy is intended to satisfy the CERCLA preference for treatment to reduce toxicity, mobility and volume of hazardous substances, and to eventually eliminate the long-term threat which mobile NAPL poses to the Willamette River. NAPL recovery is currently being conducted using manual LNAPL skimmers in select monitoring wells and manual LNAPL and DNAPL skimmers using pneumatic pumps. The NAPL recovery system will be evaluated for enhancement opportunities following construction of the barrier. These enhancements likely will include installation of new recovery wells in areas where NAPL accumulates.

Re-evaluation of Surface Water Protection Goals

National Oceanic and Atmospheric Administration (NOAA), NMFS and the Confederated Tribes of Grand Ronde, in written comments on the preliminary barrier wall proposal, stated that the ACLs may be set too high to be protective of ecological receptors in the Willamette River. To address this concern, DEQ and EPA will re-evaluate the surface water protection criteria specified in the ROD. This re-evaluation will determine whether the current groundwater ACLs are still adequate to protect human health and ecological receptors from exposure to groundwater

discharging into the Willamette River. Ecological receptors of particular interest are salmon and steelhead which were recently listed as threatened under the Endangered Species Act. New surface water protection goals will be developed if it is determined that existing goals are not protective.

Evaluation of Pilot Testing of Innovative Technologies for NAPL Recovery

The ROD specifies that pilot testing shall be conducted for innovative technologies which increase the effectiveness and rate of NAPL removal. This provision of the groundwater remedy has not yet been implemented because NAPL accumulations on site appear to be decreasing based on the NAPL monitoring/extraction program and there are concerns that, in the absence of containment, the pilot tests could mobilize NAPL resulting in increased discharge to the Willamette River. The evaluation of pilot testing of innovative groundwater technologies at McCormick & Baxter will be considered after the barrier wall has been implemented and NAPL discharge is contained.

Consideration of Impermeable or Semi-permeable Soil Cap

DEQ and EPA will consider the use of impermeable or semi-permeable features in the soil cap during its' design. NOAA and NMFS have recommended the site cap be impermeable to minimize infiltration and the quantity of groundwater potentially flowing through the primary source areas. The ROD provided for construction of a soil cap on the site; however, an impermeable soil cap was not considered necessary to be protective of groundwater. Groundwater data obtained following construction of the barrier wall will be assessed to determine whether additional measures would be appropriate to minimize surface water infiltration into the NAPL source areas contained within the fully encompassing barrier wall.

V. HIGHLIGHTS OF COMMUNITY PARTICIPATION

DEQ and EPA have met with local governments and several neighborhood associations in the site vicinity to discuss cleanup efforts at the Site and present the proposed barrier wall. Additionally, the barrier wall proposal was provided for review to the following native American tribal governments and natural resource trustees:

- Confederated Tribes of Grand Ronde
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes and Bands of the Yakama Nation
- Nez Perce Tribe
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Warm Springs Reservation
- National Oceanic and Atmospheric Administration (NOAA)
- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (FWS)

NOAA, NMFS and the Confederated Tribes of Grand Ronde provided written comments on the barrier wall. EPA and DEQ held several discussions with these parties to clarify concerns and provide preliminary responses to the comments. The outcome of these consultations is reflected in this ESD by the barrier wall design as well as the additional measures to be performed following construction of the barrier wall.

In accordance with the NCP, Section 300.435(c)(2)(i)(B), when this ESD is issued a public notice of its availability will be published in the Oregon Secretary of State's Bulletin and *The Oregonian* newspaper. In addition, a copy of the public notice will be mailed to the McCormick & Baxter Site mailing list of approximately 1000 individuals. The Administrative Record, including this ESD, will be available for public review at the two information repositories for the Site listed above.

VI. STATUTORY DETERMINATIONS

This ESD changes a component of the remedy selected in the 1996 ROD by implementing the contingency subsurface barrier wall. The remedy continues to satisfy the provisions of Section 121 of CERCLA, 42 USC §9621 and the Oregon Revised Statutes (ORS) 465.315. DEQ and EPA believe the remedy is protective of human health and the environment, attains Federal and State requirements that are legally applicable or relevant and appropriate for this remedial action, is cost effective and continues to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also continues to satisfy the statutory preference for treatment that reduces toxicity, mobility and volume of hazardous substances as a principal element. As provided in the ROD, reviews will the conducted every five years to ensure that the remedy continues to provide adequate protection of human health and the environment. The next Five-Year Review is scheduled for 2006.

Table 1 – Cost Estimate Breakdown for Barrier Wall

Item Description	Quantity	Unit	Cost/Unit	Factor [1]	Cost [2]
Direct Capital Costs					
Monitoring Well Abandonment [3]	1	lump sum	$10,000	1	$10,000
Wall Contractor Mobilization/Demobilization	1	lump sum	$200,000	1	$200,000
Slurry Wall Construction [4]	149,825	square feet	$7.31	1	$1,095,000
Sheet Pile Wall Construction [4,5]	83,008	square feet	$15.00	1	$1,245,000
Contingency for Waste Soil Disposal	1	lump sum	$100,000	1	$100,000
Subtotal direct Capital costs					$2,650,000
Contingency Allowance (20%)					$530,000
Total Direct Capital costs					**$3,180,000**
Indirect Capital Costs					
Treatability Study	1	lump sum	$5,000	1	$5,000
Slurry Wall Performance Bond (1% of wall cost)					$32,000
Engineering and Design (3%)					$95,000
Legal Fees and License/Utility connection Costs (5%)					$159,000
Contractor Reporting Requirements (5%)					$159,000
Construction Oversight (10%)[6]					$318,000
Total Indirect Capital costs					**$768,000**
TOTAL CAPITAL COST					**$3,948,000**
Operation and Maintenance (O&M) and Periodic Costs					
Testing of Barrier Wall [7]	1	5 Years	$30,000	1	$30,000

Note:
All costs rounded to nearest $1,000.

[1] The factors represent adjustments for materials and installation for Portland, Oregon, if the costs were estimated using either R.S. Mean Building Construction Cost Data or from estimating data contained in Environmental Cost and Handling Option Solutions.

[2] Because of rounding, the amount in the "Cost" column may be slightly different from the product of the values in the "Quantity", "Cost/Unit", and "Factor" columns.

[3] Assumes 12 wells with an average depth of 50 feet would require decommissioning along the wall alignment.

[4] See "Barrier Wall Costs" Sheet, *Barrier Wall Focused Technology Evaluation*, for how unit cost was developed.

[5] Assumes contractor within Portland area and mobilization/demobilization costs are negligible.

[6] Includes preparation of site-specific construction plans, construction management, resident inspections and agency oversight.

[7] Assumes wall will be tested every 5 years.

Site Location
McCormick & Baxter Creosoting Company Superfund Site

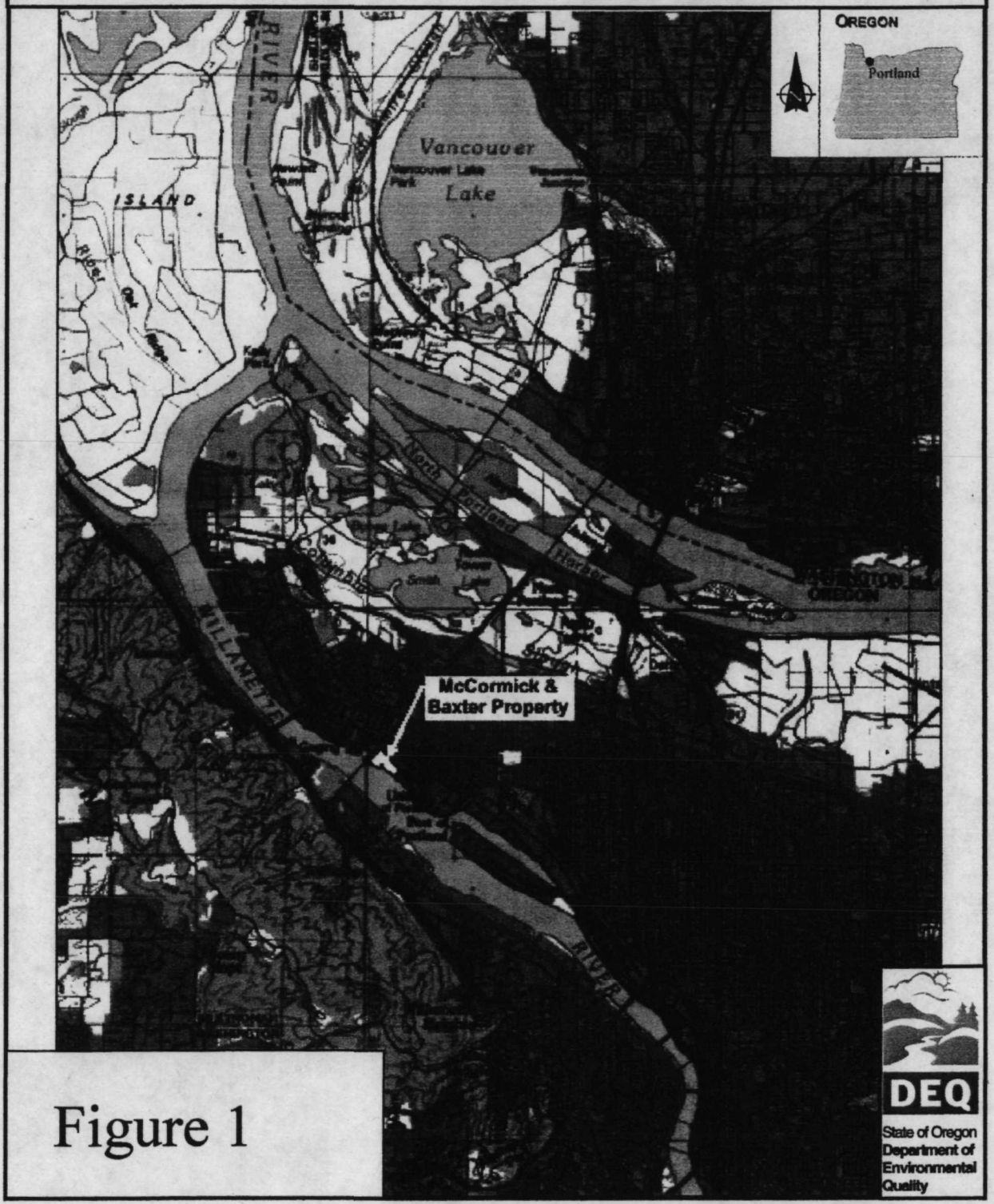

Figure 1

Current Site Features

Figure 2

Historic Site Features

Aerial Photo
1973

Figure 3

DEQ
State of Oregon
Department of
Environmental
Quality

Extent of NAPL Contamination (current site features)

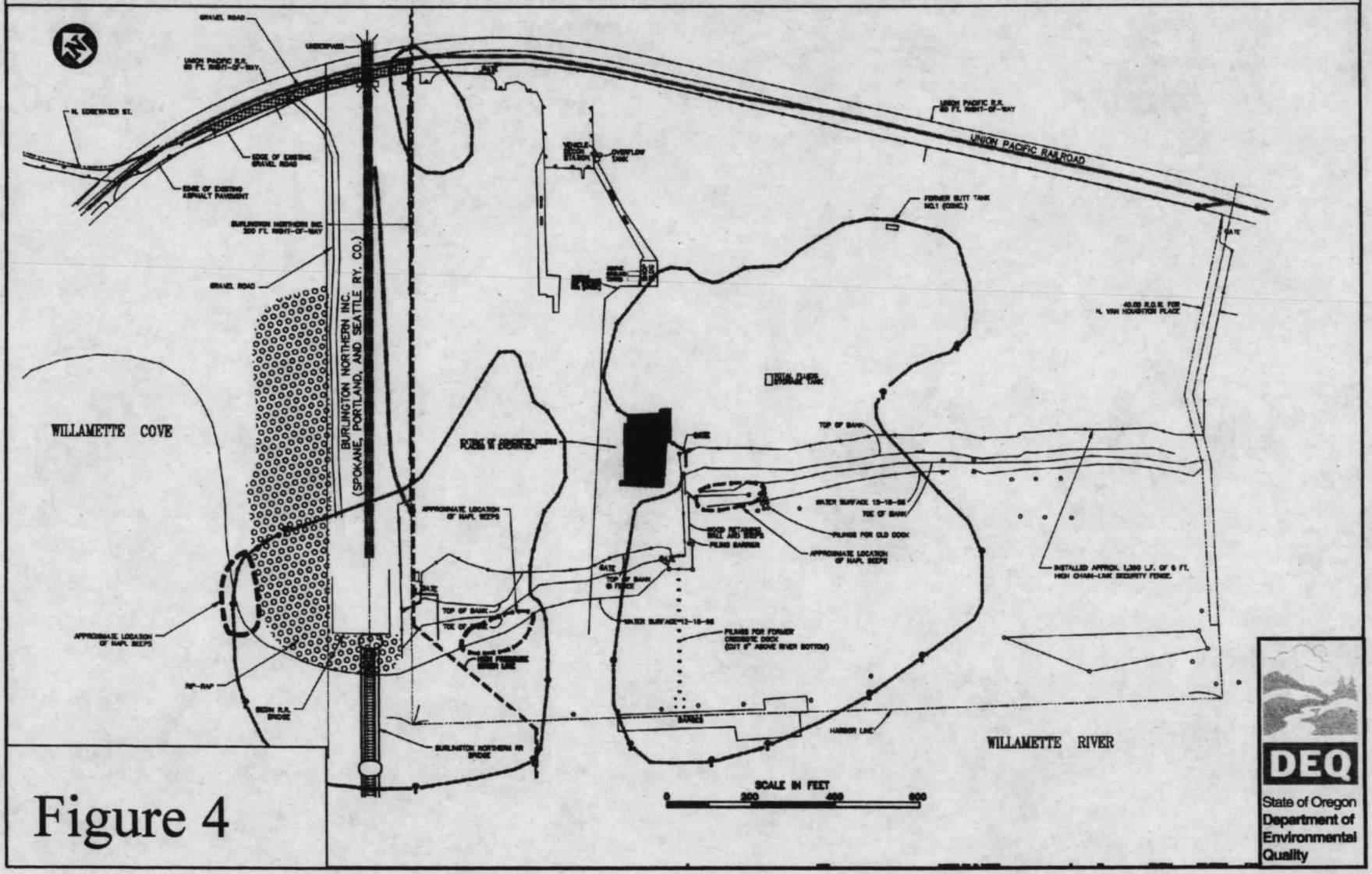

Figure 4

DEQ
State of Oregon Department of Environmental Quality

Barrier Wall Alternatives Evaluated
(current site features)

Figure 5

Barrier Wall Alignment
(historic site features)

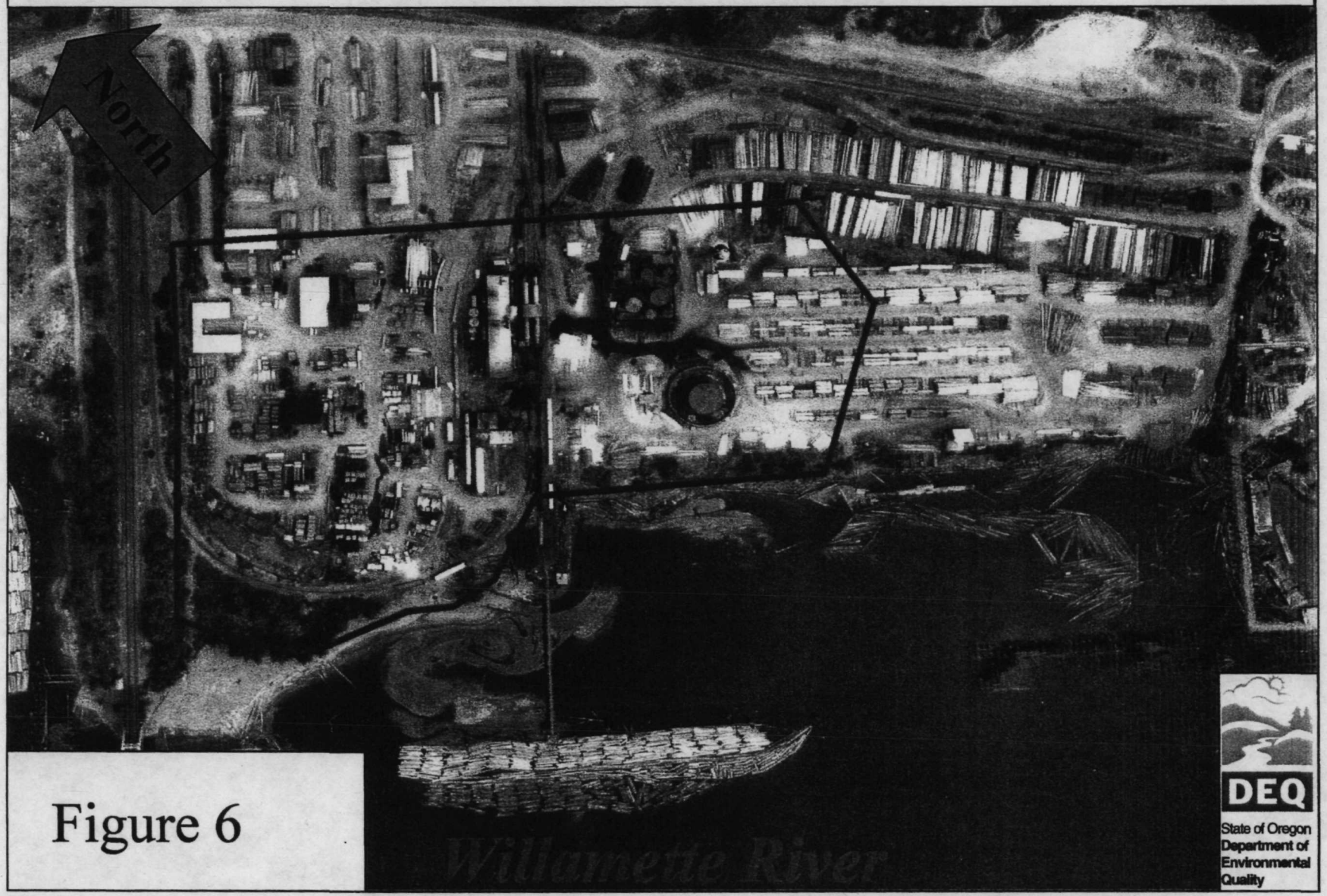

Figure 6

DEQ
State of Oregon
Department of
Environmental
Quality

Barrier Wall Alignment
(current site features)

Figure 7

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
525 NE Oregon Street
PORTLAND, OREGON 97232-2737

Refer to:
2002/00761

August 20, 2002

Alan Goodman
US EPA, Region 10
Oregon Operations Office
811 SW 6th Avenue
Portland, OR 97204

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation for the Construction of a Barrier Wall at the McCormick and Baxter Creosoting Company Site, Portland, Oregon.

Dear Mr. Goodman:

Enclosed is a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of the construction of a subsurface barrier wall at the McCormick and Baxter Creosoting Company site (the Site) in Portland, Oregon. The Site is adjacent to the Willamette River, and has been designated a Federal Superfund site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The proposed action is the first of three remedial actions proposed for the Site to reduce the potential exposure to contaminants present in the sediment, groundwater, and soils at the project site. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River chinook salmon, Columbia River chum salmon (*O. keta*), Upper Willamette River steelhead (*O. mykiss*), and Lower Columbia River steelhead. As required by section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with non-discretionary terms and conditions that NOAA Fisheries believes are necessary to minimize the impact of incidental take associated with this action.

This Opinion also serves as consultation on essential fish habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations at 50 CFR Part 600.

If you have any questions regarding this consultation, please contact Dr. Nancy Munn of my staff in the Oregon Habitat Branch at 503.231.6269.

Sincerely,

Michael R Crouse

D. Robert Lohn
Regional Administrator

cc. Kevin Parrett, ODEQ
Kathy Kunz, COE
Kathy Ivy, EPA
Helen Hillman, NOAA Office of Response and Restoration

Endangered Species Act - Section 7 Consultation
&
Magnuson-Stevens Act Essential Fish Habitat Consultation

BIOLOGICAL OPINION

Construction of the Barrier Wall at the McCormick and Baxter Creosoting Company Superfund Site, Willamette River, Portland, Oregon.

Agency:	U.S. Environmental Protection Agency, Oregon Operations Office
Consultation Conducted By:	NOAA Fisheries, Northwest Region
Date Issued:	August 19, 2002
Issued by:	Michael R Course D. Robert Lohn Regional Administrator
Refer to:	**2002/00761**

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1. ENDANGERED SPECIES ACT

1.1 Background

On June 17, 2002, the National Marine Fisheries Service (NOAA Fisheries) received a letter and a biological assessment (BA) from the U.S. Environmental Protection Agency (EPA) requesting formal consultation under the Endangered Species Act (ESA) for the construction of a subsurface barrier wall at the McCormick and Baxter Creosoting Company site (the Site) along the Willamette River in Portland, Oregon. The Site has been designated a Federal Superfund site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This action is one of several remedial actions being taken under CERCLA to significantly reduce the potential risk to human health and ecological receptors resulting from potential exposure to contaminants present in the sediment, groundwater, and soils at the project site. The project applicant is EPA, and EPA and the Oregon Department of Environmental Quality (DEQ) jointly prepared the BA. EPA has designated DEQ as the lead in implementing the actions contained with the CERCLA Record of Decision (ROD), although this remains a Federal action with Federal funding. DEQ will be solely responsible for the long-term operation and maintenance of the Site.

Activities at the Site include the removal of existing wooden pilings from the shoreline area, removing pieces of large wood that have accumulated along the shoreline to facilitate sheet pile wall construction, the construction of a sheet pile wall along the ordinary high water line of the Willamette River, and construction of a slurry wall on the upland portion of the Site. The barrier wall will fully encircle the upland portion of the Site, and is expected to substantially reduce the off-site migration of contaminants. Additional remedial actions will take place to address the contaminated sediments in the Willamette River, and to address contaminated groundwater and soils on the upland portion of the Site. The additional actions are in design phase and will not begin construction until 2003 or later. The barrier wall can be treated as an action of independent utility because containment of the upland sources of contamination is critical for any future remedial actions, and must take place regardless of the final selection of remedies for contaminated soils, sediment and groundwater at the Site. EPA anticipates that the future construction actions will include the construction of a sediment cap on Willamette River sediments and the construction of a soil cap on the contaminated upland sediments. This consultation does not include construction of the soil or sediment cap. Consultation on these portions of the remedy will occur at a later design phase and when funding is more assured.

In the June, 2002, BA, EPA determined that Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River (LCR) chinook salmon, Columbia River chum salmon (*O. keta*), UWR steelhead (*O. mykiss*), and LCR steelhead, may occur within the project area and that the proposed action is "likely to adversely affect" the listed species. The objective of this biological opinion (Opinion) is to determine whether the activities included in the barrier wall construction plan are likely to jeopardize the continued existence of the above-listed species. This Opinion was prepared based on information received from the EPA and

DEQ, and the best available science. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations, 50 CFR 402.

1.2 Proposed Action

1.2.1 Location

The Site is along the west bank of the Willamette River at river mile (RM) 7. The Site is located on approximately 43 acres of uplands and 17 acres of contaminated sediments in the Willamette River. An additional 5 acres of steeply-sloping riverbank is located between the river and the uplands. The Site is zoned for heavy industrial use but has been vacant since the early 1900s. The Site is bordered by railroad tracks to the northeast and northwest, a barge maintenance and dredging facility to the southeast, and an empty lot where a shipyard and cooperage were once located on the northwest. Nearly all the infrastructure has been removed from the Site and adjacent industrial properties.

1.2.2 Background

The McCormick and Baxter Creosoting Company operated between 1944 and 1991, treating wood products with creosote, pentachlorophenol, and inorganic preservative solutions (arsenic, copper, chromium, and zinc). Historically, process wastes were disposed of in several areas of the Site, including the Formal Waste Disposal Area (FWDA). In addition, there were periodic spills and leaks of wood-treating chemicals in the Tank Farm Area (TFA) and the Central Process Area (CPA). Creosote was delivered by barge and transported via a 6-inch line to the storage site on shore. As a consequence of these activities, significant concentrations of wood-treating chemicals are now present in groundwater beneath the Site. Sources of sediment contamination include spills at the transfer site, FWDA, TFA, and CPA, and via groundwater contamination.

The McCormick and Baxter Site was proposed for addition to the National Priorities List (NPL) under CERCLA on June 18, 1992, and was added to the NPL on June 1, 1994. After a detailed study of the nature and extent of contamination at the Site and a detailed analysis of cleanup alternatives, EPA, in conjunction with DEQ, signed a Record of Decision (ROD) in 1996. The ROD identifies the selected remedy for the Site, and describes the source areas and the nature and extent of contamination in the soil, sediment and groundwater.

The selected remedy is a series of remedial actions that address the human and environmental health threats at the Site by treating the most highly contaminated soil, capping less contaminated soil, extracting nonaqueous phase liquid (NAPL), installing a subsurface barrier wall as a contingency if on-site treatment was not effective, and capping contaminated sediments. Several of these actions have been completed or are ongoing. A ROD Amendment was issued in 1997 and changed the treatment requirement for highly contaminated soil to off-site disposal at a permitted landfill. This provides the basis and justification for invoking the barrier wall contingency. The proposed action for this consultation is the construction of the barrier wall.

Funding is pending for the construction of the barrier wall. Funding has not been allocated yet for the sediment or soil cap.

1.2.3 Groundwater Contamination

The Site-related groundwater contaminants are polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol (PCP), and metals associated with wood-treating solutions. The main source areas of the groundwater contamination include the TFA, the FWDA, and the CPA. Wood-treating products (*i.e.*, containing PAHs) generally have low-to-moderate solubility in water, and they either float on the water table or continue to sink depending on the density of the product compared to that of the water. The relatively insoluble materials are described as nonaqueous phase liquids (NAPL). NAPL that floats is referred to as lighter-than-water nonaqueous phase liquid (LNAPL), and NAPL that is heavier than water and sinks is referred to as denser-than-water nonaqueous phase liquid (DNAPL). The density of DNAPL at the Site is close to that of water, and tends to be suspended throughout the water column or aquifer thickness. LNAPL is predominantly found at the water surface without much vertical suspension. Groundwater quality at the Site also has been impacted by dissolved-phase contaminants.

Releases of NAPL contaminants from the main source areas at the Site, particularly from the TFA and FWDA, have affected the shallow aquifer. Two distinct NAPL plumes are present at the Site: one in the TFA and one in the FWDA. These contaminant plumes contain LNAPL and DNAPL or both. The plumes also contain dissolved-phase contaminants.

The FWDA NAPL plume is estimated to affect approximately 4 acres of soil and 5 acres of sediment. The contaminants in this plume originated from waste oil, stormwater from system pits, and other liquid wastes that were disposed of in the FWDA. This mixture of contaminants migrated vertically to the water table (approximately 30 feet below ground surface (bgs)), and then laterally toward the river, spreading as LNAPL and DNAPL.

The TFA plume is estimated to affect approximately 8 acres of soil and 6 acres of sediment. The contaminants in this plume originated from the former tank farm, the large creosote tank, the creosote retorts, the butt tanks, and the southeast waste disposal trench, in which either periodic spills or disposal of waste oils (creosote and PCP) and other liquid waste occurred. This mixture of contaminants migrated vertically to the water table and then laterally toward the river, spreading as LNAPL and DNAPL. Near the beach, LNAPL occasionally has been observed in seeps at low tides and at low river stage (*i.e.*, generally during late summer).

Contaminant flux from shallow aquifer groundwater to river sediment still is occurring at the Site downgradient from the FWDA and TFA plumes. The groundwater gradient direction in the shallow, intermediate, and deep zones is generally from the bluff toward the river. However, periodic reversals of the groundwater gradient occur near the shoreline. As previously discussed, contaminated groundwater can be observed in beach seeps during late summer when the river stage is low and hydrostatic pressures decrease, allowing NAPL and contaminated groundwater to enter the river sediment.

1.2.4 Sediment Contamination

Sediment sampling was initiated in the early 1990s during the Remedial Investigation (RI). Results indicated that the contamination could be correlated to the NAPL plumes emanating from the TFA and FWDA. Subsurface sample data indicate that contamination may extend as deep as 35 feet bgs in heavily contaminated areas. RI studies concluded that NAPL, when present, was found in the upper 7 feet of the sediment and that NAPL discharge, as indicated by an oily sheen or beach seeps, appeared to be greatest during river stages of -3 CRD or lower.

Additional sediment sampling and analyses were conducted in 1999 and 2001. The sample locations included sites in the vicinity of the former creosote dock where spillage occurred during off-loading procedures. The results indicated that carcinogenic PAHs and dioxin/furan compounds contaminate sediments at the Site. Bioassay tests resulted in significant mortality to test organisms at a number of sampling locations.

Based on evaluation of the 1999 and 2001 sediment sampling results, the following general conclusions can be reached:

- High concentrations of PAHs were detected in samples collected where LNAPL releases are known or are suspected to be occurring (*i.e.*, near the creosote dock, downstream into Willamette Cove, and along the sediment drop-off along the harbor line);
- PAH concentrations appear to decline rapidly away from known or suspected NAPL release areas, suggesting little lateral spreading of PAH-contaminated sediment; and
- Sediment testing for PAHs is a generally reliable indicator to define the area to be capped due to chemical contamination.
- NAPL blebs (visible globules of NAPL) extend down to 70 feet bgs in some areas.

During an extreme low-water period in August 2001, a NAPL seep emerged at Willamette Cove that had not been observed previously, except as an occasional sheen. Drought conditions and an extremely low river water level may have led to the emergence of the seep. The location of the seep is in the predicted downgradient direction from the FWDA and comparison of ratios of LPAH to high-molecular-weight PAH between seep sediment samples and on-site subsurface soil samples appear to verify that the FWDA is the source of this NAPL contamination.

1.2.5 Soil Contamination

The ROD provided two sets of criteria for soil, based on the cost-effectiveness of treatment alternatives to achieve the Remedial Action Objectives (RAOs). Highly contaminated soil required treatment, which was later amended to removal. Residually-contaminated soil could remain on site but measures were required to prevent direct contact or ingestion with contaminated soil, or surface runoff from contaminated soil.

In 1996 and 1997, extensive surface (0 to 6 inches bgs) and subsurface (4 and 10 feet bgs) soil samples were collected and analyzed in anticipation of excavating and treating the most heavily contaminated soil. Removal of the highly contaminated soil began in March 1999, and was

completed in May 1999. Approximately 33,000 tons of contaminated soil and debris were removed from the Site and disposed of in a permitted, hazardous waste landfill in Idaho. The *Revised Final Remedial Design Data Summary Report* (DEQ 1998) depicted the locations of the residually contaminated surface soil and concluded that the entire upland area of the Site should be capped.

1.2.6 Construction of the Barrier Wall (Proposed Action)

The purpose of the proposed action is to construct a barrier wall to minimize or prevent the movement of contaminants from the upland sources to Willamette River sediments and water column. Activities associated with the proposed action include removal of existing wooden pilings, the displacement of large wood along the shoreline to facilitate sheet pile wall construction, the construction of the sheet pile wall along the ordinary high water line of the Willamette River, and construction of a slurry wall on the upland portion of the Site. Construction will occur in 2003. Construction of the soil slurry wall is anticipated to require approximately 8 to 10 weeks, and construction of the sheet pile wall is anticipated to require approximately 12 weeks.

The wood pilings will be removed at the sediment surface, either by cutting or pulling and will be transported to an upland site (either on-site or off-site). The disposition of the wood pilings will be determined during design of the uplands soil cap.

Since the sheet piles cannot be driven through wood, the wood that has accumulated along the shoreline may need to be relocated a short distance away from its existing location. The wood will be moved by heavy equipment from the shoreline to another part of the Site.

The barrier wall will fully encompass the upland portion of the Site; the portion of the barrier wall along the Willamette River will be constructed out of sheet pile, while the rest of the wall will be constructed out of a slurry material. The sheet pile part of the wall will be 1,270 linear feet of steel. It will be driven with a compression and/or a vibratory hammer, and will be driven flush with the ground surface.

The upland slurry wall will be constructed by excavating a 3-foot wide by 2,380-foot long trench to depths up to approximately 80 feet bgs. As the trench is excavated, it will be immediately backfilled with a bentonite-water slurry and a soil-bentonite mixture, which forms an impermeable barrier wall. The finished slurry wall will be capped with soil to be flush with the ground surface. The slurry will not come within 100 feet of the banks and shoreline of the Willamette River, and will not result in the discharge of any materials to the river. All construction stormwater will be restricted to the construction site with no discharges to surface waters.

1.3 Biological Information

The action area is defined by NOAA Fisheries regulations (50 CFR 402) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved

in the action." The action area for the proposed project is the Willamette River extending from RM 8 downstream one mile, including the water column and substrate. The action area includes the area of disturbance in the upland and riparian parts of the Site. The size of the action area is based on the possible extent of a toxic plume if NAPL is mobilized during the driving of the sheet piles.

The Willamette River within the action area serves as a migration area for all listed species under consideration in this Opinion, with the exception of chum salmon. It may also serve as a feeding and rearing area for juvenile steelhead and chinook salmon. Essential features of the area for the species are: Substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions (50 CFR 226). The proposed action may affect the essential habitat features of water quality, substrate, food, and riparian vegetation.

References for further background on listing status and biological information can be found in Table 1. Information about Lower Columbia River/Southwest Washington coho salmon is provided in the table, but that ESU is not discussed in this Opinion because it remains on the candidate list. A discussion of the historical status of the ESUs can be found in the biological assessment (2002).

The LCR chinook salmon includes both fall-run and spring-run stocks. Adults migrating to the Clackamas River may be present in the lower Willamette River starting in August and continuing through November, with peak migration occurring in September and October. Juveniles in this ESU would be expected in the lower Willamette River starting in March, continuing through July, with the peak occurring in April, May, and June.

Adults from the UWR chinook salmon ESU migrate through the action area beginning in March, and complete their migration by the end of July, with the peak between late April and early June. It is also possible that some adults hold for periods of time within the Portland harbor. Chinook smolts would typically pass through the action area from January through June, and from August through December. Juveniles would be expected in the lower Willamette River anytime from March through mid-December. Information on the migratory behavior of subyearling chinook is limited. Subyearling chinook have been found in the harbor area over a longer period than other species of salmonids, probably because they actively feed during migration. Some juveniles may over-winter in the lower Willamette River.

Adult chum salmon may occur near the mouth of the Willamette River during their upstream migration from late September through December. They do not spawn in the Willamette River or its tributaries. Chum salmon fry may move into the lower Willamette River during incoming tides and could feed on organisms within the action area for short periods during their downstream migration.

LCR steelhead move through the action area throughout the year. Peak movement is expected from late April through May. Juvenile steelhead migration peaks in April and May. Most steelhead smolts move downriver through the action area in less than one day. UWR steelhead

adults could be expected in the action area from January through mid-May. Smolts would be present from March through mid-July, with peak migration occurring in May.

Table 1. References for Additional Background on Listing Status, Biological Information, and Protective Regulations for the ESA-Listed and Candidate Species Considered in this Consultation.

Species / ESU	Status	Protective Regulations	Biological Information
Chinook salmon (*O. tshawytscha*)			
Lower Columbia River	Threatened 3/24/00; 64 FR 14308	7/10/00; 65 FR 42422	Myers et al. 1998; Healey 1991
Upper Willamette River	Threatened 3/24/00; 64 FR 14308	7/10/00; 65 FR 42422	Myers et al. 1998; Healey 1991
Chum Salmon (*O. keta*)			
Columbia River	Threatened 3/25/99; 64 FR 14508	7/10/00; 65 FR 42422	Johnson et al. 1997; Salo 1991
Steelhead (*O. mykiss*)			
Lower Columbia River	Threatened 3/19/98; 63 FR 13347	7/10/00; 65 FR 42422	Busby et al. 1995; 1996
Upper Willamette River	Threatened 3/25/99; 64 FR 14517	7/10/00; 65 FR 42422	Busby et al. 1995; 1996
Coho salmon (*Oncorhynchus kisutch*)			
Lower Columbia River/ Southwest Washington	Candidate 7/25/95; 60 FR 38011	Not Applicable	Weitkamp et al. 1995, Sandercock 1991

1.4 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species. This analysis involves the initial steps of defining the biological requirements and current status of the listed species, evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of mortality attributable to: (1) Collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. If NOAA Fisheries finds that the action is likely to jeopardize the listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

Furthermore, NOAA Fisheries evaluates whether the action is likely to result in habitat modifications that appreciably diminish the value of the habitat for both survival and recovery of the listed species. NOAA Fisheries identifies those effects of the action that are likely to impair the function of habitat. If NOAA Fisheries concludes that the action modifies habitat in a way that affects the survival and recovery of listed species, it must identify any reasonable and prudent measures available.

For the proposed action, a jeopardy analysis by NOAA Fisheries considers direct or indirect mortality of fish attributable to the action. NOAA Fisheries also considers the extent to which the proposed action impairs habitat to determine whether the action is likely to result in jeopardy.

1.4.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmonids is to define the species' biological requirements that are most relevant to each consultation. The NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess to the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list the species for ESA protection and also considers new data available that are relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to a naturally-reproducing population level at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance its capacity to adapt to various environmental conditions, and allow it to become self-sustaining in the natural environment.

For this consultation, the biological requirements are improved habitat characteristics that function to support successful rearing and migration. The current status of the listed species, based upon their risk of extinction, has not significantly improved since the species were listed. Chum salmon returns began to decline in the 1950s, and have remained at a depressed level since 1965 (Muldoon *et al.* 2001). The five-year average adult escapement of native, late-run winter steelhead within both ESUs has been declining since 1971 (Foster 2001). LCR chinook salmon in the Willamette River basin are represented by a single, small population of fall-run fish that spawn primarily in the lower mainstem Clackamas River. Long-term trends of this ESU are declining. Trends in the UWR chinook salmon populations are declining as well. The North Santiam population currently does not meet the critical viability threshold for abundance and productivity (King 2001).

1.4.2 Environmental Baseline

The Site is within the lower Willamette River watershed at RM 7 within the Portland Harbor. The Willamette River watershed covers approximately 11,500 square miles in northwest Oregon between the Coast and Cascade mountain ranges. The river travels 187 miles from its headwaters to its mouth at the Columbia River. Most of the rainfall occurs in the fall, winter,

and spring, with little rainfall during June, July, and August. The lowest river flow occurs during late summer. The 13 U.S. Army Corps of Engineer (COE) dams on tributary systems largely regulate flows in the mainstem Willamette River.

Significant changes have occurred in the watershed since the arrival of Europeans in the 1800s. The watershed was mostly forested land prior to the arrival of white settlers. Now, about half the basin is still forested. One-third of the basin is used for agriculture, and about five percent is urbanized or is in residential use. The river receives direct inputs from treated municipal wastes and industrial effluents. Nonpoint source input from agricultural, silvicultural, residential, urban and industrial land uses are also significant, especially during rainfall runoff.

The Willamette River, from its mouth to Willamette Falls, is currently on the 1998 Oregon DEQ 303(d) list as water quality limited for the following parameters: Temperature (summer), bacteria, biological criteria (fish skeletal deformities), and toxics (mercury in fish tissue). Results from DEQ ambient monitoring data indicate that 68 percent of the values at RM 7 and 61 percent of the values at RM 13.2 collected during the summer exceed the temperature standard of 68°C. Sediment conditions in the Willamette River watershed range from excellent in some of the upper tributaries to poor in much of the mainstem of the river (Altman et al. 1997). In the lower Willamette River, average turbidity levels tend to be higher in fall and winter. Monthly average turbidity ranges from four NTUs to 149 NTUs.

In 1997, DEQ and the EPA took sediment samples within the Portland Harbor. The results of the study indicated that sediments in the harbor, including within the project area, contain concentrations of metals, PCBs, pesticides, herbicides, dioxins/furans, tributyltin (TBT), and PAHs above EPA contaminant guidelines. Cleanup of the contaminated sediments is presently being addressed under the Federal Superfund process. In addition, the skeletal deformities in fish upstream of Willamette Falls suggests that there may also be chemical contamination upstream of the Portland Harbor area.

Habitat conditions within the lower Willamette River are highly degraded. The streambanks have been channelized, off-channel areas removed, tributaries put into pipes, and the river has been disconnected from its floodplain as the lower valley was urbanized. Silt loading to the lower Willamette River has increased over historic levels due to logging, agriculture, road building, and urban and suburban development within the watershed. The river in the vicinity of McCormick and Baxter site has a soft bottom, with little or no aquatic vegetation. Limited opportunity exits for large wood recruitment to the lower Willamette River due to the paucity of mature trees along the shoreline, and the lack of relief along the shoreline to catch and hold the material. The banks of the river in the action area are heavily industrialized, with much of the bank hardened with riprap, vertical concrete walls, and docking facilities. Much of the historic off-channel habitat has been lost due to diking and filling of connected channels and wetlands. Columbia Slough, located downstream from the project site, is the closest remaining off-channel habitat. Connections between the slough and the river have been cut off, and dikes have been constructed along much of the slough.

In the past two years, the Lower Willamette Group has been investigating the physical, chemical and biological characteristics of the Portland Harbor as part of the Remedial Investigation (RI) for the Portland Harbor Superfund. The McCormick and Baxter site is within the investigation area of the Portland Harbor; however, the McCormick and Baxter Superfund designation predates the Portland Harbor designation, and the RI for the McCormick and Baxter site is complete. At least two more years of data collection will be conducted before completion of the RI for the Portland Harbor. Existing data shows little migration of contaminants downstream. Contaminant concentrations in river sediments are highest adjacent to major industrial facilities and stormwater outfalls. Contaminant plumes downstream from these sources are minimal. The Willamette River adjacent to the Site is within a depositional area, with a tendency toward coarser-grained sediments. A summary of the extent of groundwater, soil and sediment contamination at the Site is described in section 1.2 above.

The Willamette River is tidally influenced at the project site. At RM 7, the river is about 1,500 feet wide, with a maximum depth of 60 to 70 feet. COE maps indicate that there are steep slopes to the dredged navigation channel approximately 150 feet offshore. In addition to chinook salmon and steelhead, coho salmon, sockeye salmon, American shad, and white sturgeon occur in the area. Cutthroat trout are also present, but their abundance is low. Both juveniles and adults use the project area as a migratory corridor and as rearing habitat for juveniles.

The Willamette River, from its mouth to Willamette Falls, is a free-flowing river. Historically, Willamette Falls was impassable to fall chinook salmon, coho salmon, chum salmon, and cutthroat trout. Only steelhead and some spring chinook salmon were known to ascend the falls. Fish passage facilities were constructed at the falls in the early 1900s, and were upgraded in 1971, however, the passage facilities are inefficient, and delay upstream migration.

1.5 Analysis of Effects

1.5.1 Effects of Proposed Action

1.5.1.1 Effects of Removal of Existing Piling

The shoreline of the Site has many remnant treated piles that will impede access by equipment. Some of the piles appear to part of former docks or piers, and others form a retaining wall parallel to the shoreline. Removal of many of the piles will be required to facilitate the installation of the sheet pile wall. The effects of pile removal depends on the elevation of the water surface at the time of pile removal. The proposed method of pile removal is cutting the piles at the sediment/water interface or the mudline, if exposed. This may require digging the surrounding soil/sediment to facilitate a cutting surface. If the water elevation is high, these activities may occur within the water. Under this scenario, any fish in the vicinity would be displaced, and localized turbidity is likely. EPA states that a silt curtain may be installed to limit turbidity. If water levels are low, these activities are not likely to result in increased turbidity or fish displacement. In either case, staging for pile removal will be done from the upland portion of the Site, and no equipment will be placed in the water, other than equipment used to grab or cut the piles.

EPA stated in the BA that they will try to remove the pilings in the dry, when the beach is exposed. However, the need to stop the migration of the contaminant plume into the river sediments and water column is a higher priority than waiting for low water to remove the pilings. The risk of contamination through a sediment plume associated with pile removal is less than the risk of continued exposure. Removal of the piles will occur in an area known to have contaminated sediments. The potential for mobilizing the contaminated sediments will be minimized through the use of sediment curtains or other containment devices. The pilings will be contained during removal and disposed in a suitable disposal site.

NOAA Fisheries generally prefers treated piles to be removed completely, rather that cut, leaving a portion of piling below the sediment/water interface (Jim Meador, personal communication, May 31, 2002). The reason for this is that treated piles, even piles older than 40 years, continue to leach contaminants at concentrations that are toxic to aquatic organisms (Poston 2001). With the situation at the Site where the background concentrations of the sediment are higher than in the pilings, it is doubtful that complete removal of the pilings would provide any benefit for salmonids and their prey base. However, if it is determined that excavation of the sediments at the contaminant hot spots is the preferred remedial action for the sediments, complete removal of the pilings is a better choice.

The effects of increased turbidity associated with pile removal will be addressed in section 1.5.1.3 below.

1.5.1.2 Effects of Displacement of Large Wood

Many pieces of large and small wood have deposited along the shoreline of the project site. Most pieces are submerged during winter flows and exposed during summer flows. Several of the pieces are large with root wads attached, but most pieces appear to be relatively transitory, with no development of complex wood structures. However, because of the paucity of large wood in the lower Willamette River, this material likely provides some complexity and limited refugia during high water events.

The wood will be removed to facilitate the placement of the sheet pile wall. The removal of the large wood will occur at the same time as the removal of the pilings. If any of the pieces are partially buried, some suspension of contaminated sediments may occur. Because most wood does not appear to be buried, the consequence of this would likely be localized and of a short duration.

The wood that is removed from the McCormick and Baxter shoreline will be placed at a similar shoreline location in the lower Willamette River. There will be no change in the amount or availability of large wood in the lower Willamette River. In addition, it is likely that additional wood will accumulate along the Site's shoreline.

1.5.1.3 Effects of Construction of Sheet Pile Wall

Construction of the sheet pile wall along the shoreline of the Site will occur from the upland side of the shoreline, and will not occur during any flooding or high water events. It is likely that the construction will increase turbidity at the Site by disturbing the existing shoreline surface. The disturbance will result in increased suspension of sediments during the first few high water events after or during construction. During the high water events, the sediment inputs from the Site will contribute to already high sediment levels in the river, so the effect is likely to be minimal. Site controls will be used to minimize the movement of soils from the Site, and all construction stormwater will be detained and treated on-site.

The purpose of the sheet pile wall is to contain areas that contain mobile NAPL that frequently discharge to the Willamette River. However, the vibration or pounding associated with driving the sheet pile may mobilize NAPL in the soil, and may result in additional surface discharges. If these releases were to occur, they would likely be directly adjacent to the sheet pile alignment. Controls will be put in place to limit the extent of any release. These controls include daily construction monitoring and documentation of any releases, the placement and maintenance of absorbent booms during construction of the sheet pile wall to contain potential releases, and a containment plan should NAPL be observed outside of the absorbent booms.

Releases of NAPL during project construction are most likely to occur in shallow water areas adjacent to construction. It is unlikely that any juvenile salmonids would be rearing in these shallow water areas because of the background concentrations of contaminants and the consequent lack of a prey base. However, any juvenile salmonids moving through the area would be exposed to NAPL. As stated previously, PAHs are a primary component of the NAPL at the Site. Although PAHs generally do not generally bioaccumulate in fish or other vertebrates, the metabolites present in food are bioavailable to the consumer (James et al. 1991), and PAH-DNA adducts accumulate in the liver of fish chronically exposed to sediment-associated PAHs (Reichert et al. 1998). Moreover, PAHs are capable of causing a variety of deleterious effects in exposed animals. While metabolism serves mainly as a pathway for detoxification for PAH, some of the metabolites that are intermediates in this process possess carcinogenic, mutagenic and cytotoxic activity. Based on recent research with English sole, a variety of effects resulting from PAH exposure include toxicopathic liver lesions, DNA adducts in liver, inhibited gonadal growth, inhibited spawning, reduced egg viability, and reduced growth (Johnson 2000). It would be difficult to predict or estimate the effect of construction-related exposure to NAPL on salmonids moving through the area because background concentrations of NAPL are already above the levels predicted to have an effect. However, any construction-related releases of contaminants would contribute to sublethal effects, and further degrade any potential prey base.

Despite potentially harmful short-term effects, the long-term effect of the construction activities will be to control the current and on-going release of contaminants from the soils and groundwater on the upland portion of the Site. This will ultimately result in significantly decreased levels of contamination of surface water and sediments in the Willamette River, and less exposure to the contaminants through time.

To construct the sheet pile wall, some riparian vegetation along the north section of the shoreline will be removed. It is likely that several large trees and the associated understory will be removed. EPA will minimize tree removal to the greatest extent possible. The vegetation may be restored during additional remedial activities at the Site, depending on the outcome of the remedy selection, and an evaluation of the exposure risk for any species attracted by the habitat provided by the vegetation.

Increased turbidity could occur during sheet pile driving and/or pile removal. The effects of suspended sediment and turbidity on fish reported in the literature range from beneficial to detrimental. Elevated total suspended solids (TSS) conditions have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival. Elevated TSS conditions have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Of key importance in considering the detrimental effects of TSS on fish are the frequency and the duration of the exposure, not just the TSS concentration.

Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore *et al.* 1980, Birtwell *et al.* 1984, Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (Sigler *et al.* 1984, Lloyd 1987, Scannell 1988, Servizi and Martens 1991). Juvenile salmonids avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, unless the fish need to traverse these streams along migration routes (Lloyd 1987).

Fish that remain in turbid, or elevated TSS, waters experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial tradeoff (*e.g.*, enhanced survival) to the cost of potential physical effects (*e.g.*, reduced growth). Turbidity levels of about 23 NTUs have been found to minimize bird and fish predation risks (Gregory 1993). Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjorn and Reiser 1991). However, research shows that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987, Lloyd 1987, Servizi and Martens 1991).

NOAA Fisheries anticipates that turbidity generated from pile removal and sheet pile wall driving will be limited in both time and extent. NOAA Fisheries does not expect direct lethal take to occur because of turbidity. NOAA Fisheries expects that some individual chinook salmon and steelhead (both adult and juvenile) may be harassed by turbidity plumes but could easily avoid the plumes.

1.5.1.4 Effects of Construction of Slurry Wall

All activities associated with the construction of the slurry wall will be limited to the upland portion of the Site. All waste materials generated by construction or rain events will be contained and will not be discharged to the Willamette River prior to discharge.

1.5.2 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as those effects of "future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes. Implementation of additional remedies at the Site will also be reviewed through separate section 7 consultation processes. Clean-up of the Portland Harbor will also be reviewed through section 7. Therefore, these actions are not considered cumulative to the proposed action.

NOAA Fisheries is not aware of any specific future non-federal activities within the action area that would cause greater impacts to listed species than presently occurs. NOAA Fisheries assumes that future private and state actions will continue at similar intensities as in recent years.

1.6 Conclusion

NOAA Fisheries believes that the proposed action would cause a minor, short-term degradation of anadromous salmonid habitat due to a potential for short-term increases in turbidity and a potential for mobilization of NAPL during driving of the sheet pile wall. However, NOAA Fisheries has determined, based on the available information, that the proposed action covered in this Opinion is not likely to jeopardize the continued existence of listed salmonids, and will result in reduced exposure of salmonids to contaminants at the McCormick and Baxter Creosoting Company site. NOAA Fisheries used the best available scientific and commercial data to apply its jeopardy analysis. Our determination is based on these findings: (1) The overall effect of the action is positive because it will remove or drastically minimize a continued source of contamination to the river sediments and water; (2) short-term releases of NAPL will be treated with absorbent booms and other tools to contain and remove any observed NAPL; and (3) there will likely be limited exposure of contaminated sediments outside of the action area because of proposed methods to contain sediments on site.

1.7 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are *discretionary* measures suggested to minimize or avoid adverse effects of a proposed action on listed species, or to develop additional information. NOAA Fisheries believes the following conservation recommendation is consistent with these obligations, and therefore should be carried out by EPA:

1. To the greatest extent possible, EPA should design and build a stormwater collection system for the upland portion of the Site within the sheet pile/slurry wall. A stormwater collection system would limit the infiltration of rain water into the Site, and limit the movement of contaminated groundwater under and around the containment wall. The design and construction of a stormwater collection system should occur concurrently with the final remedial action for the upland portion of the Site.

1.8 Reinitiation of Consultation

This concludes formal consultation on these actions in accordance with 50 CFR 402.14(b)(1). Reinitiation of consultation is required: (1) If the amount or extent of incidental take is exceeded; (2) if the action is modified in a way that causes an effect on the listed species that was not previously considered in the biological assessment and this biological opinion; (3) new information or project monitoring reveals effects of the action that may affect the listed species in a way not previously considered; or (4) a new species is listed that may be affected by the action; or (5) new critical habitat rulemaking results in the designation of critical habitat that may be affected by the action (50 CFR 402.16).

2. INCIDENTAL TAKE STATEMENT

Section 9 and rules promulgated under section 4(d) of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering. "Harass" is defined as actions that create the likelihood of injuring listed species by annoying it to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. "Incidental take" is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in complicance with the terms and conditions of this incidental take statement.

2.1 Amount or Extent of the Take

NOAA Fisheries anticipates that the action covered by this Opinion is reasonably certain to result in incidental take of listed salmonids because of detrimental effects from increased turbidity levels (non-lethal) from removing the treated pilings and/or construction of the sheet pile wall, and detrimental effects associated with the exposure to a potential release of NAPL during sheet pile driving (lethal and/or non-lethal). Effects of actions such as the one covered by this Opinion are largely unquantifiable in the short term, and are not expected to be measurable as long-term effects on habitat or population levels. Therefore, even though NOAA Fisheries expects some low level incidental take to occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to

estimate a specific amount of non-lethal incidental take to the species itself. In instances such as these, the NOAA Fisheries designates the expected level of take as "unquantifiable". The extent of take is limited to the project area.

2.2 Reasonable and Prudent Measures

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to avoid or minimize take of listed salmonid species resulting from the action covered by this Opinion. The EPA shall:

1. Minimize the potential for incidental take of juvenile steelhead and chinook salmon during the removal of existing treated piles.

2. Minimize the potential for loss of riparian habitat or complexity in the project vicinity.

3. Minimize the potential for the release of hazardous materials into the water column or sediments of the Willamette River during the construction of the sheet pile wall.

4. Complete a comprehensive monitoring and reporting program to ensure measures provided in this Opinion are effective in minimizing the likelihood of take from permitted activities.

2.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, EPA and/or their contractors must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (potential for incidental take), the EPA shall ensure that:
   a. In-water work. All work within the active channel of all anadromous fish-bearing streams, or in systems which could potentially contribute sediment or toxicants to downstream fish-bearing systems, will be completed within the ODFW approved in-water work period of July 1 through October 31 or December 1 through January 31. Extensions of the in-water work period, including those for work outside the wetted perimeter of the stream but below the ordinary high water mark, must be approved by biologists from NOAA Fisheries.
   b. Turbidity. Sediment curtains or some other tool will be used to contain sediments if the pile removal is done in the wet. If done outside of the wetted river, other tools will be used to prevent the discharge of turbid construction water into the Willamette River.
   c. Pollution control plan. A Pollution Control Plan (PCP) will be developed for each authorized project to prevent point-source pollution related to construction operations. The PCP will contain the pertinent elements listed below and meet requirements of all applicable laws and regulations:

i. Methods that will be used to prevent erosion and sedimentation associated with equipment and the removal action.

ii. A description of the hazardous products or materials that will be used, including inventory, storage, handling, and monitoring.

iii. A spill containment and control plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures will be available on site, proposed methods for disposal of spilled materials, and employee training for spill containment.

iv. Measures that will be taken to prevent debris from falling into any aquatic habitat. Any material that falls into a stream during construction operations will be removed in a manner that has a minimum impact on the streambed and water quality.

d. Waste management. All contaminated waste generated will be disposed of off-site at an appropriate facility.

e. Exposure to hazardous materials. If excavation of sediment contaminant hot spots is a possibility, then the treated piles will be completely removed rather than cut at the sediment/water interface. Pile removal must occur in the dry or within containment booms.

2. To implement reasonable and prudent measure #2 (loss of riparian habitat and complexity), EPA shall ensure that:

a. Any pieces of large wood removed from the shoreline construction area will be placed at a similar area within the lower Willamette River system.

b. All trees and shrubs removed will be replanted at a 2:1 ratio. They may be planted at a similar lower Willamette River riparian site if it is determined that the trees and shrubs would provide an attractive nuisance at the McCormick and Baxter site.

3. To implement reasonable and prudent measure #3 (release of NAPL blebs during driving of the sheet pile wall), EPA shall ensure that:

a. Absorbent booms will be placed and maintained adjacent to the sheet pile construction area to contain any potential release of NAPL triggered by the driving of the sheet piles.

b. A containment plan will be prepared prior to the beginning of construction to describe required actions should NAPL be observed outside of the absorbent booms.

4. To implement reasonable and prudent measure #4 (monitoring and reporting), EPA shall ensure that:

a. Monitoring. During the driving of the sheet piles, the water within and outside of the absorbent booms will be monitored for the presence of any sheen. This monitoring will occur on a daily basis, at a minimum, during construction. Within 30 days of completing the construction of the barrier wall, EPA will

submit a monitoring report to NOAA Fisheries describing the success meeting these terms and conditions. This report will consist of the following information.

i. Project identification.
ii. Project initiation and completion dates.
iii. Photographic documentation of environmental conditions at the project site before, during and after project completion. Each photograph will be labeled with the date, time, photo point, project name, the name of the photographer, and a comment describing the photograph's subject.
iv. Documentation of any reported sighting of a sheen on the water, and response for removing the sheen from the water.

b. If a dead, injured, or sick endangered or threatened species specimen is located, initial notification must be made to the NOAA Fisheries Law Enforcement Office, located at Vancouver Field Office, 600 Maritime, Suite 130, Vancouver, Washington 98661; telephone: 360/418-4246. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered and threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

c. Monitoring reports will be submitted to:

NOAA Fisheries
Oregon Habitat Branch
Attn: 2002/00761
525 NE Oregon Street
Portland, OR 97232

3. MAGNUSON-STEVENS ACT

3.1 Background

The objective of the essential fish habitat (EFH) consultation is to determine whether the proposed action may adversely affect designated EFH for relevant species, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), requires the inclusion of EFH

descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of essential fish habitat: "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50CFR600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

3.3 Identification of EFH

The Pacific Fisheries Management Council (PFMC) has designated EFH for federally-managed fisheries within the waters of Washington, Oregon, and California. The designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years) (PFMC 1999). In estuarine and marine areas,

designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of EFH for the groundfish species are found in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Management Plan (PFMC 1998a) and the NOAA Fisheries Essential Fish Habitat for West Coast Groundfish Appendix (Casillas *et al.* 1998). Detailed descriptions and identifications of EFH for the coastal pelagic species are found in Amendment 8 to the Coastal Pelagic Species Fishery Management Plan (PFMC 1998b). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the potential adverse effects to these species' EFH from the proposed action is based on this information.

3.4 Proposed Actions

The proposed action is detailed above in section 1.2. This area has been designated as EFH for various life stages of chinook and coho salmon, and starry flounder (*Platyichthys stellatus*).

3.5 Effects of Proposed Action

As described in detail in section 1.5, the proposed activities may result in detrimental short-term adverse effects to water and sediment quality. These impacts include:

1. A potential for short-term releases of NAPL to the water column and surface sediments.

2. Short-term increases of turbidity associated with removal of existing piling and sheet pile wall if done during high water events.

3.6 Conclusion

NOAA Fisheries believes that the proposed action may adversely affect the EFH for starry flounder and Pacific salmon species (chinook and coho salmon). Conservation measures proposed by EPA and DEQ such as the deployment of absorbent boom along the shoreline of the Site during the construction of the sheet pile wall and the conservation measures and terms and conditions provided in this Opinion will minimize impacts to EFH. Therefore, NOAA Fisheries incorporates them here as EFH conservation recommendations.

3.7 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the Magnuson-Stevens Act, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or State agency action that would adversely affect EFH. The conservation measures proposed for the project by EPA and all of the Reasonable and Prudent Measures and the Terms and Conditions contained in sections 2.2 and

2.3 are applicable to EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.8 Statutory Response Requirement

Please note that the Magnuson-Stevens Act (section 305(b)) and 50 CFR 600.920(j) requires the Federal agency to provide a written response to NOAA Fisheries after receiving EFH conservation recommendations within 30 days of its receipt of this letter. This response must include a description of measures proposed by the agency to avoid, minimize, mitigate or offset the adverse impacts of the activity on EFH. If the response is inconsistent with a conservation recommendation from NOAA Fisheries, the agency must explain its reasons for not following the recommendation.

3.9 Supplemental Consultation

EPA must reinitiate EFH consultation with NOAA Fisheries if the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

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