FINAL
RECORD OF DECISION

OESER COMPANY SUPERFUND SITE
REMEDIAL ACTION

BELLINGHAM, WASHINGTON

SEPTEMBER 2003

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Oeser Company Superfund Site
Bellingham, Washington
EPA CERCLIS No. WAD008957243

Statement of Basis and Purpose

This decision document presents the selected final remedial action for The Oeser Company Superfund Site near Bellingham, Washington, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record file for the site. The Washington State Department of Ecology agreed with the selected remedy when it was presented in the proposed plan.

Assessment of the Site

The response action selected in this Record of Decision (ROD), is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Such a release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

This ROD selects the final remedy for the site. The remedy documented in this ROD was designed to protect human health and the environment by containing and preventing contact with the wood treating facility wastes. Major elements of the final remedy include:

- Excavation or capping of contaminated soils located on the Oeser property in the North Pole Yard and South Pole Yard.

- Excavation or capping of contaminated soils on the Oeser property in the primary wood treating areas (Treated Pole Area, North Treatment Area, East Treatment Area, West Treatment Area, Wood Storage Area) in coordination with RCRA/Washington State Dangerous Waste Regulations.

- Institutional controls on the Oeser property restricting groundwater use and non-industrial use.

- Monitoring groundwater on the Oeser property and passive removal of nonaqueous phase liquid (NAPL), if detected.

- Operation and maintenance of the caps.

The selected remedy is expected to protect human health and the environment by preventing contact with contaminated soil above the cleanup levels and reducing the potential for contamination to migrate to the deep aquifer.

Statutory Determinations (Declaration Statement)

The selected remedial action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. These remedial actions utilize permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

Most of the principal threat waste at Oeser has already been excavated and treated offsite using incineration during EPA's 1998 removal action. The remaining principal threat waste is located directly under the operating treatment facility near the center of the site and is not practicable to remove. Because treatment of the accessible principal threats waste was conducted, this remedy does satisfy the statutory preference for treatment as a principal element of the remedy.

Because this remedial action will result in hazardous substances, pollutants, or contaminants remaining on the site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ROD Data Certification Checklist

The following information is included in the Decision Summary section of the Record of Decision. Additional information can be found in the Administrative Record for the site.

- Contaminants of concern and their respective concentrations. (Section 5, 7.1, and Table 12)
- Baseline risk represented by the contaminants of concern. (Section 7)
- Cleanup Levels established for contaminants of concern and the basis for these levels. (Section 8)
- How source materials constituting principal threats are addressed. (Section 12.5)
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessment and the ROD. (Section 7)
- Potential land and groundwater use that will be available at the site as a result of the selected remedy. (Section 11.)
- Estimated capital, annual O&M, and total present worth cost, discount rates, and the number of years over which the remedy cost estimates are projected. (Section 11.3)
- Key factors(s) that lead to the selection of the remedy. (Section 11.1)

AUTHORIZING SIGNATURE

Thomas Eaton for

Michael F. Gearheard, Director
Environmental Cleanup Office, Region 10
U.S. Environmental Protection Agency

9/18/03
Date

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LIST OF ACRONYMS

Acronym	**Definition**
ARARs	applicable or relevant and appropriate requirements
B(a)P	benzo(a)pyrene
bgs	below ground surface
BOD	biological oxygen demand
BTC	Bellingham Technical College
CCA	chromated copper arsenates
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	contaminants of concern
COPCs	contaminants of potential concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CPT	cone penetrometer testing
CSM	conceptual site model
CULs	clean-up levels
DL	detection limit
DOT	United States Department of Transportation
E & E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
EPCs	exposure point concentrations
EPHs	extractable petroleum hydrocarbons
ERA	ecological risk assessment
FS	feasibility study
HEAST	Health Effects Assessment Summary Tables
HHRA	human health risk assessment
HIs	hazard indices
HQ	hazard quotient
IRIS	Integrated Risk Information System
LADI	lifetime average daily intake
LIF	laser-induced fluorescence
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

LIST OF ACRONYMS (Continued)

Acronym	**Definition**
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
NAPL	nonaqueous phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCEA	National Center for Environmental Assessment
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NWAPA	Northwest Air Pollution Authority
O&M	operation and maintenance
OCCC	Oeser Cedar Cleanup Coalition
Oeser	The Oeser Company
PAHs	polycyclic aromatic hydrocarbons
PCP	pentachlorophenol
PRGs	preliminary remediation goals
PSLs	preliminary screening levels
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RfD	chronic reference dose
RI	remedial investigation
ROD	Record of Decision
ROST	rapid optical screening tool
SF	slope factor
SPLP	synthetic precipitation leaching procedure
SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-p-dioxin
TDS	total dissolved solids
TEQ	toxicity equivalent quotient
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TRV	toxicity reference values
TSS	total suspended solids
U & I	Utah and Idaho Sugar Company
VOC	volatile organic compound
VPHs	volatile petroleum hydrocarbons

1.0 SITE NAME, LOCATION AND BRIEF DESCRIPTION

1.1 Site Name and Location

The Oeser Company Superfund Site
730 Marine Drive
Whatcom County, Washington
EPA CERCLIS No. WAD008957243

On October 27, 1997, The Oeser Company (Oeser) Superfund site was added to the United States Environmental Protection Agency's (EPAs) National Priorities List (NPL). Oeser is located on a 26-acre property located in Whatcom County, Washington (Figure 1). A small portion (less than one-quarter) of the site is located within the City of Bellingham. Oeser is an active wood-treating facility that historically used treating solutions of creosote and pentachlorophenol (PCP) to preserve utility poles and pilings. The company currently uses PCP.

This Record of Decision (ROD) specifically addresses all contaminated media at the Oeser Superfund site. EPA is the lead agency for the remedial cleanup activities. EPA expects Oeser to conduct or fund the cleanup of this Site.

1.2 The Oeser Property

The Oeser property contains two distinct areas, the storage yards and the primary treatment area. To be consistent with previous reports, the Oeser property is further divided into seven sections (Figure 2). The facility receives raw logs which are stored in the Wood Storage Area along the south and eastern portion of the site. The raw logs are then peeled, incised for certain clients, and transferred to the North or South Pole Yards to dry. After drying for approximately 1 year, the logs are treated with a PCP solution (approximately 5% PCP) in a diesel-like carrier oil. After treatment, the poles are stored in the Treated Pole Area prior to inspection and shipment to customers.

The wood treatment area covers approximately 5.6 acres in the east-central portion of the facility. The treatment area has been divided into three sections including the North Treatment Area, the West Treatment Area and the East Treatment Area, and most of the area is paved. The treatment area comprises an array of buildings and structures including above-ground tanks, a retort, drip pads, and underground piping. The North and South Pole Yards, a portion of the North Treatment Area, and the Wood Storage area are not paved. Approximately 20-25 people work at Oeser and approximately 208 people live within 0.25 mile of the facility.

1.3 South Slope and Little Squalicum Creek Areas

The Oeser property is located approximately 1,500 feet north of Bellingham Bay at 75 feet above mean sea level. The site is relatively flat, with a general slope less than five degrees towards the southwest. Directly to the south of the Oeser property is an operating railroad line that runs east-west. The South Slope Area (Figure 2) is directly south of the railroad line and consists of a sloped area that drops down into a ravine containing Little Squalicum Creek.

Little Squalicum Creek which functions primarily as a storm water drainage ditch (over 90% of average annual water flow), is located at the base of a ravine (Figure 3). The steep ravine side slopes (South Slope Area) are thickly vegetated by blackberry and alder and are relatively undisturbed. Some spoils piles are located along the creek which appear to be excavated material from the creek bed.

The City of Bellingham and Whatcom County use the Little Squalicum Creek and ravine as an outlet for their storm drain system. Runoff from the Birchwood neighborhood, including Oeser, is released to the creek via the Oeser and Birchwood outfalls. The Marine Drive outfall collects runoff from areas south and west of Oeser and flows into the creek above the Marine Drive bridge. In addition to storm water drainage, the creek is fed by local springs.

A second active rail line runs parallel to Bellingham Bay about 100 feet from the shore. A rail line existed along the west side of the creek in the past but has been removed. The old rail bed has been renovated and now serves as a footpath. A second trail along the east side of the ravine runs from the nearby college to the bay.

2.0 SITE HISTORY AND ENFORCEMENT ACTIONS

2.1 Site History

In 1925, the Utah and Idaho Sugar Company (U & I) bought the property now occupied by Oeser and constructed a sugar beet processing plant at the site. The Oeser Cedar Company, received title to the U & I property on February 17, 1943. A number of residential lots north of the current facility were deeded to individuals during the 1940s. Over time, a residential neighborhood developed around the north and east sides of the facility.

2.2 Facility Operational History

During the early days of operation, the company manufactured poles for utility companies and primarily used creosote to treat the wood products. In 1983 or 1984, the company ceased using creosote at the facility, although approximately 22,000 gallons continued to be stored in a tank until it was removed in December 1997.

Oeser continues to primarily manufacture utility poles utilizing a pressurized-thermal treatment process (Figure 4). PCP currently is the only preservative in use at the facility. It is used to protect wood from insect attacks and decay. The pressure plant is comprised of an 8-foot-diameter retort that is approximately 180 feet long, a heat exchanger, and an oil/water separator. In the pressure-treatment process, whole poles are placed in the pressure retort. The poles are then heated while immersed in a preservative bath of oil and approximately 5% PCP. A vacuum is then drawn, causing water vapor and excess PCB to leave the wood. The vapor is condensed and discharged to the oil/water separator. Finished poles are shipped off site by rail or truck. There is no evidence that any types of water-based preservatives such as chromated copper arsenates (CCA) were ever used at Oeser.

2.3 Groundwater Use

Oeser receives its water from the City of Bellingham and has no on-site potable or industrial water supply wells. The City of Bellingham supplies its customers with water from Lake Whatcom located about 6.5 miles east of the facility. There are no domestic wells located within 1 mile of Oeser. There are no known potable or industrial water supply wells down gradient of Oeser. Two cross gradient wells (which are not utilized for drinking water) are located on Tilbury Cement Company property, approximately 1,875 feet west-southwest of the retort on the facility.

2.4 Storm Water Drainage

In 1995 and 1996, Oeser regraded the North and South Pole Yards to achieve better storm water control. In addition, the Treated Pole Area was contoured to direct surface flow to a large depression which, at the time, permitted infiltration into the gravel. In 1997 the Treated Pole Area was paved and contoured to direct surface flow to a storm water collection pond. The ponded water was then directed to an on-site filter system. In September 1997, Oeser constructed a berm north of the North Pole Yard to minimize surface water runoff from the facility. During the EPA removal action in 1997/1998, several additional caps were constructed which are discussed later in this section. In the fall of 2000, Oeser installed a new bag filter and a granular activated carbon adsorption treatment system to meet storm water discharge requirements.

2.5 Other Regulatory Requirements and Permit History

From 1963 to present, Oeser has operated under several wastewater discharge permits. The company is currently operating under a National Pollution Discharge Elimination System (NPDES) permit issued by the Washington State Department of Ecology (Ecology). This permit has become increasingly restrictive over the years and places discharge limits on several parameters including PCP.

The Northwest Air Pollution Authority (NWAPA) regulates Oeser by permit for visual emissions, discharge of odor-producing air contaminants, and prevention of particulate matter from becoming airborne. Oeser is also subject to the Washington State Dangerous Waste Regulations, the Solid Waste Disposal Act, and the Resource Conservation and Recovery Act (RCRA).

2.6 Spills and Other Hazardous Substance Releases

Oeser documented spills of PCP preservative in 1971 and 1975. The potential release of air contaminants also occurred during an on-facility fire in 1994. There have been several historical violations of the various storm water discharge permits, but the company has made improvements in their storm water treatment process during the past few years.

During the Removal Action discussed in Section 2.7, a rainstorm occurred on the night of July 11, 1998, while EPA was excavating contaminated soil from an area east of the evaporator. To prevent catastrophic failure of the sidewalls of the excavated pit, the storm water from the pit was pumped to the storm pipe downstream of the excavation. As a precautionary measure, notifications were made to the National Response Center.

On June 27, 1996, EPA performed a RCRA inspection of Oeser. EPA issued a Notice of Violation (NOV) on October 3, 1996, citing “failure to meet drip pad requirements” and “failure to hold treated wood on the drip pad until drippage has ceased.” More recently on June 17, 2002, and on November 22, 2002, EPA issued two more NOVs to Oeser regarding its failure to comply with certain Washington State Dangerous Waste and RCRA operating and disposal requirements. EPA follow-up action is pending. Oeser remains subject to Washington State Dangerous Waste and RCRA requirements regardless of the remedy implemented at the site.

2.7 Removal Action

On-site removal work was conducted from September 1997 through November 1998 (Figure 5). First, Oeser completed installation of a chain-link fence with two locking gates around the site property to restrict public access. A berm was constructed on the north side of the North Pole Yard to minimize the chance of surface water runoff from the site.

The most contaminated soils at the facility were excavated to a depth of 20 feet below ground surface in the area of the former dry well located east of the east treatment area near the evaporator. During the removal of soil from the large excavation, product was observed draining from soil lenses and strong odors and soil staining occurred in the excavations at varying depths. Some 8,456 tons of contaminated soil wastes were transported offsite by rail for disposal. Also, 26,948 gallons of liquid waste from the excavated pit were transported offsite by vacuum truck for treatment and disposal. The excavated area was backfilled and compacted. A 60-foot section of the storm pipe running through the most highly contaminated area was then removed and replaced. New collection basins were also constructed.

To protect workers and trespassers, caps were designed and placed over 4 acres of dioxins/furans-contaminated soils which exceeded the removal action level of 6.9 micrograms per kilogram (µg/kg). Two different capping materials were utilized: an environmentally engineered asphalt cap near and around the retort drip pad in the North Treatment Area; and a 6-inch gravel cap east of the asphalt cap and over the North and South Pole Yards. In December 1998, Oeser transferred 23,000 gallons of creosote from the creosote storage tank to rail tank cars. The creosote was sold and transported off site.

2.8 The Remedial Investigation and Feasibility Study

EPA assumed the lead in preparing the Remedial Investigation and Feasibility Study (RI/FS), after attempts to negotiate with Oeser to conduct the work failed. The Remedial Investigation (RI) report was finalized by EPA in June 2002. The report summarizes the site investigation activities and presents data on the nature and extent of contamination at the site. Data collected during the RI were used to conduct a human health risk assessment (HHRA) and an ecological risk assessment (ERA).

The Feasibility Study (FS) report was finalized by EPA in August 2002. This report describes the development and evaluation of remedial action alternatives for affected soil and groundwater. As part of the FS process, remedial technologies appropriate for use at Oeser were screened. Based upon the screening results, five alternatives were developed and analyzed in detail against the site-specific remedial action objectives (RAOs) and criteria in the National Contingency Plan (NCP). An Addendum to the FS was developed in December 2002, which evaluated Alternative 6 (Excavation and Capping) in detail.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Local knowledge and the needs of the community play a part in deciding what cleanup actions are appropriate, so EPA has strived to make sure community members have adequate information about the site to be an informed participant in the decision making process. EPA must also meet CERCLA requirements for public participation including providing a public comment period on the Proposed Plan, and conducting a public meeting to discuss the plan.

A variety of community involvement activities have taken place at the Oeser site over the past several years. A Technical Assistance Grant was awarded to the Oeser Cedar Cleanup Coalition, which has participated in the development and review of technical information during the RI/FS. The following Superfund community relations activities were conducted by EPA for the Oeser Superfund site:

August 1995	EPA released a fact sheet announcing the beginning of the site investigation

April 29, 1996	EPA released a fact sheet announcing significant contamination found during the expanded site investigation.
December 20, 1996	EPA released a fact sheet announcing that the Site has been proposed for inclusion on EPA's National Priorities List (NPL).
August 7, 1997	EPA released a fact sheet announcing an Unilateral Administrative Order that had been issued to Oeser ordering them to conduct a removal action.
January 23, 1998	EPA released a *Community Relations Plan* which encouraged community involvement.
June 5, 1998	EPA released a fact sheet describing the removal action that EPA was conducting.
October 2000	EPA released a fact sheet announcing a Community Information Meeting and describing the start of the Remedial Investigation and Feasibility Study.
October 18, 2000	EPA conducted a Community Information Meeting for concerned citizens.
May 9, 2002	EPA released a fact sheet announcing the results of the baseline risk assessment.
December 11, 2002	EPA released the Proposed Plan.
December 13, 2002	Newspaper advertisement ran in the Bellingham Herald announcing the public comment period on the Proposed Plan and a Public Meeting.
January 12, 2003	A second newspaper advertisement ran in the Bellingham Herald announcing the public comment period on the Proposed Plan and the Public Meeting.
January 15, 2003	EPA conducted a Public Meeting to discuss the Proposed Plan and preferred cleanup option.
January 24, 2003	Comment period on Proposed Plan closed.

September 2003	A Responsiveness Summary, which is part of the Record of Decision, has been prepared in response to comments received during the public comment period.

Selection of the final remedy is based on the Administrative Record. There are two copies of the Administrative Record available for public review. One copy is located at the EPA Region 10 office at 1200 Sixth Avenue, in Seattle, Washington. The second copy is located at the Bellingham Public Library in Bellingham, Washington.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

There is only one operable unit at this site and this ROD selects the final remedy for the site. This ROD explains how the selected remedy will protect human health and the environment by reducing exposure, controlling contaminated releases, and protecting potential drinking water sources near the site.

EPA has determined that remediation in the surrounding residential area, South Slope Area, and Little Squalicum Creek is not warranted under this CERCLA action. Data collected from the Little Squalicum Creek area has been sent to the Washington State Department of Ecology (Ecology) for further consideration. EPA is also in the process of awarding a Brownfields grant to the City of Bellingham for additional environmental investigation for development of a future renovation project in the Creek.

Oeser is an operating wood treating facility that is operating under a NPDES permit and an air permit. Regulation of Oeser's ongoing operations is also covered under the Washington State Department of Ecology's Dangerous Waste Regulations, RCRA and under other State and Federal environmental laws. This ROD does not address Oeser's ongoing operations nor preclude the need for Oeser's ongoing operations to comply with other environmental laws or regulations.

Since Oeser is an operating facility, EPA has determined that it is important to coordinate the implementation of the cleanup action with the resolution of the RCRA operational and closure issues discussed in Section 2.6. Since the application and implementation of RCRA and the RCRA closure requirements are currently in dispute between EPA and the Oeser Company, EPA expects the timing and implementation of the selected remedy in the primary wood treating areas to be coordinated with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations.

5.0 SITE CHARACTERISTICS

5.1 Physical Characteristics

5.1.1 Soils and Geology

Surface and subsurface soils at Oeser and in the Little Squalicum Creek ravine have been altered by development. An "upper sandy zone" occurs typically from land surface to a depth of 20 or 25 feet and is predominantly fine to medium sand with lenses of silt and clay. A "gravelly zone" occurs below the upper sand zone and is composed of gravel and sand, with minor pure sand, silt, and clay lenses. The gravelly zone is 25 to 40 feet thick. A "lower sandy zone" is encountered at depths of 40 to 50 feet below ground surface (bgs) and is composed of poorly-graded fine to medium sand with silt and clay.

5.1.2 Hydrogeology

Groundwater occurs in two zones beneath the property. Shallow groundwater occurs at a depth of 4 to 15 feet bgs in the "upper sandy zone." Shallow groundwater is discontinuous consisting of several perched lenses of water. Deep groundwater generally occurs at a depth of 30 to 45 feet bgs in the "gravelly zone" and the "lower sandy zone." The deep aquifer is composed of coarser, more permeable material and occurs as a continuously saturated aquifer. Deep groundwater likely discharges to the lower reaches of Little Squalicum Creek and Bellingham Bay.

5.1.3 Surface Water

Little Squalicum Creek is the dominant surface water feature near the site (Figure 3) and primarily functions as a storm water drainage ditch for the area. The creek flows from northeast to southwest and discharges to Bellingham Bay. It is located 250 feet south of the Oeser property at its closest point and the creek's surface is about 40 to 50 feet lower than the facility. Little Squalicum Creek likely acts as a discharge point for the deep aquifer in its downstream reaches.

The Little Squalicum Creek channel ranges in width from 3 to 8 feet. Water in the creek is generally less than 1 foot deep. During the dry season, the upper reaches of the creek dry up and the creek bed is exposed. When the Creek is flowing, creek effluent empties onto the beach at Bellingham Bay through an elevated culvert.

The sources of water to Little Squalicum Creek include baseflow from groundwater seeps, precipitation, and storm drain flow. The creek is also fed by local municipal/county storm water drainage systems, including the Oeser outfall, which serves both Oeser and the northwest portion of the Birchwood neighborhood. However, the main source of water for the creek, which is located upstream of the Oeser outfall, is the Birchwood storm water outfall. It serves a mixed industrial and residential neighborhood including the Bellingham Technical College (BTC) parking lot.

5.2 Site Conceptual Model

Elevated levels of hazardous substances were detected at the Oeser property in surface and subsurface soil, groundwater, and air. In addition, some hazardous substances were detected in nearby off-property areas in soil, groundwater, air, sediment, surface water, and berries. In order to assess the risk posed by the hazardous substances on the Oeser property and in nearby areas, EPA developed a Human Health Conceptual Site Model (CSM) and an Ecological CSM. A graphical depiction of the Human Health CSM is contained in Figure 6 and the Ecological CSM is contained in Figure 7.

The CSMs identified potential transport of contaminants from surface soil, including the potential for contaminants in surface soil to volatilize; to be dispersed by wind as particulates; to be transported over the surface by runoff or overland flow to off-property surface soils; and/or to infiltrate subsurface media, including subsurface soil and groundwater. The EPA's removal activities, including removal and capping of contaminated surface and subsurface soil, have reduced the potential for future contaminant migration.

These site models also indicated the need to evaluate the potential for contaminants in groundwater underlying the Oeser property to flow toward Little Squalicum Creek and to be released through seeps to creek water, creek sediment, and soils adjacent to the creek.

In addition, the CSMs indicated the need to evaluate the potential for vapors and particulates released from facility processes and vapors released from treated logs to be transported as volatiles or particulates by wind.

Media that were evaluated as potentially impacted as a result of these transport processes include:

- Surface soil on the Oeser property and nearby properties;
- Fugitive dust on the Oeser property and nearby properties;
- Subsurface soil on the Oeser property and nearby properties;
- Surface water and sediment in Little Squalicum Creek;
- Groundwater underlying the facility and down gradient of the facility; and
- Air on the Oeser property and nearby properties.

Foods that may be impacted by facility-related contaminants were also evaluated, including berries growing along recreational trails (near the facility and Little Squalicum Creek) and home-grown produce (from nearby residences). A City of Bellingham ordinance prohibits hunting in the creek vicinity. The creek does not support fish likely due to the creek's shallow depth, limited flow, and tendency to run nearly dry at times.

Although groundwater is not used or planned as a source of drinking water at Oeser, groundwater was evaluated as an exposure medium for people potentially living on the Oeser property in the future. Perched groundwater in the shallow zone is unlikely to be developed as a drinking water source in the future because it is discontinuous across the facility (see Section 6.4). Because the deeper aquifer may be usable as a potential future source of domestic drinking water, protection of the deep aquifer from contamination present in the shallow perched aquifer was also evaluated.

People that potentially are exposed to Oeser-related contamination, or that may be exposed if current land uses change, include:

- Current and future residents (adults and children) living adjacent to or nearby the Oeser property and future residents on the Oeser property;
- Current and future workers on the Oeser property;
- Current and future construction and utility workers on the Oeser property;
- Current and future trespassers on the Oeser property; and
- Current and future recreational users who visit Little Squalicum Creek and the adjacent trail.

Potential residential exposure scenarios that were evaluated for this ROD include the potential for contaminants to migrate from the Oeser property to residential areas where residents may inhale airborne contaminants transported as particulates and vapors, and the potential for residents to ingest or have dermal contact with contaminants in surface soil or to ingest potentially contaminated home-grown produce. If the deep aquifer were to be developed for future domestic use, residents potentially could ingest contaminated groundwater, or have skin contact with contaminants in groundwater during household use. If the Oeser property were developed for residential use in the future, evaluation of these same residential exposure pathways would be appropriate for that property. In addition, if excavation activities were to occur on the Oeser property as a result of development, subsurface soils then could be brought to the surface, resulting in direct contact with contaminants currently found in subsurface soils.

Potential current and future worker exposure scenarios that were evaluated for this ROD include the potential for workers on the Oeser property to inhale particulates and vapors in air or have direct contact with exposed facility surface soil. Workers also could be exposed to contaminants in groundwater through direct contact if the deep aquifer were developed for facility use. If excavation activities occur on the facility, then construction and utility workers may have direct contact with contaminated subsurface soil and groundwater.

Recreational exposure scenarios that were evaluated for this ROD include the potential for recreational visitors to Little Squalicum Creek and nearby trails to have dermal contact with contaminants in surface water and sediment from the creek. Recreational visitors may also contact contaminated surface soil. Recreational visitors who eat berries growing near Oeser and Little Squalicum Creek may ingest contaminants deposited onto plant surfaces or incorporated into plants through root uptake or vapor transport through leaves. The City of Bellingham intends to develop Little Squalicum Creek and adjacent areas into a park as soon as feasible. Although this likely will increase the number of recreational users, the potential exposure pathways identified above are not expected to change.

5.3 Sampling Strategy (Data and Media Sampled)

Numerous investigations conducted at the Oeser site during the past two decades have documented the presence of Oeser-related contaminants, such as PCP and polycyclic aromatic hydrocarbons (PAHs), in soil and shallow groundwater on the Oeser property. Evaluation of these investigations identified data gaps relevant to the assessment of human health and ecological risks at the site. Most notably, no dioxins/furans data were available for the Oeser property, and no historic sampling data for any contaminants were available for the South Slope Area. These data gaps and others were addressed by sampling conducted for the RI/FS in 1999.

5.3.1 Site Survey

Several methods were utilized during the RI field work to ensure accurate horizontal and vertical control of sampling sites, boring locations, and monitoring well monuments. These methods included a grid system established with a geographic information system, and both pre- and post-field work topographic surveys using traditional surveying methodologies.

5.3.2 Geophysical Investigations

Geophysical investigations were conducted during the RI using the Cone Penetrometer Testing (CPT) to characterize the subsurface stratigraphy. CPT technology is used to determine soil type and stratigraphy, geotechnical properties of subsurface soils, and the presence of groundwater. CPT soundings were conducted at a total of 315 locations during the RI. CPT points penetrated to depths ranging from 2.3 to 29.5 feet bgs, with the average penetration depth for most soundings being approximately 18 feet bgs.

In addition, the CPT was coupled with Laser-Induced Fluorescence (LIF) technology to provide a screening tool for the identification of hydrocarbons in subsurface soils. LIF is used to collect real-time, screening level data regarding the presence of hydrocarbons in subsurface soils. LIF measurements were collected at a total of 296 of the CPT sounding locations.

5.3.3 Surface Soil Sampling

During the RI, surface soil samples were collected from background locations which included parks and residences located a mile to 2 miles from the facility (20 samples), nearby residential yards (61 samples), Oeser property soils (24 samples), South Slope Area soils (21 samples), and along Little

Squalicum Creek (56 samples). The samples were analyzed for semivolatile organic compound (SVOCs), metals, and dioxins/furans. Some of the samples were also analyzed for volatile petroleum hydrocarbons (VPHs), extractable petroleum hydrocarbons (EPHs), total organic carbon (TOC), grain size, and synthetic precipitation leaching procedure (SPLP).

5.3.4 Subsurface Soil Sampling

The primary objectives of the subsurface soil sampling program were to confirm the absence of contaminants in areas where contaminants were not expected and to further characterize areas of known contamination for remedial consideration. Subsurface soil samples were collected from Oeser property soil borings and monitoring wells (119 samples), South Slope Area soil borings (11 samples), monitoring wells in the Little Squalicum Creek area (10 samples), and from a test trench adjacent to Little Squalicum Creek (3 samples). The samples were analyzed for VPHs, EPHs, and SVOCs. Selected subsurface soil samples also were analyzed for metals, dioxins/furans, TOC, grain size, and SPLP.

5.3.5 Ash/soot Sampling

The interior of the old inactive U & I stack was free of visible ash and soot; therefore, no samples were collected. Access to the hog fuel boiler stack was limited severely by size and, therefore, precluded collection of a soot sample. A sample of boiler ash was obtained from beneath the fire box of the boiler unit. The sample was submitted for dioxins/furans and metals analyses.

5.3.6 Hydrogeologic Investigation

The hydrogeologic investigation included groundwater screening sample collection, monitoring well installation, groundwater sampling, well point installation, water level measurements, stream stage measurements, seep sampling, hydraulic conductivity testing, and soil sampling.

Twelve shallow monitoring wells and 11 deep monitoring wells existed on Oeser's property at the beginning of the RI. Seven additional shallow wells (5 to 10 feet bgs) and four deep wells (35 to 45 feet bgs) were installed on the Oeser property as part of the RI. Four monitoring wells were also installed between the Oeser property and Little Squalicum Creek.

Groundwater samples were collected from once per quarter for one year to assess the nature and extent of site contaminants. The first quarterly groundwater sampling event in June 1999 included only preexisting on- and off-property wells. The monitoring wells installed for the RI were completed in August 1999. The September 1999 event and two subsequent groundwater sampling events, in December 1999 and February/March 2000, included preexisting on- and off-site wells and all new wells installed during the RI.

In addition, four shallow and two deep monitoring wells located at the adjacent Ershigs property were sampled to help characterize off-site groundwater quality. Two production wells operated by the Tilbury Cement Company, located west of the site, were also sampled once in September 1999 during the second quarterly groundwater monitoring event.

Samples were analyzed for SVOCs, VPHs, EPHs, volatile organic compound (VOCs), dioxins/furans, TOC, total metals, dissolved metals, total suspended solids (TSS), total dissolved solids (TDS), anions (chloride, fluoride, bromide, and phosphate), nitrate/nitrite, hardness, alkalinity, sulfide, and biological oxygen demand (BOD).

Groundwater level measurements were made to evaluate the relationship between shallow perched groundwater, deep groundwater, and Little Squalicum Creek. Groundwater levels were measured in all wells and at surface water monuments during each of the quarterly groundwater sampling events, as well as several other occasions throughout the RI. Hydraulic conductivity testing was performed to characterize the spatial variability in aquifer properties in the shallow perched groundwater zone and in the deep aquifer. Short-term, constant rate pumping tests were conducted in five shallow monitoring wells and in seven deep wells.

In order to identify the significance of flows into Little Squalicum Creek, measurements of surface water flow (seeps, springs, and storm drain outfall) into and out of the creek into Bellingham Bay were conducted. One seep was also sampled once during the first quarterly groundwater sampling event and both surface water sampling events to characterize the discharge.

5.3.7 Air Investigation

Air sampling at Oeser's property was used to determine airborne contaminants of potential concern (COPCs) concentrations; these data were used in the human health risk assessment. Sampling began in the second quarter of 1999 (July 7 to July 13), and a second sampling event was conducted in the third quarter of 1999 (September 27 to October 2). During both events, conditions were dry and dusty, and Oeser was actively treating wood products. Consequently, typical peak airborne concentrations of volatile and semivolatile COPCs, associated with particulates (dust), were expected. Following the September/October event, the EPA decided not to collect samples during the ensuing winter and spring quarters when conditions would likely be wet, and airborne concentrations of COPCs, especially dust-borne SVOCs, were expected to be much lower. Consequently, calculation of annual average airborne COPCs concentrations likely were conservative (biased high).

A total of 235 air samples were collected from ten air sampling stations: 102 in July and 133 in September. All samples were analyzed for the following COPCs: metals (arsenic and chromium), SVOCs, dioxins/furans, and nonchlorinated VOCs.

5.3.8 Creek Area Investigation

On July 26 and 27, 1999, surface water samples were collected from five locations in Little Squalicum Creek, one groundwater seep, one “tapped” spring on the north bank of the creek, and a pond near BTC. At all locations except the seep, samples were collected for the following parameters: dioxins/furans, VOCs, SVOCs, EPHs, metals, major anions, TOC, TSS, TDS, chemical oxygen demand, BOD, hardness, and alkalinity. Because flow at the seep was very limited, samples were collected only for SVOCs and dioxins/furans as indicators of contamination. A second surface water sampling event took place between December 6 and 11, 1999. All previous locations were sampled in addition to one additional sample at a tapped spring found on the hillside above the creek, downstream from Marine Drive.

On July 28 and 29, 1999, sediment samples were collected from nine locations in Little Squalicum Creek, one location in the channel leading from the Oeser Outfall to the creek, and at a pond near BTC. Sediment was analyzed for the following parameters: SVOCs, EPHs, dioxins/furans, metals, TOC, acid volatile sulfides, metals, grain size, and sediment toxicity.

Ripe, edible berries (Himalayan blackberry) were collected on August 20 and 21, 1999, at three locations within the South Slope/Little Squalicum Creek area and one background location. All samples were analyzed for dioxins/furans, SVOCs, and VOCs.

5.4 Nature and Extent of Contamination

Contaminant concentrations in all media were compared to the appropriate residential or industrial EPA Region 9 Preliminary Remediation Goals (PRGs), MTCA cleanup levels, and federal Maximum Contaminant Levels. These levels will be referred to as preliminary screening levels (PSLs). An overview of sampling results and screening against PSLs is provided in the following sections.

5.4.1 Overview of Surface Soil Sample Results

Surface soil samples were collected from areas within the Oeser property, as well as from nearby residences, the South Slope, Little Squalicum Creek, and background areas located between 0.6 and 1.6 miles east of the facility. Concentrations of PAHs exceeded PSLs within the Oeser property boundaries as well as at off-site and background locations (Tables 1-11). While PCP was found on the Oeser property at concentrations above PSLs, it was almost completely absent from the nearby residential area. In addition, the concentration of dioxins/furans (2,3,7,8-TCDD TEQ) in nearby areas was found to be statistically similar to background concentrations.

5.4.2 Overview of Subsurface Soil Sample Results

Subsurface soil samples were collected and analyzed from the Oeser property, the South Slope Area, and the Little Squalicum Creek area (Tables 12-19). In general, contaminant concentrations decreased with depth and were less than surface soil concentrations except in the main treatment area of the facility. PSLs for several analytes were exceeded at various locations and depths across the Oeser property. LIF-rapid optical screening data provided clear indications of contamination in isolated pockets, primarily around the treatment areas on the Oeser property. Little contamination was found at depths greater than 10 feet below the surface. Only small amounts of contamination were detected in the South Slope and the Little Squalicum Creek subsurface soil, and no concentrations exceeded PSLs in those areas.

5.4.3 Overview of Groundwater Sample Results

Groundwater occurs in two zones beneath the site. Discontinuous pockets of perched shallow groundwater occurs to a depth of 15 feet below the surface. A deep groundwater aquifer occurs at a depth of 30 to 45 feet below the surface and likely discharges to Little Squalicum Creek and Bellingham Bay. Both shallow and deep wells were sampled and analyzed for contaminants (Table 20).

Perched groundwater in the shallow zone is unlikely to be developed as a domestic water source in the future because it is discontinuous across the facility and the flow is too small to support residential use. However, since contaminant concentrations above the screening levels were found in the shallow zone and because the deeper aquifer may be a potential future source of domestic drinking water, protection of the deep aquifer from contamination in the shallow perched aquifer also was evaluated in the risk assessment.

During the RI samples were collected during four quarterly sampling events from several deep aquifer wells. Only a minor amount of contamination was found in the deep aquifer directly under the treatment facility on the Oeser property. Samples from two wells located next to the treatment facility in the center of the Oeser property exceeded the PSLs for PCP. One well also had one slight exceedance of a PSL for dioxins/furans. Generally, the extent and concentration of contaminants appear to have decreased in the deep aquifer since 1995. No contaminants were detected above PSLs in the deep groundwater samples collected from nearby off-property areas including the South Slope area.

5.4.4 Overview of Air Sampling

Three sets of air samples were collected during July 1999, with another three taken in September/October 1999. During both events, conditions were dry and dusty, and Oeser was actively treating wood products. Air samples were analyzed for phenols, PAHs, dioxins/furans, and VOCs (Table 21). VOCs were detected in samples collected within the Oeser property boundary and only benzene was detected at levels above PSLs in nearby off-property areas.

5.4.5 Overview of Surface Water and Sediment Results

Surface water and sediment samples from Little Squalicum Creek were collected in July 1999 and again in December 1999. Contaminants detected in surface water from Little Squalicum Creek included PAHs, chlorinated phenols, and dioxins/furans (Table 22). Only Benzo(a)pyrene (B(a)P), PCP, and dioxins/furans exceeded screening levels protective of aquatic life. Other contaminant concentrations were less than available screening levels. All of these contaminants were considered in both the ecological and human health risk assessments, which are discussed later.

Sediment concentrations at several locations in the creek exceeded background levels (Table 23). At a few locations in the creek, concentrations of these contaminants exceeded conservative screening benchmarks for effects on benthic life; however, no adverse growth or survival effects were observed in sediment toxicity tests with laboratory-reared organisms.

5.4.6 Overview of Berry Sampling

Berries growing along recreational trails were sampled in August 1999 to assess if eating them was a concern. Contaminant concentrations in the berries did not exceed risk based screening levels (Table 24).

6.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

6.1 Current Land Use

An active wood treating facility is currently located and operating on the Oeser property. The facility (Figure 2) as described earlier in this document consists of a Wood Storage Area, North and South Pole Yards (white or pre-treated pole storage areas), Treatment Areas (East, West and North), and Treated Pole Area. A railroad spur also runs onto the site which connect to the active line just south of the facility. The Oeser office and parking lot is located on the south side of the property. An inactive tall smoke stack is consider a landmark in the area.

Oeser’s property is surrounded by a mixture of land uses, ranging from industrial to residential (Figure 8). Immediately adjacent to the north boundary of the Oeser property is Bellingham’s Birchwood neighborhood. The eastern boundary of the Oeser property is adjacent to Morse Industrial Park (occupied by Morse Hardware Company) and an undeveloped property owned by the Washington State Board for Community and Technical Colleges.

The south boundary of the Oeser property abuts a Burlington Northern Railroad line. To the south of the railroad are homes, additional industrial businesses, and undeveloped open space. Little Squalicum Creek flows along the southeast border of the open space. Adjacent to the west boundary of the Oeser property are additional heavy industrial facilities, including steel fabrication and fiberglass manufacturing facilities, warehouses, electrical and repair shops, storage facilities, and some vacant parcels and homes. The Tilbury Cement Company is located farther to the west, on the opposite side of Marine Drive.

6.2 Zoning

Except for a small portion of Oeser's northern section located within the city limits of Bellingham, the majority of the facility is located within Whatcom County's jurisdiction. The City of Bellingham's and Whatcom County's current zoning for the facility and immediate surrounding area are indicated in Figure 9.

Most of the Oeser property is zoned as heavy impact industrial use, but a small portion of the Oeser property within city limits is zoned as residential-single. This portion is considered a "non-conforming use" which existed prior to passage of the city's 1982 zoning ordinance.

The Whatcom County Comprehensive Plan designates land use zones in the county's unincorporated areas by subarea. The majority of Oeser's property is zoned heavy impact industrial to acknowledge existing heavy industrial uses near Bennett Drive, Marine Drive, and Roeder Avenue. Light-impact industrial areas, including warehouses, repair shops, several industrial businesses, and a restaurant and lounge, are located to the east and south of Oeser's property. Adjacent to the southwest corner of Oeser's property, an approximate 2-acre area is identified as neighborhood commercial. Adjacent to the northwest corner of Oeser's property, an urban residential-mixed use area provides transition from rural to urban development, although the area is characterized as a single-family neighborhood.

6.3 Future Land Use

The City of Bellingham updated its comprehensive plan in 1995 and Whatcom County adopted the land use designations for the Urban Fringe Subarea in late 1997. Neither the county nor the city has plans to change the land use designations in this area. The surrounding land areas have been limited to mixed residential and industrial use for over 70 years.

Due to the proximity of Little Squalicum Creek to the beach at Bellingham Bay, the city plans to develop the area currently zoned recreation open space into a functional recreational park. The county concurs and recommends that the new city park include a paved trail system from the Bellingham Technical College parking lot to the beach, limited multi-use open grass play areas, and picnic and restroom facilities.

6.4 Surface Water and Groundwater Use

Surface water is not used as a source of drinking water or for irrigation. Oeser receives its water from the City of Bellingham and has no on-site potable or industrial water supply wells. Groundwater from the deep aquifer currently is not known to be used for drinking water. A nearby cement plant (Tilbury Cement Company) located approximately 1,875 feet southwest of the Oeser property, draws water from the deep aquifer for industrial purposes. There are no domestic wells located within 1 mile of Oeser's property and only one well is located within a 2-mile radius.

Under federal groundwater classification guidelines, deep groundwater under the site would be classified as Class II (water currently being used or water that might be used as a drinking water source in the future). Because shallow groundwater cannot be pumped in sufficient quantities to meet the needs of an average household, this groundwater would be classified as Class III (groundwater that cannot be used for drinking water due to insufficient quality or quantity).

7.0 SUMMARY OF SITE RISK

A baseline risk assessment was conducted to evaluate the current and future human health and ecological risks associated with COPCs in various effected media in the vicinity of the Oeser Superfund site. The assessment serves as a baseline to indicate risks that could exist if no action was taken. The risk assessment takes into consideration potential risks if existing land use patterns shift in the future and the site is used for residential development. The results of the baseline risk assessment are used to evaluate whether remedial action is needed.

7.1 Summary of Human Health Risk

The human health risk assessment (HHRA) followed the basic guidelines set by EPA. A HHRA evaluates the likelihood of adverse effects occurring in human populations potentially exposed to contaminants released in the environment. Risk assessments are not intended to predict actual risk to an individual. Instead, they provide upper-bound and central tendency estimates of risk with an adequate margin of safety, according to EPA guidelines, for the protection of a population that may potentially come into contact with contaminants at the site. This section of the ROD summarizes the results of the baseline HHRA for this site.

7.1.1 Identification of Contaminants of Potential Concern

All analytes detected during multi-media studies of the Oeser site were reviewed to determine if they should be kept for consideration as COPCs. Screening concentrations used in this evaluation were derived from the EPA Region 9 PRGs, which provide chemical-specific screening concentrations that correspond to a 1×10^{-06} excess lifetime cancer risk for carcinogens or a hazard quotient (HQ) of 1 for noncarcinogens. Petroleum was screened using Model Toxics Control Act (MTCA) Method A cleanup levels. Contaminant concentrations detected in berries were screened against site-specific, risk-based levels. Risk-based screening levels were based on EPA default exposure assumptions for residential use for all media.

If the appropriate screening concentration was exceeded, then the chemical was considered a

COPC (Table 25) and evaluated quantitatively in the risk assessment. Several chemicals including dioxins/furans, PAHs, and PCP, were identified as COPCs in most of the media. Based upon screening the data, metals were not considered COPCs, and were not evaluated in the risk assessment. Background samples were collected for soil, air, groundwater, surface water, and berries. Organic contaminants detected in background samples were compared to PRGs and carried forward through the risk assessment. The risks based on organic chemical concentrations in the background samples versus those samples collected from areas impacted by Oeser operations then were compared.

7.1.2 Exposure Assessment

The purpose of the exposure assessment is to estimate the pathways by which humans potentially are exposed, the magnitude of human exposures, and the frequency and duration of these exposures. COPCs were detected in on-facility surface and subsurface soil, groundwater, and air. In addition, contaminants were detected in off-facility soil, groundwater, air, sediments, surface water, and berries.

Contamination sources listed in the CSM include contaminated surface soil on the Oeser property, buried process wastes on the Oeser property, and spoils piles immediately adjacent to Little Squalicum Creek. The CSM also lists process emissions and treated logs as current sources of contamination. Contamination from these sources maybe released into the surrounding environment via wind dispersion, percolation in soil, groundwater transport, and surface run-off. People may be exposed to contaminants in surface and subsurface soil, groundwater, sediment, surface water, and air.

Based on current and potential future land uses, exposure pathways were evaluated for current off-property and future on and off-property residents, current and future on-property workers, and recreational users of Little Squalicum Creek. Although Oeser is expected to operate as an industrial facility in the future, residential development of the site was evaluated in this baseline HHRA to provide information for risk management decisions.

A residential exposure scenario was evaluated to estimate risks to adult and child residents living near the Oeser property. A potential future residential scenario was evaluated for the Oeser property, representing risks to residents in the event that the Oeser operations close and the site is redeveloped for residential use.

An industrial exposure scenario was evaluated to estimate risks to current and future workers at the Oeser property. The purpose of this scenario is to evaluate risks associated with chemical contamination in soil and water at the Oeser property. A recreational exposure scenario was used to estimate risks to individuals that may be exposed to contamination in undeveloped areas south of the Oeser property, in and near Little Squalicum Creek.

Exposure scenarios were developed by examining the major exposure pathways to estimate the overall potential exposure of each person. The exposure scenarios and pathways that are evaluated in this baseline HHRA are summarized in the CSM which is described in Section 5.2 and Figure 6. The following exposure pathways were evaluated quantitatively in the baseline HHRA:

- Incidental ingestion of soil;
- Dermal contact with soil;
- Inhalation of volatilized substances from soil;
- Inhalation of wind-blown dust;
- Ingestion of home-grown produce;
- Dermal contact with surface water and sediments;
- Ingestion of groundwater; and
- Dermal contact with groundwater.

Estimates of chemical intake were based on exposure point concentrations (EPCs) and on the estimated magnitude of exposure to contaminated media. Analytical data were grouped in various ways for the purpose of calculating EPCs. Where possible, data were grouped across areas where someone would spend a large portion of the time that they are exposed at the site. Several sources of contamination have been identified at Oeser. The known sources and types of soil contamination generally can be differentiated into the seven on-property areas. The lifetime average daily intake (LADI) was estimated for exposure to carcinogenic COPCs and the chronic daily intake (CDI) was estimated for exposure to noncarcinogenic COPCs.

7.1.3 Toxicity Assessment

The purpose of the toxicity assessment is to compile toxicity data for the COPCs identified at the Oeser property and to estimate the relationship between the amount of exposure to a COPCs (i.e., dose level) and the likelihood of adverse effects. Toxicity of COPCs are represented by slope factors (SFs) and reference doses (RfDs) for carcinogenic and non-carcinogenic COPCs, respectively.

The Integrated Risk Information System (IRIS) computer database is the preferred source of information because this database contains the most recent toxicity values reviewed extensively by the EPA. The Health Effects Assessment Summary Tables (HEAST) were consulted if a toxicity value was not available in IRIS and the EPA's National Center for Environmental Assessment (NCEA) tables were used if values were not available in IRIS or HEAST.

The potential cancer risks posed by dioxins/furans and PAHs were evaluated using EPA’s toxicity equivalency factor (TEF) approach. Carcinogenic PAHs were combined and referred to as total benzo(a)pyrene [B(a)P] equivalents. Dioxins/furans compounds were also evaluated using a TEF approach, by which 2,3,7,8-TCDD equivalents were derived by multiplying each individual dioxins/furans congener by its equivalency factor and summing the results.

7.1.4 Risk Characterization

The risk characterization integrates the information developed in the exposure assessment and toxicity assessment sections to identify the contaminants of concern (COCs) and to obtain estimates of the potential risks posed to human health at Oeser. The purpose of the risk characterization is to present the key findings of the risk assessment and to put them into perspective with respect to assumptions and uncertainties. A summary of the assumptions used to calculate the human health risks is presented in Table 26.

7.1.4.1 Potential Cancer Risks

Cancer risks were assessed by multiplying the LADI of a carcinogen by its slope factor. The calculated risk is expressed as the probability of an individual developing cancer over a lifetime and is an estimated upper-bound, incremental probability. For example, a cancer risk of 1×10^{-4} (1E-4) refers to an upper-bound increased chance of one in ten thousand of developing cancer as a result of site-related exposure to a carcinogen over the expected exposure duration. The National Oil and Hazardous Substances Pollution Contingency Plan recommends a target risk range for excess cancer risk of $1\text{x}10^{-4}$ to $1\text{x}10^{-6}$.

$$\text{Risk} = \text{LADI x SF}$$

Cancer risks were estimated separately for exposure to each chemical or range of petroleum hydrocarbon fractions for each exposure pathway and then were summed across all exposure pathways for each medium (i.e., air, water, soil, and groundwater) for each potentially exposed population (Table 27). This process was performed for each exposure scenario (e.g., worker, resident, etc.) evaluated at Oeser.

7.1.4.2 Noncarcinogenic Effects

The potential for adverse effects resulting from exposure to noncarcinogens was assessed by comparing the COPCs-specific CDI to its RfD. This comparison was made by calculating the ratio of the estimated CDI to the corresponding RfD to yield an HQ:

$$\text{HQ} = \text{CDI / RfD}$$

HQs for individual chemicals and petroleum hydrocarbons fraction groupings were then summed to yield hazard indices (HIs). HIs are presented separately for each evaluated exposure scenario (e.g., workers). The receptor-specific HIs then were summed across exposure pathways for each scenario (Table 28). An HI less than 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, noncarcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

7.1.5 Risk Characterization Summary

The HHRA evaluated potential adverse health effects due to site-related contaminants. Wood-treating wastes, including PAHs (most of the compounds that make up creosote), PCP and dioxins/furans (contaminants found in PCP treating solutions), were the primary contaminants identified in surface and subsurface soil, groundwater, air, surface water, and sediment.

Current and future exposure scenarios were evaluated for workers on the Oeser property, on- and off-property residents, and nearby recreational visitors. Exposure to COPCs derived from surface soil and air on the Oeser property was evaluated for the current Oeser Company worker. For the current nearby residents, exposure to contaminants in the surface soil, home-grown vegetables, and air were evaluated. Exposure to contaminants derived from nearby off-property surface soil, Little Squalicum Creek surface water and sediment, and air was evaluated for the current recreational visitor. For the future exposure scenario, exposure to contaminants derived from surface and subsurface soil and groundwater on the Oeser property was evaluated for both Oeser workers and residents that could potentially live on the Oeser property in the future. Exposure to contaminants derived from surface and subsurface soil and Little Squalicum Creek surface water and sediment was also evaluated for the future recreational visitor. A summary of the human health risk assessment is provided below.

- Off-property Residential Investigation: To assess whether contamination is a problem outside the boundaries of the Oeser property, the investigation looked at residential yards and vacant land next to the Oeser property. Samples from yards were analyzed for organic contaminants including dioxins/furans. Results of the sampling were used to estimate cancer risk and the potential for non-cancer health problems. EPA assumed that people touched the soil, resulting in incidental ingestion of contaminated soil, inhaled re-suspended dust, and ate vegetables grown in backyard gardens. The results of this analysis indicated that risks are within EPA’s acceptable range at existing residences in all cases. Risks in a background residential area were estimated for comparison purposes and were not different from those in the area next to the Oeser property.

- Recreational Scenario: Risks also were estimated for an 8- to 18-year old who visits the Little Squalicum Creek twice a week for 11 years. These individuals were assumed to contact the soil along the trail and inhale particles released from soil, and contact sediment and surface water in the creek. The risk to these individuals was within EPA's acceptable range except for dermal contact with surface water, which was elevated because of the presence of dioxins/furans, PAHs, and PCP, and due to conservative assumptions about the presence of contaminants that were not detected. Since the study, more restrictive storm water discharge limits have gone into effect via the NPDES permit and Oeser has implemented a new and more effective storm water treatment process.

- Industrial Scenario for the Oeser Property: Risks were estimated for workers at Oeser assuming that they ingest and dermally contact soil and inhale particles and vapors emitted from soil. Risks associated with worker exposures exceed EPA's acceptable range for a variety of areas under current and future conditions.

- Air Assessment: Air samples were collected on the Oeser property and along the fence line during typical operating conditions to determine whether concentrations of contaminants in air could impact people that live next to the facility. Based upon conservative assumptions, the cancer risks for residents located near the facility were within EPA's acceptable range; however, the potential for noncancer effects was slightly elevated above EPA's screening level at two locations along the northeast fence line.

- Groundwater Assessment: Groundwater underlying the Oeser property and the nearby neighborhood is not expected to be used as a source of drinking water in the future; however, EPA assumed that groundwater would be used by residents to determine if such use would result in unacceptable risks. While risks associated with future potential wells located on the Oeser property for drinking water were elevated, it is important to note that much of the risk was based upon conservatively assuming that one-half of the analytical detection limit was present for several contaminants that were not actually detected.

7.1.6 Risk Characterization Uncertainties

The risk characterization combines and integrates the information developed in the COPCs selection process, as well as in the exposure and toxicity assessments. Therefore, uncertainties associated with these aspects of this baseline HHRA also may affect the degree of confidence that can be placed in risk characterization results.

The most conservative exposure scenarios evaluated in this baseline HHRA involved residential exposure assumptions. This assumption is plausible considering current residential locations; however, future residential development of Oeser is not expected.

Uncertainties also are associated with environmental sampling, calculation of EPCs, contaminant migration modeling, exposure parameters, future land use, steady-state assumption, and bioavailability. Each of these factors directly impacts the overall risk estimates obtained for each complete exposure pathway.

Because numerous conservative assumptions were used in the selection of COPCs and the exposure and toxicity assessments, the risk characterization results likely overestimate risks associated with COPCs at Oeser. One of the major items that likely overestimates risk at Oeser is the use of one-half the detection limits for nondetected dioxins/furans and cPAHs. For example, the potential excess lifetime cancer risks for facility residential exposure to groundwater at the Oeser property exceeded EPA criteria based solely on the use of one-half detection limits for nondetected compounds. However, use of one half the detection limit likely underestimates the variability in actual sample results. This can affect the derivation of the EPC used for estimating cancer risks. Therefore, using of one half the detection limit is assumed to be conservative.

7.2 Ecological Risk Assessment

Numerous investigations conducted at Oeser during the 1980s and 1990s identified Oeser-related contaminants, such as PAHs and PCP, in environmental media on the Oeser property and in nearby off-property areas. A screening-level ecological evaluation based on existing site information was performed during the start of the RI work. The evaluation identified Little Squalicum Creek and the south slope terrestrial area as natural areas attractive to wildlife. Also, the evaluation concluded that additional ecological risk assessment work was warranted for two primary reasons: (1) levels of Oeser-related contaminants in creek sediment exceeded benchmarks for the protection of benthic life, and (2) insufficient data were available to evaluate risks to wildlife from Oeser-related contaminants.

The RI data demonstrated that Oeser-related contaminants were present in sediment and water from the creek and in soil from the south slope and creek banks. The data were used in a baseline ecological risk assessment to evaluate the following assessment endpoints: (1) maintenance of a healthy creek aquatic community (i.e. benthic life and other aquatic biota) typical of a small stream with seasonally limited flow; (2) maintenance of healthy plant and soil-organism communities in the south slope and creek area; and (3) sufficient rates of growth, survival, and reproduction of songbirds and small mammals to sustain healthy populations in the south slope and creek area.

7.2.1 Identification of Contaminants of Potential Concern

The ecological problem formulation included an initial identification of COPCs. COPCs were identified through a screening process similar to that used in the HHRA. Maximum concentrations of contaminants detected in south slope surface soil and in Little Squalicum Creek surface water and sediment were screened against benchmarks for ecological receptors. The benchmarks included Probable Apparent Effects Thresholds, Washington State Sediment Management Standards, EPA ECOTOX benchmarks for screening of contaminants in soil and sediment, and other published values. Maximum surface water chemical concentrations were screened against EPA Ambient Water Quality Standards. The benchmarks for ecological screening are based on the lowest concentration at which adverse effects are seen. Those contaminants present at concentrations exceeding ecological benchmarks were selected as COPCs.

7.2.2 Ecological Effects Assessment

The specific investigations conducted to further evaluate ecological risks at the Oeser site were: (1) analysis of creek sediment and water for Oeser-related contaminants; (2) toxicity testing with creek sediment to evaluate effects of sediment contamination on the survival and growth of benthic life; (3) bioaccumulation testing with creek sediment to evaluate uptake of Oeser-related contaminants by benthic organisms; and (4) analysis of surface soil from the south slope and creek area for Oeser-related contaminants.

To assess risk to plants and soil invertebrates, COPC concentrations in soil were compared with phytotoxicity and soil-fauna screening benchmarks, respectively. To assess risks to aquatic life in Little Squalicum Creek, COPC levels in surface water were compared with ambient water quality criteria and other published surface-water screening values. Benthic life risks were assessed by conducting toxicity tests with laboratory-reared organisms in creek sediment, and by comparing COPC levels in creek sediment with published sediment benchmarks. The toxicity test selected to assess chronic toxicity was a 10-day growth and survival test with *Hyalelle azteca*, a freshwater amphipod. It should be noted that this test was the longest duration EPA-approved test available at the time of the RI study.

Wildlife receptor risks were assessed by estimating the intake of COPCs and conducting an ecological effects assessment. The total chemical exposure for wildlife receptors was calculated as the sum of exposures from diet and from incidental soil/sediment ingestion. Estimated intake was presented in terms of the amount of COPCs ingested per kilogram of body weight per day (mg/kg/day). This exposure assessment takes into account the fraction of the contaminated site used by the receptor, exposure duration, ingestion rate, and the receptor's body weight. The exposure estimates were then compared to toxicity reference values (TRVs) specific to the species being evaluated. The TRVs are analogous to a RfD and were derived from toxicity studies reported in the scientific literature, representing a no or lowest observed adverse effect level for each chemical for each receptor. TRVs are expressed as a chemical concentration per amount of receptor body weight per day (mg/kg/day). A HQ then was calculated for exposure of each receptor to each COPCs by dividing the exposure estimate by the TRV.

7.2.3 Ecological Risk Characterization

The discussion below summarizes the risk characterization results.

- **Benthic Life Risks:** Current levels of sediment contamination in Little Squalicum Creek do not appear to pose a threat to benthic life based on results of sediment toxicity tests with creek sediment. Test organism (*Hyalella azteca*) survival in sediment from the creek was high (78 to 93%) and no different than control samples. In addition, test organism growth was not impaired.

- **Other Aquatic Life Risks:** Surface water samples were collected from Little Squalicum Creek in July and December 1999. In July 1999, no contaminants in surface water were present at concentrations in excess of the State water quality criteria for aquatic life protection. In December 1999, the criteria for PCP and dioxins/furans were marginally exceeded at selected locations, likely as a result of higher concentrations of suspended sediment in the creek at this time. The bioavailability of particle-bound contaminants in surface water is low and Oeser related contaminants do not appear to pose a serious threat to the aquatic community.

- **Plant and Soil Fauna Risks:** No risks to plants or soil fauna from PCP were identified for the south slope or Little Squalicum Creek area. For PAHs, potential risks to plants and soil fauna appear to be limited to a single sample location on the north bank of Little Squalicum Creek.

- **Wildlife Risks:** Based on the results of a comprehensive sampling effort in the south slope and creek areas, small mammals and songbirds which feed extensively at one specific location on earthworms and other soil invertebrates (a situation that seems unlikely) may be at marginal risk from contaminants present in surface soil. However, because soil contamination is restricted to a small area, it is unlikely to pose a threat to the greater population of small mammals and songbirds. Overall, Oeser-related contaminants do not appear to pose a serious threat to the local wildlife.

- **Synopsis of Effects on Assessment Endpoints:** The assessment found that current levels of water and sediment contamination in Little Squalicum Creek do not pose a serious threat to a healthy aquatic community typical of a small stream with limited flow. For plant and soil-organism communities, risks were identified only at a single sample location on the north bank of the creek. Elsewhere on the south slope and near the creek, plant and soil-organism communities should not be affected adversely by the presence of facility-related contaminants. For the health of small-mammal and songbird populations, the greatest potential risks were identified for the species feeding extensively on soil invertebrates.

7.2.4 Uncertainties

Ecological risk assessments include uncertainties at every step of the process due to the varying assumptions made in determining risk to ecological receptors. Uncertainties include non-site-specific toxicological screening benchmarks and exposure assumptions which are often extrapolated from other species.

For terrestrial invertebrates and aquatic life, risks were assessed by screening against ecological benchmarks. This method is not precise and screening benchmarks were not always available for all COPCs. Uncertainty in assessing risks to benthic invertebrates is considered low because a direct toxicity test was used. However, the test method did not evaluate potential effects on reproduction because such protocols were not fully developed at the time of the RI sampling effort.

Uncertainties in assessment of wildlife risks are associated with several aspects of the evaluation. Uncertainty may result from use of literature-based estimates of food intake, diet composition, incidental soil ingestion, and home range size; although, the values selected for risk assessment are assumed to be representative of the species selected for evaluation. Uncertainty also arises from the limited amount of toxicity data for certain COPCs, which necessitated the use of some contaminants as surrogates for others or prevented an evaluation of risks for some COPCs to some receptors.

8.0 REMEDIAL ACTION OBJECTIVES

Soil and groundwater investigations have identified contamination requiring remedial action at Oeser. The need for remedial action is based upon the results of the human health and ecological risk assessments. In addition, contamination on Oeser's property exceeds the MTCA standards for residential and industrial use. The response action in this Record of Decision is necessary to protect the public health, welfare, or the environment from actual or threatened releases of hazardous substances in the environment. Such a release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment. Consistent with NCP and EPA policy, remedial action is warranted to address these potential risks.

Based on the potential risks identified, Remedial Action Objectives (RAOs) were developed for the site. RAOs consist of medium-specific or location-specific goals for protecting human health and the environment. COCs were selected from the COPCs evaluated in the baseline risk assessment, based on potential human exposures at the site. RAOs were developed for the Oeser Superfund site for these COCs, which are listed in Section 8.3 (Table 29).

8.1 Basis and Rationale for the Remedial Action Objectives

8.1.1 Residential Area Near The Oeser Property

Composite soil samples from a series of homes near the Oeser property were collected and analyzed for constituents associated with Oeser's wood treating activities. Air samples also were collected from locations near the facility. Estimated risks based on dioxins/furans in soil and air were compared with soil and air samples obtained from urban areas in Bellingham (background samples) not expected to be affected by releases to air from Oeser. Results indicated that estimated risks from dioxins/furans in soil and air are similar for the residential area around the facility and the background area.

Because risks associated with exposure to residential soil were similar for those associated with background soils, RAOs were not developed for the residential area near the Oeser property. The RAO for Oeser property soil (described in Section 8.2) is expected to decrease residential exposure to Oeser-related dust and vapors by nearby residents. To the extent that residential soils are impacted currently by such releases, those impacts should be reduced as a result of the RAO.

8.1.2 South Slope and Hiking Path

Estimated individual excess lifetime cancer risk associated with dermal, inhalation and ingestion exposure to surface soil within the south slope area and along the old railroad bed hiking path above Little Squalicum Creek to a recreational visitor was $1x10^{-06}$. Conservatively, as with residential surface soil, risks calculated from dioxins/furans and carcinogenic PAHs were based in many cases on one-half of the analytical detection limits when these contaminants were not detected. As described in Section 8.1.3, ecological risks were driven by the levels of chemical contamination in surface soil along the banks of Little Squalicum Creek (i.e. spoils piles), not by surface-soil contamination on the south slope or hiking path, which were very low in comparison. Based on this information, RAOs were not developed for the south slope and hiking path areas.

8.1.3 Spoils Piles on the Creek Bank

There are several small piles of soil located along the reach of the Creek which appear to be excavated material from the construction of the creek or some other dumped material. These piles of dirt (spoils piles) were sampled as part of the Remedial Investigation. Samples from the spoils piles showed the presence of carcinogenic PAHs, dioxins/furans, and TPH. The risks and hazards associated with exposure of the recreational visitor to the spoils piles were within the acceptable range. Estimated individual excess lifetime cancer risk to the recreational visitor was $4x10^{-05}$ and the hazard index was 0.5.

The ecological risk assessment considered the south slope, hiking path, spoils piles, and creek bank as one area because wildlife are able to move freely between these areas. The assessment involved screening soil samples against benchmarks for plants and terrestrial invertebrates (e.g., earthworms). No risks to plants and soil fauna from PCP were identified; potential risks from exposure to PAHs appear to be limited to one sample location on the north bank of the creek. However, the location was heavily overgrown by various species of grasses, shrubs, and vines, and there was no visible evidence that the vegetation was stressed. Risks to the American robin and masked shrew were also evaluated due to their potential to feed on flora and fauna within the creek area. Total exposure estimates were calculated based on the sum of exposures via incidental ingestion of soil and ingestion of terrestrial invertebrates. Hazard quotients exceeded the benchmark level of 1 for exposure of both the robin and shrew to PCP, PAHs, and dioxins/furans.

The estimated risks from PCP reflect the use of one-half the detection limit to represent the PCP concentration when it was not detected. Because the PCP detection limit was elevated in several samples due to matrix interference, the calculated risks to wildlife from PCP likely are overestimated. For dioxins/furans and particularly for PAHs, the level of soil contamination at a single sample location contributed most to the estimated wildlife risks. For these groups of contaminants, because the contamination is restricted to a small area, it does not represent a threat to the population of small mammals and songbirds that use the creek area and south slope, although a few individuals could be affected if they were to forage only in the most contaminated locations (a situation that seems unlikely). This situation does not present a threat to human health and the environment for which remedial work is necessary to reduce the risk to ecological receptors. Consequently, RAOs for the spoils piles were not developed.

8.1.4 Little Squalicum Creek

8.1.4.1 Surface Water

Little Squalicum Creek is an intermittent stream fed primarily by untreated storm drainage from the surrounding area. Consequently, the surface water is not currently a source of drinking water by humans and is not expected to be used in the future for human drinking water. However, the surface water is visited by humans and is probably a source of drinking water to wildlife. The lack of flow appears to be the primary reason why this creek does not support fish, nor is it likely to in the future. Oeser maintains a current NPDES permit allowing the discharge of treated storm water from its property into Little Squalicum Creek. The volume of Oeser discharge to the creek is very small compared to the neighborhood outfalls.

Since storm water from Oeser is treated under the provisions of a State NPDES permit, compliance with discharge limits is enforced through Ecology. It should be noted that surface water data used in the HHRA and ERA was collected prior to the installation of Oeser's carbon treatment system. This is expected to significantly reduce the level of Oeser-related contaminants in storm water which might otherwise be discharged to the creek.

EPA also evaluated potential risks and hazards to a recreational visitor that was assumed to frequently wade in Little Squalicum Creek. Under very conservative assumptions, potential excess individual lifetime cancer risk associated with dermal exposure to surface water by a recreational visitor was estimated to be $5x10^{-04}$. Dioxins/furans account for approximately 90% of the risk estimate. The hazard index associated with dermal exposure to surface water was 0.005. However, the assessment of risks and hazards from dermal contact with surface water containing contaminants such as dioxins/furans, B(a)P and PCP, is highly uncertain. Their dermal permeability coefficients are outside the effective predictive domain, and therefore the estimations of doses received from dermal contact are considered to be less than reliable, but are in any case most likely to be highly overestimated.

The creek supports benthic invertebrates and probably other forms of aquatic life, such as amphibians. In addition, salmon fingerlings have occasionally been observed in the small pool that forms where the creek meets the Bellingham Bay beach. Risks to such receptors from chemical contamination in surface water appear to be minimal, being restricted to two locations where minor exceedances of benchmarks were observed during a storm event. In evaluating risks to ecological receptors, one-half the detection limit was used for non-detects. However, even in the absence of chemical contamination, it seems unlikely that the creek would support a diverse community of aquatic biota given its shallowness and current flow condition. Drinking of creek water by wildlife accounts for an insignificant fraction of their total chemical exposure.

Shallow groundwater does not appear to discharge directly to the creek, and deep groundwater is likely a source of only de minimus concentrations of Oeser-related contamination entering the creek. Based on the relationship of the transport of contaminants between the shallow to deep groundwater and then to the surface water, it is not necessary to develop RAOs for protection of surface water from shallow/deep groundwater

8.1.4.2 Sediment

Calculated excess cancer risks associated with human dermal exposure to sediment in Little Squalicum Creek were within the acceptable range of risks; $8x10^{-07}$ upstream from Marine Drive and $5x10^{-07}$, downstream from Marine Drive. The background sediment sample risk was estimated to be $1x10^{-08}$. PAHs were the primary COPCs for these locations. Risks associated with non-carcinogens were de minimus. Current levels of sediment contamination do not appear to pose a threat to benthic life in the creek, and risk to wildlife that consume aquatic insects from the creek also appears to be minimal. Therefore no RAOs have been developed for Little Squalicum Creek sediment.

8.1.5 Soils On the Oeser Property

Potential excess individual lifetime cancer risks associated with exposure (ingestion, inhalation of soil-derived particulates and vapors, and dermal contact) to surface soil for current Oeser workers exceeded the acceptable range of risks as defined by the EPA. Risks were calculated separately for each section on the property and ranged from $5x10^{-04}$ to $1x10^{-03}$. Risks associated with future workers' exposure to subsurface soil on the Oeser property also exceeded the acceptable risk range. Incidental ingestion accounts for more than 90% of the risk estimate for the worker exposure scenario. The hazard index of 1 was not exceeded for surface soil but was exceeded for exposure to subsurface soil. RAO 1 was developed for soils on the Oeser property because of the elevated risks to workers exposed to surface and subsurface soil.

8.1.6 Groundwater

8.1.6.1 Shallow Groundwater

Shallow groundwater is not used at or near the Oeser property. Shallow groundwater fails to meet either Washington State MTCA (Chapter 173-340-720 WAC) criteria or Federal (EPA 1986) guidelines for classification as a drinking water aquifer due to the low yield of water on pumping. During the RI, light non-aqueous phase liquid (NAPL) was found in three shallow wells. Passive absorbent systems were installed in these wells for one year during the RI field event. Although light NAPL was not detected in these wells after one year, NAPL may still be present in the subsurface soils on the Oeser property and could potentially be re-mobilized if water continues to infiltrate the area. As shallow groundwater impacts the deep aquifer and because contamination was found in the shallow groundwater, RAO 2 was developed for shallow groundwater underlying the Oeser property.

8.1.6.2 Deep Groundwater

The deep groundwater yields sufficient water on pumping to be classified as a drinking water aquifer. The deep groundwater underlying and surrounding the Oeser property is not currently being used. However, the Tilbury Cement Company, located cross-gradient of groundwater flow from Oeser, did historically use the deep aquifer for drinking water and showering. EPA sampled the two existing deep groundwater wells at Tilbury and found no detectable levels of Oeser-related contamination. The deep groundwater potentially discharges to Little Squalicum Creek and to Bellingham Bay, but it is only a de minimus source of contamination.

Future potential excess cancer risks associated with deep aquifer groundwater ingestion and dermal contact to residents on the Oeser property ranged from $5x10^{-04}$ to $1x10^{-03}$, and potential hazard indices ranged from 0.01 to 0.1. The MCL's for PAHs and PCP were slightly exceeded directly under the property. For future workers on the Oeser property, estimated excess cancer risk with deep aquifer groundwater ingestion were $8x10^{-06}$ and potential hazard indices ranged from $1x10^{-04}$ to $2x10^{-03}$. The estimated risks were primarily associated with dioxins/furans, PCP, and PAHs. However, only two PAHs were detected in one well, so most of the estimated risks for PAHs were based on the use of one-half of the detection limits for these compounds. At least one dioxins/furans congener was detected in every well, although none of the concentrations exceeded the respective screening value. Consequently, the calculation of the risks due to dioxins/furans is based largely on the use of one-half of the detection limits for non-detected compounds and therefore is conservatively estimated. RAO 3 was developed for the deep groundwater due to the presence of slightly elevated contaminant concentrations in the aquifer.

8.1.7 Air Quality

Oeser is an active wood treating facility that is a registered emission source with NWAPA. Estimated excess cancer risks associated with exposure to air (inhalation of dust and vapors) to nearby residents ranged from $3x10^{-06}$ to $3x10^{-05}$. Only one sample location exceeded a cancer risk of $1x10^{-5}$ (AS-29). The main COCs that contributed to that risk was PCP. Noncancer hazard indices for air inhalation ranged from 0.06 to 5. Hazard indices exceeded 1 at two air sampling stations located along the facility's northeast fence line. The chemical contributing most to the hazard indices was 1,2,4-trimethylbenzene.

Because these risks and hazards at the nearby residential area are likely associated with on-going permitted facility operations, this information has been provided to other programs within the EPA (i.e., RCRA), NWAPA, and Ecology, as well as to Oeser and the residents.

Given the above information, RAOs have not been developed for air. However, to the extent that portions of the measured COCs in air were due to dust and vapors from contaminated soil at Oeser, as opposed to on-going facility operations, the RAO for on-facility soils is expected to reduce such exposures.

8.2 Remedial Action Objectives

The remedial action objectives developed for the Oeser Superfund site are:

- RAO 1 - Reduce ingestion, inhalation, and dermal contact with soil contaminants above industrial cleanup levels on the Oeser property and reduce migration of soil and shallow groundwater contaminants that could result in deep groundwater contamination exceeding groundwater cleanup levels.

- RAO 2 - Restrict ingestion and dermal contact with shallow groundwater, and reduce migration of contaminants from shallow groundwater that could result in deep groundwater contamination exceeding groundwater cleanup levels.

- RAO 3 - Restrict ingestion and dermal contact with deep groundwater until the groundwater cleanup levels are achieved and prevent off-property migration of groundwater with contaminants above CULs.

8.3 Cleanup and Action Levels for COCs

The MTCA Cleanup Regulations (WAC 173-340) provide cleanup standards for soil, groundwater, surface water, and air in the state of Washington. The Oeser property is zoned and used for industrial purposes and generally qualifies for the MTCA Method C soil cleanup levels. However, more restrictive site-specific cleanup levels were calculated in the baseline risk assessment for the industrial worker scenario that were based on an acceptable risk level of 1E-05 for carcinogens and an acceptable HI of 1 for noncarcinogens. These site specific levels were selected as the cleanup levels for soil except for dioxins/furans which is based upon the MTCA Method C industrial standard.

For groundwater, the MTCA Method B (unrestricted use) calculation for the deep groundwater aquifer is appropriate. It assumes exposure through inhalation and ingestion and is based on an acceptable risk level of 1E-6 for individual carcinogens and 1E-5 multiple carcinogens, and an acceptable HI of 1 for noncarcinogens. Both CERCLA and MTCA specify that federal Maximum Contaminant Levels (MCLs) are also applicable cleanup goals for groundwater. However, under MTCA, calculated values must be used where MCLs are considered insufficiently protective. The selected cleanup levels for the Oeser Superfund Site are contained in the following table and Table 29. The following table also contains the MTCA Method C soil cleanup levels, and the MTCA Method B levels and MCLs for groundwater for comparison purposes only.

Cleanup Levels For Soil and Groundwater

Contaminant of Concern	**OESER Cleanup Levels For Soil (mg/kg)**	**OESER Cleanup Levels For Groundwater (Fg/L)**	**MTCA Method C Soil (mg/kg)**	**MTCA Method B Groundwater (Fg/L)**	**Federal Maximum Contaminant Levels (Fg/L)**
cPAHs[a]	**8.9**	**0.012**	18	0.012	0.2
Dioxins/ furans[a]	**0.000875[b]**	**0.000000583[c]**	0.000875	0.000000583	0.00003
PCP	**120**	**1[e]**	1,090	0.729	1
Naphthalene	**262**	**160**	70,000	160	NA
TPH	**1,100**	**500[d]**	2,000	NC	NA

Notes:
a = Clean up levels for cPAHs and dioxins/furans are respectively based on benzo(a)pyrene and 2,3,7,8-TCDD equivalencies.
b = The soil cleanup level for dioxins/furans is based on MTCA Method C for industrial properties.
c = Since the CUL for dioxins/furans is below the lowest achievable PQLs, the PQL will represent the CUL.
d = The cleanup level for TPH is based on MTCA Method A and applies to diesel range and gasoline range organics.
e = The MCL is used for PCP because its risk doesn't exceed 10^{-05}
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.

mg/kg = milligrams of contaminant per kilogram of soil.
Fg/L = micrograms of contaminant per liter of water.
TPH = Total petroleum hydrocarbons.
NA = Not available.
NC = Not a contaminant of concern in groundwater.

Maps that show areas where contamination is above the cleanup levels for surface and subsurface soil can be found in (Figures 10-13). All these areas are on the Oeser property.

9.0 DESCRIPTION OF ALTERNATIVES

9.1 Alternative 1: No Action

The no-action option involves no active remedial efforts and would not reduce the mobility, toxicity, or volume of the contamination in the area of concern. Any potential for human and ecological exposure to contamination would remain.

Existing contamination would remain in place. Organic contaminants would be left to degrade through natural processes such as dilution, dispersion, and biodegradation. Any activities occurring on or near the contaminated areas would be allowed to continue without restriction. There are no additional cost associated with this alternative.

9.2 Alternative 2: Capping

The capping option consists of installing several new caps over approximately five acres of the most contaminated portions of the site and replacing or enhancing the existing caps. Capping would prevent workers from coming in contact with contaminated soil and would reduce the generation of dust. This option would also reduce the potential threat of contamination being washed down into the deep aquifer.

Capping is an easily implemented technology which will allow continued site operations, although there probably would be some temporary disruption to the facility operations during construction. EPA estimates that construction of the new caps and the enhancement of the old asphalt would take less than one year. Limited excavation of contaminated soil and grading to promote proper drainage would be required prior to capping; therefore, the use of heavy equipment would be necessary. Storm water and drainage from the capped areas would also have to be collected and treated to minimize the release of contamination to the creek and surrounding areas.

Institutional controls and long-term operations and maintenance measures would be implemented to ensure that the cap remains in good condition and continues to function as designed.

Institutional controls would also be used to limit access and restrict non-industrial use (e.g. residential or recreational use) of the Oeser property, and to restrict the use of the deep groundwater underlying the Oeser property. Long-term groundwater monitoring would also be implemented. During sampling events for the shallow aquifer, a passive contaminant removal system using oil-absorbing material in the well could be used to remove floating product if present.

The estimated capital cost for this alternative is $2,876,800. The estimated average annual cost for operation and maintenance is $93,000. The estimated Total Present Worth for the alternative is $4,177,000. For cost estimating purposes, the new cap was assumed to have a design from bottom to top consisting of 10" rock foundation base, 3" class B asphalt, geo-textile mats, cold spray liquid membrane, 3" environmental asphalt, 3" low permeability asphalt, 2" top layer of asphalt and 3 coats of sealant. It was also assumed that for cost estimation purposes, the existing asphalt caps (approximately 6 acres) would be enhanced by adding the following material to the existing asphalt; a cold spray liquid membrane, geo-textile mat, 3" of class B asphalt, and 3 coats of sealer.

9.3 Alternative 3: Soil Excavation

This alternative includes the demolition and removal of the wood treating facility (including the existing buildings, structures, and asphalt caps) and the excavation and off-site disposal of approximately 40,700 cubic yards of contaminated soil located on the Oeser property. Removing contaminated soil from the Oeser property would eliminate the soil as a potential source of groundwater contamination. This action would also reduce contaminated soil exposure to workers. The use of heavy equipment would be required and operation of the facility would be disrupted. EPA estimated that the excavation of contaminated materials from the Oeser property, would take approximately one year. Some of the excavated soil would have to be treated prior to disposal. Institutional controls would restrict the use of deep groundwater underlying the Oeser property, and long-term monitoring would be implemented.

The estimated capital cost for this alternative is $13,481,000. The estimated average annual cost for operation and maintenance is $14,600. The estimated Total Present Worth for the alternative is $13,717,000.

9.4 Alternative 4: Capping and Ex-situ Groundwater Treatment

This alternative includes capping contaminated soil and treatment of shallow groundwater. Under this alternative, shallow groundwater would be extracted utilizing extraction wells or trenches on the Oeser property. Contaminated water would be treated using a carbon adsorption system. Treated water would then be discharged to either the local sewer system or to the creek under a NPDES permit.

Similar to Alternative 2, contamination above the cleanup levels would be capped (approximately 5 acres) with temporary disruption to the facility. The existing asphalt caps (approximately 6 acres) would also have to be either replaced or enhanced by adding additional layers of capping materials. The use of heavy equipment would be required and the groundwater extraction system may require long-term operation and maintenance. However, the groundwater treatment system would not require significant space or labor to operate.

Institutional controls would be used to restrict future non-industrial use (e.g. residential or recreational use) of the Oeser property, to limit access, and to restrict the use of deep groundwater underlying the Oeser property. In addition, groundwater would be monitored periodically. EPA estimates that construction of the new cap and the enhancement of the old asphalt would take less than one year and that the extraction and the treatment of shallow groundwater would take approximately 80 days.

The estimated capital cost for this alternative is $3,224,500. The estimated average annual cost for operation and maintenance is $93,000. The estimated Total Present Worth for the alternative is $4,524,000.

9.5 Alternative 5: Ex-situ Soil and Groundwater Treatment

This alternative includes the demolition and removal of the wood treating facility (including the existing buildings, structures, and asphalt caps) and the excavation of approximately 40,700 cubic yards of contaminated soil located on the Oeser property. Approximately 35,000 cubic yards of contaminated soil would be treated on the Oeser property using bioremediation. The treated soil would then be utilized as fill material on the Oeser property. A four-acre land treatment unit would be constructed on the Oeser property under this alternative. Excavation and off-site disposal also may be required in selected areas to remove dioxins/furans-contaminated soil, which bioremediation is less effective in treating.

Shallow groundwater would be remediated in the same manner as Alternative 4. Shallow groundwater would be extracted utilizing extraction wells or trenches on the Oeser property. Contaminated water would be treated using a carbon adsorption system. Institutional controls would restrict the use of deep groundwater underlying the Oeser property and long-term monitoring would be implemented. EPA estimates that the excavation and bioremediation of contaminated materials on the Oeser property would take approximately three to four years.

The estimated capital cost for this alternative is $6,591,000. The estimated average annual cost for operation and maintenance is $27,120. The estimated Total Present Worth for the alternative is $7,155,000.

9.6 Alternative 6: Capping and Excavation

This alternative includes installation of a new cap over approximately 1.5 acres of contaminated soil located just south of the East and West Treatment Areas, and the excavation and off-site disposal of approximately 2,700 cubic yards of soil in the remaining contaminated portions of the site. Areas targeted for excavation have shallow contamination located primarily in the North and South Pole Yards. For cost estimating purposes the existing asphalt caps (approximately 6 acres) were assumed to be enhanced by adding additional layers of capping materials similar to Alterative 2.

This option would significantly reduce the threat of contamination being washed down into the deep aquifer, since the cap would inhibit rain and storm water from flowing into the ground. This alternative would also prevent workers from coming in contact with contaminated soil and would reduce the generation of contaminated dust. Capping and excavation are easily implemented technologies, and will allow for continued site operations although there probably would be some temporary disruption to the facility. Excavation of contaminated soil and grading for the cap construction would require the use of heavy equipment. EPA estimates that soil excavation, construction of the new cap, and the enhancement or replacement of the old asphalt would take approximately one year. Storm water and drainage from the capped areas would also have to be collected and treated to minimize the release of contamination to the creek and surrounding areas.

Institutional controls and long-term operation and maintenance measures would be implemented to ensure protectiveness of the caps. Institutional controls would also be used to restrict non-industrial use (e.g. residential or recreational use) of the Oeser property, to limit access, and to restrict the use of the deep groundwater underlying the Oeser property. Long-term groundwater monitoring would also be implemented. During sampling events for the shallow aquifer, a passive contaminant removal system using oil-absorbing material could also be used to remove floating product and contamination from the wells.

The estimated capital cost for this alternative is $2,570,000. The estimated average annual cost for operation and maintenance is $73,340. The estimated Total Present Worth for the alternative is $3,610,000.

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, EPA used the following nine criteria to evaluate and compare each remedial alternative. While all nine criteria are important, they are weighted differently in the decision-making process depending on whether they are the threshold criteria (protection of human health an the environment and compliance with applicable or relevant and appropriate requirements

[ARARs]) or balancing criteria. Comments on the proposed plan were used to evaluate the preferred alternative regarding the last criteria (community acceptance).

- *Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.*

- *Compliance with applicable or relevant and appropriate requirements addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver.*

- *Long-term effectiveness and permanence refers to expected residual risk and the ability of the remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.*

- *Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.*

- *Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.*

- *Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.*

- *Cost includes estimated capital and operation and maintenance (O&M) cost, as well as present-worth cost.*

- *The State of Washington's acceptance includes consideration of the State's comments on the Proposed Plan and whether they support EPA's preferred alternative.*

- *Community acceptance summarizes the public's general response to the alternatives described in the Proposed Plan and RI/FS Report.*

10.1 Overall Protection of Human Health and the Environment

Alternative 1 would not satisfy the NCP threshold criteria for overall protection of human health and the environment. With respect to contaminated soil at the site, Alternatives 3 and 5 would be most protective of human health and the environment because all soil containing contaminants in excess of the CULs would be removed or treated, significantly reducing the possibility of direct contact with contaminated soil and removing the source of potential future groundwater contamination. Alternatives 2, 4, and 6 also are protective with respect to the risks posed by contaminated soil. Alternatives 2, 4, and 6 would leave existing soil contamination in place but would achieve RAOs through the implementation of institutional controls and by reducing the potential for direct contact with contaminants and limiting contaminant mobility. Since several of the contaminated areas would be excavated under Alternative 6, it would be more protective of human health and the environment than Alternatives 2 and 4.

Alternatives 4 and 5 would be slightly more protective with respect to shallow groundwater contamination, but because the total mass of contamination in shallow groundwater is low relative to the mass in soil, the extraction and treatment of shallow groundwater would not significantly increase the overall protection to human health and the environment. Each of the five action alternatives include the same monitoring requirements and institutional controls for the deep groundwater and therefore would be equally protective in that respect.

10.2 Compliance with ARARs

Alternative 1 would not comply with ARARs. The other five action alternatives would comply with ARARs including the requirements set forth under RCRA, MTCA, CERCLA, CAA and Washington State Dangerous Waste regulations. Alternatives 2, 4, and 6 also must comply with federal and state NPDES requirements associated with design and control of the additional surface water generated from the newly capped areas, which are not included in the other alternatives. ARARs for Alternative 5 also includes Washington State Dangerous Waste Regulations and RCRA requirements for land treatment.

Ongoing operations would continue to be subject to all regulatory requirements governing such operations, including but not limited to RCRA, Washington State’s Dangerous Waste requirements and NPDES requirements. Each of the five action alternatives would require property and groundwater use restrictions. In the case of Oeser's property, restrictive covenants would be required. In summary, with the exception of Alternative 1, all of the action alternatives would be equally compliant with ARARs.

10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness concerns two primary factors: the magnitude of the residual risk remaining from untreated contaminants and the risks remaining at the conclusion of remedial activities. Although natural attenuation of contaminated soil and groundwater would occur under Alternative 1, the risk levels associated with the site would not be reduced for a very long time. Alternatives 3 and 5 would be more permanent and effective over the long-term than Alternatives 2 and 4 because instead of simply reducing contaminant mobility (Alternatives 2 and 4), the contamination would be removed. Alternative 6 would be less permanent and effective than 3 and 5, but more so than 2 and 4. The adequacy and reliability of caps are dependant on frequent inspection and proper maintenance. Thus, regular inspections and maintenance of the cap would be required under Alternatives 2, 4, and 6, but would not be required for excavation under Alternative 3 or for ex-situ treatment under Alternative 5. Shallow groundwater contamination would be addressed more effectively and permanently through Alternatives 4 and 5 (extraction and treatment) than through Alternatives 2, 3, and 6.

To summarize, the long-term effectiveness and permanence of the alternatives in order of most effective and permanent to the least are as follows: Alternative 3, Alternative 5, Alternative 6, Alternative 4, Alternative 2, and then Alternative 1.

10.4 Reduction in Toxicity, Mobility, and Volume Through Treatment

Except by the mechanism of natural attenuation, the toxicity, mobility, and volume of soil contamination would not be reduced through Alternative 1, and the potential for future migration of contaminants to groundwater would remain unchanged. The volume and mobility of soil contamination would be reduced significantly by Alternatives 2, 3, 4, and 6, but not through treatment. The only alternative that would reduce toxicity, mobility, and volume of both soil and groundwater contamination through treatment is Alternative 5. Under Alternative 5, upper-zone groundwater would be treated and some of the contaminated excavated soil would be biologically treated on-site. Alternative 4 would also reduce the toxicity, mobility, and volume of the upper-zone groundwater contamination through treatment.

10.5 Short-Term Effectiveness

There are more short-term impacts associated with Alternatives 3, 5, and 6 than Alternatives 2 and 4; although, all five action alternatives involve heavy equipment operation and increases in traffic, dust generation, and noise. Alternatives 3, 5, and 6 would require the development of extensive health and safety protocols to minimize the hazards associated with excavation and/or demolition. Because contaminated soil would remain on site under Alternative 5, the potential for direct exposure to the contaminated soil would remain until treatment is complete.

The estimated in-field operational periods for each action alternative increase progressively. It is estimated that under Alternatives 2, 4, and 6 it would take one month to install the cap. Under Alternative 3, it is estimated that it would take three months to excavate; under Alternative 6, it is estimated that excavation would be completed in one month; and under Alternative 5 it is estimated that excavation would take four months and bioremediation would last approximately five years.

All of the action alternatives involve the use of heavy equipment; however, Alternatives 3, 5, and 6 would require more attention to health and safety protocols than Alternatives 2 and 4. In summary, short-term effectiveness associated with implementation of alternatives from the highest to the lowest are: Alternative 2, Alternative 4, Alternative 6, Alternative 3, Alternative 5, and then Alternative 1.

10.6 Implementability

Alternative 1 requires no implementation. Alternatives 2 and 4 would be the easiest to implement. Although re-grading and drainage control may be required for Alternatives 2, 4, and 6, all the necessary equipment, materials, and contractors are readily available in the vicinity of the site. Coordination with Oeser would be required to minimize disruption to the operation of the facility. Alternatives 2, 4, and 6 would require additional storm water controls for the newly capped areas and the implementation of institutional controls to restrict future land use and groundwater use on site. Both of these elements are also easily implementable.

Alternatives 3 and 5 would require Oeser to relocate the wood treating facilities to a different part of the site or to cease operations until the remedial construction is completed. If Oeser shut down operations, it would be easier to implement Alternatives 3 and 5 but these alternatives would involve the use of heavy equipment over a longer period of time than the other alternatives. Additionally, the implementability of ex-situ bioremediation (Alternative 5) would need to be demonstrated through treatability testing. Although this technology has been effective at other sites with similar contaminants, the technology's site-specific effectiveness must be demonstrated by bench-scale and/or pilot-scale studies.

Alternative 6 would require some excavation and therefore is more difficult to implement than Alternatives 2 and 4, but more easily implementable than Alternatives 3 and 5. With respect to implementability, the alternatives in order of the easiest to implement to the most difficult to implement are as follows: Alternative 1, Alternative 2, Alternative 4, Alternative 6, Alternative 3, and then Alternative 5.

10.7 Cost

There are no costs associated with implementing Alternative 1. The capital cost and total present worth for Alternatives 2, 4, and 6 are similar and are the lowest of the action alternatives. The capital cost and total present worth of Alternative 5 are significantly higher than Alternatives 2 and 4, but are substantially less than the total capital cost and total present worth of Alternative 3.

Although the capital costs associated with Alternatives 2, 4, and 6 are the lowest of the action alternatives, the annual O&M costs and the annual O&M present worth are the highest of the five action alternatives. The increased O&M cost for Alternatives 2, 4, and 6 is due to the increased monitoring and maintenance activities associated with implementing the three alternatives. The annual O&M costs for Alternative 5 are higher than the O&M costs for Alternatives 2, 4, and 6 during treatment but decrease significantly after treatment of the excavated soil is complete. Because the annual O&M costs for Alternative 5 decrease substantially after completing treatment, the annual O&M present worth of Alternative 5 is less than the annual O&M present worth of Alternatives 2 and 4. The annual O&M cost and annual O&M present worth of Alternative 3 are the lowest of the action alternatives as only limited environmental monitoring is associated with the long-term operations of this alternative.

The overall present worth of each alternative is calculated by summing the capital cost and the annual O&M present worth. The total present worth for the other alternatives was calculated assuming 30 years of operation and maintenance and a discount rate of 5% even though O&M would be needed in perpetuity. The cost estimated are targeted to be within +50% to -30% of the actual cost. The alternatives with the lowest present worth to the highest are as follows: Alternative 1, Alternative 6, Alternative 2, Alternative 4, Alternative 5, and then Alternative 3.

10.8 State Acceptance

Since the Superfund site is located in the State of Washington, EPA has already consulted with the Washington State Department of Ecology on the Proposed Plan. The State agreed with EPA's selected remedy (Alternative 6), during the review of the Proposed Plan.

10.9 Community Acceptance

EPA has carefully considered all comments submitted during the public comment period and taken them into account during the selection of the remedy. EPA’s responses to comments received during the public comment period are included in the attached Responsiveness Summary (Appendix D). Some of the comments support EPA’s preferred alternative and some comments do not support EPA’s preferred alternative. For the remedy on the Oeser property, Oeser and the Oeser Cedar Cleanup Coalition (OCCC) were generally supportive of Alternative 6. However, several people preferred that the operating facility be closed down and the site completely excavated (Alternative 3). For the off-property areas, several comments requested that EPA address odors from the operating facility and that EPA conduct further studies and cleanup in Little Squalicum Creek.

11.0 SELECTED REMEDY (ALTERNATIVE 6)

11.1 Summary of the Selected Remedy

The threshold criteria which must be met for the selected remedy are 1) overall protection of human health and the environment and 2) compliance with ARARs. The balancing criteria which are used to weigh major trade-offs among alternatives are 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility, or volume through treatment; 5) short-term effectiveness; 6) implementability; and 7) cost. The modifying criteria are 8) State acceptance; and 9) community acceptance.

EPA has determined that no remedial action is necessary for the South Slope Area, Little Squalicum Creek and Residential Neighborhood. Based upon the existing data, these areas currently are not considered part of the Oeser Superfund Site. EPA is selecting Alternative 6 as the final cleanup remedy for the Oeser Superfund Site (Oeser property). EPA's selected remedy for the Oeser property contains the following major elements:

- Excavation or capping of contaminated soils located on the Oeser property in the North Pole Yard and South Pole Yard.

- Excavation or capping of contaminated soils on the Oeser property in the primary wood treating areas (Treated Pole Area, North Treatment Area, East Treatment Area, West Treatment Area, Wood Storage Area) in coordination with RCRA/Washington State Dangerous Waste Regulations requirements.

- Institutional controls on the Oeser property restricting groundwater use and non-industrial land use.

- Monitoring groundwater on the Oeser property and passive removal of NAPL, if detected.

- Operation and maintenance of the remedy selected above.

EPA's selected remedy meets the statutory threshold criteria and balancing criteria and is generally accepted by the State and the community. Table 30 contains a summary of the comparison of alternatives for the threshold and balancing criteria. The Washington State Department of Ecology agreed with the selected remedy when it was presented in the proposed plan. For the remedy on Oeser's property, Oeser and the OCCC were generally supportive of the selected remedy but had different opinions on what areas and how much should be capped or excavated. However, several people preferred that the operating facility be closed down and the site completely excavated. For the off-property areas, several commentors requested that EPA address odors from the operating facility and that EPA conduct further studies and cleanup in Little Squalicum Creek. The comments and EPA's responses are further discussed in the Responsiveness Summary (Appendix C).

11.2 Description of Selected Remedy

The selected remedy includes the capping and excavation and off-site disposal of contaminated soil above the site cleanup levels. Based upon the existing data, areas that need to be remediated are identified in Figure 14. A condition of this remedy is the implementation of institutional controls as described in Section 11.2.3. In the event that the institutional controls are not implemented, site operations change, or the Oeser Company ceases operations, additional excavation and site cleanup may be required.

11.2.1 Excavation or Capping in the North and South Pole Yards

EPA has identified contaminated soils in the North Pole Yard and the South Pole Yard that need to be remediated. The contaminated soils that must be remediated are those soils that exceed the cleanup levels established in Chapter 8 of this ROD. Based upon the existing data, the soils that need to be remediated are identified in Figure 14.

Additional sampling of the contaminated areas in the North and South Pole Yards will be conducted during the remedial design to better define the areas that need to be excavated or capped. The final decision to excavate or cap an area will be made by EPA. This additional sampling would reduce the need to conduct verification sampling after areas are excavated. Visual inspections and field testing with quick or real time turnarounds will be used as EPA deems necessary to help confirm that contaminated soil above the CULs is removed or capped.

Contaminated soil that is excavated will be de-watered, as necessary, and loaded onto rail cars or trucks. The contaminated soil will be transported to an appropriate landfill or treatment facility. After excavation is complete, excavated areas will be backfilled with clean fill and re-vegetated as necessary. During excavation, backfill, and restoration activities, air will be monitored continuously by the construction manager for fine particulate levels both upwind and downwind of these dust-generating activities. Dust control measures will be required, especially if dust emissions above a pre-determined level occur. These measures may include spraying water or other dust controlling procedures, depending on the area of concern.

Contaminated soil that is capped will be capped in a manner that prevents direct contact with surface soil contamination. RCRA and the Washington State Dangerous Waste Regulations are relevant and appropriate for designing a cap that is protective of direct contact with surface soil contamination in this area of the Site. Accordingly, the cap must be built on an appropriate foundation with a minimum of four inches of asphalt or concrete and a protective sealer must be applied to the surface in a manner that prevents exposure and minimizes maintenance. O&M plans will be developed to maintain the integrity of the caps.

11.2.2 Excavation or Capping in the Primary Wood Treating Areas

EPA has identified contaminated soils in the Primary Wood Treating Areas (Treated Pole Area, North Treatment Area, East Treatment Area, West Treatment Area, Wood Storage Area) that need to be remediated. The contaminated soils that must be remediated pursuant to CERCLA are those soils that exceed the cleanup levels established in Chapter 8 of this ROD. Based upon the existing data, the soils that need to be remediated are identified in Figure 14.

The remediation of the contaminated soils in the Primary Wood Treating Area is affected by the ongoing wood treating operations of the Oeser Company and related regulatory requirements imposed by RCRA and the Washington State Dangerous Waste Regulations. The ongoing wood treating operations of the Oeser Company involve the use of heavy equipment and chemicals that could affect the integrity of the remedy. The ongoing wood treating operations of the Oeser Company also involve drip pads and other regulated units that have regulatory specifications separate from the CERCLA cleanup action. The regulatory requirements of RCRA and the Washington's Dangerous Waste Regulations impose a number of requirements that Oeser must comply with independent of the CERCLA cleanup and some requirements that must be incorporated into the CERCLA cleanup as ARARs.

Since the selected remedy involves excavation and capping of areas where hazardous waste has been disposed, EPA has determined that the RCRA and Washington State Dangerous Waste Regulations closure requirements are applicable or relevant and appropriate to all or portions of the primary wood treating areas. The RCRA and Washington State Dangerous Waste Regulations closure requirements mandate specific performance criteria for areas that are being capped to prevent direct contact with surface soil and to reduce vertical contaminant migration. The performance standards for caps are specified under RCRA in 40 CFR §265.111 (Closure Performance Standards) and 40 CFR §265.310 (Landfill Closure).

The timing and implementation of the excavation and capping in the primary wood treating areas will be coordinated with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations. The final decision to excavate or cap an area will be made by EPA.

11.2.3 Institutional Controls

A restrictive easement or covenant that runs with the land and an enforcement order or consent decree will be required to forbid future non-industrial (e.g., residential or recreational) use of the entire Oeser property unless the site is cleaned up to be protective for residential use or other non-industrial uses. The restrictive easement or covenant will also preserve the integrity of the caps to ensure that they are not breeched without prior EPA approval. Operational use restrictions on the cap will also be necessary to preserve the integrity of the cap and to ensure long-term protection of human health and the environment.

In addition, institutional controls will be employed to restrict the use of shallow and deep groundwater at the facility. Institutional controls for the deep groundwater involve implementing restrictions that will prevent the installation of wells for use as potable water on Oeser's property until the groundwater meets the cleanup level for use as drinking water. It is expected that this restriction will be part of a restrictive covenant that runs with the land and enforcement order or consent decree.

11.2.4 Groundwater Monitoring

A Field Sampling Plan will be developed prior to completion of the construction of the new caps which will include groundwater monitoring. The plan will identify the wells that will be sampled in the shallow and deep zones, and specify the contaminants to be analyzed, the frequency of sampling, the sampling methods and quality assurance procedures. A Quality Assurance Project Plan will also be prepared to define laboratory analytical procedures. The groundwater monitoring for CERCLA will be coordinated with the RCRA groundwater monitoring requirements.

11.2.4.1 Shallow Groundwater Monitoring

Monitoring that will be implemented for the shallow groundwater includes periodic sampling of the shallow groundwater for NAPL and contaminants of concern. The monitoring program for the shallow groundwater likely will consist of water level measurements, field measurements of water quality parameters, and collection and analysis of samples from shallow groundwater monitoring wells at the site. Shallow groundwater monitoring wells that likely will be included in the monitoring program will be the three wells that contained NAPL prior to the 1997/1998 Removal Action and wells co-located with deep wells that will be monitored as part of the deep groundwater monitoring program. Analytical data will be compared to previous data to determine the effectiveness of the action taken.

If NAPL is found in wells during the monitoring program, actions will be taken to remove it. Under the selected remedy, a passive removal system, rather than an active removal system, will be employed. A passive removal system is expected to be almost as effective as an active removal system but will not involve any additional space or power requirements and will be less labor-intensive. The passive removal system includes installing an oil-absorbent material in the wells containing NAPL then removing it once saturated. Because the absorbent material is hydrophobic, it only picks up NAPL. Once removed from the well, the NAPL-saturated absorbent material will be transported offsite to a treatment, storage, and disposal facility, for proper treatment and disposal.

11.2.4.2 Deep Groundwater Monitoring

Monitoring to be implemented for the deep groundwater will include periodic sampling of the deep groundwater zone. The objective of this monitoring will be to record significant changes in plume concentrations and shape in order to ensure that the plume is not migrating off the Oeser property and to determine when the cleanup levels have been achieved. Such an objective will be accomplished by collecting and analyzing samples from the wells that define the maximum geographic extent of possible remediation efforts and from the single well with the highest concentrations of contaminants. The following existing wells at Oeser are the wells that likely will be the most beneficial for monitoring: MW05-D, MW33-D, MW02-D, MW35-D, MW06-D, and MWLSC03.

11.2.4.3 Other Local Groundwater Testing Requirements

Water quality testing is required for new land development in Whatcom County, including subdivision and commercial building. When there are suspected contaminants in the groundwater, the county can require that the groundwater be tested specifically for those contaminants. If the levels of contaminants exceed drinking water standards, the groundwater cannot be used for human consumption until groundwater treatment has reduced contaminant levels below drinking water standards. The contamination present at the property and the treatment method will be noted on the property deed. Potential future property owners will become aware of the contamination when performing the title search on the property.

Whatcom County currently requires a water quality disclosure statement as part of all property sales. The disclosure statement provides information to the potential buyer regarding well testing and analytical results, known contamination, and other issues concerning the water quality at the property in question. This gives the prospective property buyer information about the property's water quality prior to purchasing the property. It also provides information as to whether or not the installation of a drinking water well on the property would be appropriate and if the water contained in the well would meet drinking water standards.

11.2.5 Operation and Maintenance

For the newly installed and renovated capped areas, an O&M plan will be developed. Long-term O&M of the cap will involve inspecting the cap's structural integrity, conducting preventative maintenance on the cap, and repairing damage to the cap as necessary into perpetuity. As part of the O&M of the cap, the drainage system will require inspection, preventative maintenance, cleaning, and repairs as necessary into perpetuity.

11.3 Cost Estimate for the Selected Remedy

The cost estimates in this ROD are based on the premise that areas with surface (shallow) contamination would be excavated and areas with subsurface (deep) contamination would be capped. Details of the cost estimate are contained in Tables 31-34.

11.3.1 Cost Assumptions for Capping

For the cost estimate contained in this ROD, it was assumed that a new cap would be installed over approximately 1.5 acres of contaminated soil located next to the operating facility near the center of the site (Figure 14). It was also assumed that the existing asphalt caps (approximately 6 acres) would be enhanced by adding additional layers of capping materials. Cost estimates included costs for mobilizing construction equipment, establishing a site office, and demobilizing. Capital costs associated with capping include the cost of materials associated with improving the existing cap, installing a new cap, and drainage improvements. Capital costs also include direct and indirect costs such as project management, engineering and design, construction oversight, and legal fees.

11.3.2 Cost Assumptions for Excavation

For the cost estimate it was estimated that approximately 2,700 cubic yards (Table 31) of contaminated soil would be excavated and disposed offsite at a RCRA Subtitle C landfill. As necessary, some of the material may have to be treated offsite prior to disposal. It was assumed that the excavated areas would then be backfilled with clean soil, covered with a 6-inch layer of topsoil, and seeded for erosion control.

Confirmation sampling would also be conducted to confirm that soil contamination above the cleanup levels has been removed from the site. It was assumed that a total of 25 samples would be collected under this alternative. All confirmation samples would be submitted to a commercial laboratory for dioxin and semivolatile organic compound (SVOC) analysis with a standard turnaround time.

11.3.3 Cost Assumptions for Shallow and Deep Groundwater Monitoring

Shallow and deep groundwater sampling is assumed to take place twice a year for the first five years of the project, then occur once a year thereafter. For the cost estimate, it is assumed that groundwater samples from six shallow wells and six deep wells would be collected and submit for SVOC and dioxin analysis. QA/QC review and reporting, and shipment costs were also included in the cost estimate.

For cost estimating purposes, monitoring for NAPL is assumed to take place twice a year for the life of the project. It is anticipated that a two-person crew would spend one day at the site, twice a year, monitoring for the presence of NAPL; removing and replacing absorbent booms from wells suspected of containing NAPL, and properly disposing of the used absorbent.

11.3.4 Operation and Maintenance (O&M) Costs

O&M costs include the cost to maintain the structural integrity of the caps for the first thirty years. The estimated maintenance costs include the cost to repair the asphalt concrete paving layer and paving fabric, and the additional maintenance costs of applying top seal coating to the capped areas once every two years. O&M cost beyond 30 years are not included in the cost estimate.

11.3.5. Summary of Estimated Total Costs of Selected Remedy

The accuracy of the cost estimate for the selected remedy is -30% to +50%. The estimated capital cost for this alternative is $2,570,000. The estimated average annual cost for operation and maintenance is $73,340. The estimated Total Present Worth for the alternative is $3,610,000 which was based upon assuming a discount rate of 5% for 30 years.

11.4 Estimated Outcomes of Selected Remedy

The expected outcome of the selected remedy in terms of resulting land use and groundwater use is described below:

- The Oeser property is currently zoned, "heavy impact industrial." With the completion of the selected remedy, the property will continue to be available for industrial use (i.e. non-residential use).
- Upon achieving the cleanup standards for groundwater in the deep aquifer in the next thirty years, groundwater could potentially be used without restrictions. It is not anticipated that groundwater directly under the site would ever be used for drinking water.
- The selected remedy will allow for the continued operation of the Oeser facility (or other industrial uses) which will provide jobs and tax revenues to the community.
- Completion of the remedy will also protect human health and the environment for the surrounding community and future employees working at the Oeser property.

12.0 STATUTORY DETERMINATIONS

The remedy selected in this ROD is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

12.1 Protection of Human Health and the Environment

The remedy selected in this ROD is protective of human health and the environment for the short and long term. The final remedy will permanently reduce the risks presently posed to human health and the environment through a combination of excavation and off site disposal of wastes or by preventing contact with waste using a combination of a low permeability cover and institutional controls. The low permeability cover will also minimize infiltration, thus reducing the potential migration of contaminated groundwater.

12.2 Applicable, Relevant and Appropriate Requirements (ARARs)

The selected remedy is expected to comply with all action-specific, chemical-specific and location-specific Federal and State applicable or relevant and appropriate requirements. The ARARs for the selected remedy are set forth below:

12.2.1 Washington State Dangerous Waste Regulations and RCRA

The Washington State Dangerous Waste Regulations for interim status facilities incorporate by reference the standards set forth in the RCRA regulations. The RCRA regulations establish performance standards that are applicable or relevant and appropriate for the construction and maintenance of caps to the extent that the caps are being designed to prevent direct contact with surface soil contamination and to reduce vertical contaminant migration by minimizing storm water infiltration. The specific RCRA regulations are 40 CFR §265.111 (Closure Performance Standards), 40 CFR §265.117 (Post-Closure Care), and 40 CFR §265.310 (Landfill Closure).

WAC 173-303-060 to 100 establish procedures for determining whether excavated soils are a dangerous waste subject to specific requirements for handling, transport and disposal.

40 CFR §265.90 to 265.92 (Ground-Water Monitoring) establish procedures for groundwater monitoring that are applicable or relevant and appropriate for monitoring attainment of cleanup levels for the contaminants of concern being addressed by this response action.

12.2.2 Washington State Implementation Plan (Dust Control and Air Emissions)

WAC 173-470 (Ambient Air Quality Standards for Particulate Matter) identifies suspended particulate standards which are relevant and appropriate for monitoring excavation activities associated with the soil removal. These standards will be met during construction activities by controlling dust and air emissions.

12.2.3 State of Washington Model Toxics Cleanup Program (MTCA)

WAC 173-340-745 establishes the cleanup levels that are being used for dioxin in soils. The cleanup levels selected for the other contaminants considered the MTCA cleanup calculations and utilized other site-specific risk assessment methodologies.

WAC 173-340-720 establishes groundwater cleanup standards for the deep aquifer.

WAC 173-340-440 is applicable to the institutional control requirements.

12.2.4 State of Washington Regulations Relating To Well Construction

WAC 173-160 establishes minimum standards for water well construction. This regulation will be applicable to wells constructed for groundwater monitoring purposes. This regulation is also applicable to the decommissioning of existing or future wells.

12.3 Cost-Effectiveness

The selected remedy is cost-effective because it provides overall effectiveness proportional to its costs such that it represents a reasonable value for the money to be spent.

12.4 Utilization of Permanent Solutions and Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Oeser site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal, and considering State and community acceptance.

12.5 Preference for Treatment as a Principal Element

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site whenever practicable [NCP §300.430(a)(1)(iii)(A)]. Principal threat waste includes waste with high concentrations of toxic compounds or is highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health and the environment should exposure occur.

Most of the principal threat waste at Oeser has already been excavated and treated offsite using incineration during EPA's 1998 removal action. The remaining principal threat waste is located directly under the operating treatment facility near the center of the site and is not practicable to remove. Although the material is not very mobile, the soils contain high levels of PCP, PAHs, and dioxins/furans. Because treatment of the accessible principal threats waste was conducted, this remedy does satisfy the statutory preference for treatment as a principal element of the remedy.

12.6 Five-year Reviews

Because this remedial action will result in hazardous substances remaining on the site above health-based levels, a statutory review will be conducted no less often than every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes to the remedy, as originally identified in the Proposed Plan, were necessary. There were some minor cost adjustments to reflect revised estimates for the amount of soil to be excavated or size of areas capped.

APPENDICES

APPENDIX B: TABLES

Table 1
OESER PROPERTY - NORTH POLE YARD SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.000041 - 0.12378	6/6	-	3/6	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	38.04 - 19084.5	6/6	-	6/6	3.9
Petroleum Hydrocarbons (mg/kg)					
TPH	37 - 38.7	2/2	-	NA	NA
Other Organics (mg/kg)					
Naphthalene	0.0022 - 0.054	5/6	0.04 - 0.04	0/6	55.92
Pentachlorophenol	0.077 - 110	6/6	-	2/6	2.98

Key:
cPAHs = Carcinogenic polycyclic aromatic hydrocarbon.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TPH = Total petroleum hydrocarbons

Table 2
OESER PROPERTY - SOUTH POLE YARD SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.002943 - 29.544	5/5	-	2/5	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	0.8864 - 7691.572	9/9	-	8/9	3.9
Petroleum Hydrocarbons (mg/kg)					
TPH	13 - 443.9	3/5	-	NA	NA
Other Organics (mg/kg)					
Naphthalene	0.0023 - 2.1	4/5	0.0051 - 0.0051	0/5	55.92
Pentachlorophenol	0.035 - 18	5/5	-	2/5	2.98

Key:
cPAHs = Carcinogenic polycyclic aromatic hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 3
OESER PROPERTY - NORTH TREATMENT AREA SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.108341 - 4.20344	7/7	-	7/7	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	6.701 - 16996	13/13	-	13/13	3.9
Petroleum (mg/kg)					
TPH	233.7 - 292	3/4	-	NA	NA
Other Organics (mg/kg)					
Naphthalene	0.017 - 0.11	7/7	-	0/7	55.92
Pentachlorophenol	0.76 - 72	7/7	-	4/7	2.98

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 4
OESER PROPERTY - WOOD STORAGE AREA SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.07194 - 5.95967	7/7	-	7/7	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	52.167 - 3769.577	5/5	-	5/5	3.9
Petroleum (mg/kg)					
TPH	43.4 - 162.3	5/5	-	NA	NA
Other Organics (mg/kg)					
Naphthalene	0.028 - 0.418	7/7	-	0/7	55.92
Pentachlorophenol	0.14 - 7.87	7/7	-	3/7	2.98

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 5
OESER PROPERTY - TREATED POLE AREA SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.006687 - 12.887	7/7	-	4/7	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	299.193 - 6911	4/4	-	4/4	3.9
Other Organics (mg/kg)					
Naphthalene	0.012 - 0.195	4/7	0.185 - 0.55	0/7	55.92
Pentachlorophenol	0.151 - 34	6/7	0.185 - 0.185	3/7	2.98

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.

Table 6
RESIDENTIAL BACKGROUND SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection	Frequency Exceeding	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.000115 - 0.936238	9/10	-	3/10	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	0.777 - 18.8	10/10	-	6/10	3.9
Other Organics (mg/kg)					
Naphthalene	0.102 - 0.196	4/10	0.139 - 0.188	0/10	55.92

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity Equivalency Quotient

Table 7
RESIDENTIAL OFF-PROPERTY SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.000103 - 2.21134	16/27	-	6/27	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	0.571 - 47.36	27/27	-	17/27	3.9
Other Organics (mg/kg)					
Naphthalene	0.0477 - 0.161	8/27	0.146 - 0.255	0/27	55.92

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity Equivalency Quotient.

Table 8
OPEN FIELD BACKGROUND SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.0000596 - 0.224709	4/10	-	1/10	0.062
Dioxin/Furan (ng/kg)					
2,3,7,8-TCDD TEQ	0.12 - 2.81	10/10	-	0/10	3.9
Other Organics (mg/kg)					
Naphthalene	0.0574 - 0.144	5/10	0.154 - 0.179	0/10	55.92

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity Equivalency Quotient

Table 9
OPEN FIELD OFF-PROPERTY SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection	Frequency Exceeding	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.000055 - 0.896212	10/28	-	5/28	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	0.279 - 434.90	28/28	-	17/28	3.9
Other Organics (mg/kg)					
Naphthalene	0.0546 - 0.592	9/28	0.129 - 0.265	0/28	55.92
Pentachlorophenol	1.53	1/28	0.646 - 1.32	0/28	2.98

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity Equivalency Quotient.

Table 10
SOUTH SLOPE SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.000055 - 1.09645	11/15	-	3/15	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	2.717 - 195.0865	15/15	-	12/15	3.9
Petroleum (mg/kg)					
TPH	6.5 - 41.8	4/10	-	0/4	
Other Organics (mg/kg)					
Naphthalene	0.0059 - 0.39	13/15	0.157 - 0.191	0/15	55.92
Pentachlorophenol	0.0056 - 0.41	7/15	0.011 - 1.09	0/15	2.98

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Pacific Groundwater Group.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalency quotient.
TPH = Total petroleum hydrocarbons

Table 11
LITTLE SQUALICUM CREEK SURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (mg/kg)					
B(a)P Equivalent	0.027268 -135,904	8/10	-	7/10	0.062
Dioxins/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	0.843 - 1560.985	10/10	-	8/10	3.9
Petroleum (mg/kg)					
TPH	48.6 - 5533	6/6	-	NA	NA
Other Organics (mg/kg)					
Naphthalene	0.03 - 5.5	6/10	0.0022 - 0.156	0/10	55.92
Pentachlorophenol	1.1 - 2.2	5/10	0.011 - 0.781	0/10	2.98

Key:
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 12 OESER PROPERTY - NORTH POLE YARD SUBSURFACE SOIL The Oeser Company Superfund Site					
Analyte	**Range of Detected Concentrations**	**Detection Frequency**	**Range of Detection Limits**	**Frequency Exceeding EPA PRGs**	**Region 9 EPA PRGs**
Subsurface (0.5 to<6 Feet BGS)					
cPAHs (mg/kg)	0.01215 - 25.559	2/4	-	1/4	0.062
Dioxins/Furans (ng/kg)	.046267 - 1119.613	3/3	-	2/3	3.9
TPH (mg/kg)	170 - 262	2/4	-	NA	NA
Naphthalene (mg/kg)	1.5	1/4	0.0024 - 0.023	0/4	55.92
Pentachlorophenol (mg/kg)	0.0092 - 490	3/4	0.012 - 0.012	2/4	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	0.006507 - 0.04868	2/4	-	0/4	0.062
Dioxins/Furans (ng/kg)	0.13131 - 51.03	2/2	-	½	3.9
TPH (mg/kg)	1892.6	1/4	-	NA	NA
Naphthalene (mg/kg)	1.3	1/4	0.0024 - 0.0025	0/4	55.92
Pentachlorophenol (mg/kg)	0.19	1/3	0.012 - 0.013	0/3	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.0009	1/4	-	0/4	0.062
Dioxins/Furans (ng/kg)	0.3457043	1/1	-	0/1	3.9
TPH (mg/kg)					
Naphthalene (mg/kg)	0.0017	1/4	0.0026 - 0.0029	0/4	55.92
Pentachlorophenol (mg/kg)	0.038	1/4	0.013 - 0.014	0/4	2.98

Key:
- B(a)P = Benzo(a)pyrene.
- bgs = Below ground surface.
- cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
- mg/kg = Milligrams per kilogram.
- NA = Not applicable.
- ng/kg = Nanograms per kilogram.
- PRG = Preliminary Remediation Goal.
- TCDD = Tetrachlorodibenzo-p-dioxin.
- TEQ = Toxicity equivalent quotient.
- TPH = Total petroleum hydrocarbons

Table 13
OESER PROPERTY - SOUTH POLE YARD SUBSURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRG
Subsurface (0.5 to<6 Feet BGS					
cPAHs (mg/kg)	0.0000038 - 1.53602	5/7	-	4/7	0.062
Dioxins/Furans (ng/kg)	0.00774 - 0.58848	2/2	-	0/2	3.9
TPH (mg/kg)	85.3	1/6	-	NA	NA
Naphthalene	0.0068 - 0.079	5/7	0.002 - 0.0022	0/7	55.92
Pentachlorophenol (mg/kg)	0.0091 - 8.6	37747	0.011 - 0.011	1/7	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	71.464	1/9	-	1/9	0.062
Dioxins/Furans (ng/kg)	0.0569 - 1157.81	3/4	-	1/4	3.9
TPH (mg/kg)	6535	1/7	-	NA	NA
Naphthalene	0.0025 - 510	4/9	0.0019 - 0.0024	1/9	55.92
Pentachlorophenol (mg/kg)	0.035 - 200	3/7	0.0097 - 0.012	1/7	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.0002 - 0.008663	3/13	-	0/13	0.062
Dioxins/Furans (ng/kg)	0.0982784	1/1	-	0/1	3.9
TPH (mg/kg)					
Naphthalene (mg/kg)	0.029 - 0.48	4/13	0.0018 - 0.04	0/13	55.92
Pentachlorophenol (mg/kg)	0.0037 - 0.8	4/10	0.0081 - 0.012	0/10	2.98

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 14
OESER PROPERTY - NORTH TREATMENT AREA SUBSURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRG
Subsurface (0.5 to<6 Feet BGS					
cPAHs (mg/kg)	0.00127 - 163.698	9/15	-	4/15	0.062
Dioxins/Furans (ng/kg)	0.200 - 1706.6	2/2	-	½	3.9
TPH (mg/kg)	11 - 5221	6/8	-	NA	NA
Naphthalene	0.0018 - 17	7/15	0.0021 - 0.391	0/15	55.92
Pentachlorophenol (mg/kg)	0.027 - 520	9/15	0.01 - 0.391	4/15	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	0.0000065 - 18.552	13/29	-	8/29	0.062
Dioxins/Furans (ng/kg)	0.0141 - 908.347	5/6	-	3/6	3.9
TPH (mg/kg)	24 - 4723	7/13	28 - 28	NA	NA
Naphthalene	0.0054 - 410	12/29	0.0018 - 0.042	4/29	55.92
Pentachlorophenol (mg/kg)	0.017 - 60	16/28	0.0089 - 0.6	9/28	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.000036 - 17.62	22/47	-	14/47	0.062
Dioxins/Furans (ng/kg)	0.03102 - 564.468	2/6	-	1/6	3.9
TPH (mg/kg)	5.3 - 20000	12/18	-	NA	NA
Naphthalene (mg/kg)	0.0011 - 550	24/47	0.0016 - 0.04	7/47	55.92
Pentachlorophenol (mg/kg)	0.0096 - 110	24/47	0.0082 - 2.8	12/47	2.98

Key:
B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 15
OESER PROPERTY - WOOD STORAGE AREA SUBSURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
Subsurface (0.5 to<6 Feet BGS)					
cPAHs (mg/kg)	0.042563 - 0.46377	5/8	-	3/8	0.062
Dioxins/Furans (ng/kg)	1.567 - 563.045	2/2	-	½	3.9
TPH (mg/kg)	8.3 - 531	4/6	-	NA	NA
Naphthalene	0.002 - 1.5	5/8	0.0019 - 0.375	0/8	55.92
Pentachlorophenol (mg/kg)	0.0091 - 19	5/7	0.012 - 0.375	1/7	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	0.007504 - 1.283	4/15	-	3/15	0.062
Dioxins/Furans (ng/kg)	0.01286	1/1	-	0/1	3.89857
TPH (mg/kg)	7.6 - 624.1	3/8	-	NA	NA
Naphthalene	0.014 - 11	6/15	0.0018 - 0.046	0/15	55.92
Pentachlorophenol (mg/kg)	0.021 - 39	5/14	0.009 - 0.19	3/14	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)					
Dioxins/Furans (ng/kg)					
TPH (mg/kg)	9.2 - 16.3	5/12	-	NA	NA
Naphthalene (mg/kg)	0.0011 - 0.085	4/26	0.0016 - 0.201	0/26	55.92
Pentachlorophenol (mg/kg)	0.0027	1/20	0.0082 - 1	0/20	2.98

Key:
B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 16
OESER PROPERTY - TREATED POLE AREA SUBSURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
Subsurface (0.5 to<6 Feet BGS)					
cPAHs (mg/kg)	0.000495 - 10.29	5/11	-	3/11	0.062
Dioxins/Furans (ng/kg)	2.620 - 6.492	2/2	-	½	3.9
TPH (mg/kg)	11.7 - 18.6	2/4	-	NA	NA
Naphthalene	0.67 - 25	2/11	0.0019 - 0.338	0/11	55.92
Pentachlorophenol (mg/kg)	0.0084 - 2.2	3/11	0.01 - 0.338	0/11	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	0.5751 - 0.7539	2/7	-	2/7	0.062
Dioxins/Furans (ng/kg)	0.000281 - 1.171	2/2	-	0/2	3.9
TPH (mg/kg)	18 - 7900	2/4	-	NA	NA
Naphthalene	0.0022 - 310	3/7	0.002 - 0.206	2/7	55.92
Pentachlorophenol (mg/kg)	0.134 - 12	4/7	0.011 - 0.012	2/7	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.002938	1/9	-	0/9	0.062
Dioxins/Furans (ng/kg)	0.00727	1/1	-	0/1	3.9
TPH (mg/kg)	11.3	1/7	-	NA	NA
Naphthalene (mg/kg)	0.006	1/9	0.0016 - 0.036	0/9	55.92
Pentachlorophenol (mg/kg)	0.043 - 0.05	2/9	0.0081 - 0.14	0/9	2.98

Key:
B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 17 **OESER PROPERTY - EAST TREATMENT AREA SUBSURFACE SOIL** **The Oeser Company Superfund Site**					
Analyte	**Range of Detected Concentrations**	**Detection Frequency**	**Range of Detection Limits**	**Frequency Exceeding EPA PRGs**	**Region 9 EPA PRGs**
Subsurface (0.5 to<6 Feet BGS)					
cPAHs (mg/kg)	0.0071 - 59.196	13/17	-	9/17	0.062
Dioxins/Furans (ng/kg)					
TPH (mg/kg)					
Naphthalene	0.043 - 39	10/17	0.042 - 0.91	0/17	55.92
Pentachlorophenol (mg/kg)	0.73 - 480	16/17	0.41 - 0.41	12/17	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	0.00654 - 45.44	13/18	-	10/18	0.062
Dioxins/Furans (ng/kg)					
TPH (mg/kg)					
Naphthalene	0.054 - 180	14/18	0.043 - 0.82	3/18	55.92
Pentachlorophenol (mg/kg)	0.24 - 300	16/18	0.18 - 3.1	13/18	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.00043 - 76.23	21/37	-	16/37	0.062
Dioxins/Furans (ng/kg)					
TPH (mg/kg)					
Naphthalene (mg/kg)	0.037 - 270	22/37	0.037 - 0.079	3/37	55.92
Pentachlorophenol (mg/kg)	0.054 - 810	28/37	0.14 - 0.16	18/37	2.98

Key:
B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 18
OESER PROPERTY - WEST TREATMENT AREA SUBSURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
Subsurface (0.5 to<6 Feet BGS)					
cPAHs (mg/kg)	0.02317 - 155.5	6/8	-	5/8	0.062
Dioxins/Furans (ng/kg)	104.52 - 1267.2	2/2	-	2/2	3.9
TPH (mg/kg)	6175.6	1/1	-	NA	NA
Naphthalene	0.35 - 2900	3/8	0.0052 - 0.406	2/8	55.92
Pentachlorophenol (mg/kg)	0.066 - 76	4/6	0.028 - 0.404	2/6	2.98
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)	0.000069 - 64.063	12/14	-	8/14	0.062
Dioxins/Furans (ng/kg)					
TPH (mg/kg)	640 - 1300	2/2	-	NA	NA
Naphthalene	0.0059 - 700	12/14	0.039 - 0.046	3/14	55.92
Pentachlorophenol (mg/kg)	0.022 - 25	7/12	0.16 - 3	2/12	2.98
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.0000075 - 146.62	31/42	-	22/42	0.062
Dioxins/Furans (ng/kg)	0.000001404 - 0.003611	4/4	-	3/4	3.9
TPH (mg/kg)	500 - 26600	6/6	-	NA	NA
Naphthalene (mg/kg)	0.0069 - 2200	38/44	0.037 - 0.263	11/44	55.92
Pentachlorophenol (mg/kg)	0.0055 - 140	18/35	0.025 - 16	6/35	2.98

Key:
B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 19
OFF-PROPERTY - SOUTH SLOPE SUBSURFACE SOIL
The Oeser Company Superfund Site

Analyte	Range of Detected Concentrations	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
Subsurface (0.5 to<6 Feet BGS)					
cPAHs (mg/kg)	No analytes detected.				
Dioxins/Furans (ng/kg)	No analytes detected.				
TPH (mg/kg)	No analytes detected.				
Naphthalene	No analytes detected.				
Pentachlorophenol (mg/kg)	No analytes detected.				
Subsurface (6 to <12 Feet BGS)					
cPAHs (mg/kg)					
Dioxins/Furans (ng/kg)	0.1535499	1/3	-	0/3	3.89857
TPH (mg/kg)					
Naphthalene					
Pentachlorophenol (mg/kg)					
Subsurface (>12 FEET BGS)					
cPAHs (mg/kg)	0.0000023 - 0.006	2/13	-	0/13	0.062
Dioxins/Furans (ng/kg)	0.0219 - 0.0426	2/6	-	0/6	3.9
TPH (mg/kg)					
Naphthalene (mg/kg)	0.002	1/13	0.002 - 0.0026	0/13	55.92
Pentachlorophenol (mg/kg)					

Key:
B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.
TPH = Total petroleum hydrocarbons

Table 20
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
THE OESER COMPANY SUPERFUND SITE

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
Deep Groundwater						
cPAHs (ug/L)						
B(a)P Equivalent	0.0007575	0.41548	21/90	-	16/90	0.0092
Benzo(a)anthracene	0.0075	0.75	15/90	0.0047 - 0.83	4/90	0.0921
Benzo(a)pyrene	0.0075	0.28	14/90	0.0047 - 1.4	11/90	0.0092
Benzo(b)fluoranthene	0.01	0.58	17/63	0.0047 - 0.13	6/63	0.0921
Benzo(k)fluoranthene	0.0075	0.27	11/63	0.00625 - 0.35	0/63	0.921
Chrysene	0.0075	0.83	14/63	0.0047 - 0.49	0/63	9.2098
Dibenzo(a,h)anthracene	0.013	0.013	1/29	0.00625 - 0.58	1/29	0.0092
Indeno(1,2,3-cd)pyrene	0.0075	0.033	7/29	0.00625 - 0.26	0/29	0.0921
Other Organics (ug/L)						
Naphthalene	0.014	7.2	28/78	0.033 - 1	1/78	6.2029
Pentachlorophenol	0.089	17	38/74	0.069 - 6.9	22/74	
Shallow Groundwater						
cPAHs (ug/L)						
B(a)P Equivalent	0.000027	1,577.1	38/70	-	35/70	0.0092
Benzo(a)anthracene	0.056	2,400	35/69	0.0049 - 1,000	34/69	0.0921
Benzo(a)pyrene	0.38	1,100	32/69	0.0049 - 1,000	32/69	0.0092
Benzo(b)fluoranthene	0.63	2,100	31/69	0.0049 - 1,000	31/69	0.0921
Benzo(k)fluoranthene	0.24	540	36/69	0.0049 - 1,000	20/69	0.921
Chrysene	0.027	2,700	36/70	0.0049 - 1,000	16/70	9.2098
Dibenzo(a,h)anthracene	0.081	9	7/54	0.0049 - 1,000	7/54	0.0092
Indeno(1,2,3-cd)pyrene	0.23	190	19/67	0.0049 - 1,000	18/67	0.0921
Other Organics (ug/L)						
Naphthalene	0.017	43,000	43/70	0.031 - 1,000	36/70	6.20
Pentachlorophenol	0.078	120,000	52/68	0.049 - 7	50/68	0.5603

Key:

cPAHs = Carcinogenic polycyclic aromatic hydrocarbon.
PRG = Preliminary remediation goal.
ug/L = Microgram per liter.

Table 21
AIR QUALITY AT THE PROPERTY BOUNDARY
THE OESER COMPANY SUPERFUND SITE

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	Region 9 EPA PRGs
cPAHs (ug/m^3)						
B(a)P Equivalent	0.0000000131	0.00187676	60/60	-	0/60	0.00216
Benzo(a)anthracene	0.0000148	0.00411	59/60	0.0000131 - 0.0000131	0/60	0.02160
Benzo(a)pyrene	0.0000146	0.00118	59/60	0.0000137 - 0.0000137	0/60	0.00216
Benzo(b)fluoranthene	0.0000177	0.00242	60/60	-	0/60	0.0216
Chrysene	0.0000131	0.00725	60/60	-	0/60	2.16
Dibenzo(a,h)anthracene	0.000016	0.000186	36/60	0.000011 - 0.005	0/60	0.00216
Indeno(1,2,3-cd)pyrene	0.0000168	0.000652	60/60	-	0/60	0.0216
Dioxins/Furans (ug/m^3)						
1,2,3,4,6,7,8-HpCDD	0.000000053	0.000266	60/60	-	12/60	0.00000448
1,2,3,4,6,7,8-HpCDF	0.0000000298	0.00000121	29/60	0.00000000578 - 0.0000483	0/60	0.00000448
1,2,3,4,7,8,9-HpCDF	0.0000000273	0.00000237	25/60	0.00000000578 - 0.0000061	0/60	0.00000448
1,2,3,4,7,8-HxCDD	0.0000000321	0.00000314	33/60	0.000000016 - 0.000015	3/60	0.000000448
1,2,3,4,7,8-HxCDF	0.0000000299	0.00000181	32/60	0.000000008 - 0.0000053	2/60	0.000000448
1,2,3,6,7,8-HxCDD	0.000000045	0.00000966	40/60	0.0000000113 - 0.000014	8/60	0.000000448
1,2,3,6,7,8-HxCDF	0.0000000225	0.000000435	28/60	0.00000000625 - 0.0000042	0/60	0.000000448
1,2,3,7,8,9-HxCDD	0.0000000428	0.00000483	34/60	0.0000000113 - 0.000013	6/60	0.000000448
1,2,3,7,8,9-HxCDF	0.000000016	0.000000167	15/60	0.00000000464 - 0.0000038	0/60	0.000000448
1,2,3,7,8-PeCDD	0.0000000294	0.000000845	31/60	0.00000000762 - 0.000018	25/60	0.0000000448
1,2,3,7,8-PeCDF	0.0000000168	0.00000029	16/60	0.0000000113 - 0.000013	0/60	0.000000896
2,3,4,6,7,8-HxCDF	0.0000000208	0.00000114	29/60	0.000000007 - 0.0000041	2/60	0.000000448
2,3,4,7,8-PeCDF	0.00000002	0.00000041	28/60	0.0000000118 - 0.000013	6/60	0.0000000896
2,3,7,8-TCDD	0.0000000159	0.000000179	18/60	0.00000000675 - 0.0000056	6/66	0.0000000448
2,3,7,8-TCDD TEQ	0.000000000000526	0.000000222	60/60	-	35/60	0.0000000448
2,3,7,8-TCDF	0.00000000941	0.000000222	12/60	0.00000000572 - 0.0000086	0/60	0.000000448
OCDD	0.0000000526	0.00179	60/60	0.0000000275 - 0.000034	2/60	0.000448
OCDF	0.0000000441	0.000114	52/60	0.0000000248 - 0.000019	0/60	0.000448
Other Organics (ug/m^3)						
Naphthalene	0.000175	1.12	60/60	-	0/60	3.12
Pentachlorophenol	0.0528	10.4	24/60	0.044 - 40	23/60	0.056

Key:

cPAHs	= Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
ng/kg	= Nanograms per kilogram.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.

Table 22
LITTLE SQUALICUM CREEK SURFACE WATER
THE OESER COMPANY SUPERFUND SITE

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding SLs	Preliminary Screening Levels
cPAHs (ug/L)						
Benzo(a)pyrene	0.0053	0.2	9/18	0.0047 - 0.0099	8/19	0.014
Dibenzo(a,h)anthracene	0.023	0.023	1/18	0.0047 - 0.01	NA	NA
Indeno(1,2,3-cd)pyrene	0.0073	0.2	4/18	0.0047 - 0.0099	NA	NA
Dioxins/Furans (pg/L)						
1,2,3,4,6,7,8-HpCDD	18.88	4,553.618	10/17	4.359 - 44.1	NA	NA
1,2,3,4,6,7,8-HpCDF	18.751	592.388	6/17	2.468 - 57.574	NA	NA
1,2,3,6,7,8-HxCDD	48.661	147.171	4/9	3.802 - 14.648	NA	NA
1,2,3,7,8,9-HxCDD	53.916	53.916	1/9	4.359 - 44.1	NA	NA
2,3,7,8-TCDD TEQ	0.011	17.701	11/13	-	2/13	10
OCDD	111.934	26,433.854	13/17	12.647 - 63.694	NA	NA
OCDF	25.507	3,311.486	11/17	3.455 - 26.403	NA	NA
Petroleum Hydrocarbons (ug/L)						
C12-C36 Aliphatics	58	110	5/9	47 - 49	NA	NA
C16-C36 Aromatics	7.9	58	3/17	47 - 50	NA	NA
EPH	7.9	121	7/7	-	NA	NA
Other Organics (ug/L)						
Naphthalene	0.0063	0.18	8/18	0.0047 - 0.4	0/18	24
Pentachlorophenol	0.027	21	11/18	0.024 - 0.48	2/18	13

Key:

cPAHs = Carcinogenic polycyclic aromatic hydrocarbon.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
NA = Not available.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
SLs = Screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.

Table 23
LITTLE SQUALICUM CREEK SEDIMENT
THE OESER COMPANY SUPERFUND SITE

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding SLs	Preliminar y Screening Levels
cPAHs (mg/kg)						
Benzo(a)anthracene	0.003	3.7	10/11	0.011 - 0.011	0/11	5
Benzo(a)pyrene	0.0041	2.4	10/11	0.011 - 0.011	4/11	0.43
Benzo(j)fluoranthene	0.0044	0.82	10/11	0.11 - 0.11	0/11	NA
Benzo(k)fluoranthene	0.0044	0.82	10/11	0.011 - 0.011	0/11	11
Chrysene	0.0098	8.3	10/11	0.011 - 0.011	1/11	7.4
Dibenzo(a,h)anthracene	0.0087	0.16	6/11	0.0022 - 0.011	0/11	0.23
Indeno(1,2,3-cd)pyrene	0.0022	0.96	9/11	0.0024 - 0.011	0/11	NA
Dioxins/Furans (ng/kg)						
1,2,3,4,6,7,8-HpCDD	232.022	26,154.979	11/11	-	NA	NA
1,2,3,4,6,7,8-HpCDF	54.344	6,065.149	11/11	-	NA	NA
1,2,3,4,7,8,9-HpCDF	4.226	116.955	8/11	9.421 - 296.912	NA	NA
1,2,3,4,7,8-HxCDD	4.34	196.558	6/11	1.073 - 15.386	NA	NA
1,2,3,6,7,8-HxCDD	13.971	803.393	11/11	-	NA	NA
1,2,3,6,7,8-HxCDF	3.51	43.159	5/11	1.423 - 39.108	NA	NA
1,2,3,7,8,9-HxCDD	3.598	454	11/11	-	NA	NA
1,2,3,7,8,9-HxCDF	2.81	8	3/11	2.253 - 61.91	NA	NA
1,2,3,7,8-PeCDD	2.305	53.971	6/11	0.568 - 5.553	NA	NA
1,2,3,7,8-PeCDF	1.594	1.594	1/11	0.287 - 22.305	NA	NA
2,3,4,7,8-PeCDF	1.678	32.741	5/11	0.501 - 26.214	NA	NA
2,3,7,8-TCDD TEQ	5.343	579.932	11/11	-	9/11	8.8
2,3,7,8-TCDF	1.374	8.993	5/11	1.856 - 0.579	NA	NA
OCDD	1,912	317,675.38	11/11	-	NA	NA
OCDF	119.636	50,005.429	11/11	-	NA	NA
Other Organics (mg/kg)						
Naphthalene	0.0035	0.048	9/11	0.0022 - 0.011	0/11	0.48
Pentachlorophenol	0.0037	2.9	10/11	0.054 - 0.054	4/11	0.36

Key:

cPAHs = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
NA = Not available.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
SLs = Screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.

Table 24
SUMMARY OF ANALYTICAL RESULTS FROM BERRIES
THE OESER COMPANY SUPERFUND SITE

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding SLs	Preliminary Screening Levels
Dioxins/Furans (ng/kg)						
1,2,3,4,6,7,8-HpCDD	1.065	2.695	2/8	0.922 - 3.186	0/8	29300
2,3,7,8-TCDD TEQ	0.001	0.030	7/7	-	0/7	293
OCDD	9.447	31.07	7/8	10.892 - 10.892	0/8	2930000
OCDF	2.715	2.905	2/8	0.871 - 2.519	0/8	2930000
Other Organics (mg/kg)						
Naphthalene	-	-	0/8	0.00032 - 0.00036	0/8	37.60

Key:

cPAHs = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
NA = Not available.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
SLs = Screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.

Table 25
Contaminants of Potential Concern
The Oeser Company Superfund Site

Air	Berries	Groundwater	Sediment	Surface Water	Soil
B(a)P equivalent	None	B(a)P equivalent	B(a)P equivalent	B(a)P equivalent	Acenaphthene
1,2,3,4,6,7,8-HpCDD		2,3,7,8-TCDD TEQ	Benzo(a)anthracene	Benzo(a)pyrene	B(a)P equivalent
1,2,3,6,7,8-HxCDD		EPH	Benzo(a)pyrene	1,2,3,7,8,9-HxCDD	Benzidine
1,2,3,4,7,8-HxCDD		Naphthalene	Benzo(b)fluoranthene	1,2,3,4,6,7,8-HpCDD	Benzo(a)anthracene
1,2,3,7,8,9-HxCDD		Pentachlorophenol	Benzo(k)fluoranthene	1,2,3,4,6,7,8-HpCDF	Benzo(a)pyrene
1,2,3,7,8-PeCDD			Benzo(j)fluoranthene	1,2,3,6,7,8-HxCDD	Benzo(b)fluoranthene
2,3,7,8-TCDD TEQ			Dibenzo(a,e)pyrene	OCDD	Benzo(k)fluoranthene
1,2,4-Trimethylbenzene			Dibenzo(a,h)anthracene	2,3,7,8-TCDD TEQ	Chrysene
1,3,5-Trimethylbenzene			Dibenzo(a,h)pyrene	Pentachlorophenol	Dibenzo(a,e)pyrene
2-Methylnaphthalene			Dibenzo(a,j)pyrene		Dibenzo(a,h)anthracene
Naphthalene			Dibenzo(a,l)pyrene		Dibenzo(a,h)pyrene
Benzene			7,12-Dimethylbenz(a)anthracene		Dibenzo(a,i)pyrene
sec-Butylbenzene			Indeno(1,2,3-cd)pyrene		7,12-Dimethylbenz(a)anthracene
Dibenzofuran			1,2,3,4,6,7,8-HpCDD		Fluoranthene
Pentachlorophenol			1,2,3,4,6,7,8-HpCDF		Fluorene
n-Propylbenzene			1,2,3,4,7,8-HxCDD		Indeno(1,2,3-cd)pyrene
			1,2,3,6,7,8-HxCDD		1,2,3,4,6,7,8-HpCDD
			1,2,3,6,7,8-HxCDF		1,2,3,4,6,7,8-HpCDF
			1,2,3,7,8,9-HxCDD		1,2,3,4,7,8,9-HpCDF
			1,2,3,7,8-PeCDD		1,2,3,4,7,8-HxCDD
			2,3,4,7,8-PeCDF		1,2,3,4,7,8-HxCDF

Table 25 (Continued) Contaminants of Potential Concern The Oeser Company Superfund Site					
Air	**Berries**	**Groundwater**	**Sediment**	**Surface Water**	**Soil**
			2,3,7,8-TCDD TEQ		1,2,3,6,7,8-HxCDD
			OCDD		1,2,3,6,7,8-HxCDF
			OCDF		1,2,3,7,8,9-HxCDD
					1,2,3,7,8,9-HxCDF
					2,3,4,6,7,8-HxCDF
					1,2,3,7,8-PeCDD
					1,2,3,7,8-PeCDF
					2,3,4,7,8-PeCDF
					2,3,7,8-TCDD
					2,3,7,8-TCDF
					OCDD
					OCDF
					2,3,7,8-TCDD TEQ
					2-Methylnaphthalene
					Naphthalene
					Phenanthrene
					Pentachlorophenol
					Pyrene
					Total EPH
					Total VPH

Table 26
SUMMARY OF HUMAN HEALTH RISK ASSESSMENT ASSUMPTIONS
THE OESER COMPANY SUPERFUND SITE

	Exposure Scenario			
Assumption	**Current/Future Resident**	**Reference**	**Current/Future Child Resident**	**Reference**
Exposure Factors - Reasonable Maximum Exposure				
Groundwater Ingestion Rate	2 L/day[a]	EPA 1989	1 L/day[a]	EPA 1989
Fraction of Water Ingested	1	EPA 1989	1	EPA 1989
Soil Ingestion Rate	100 mg/day	EPA 1991	200 mg/day	EPA 1991
Fraction of Soil Contacted	1	EPA 1991	1	EPA 1991
Skin Surface Area - soil	2,500 cm^2 [b]	EPA 2000a	2,200 cm^2 [c]	EPA 2000a
Skin Surface Area - water	18,000 cm^2 [a]	EPA 2000a	6,500 cm^2 [a]	EPA 2000a
Skin Surface Area - sediment	NA	NA	NA	NA
Inhalation Rate	20 m^3/day	EPA 1991	10 m^3/day	EPA 1989
Event Frequency - soil/sediment	1	EPA 2000a	1	EPA 2000a
Exposure Time - water	0.25 hours/day	EPA 1998	0.25 hours/day	EPA 1998
Exposure Frequency	350 days/year	EPA 1991	350 days/year	EPA 1991
Exposure Duration	24 years	EPA 1991	6 years	EPA 1991
Body Weight	70 kg	EPA 1989	15 kg	EPA 1989
Averaging Time - noncancer	8,760 days	EPA 1989	2,190 days	EPA 1989
Averaging Time - cancer	25,550 days	EPA 1989	25,550 days	EPA 1989
Soil-Skin Adherence Factor	0.1 mg/cm^2	EPA 2000a	0.2 mg/cm^2	EPA 2000a
Soil Particulate Emission Factor	2.1E+9 m^3/kg	EPA 1996	2.1E+9 m^3/kg	EPA 1996
Risk Management				
Acceptable Range for Excess Lifetime Cancer Risk: 1E-06 to 1E-04 for all scenarios				
Threshold for Non-Cancer Health Effects: Hazard Index = 1 for all scenarios				

Notes: Non-chemical-specific assumptions listed only.
a = Future Condition only.
b = Skin surface area is based on average area of head, face, hands, and forearms.
c = Skin surface area is based on average area of head, face, hands, forearms, and legs.
d = Skin surface area is based on average area of head, face, hands, and forearms.
e = Skin surface area based on boys, age 12-13 years. The percentage of surface area for half legs (15%) was multiplied by the 90th percentile whole body skin surface area for 12-13 year olds.
BPJ = Best Professional Judgement
NA = Not applicable
cm^2 = square centimeter
kg = kilogram
L = liter
m^3 = cubic meter
mg = milligram

EPA 1989, Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A, Interim Final.
EPA 1991, Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors, Interim Final.
EPA 1996, Soil Screening Guidance.
EPA 1997, Exposure Factors Handbook.
EPA 1998, Interim Final Guidance: Developing Risk-Based Cleanup Levels at Resource Conservation and Recovery Act Sites in Region 10.
EPA 2000a, Risk Assessment Guidance for Superfund: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Draft Guidance, (recently updated as EPA 2001, Interim Final).
EPA 2000b, Region 10 Supplemental Human Health Risk Assessment Guidance, Office of Environmental Assessment, Soil Ingestion Rates.

Table 26 (Continued)
SUMMARY OF HUMAN HEALTH RISK ASSESSMENT ASSUMPTIONS
THE OESER COMPANY SUPERFUND SITE

Assumption	Exposure Scenario: Current/ Future Adult On-site Worker	Reference	Current/Future Adolescent Recreational User	Reference
Exposure Factors - Reasonable Maximum Exposure				
Groundwater Ingestion Rate	2 L/day[a]	EPA 1989	NA	NA
Fraction of Water Ingested	0.5	BPJ	NA	NA
Soil Ingestion Rate	200 mg/day	EPA 2000b	100 mg/day	EPA 1991
Fraction of Soil Contacted	0.5	BPJ	0.25	BPJ
Skin Surface Area - soil	2,500 cm^2 [d]	EPA 2000a	2,500 cm^2 [e]	EPA 2000a
Skin Surface Area - water	NA	NA	2,400 cm^2 [e]	EPA 1997
Skin Surface Area - sediment	NA	NA	2,400 cm^2 [e]	EPA 1997
Inhalation Rate	20 m^3/day	EPA 1991	20 m^3/day	EPA 1991
Event Frequency - soil/sediment	1	EPA 2000a	1	EPA 2000a
Exposure Time - water	NA	NA	4 hours/day	BPJ
Exposure Frequency	250 days/year	EPA 1991	104 days/year	BPJ
Exposure Duration	25 years	EPA 1991	11 years	BPJ
Body Weight	70 kg	EPA 1989	49 kg	EPA 1997
Averaging Time - noncancer	9,125 days	EPA 1989	4,015 days	EPA 1989
Averaging Time - cancer	25,550 days	EPA 1989	25,550 days	EPA 1989
Soil-Skin Adherence Factor	0.2 mg/cm^2	EPA 2000a	0.1mg/cm^2	EPA 2000a
Soil Particulate Emission Factor	2.1E+9 m3	EPA 1996	2.1E+9 m^3/kg	EPA 1996
Risk Management				
Acceptable Range for Excess Lifetime Cancer Risk: 1E-06 to 1E-04 for all scenarios				
Threshold for Non-Cancer Health Effects: Hazard Index = 1 for all scenarios				

Notes: Non-chemical-specific assumptions listed only.
- a = Future Condition only.
- b = Skin surface area is based on average area of head, face, hands, and forearms.
- c = Skin surface area is based on average area of head, face, hands, forearms, and legs.
- d = Skin surface area is based on average area of head, face, hands, and forearms.
- e = Skin surface area based on boys, age 12-13 years. The percentage of surface area for half legs (15%) was multiplied by the 90th percentile whole body skin surface area for 12-13 year olds.
- BPJ = Best Professional Judgement
- NA = Not applicable
- cm^2 = square centimeter
- kg = kilogram
- L = liter
- m^3 = cubic meter
- mg = milligram

EPA 1989, Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A, Interim Final.
EPA 1991, Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors, Interim Final.
EPA 1996, Soil Screening Guidance.
EPA 1997, Exposure Factors Handbook.
EPA 1998, Interim Final Guidance: Developing Risk-Based Cleanup Levels at Resource Conservation and Recovery Act Sites in Region 10.
EPA 2000a, Risk Assessment Guidance for Superfund: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Draft Guidance, (recently updated as EPA 2001, Interim Final).
EPA 2000b, Region 10 Supplemental Human Health Risk Assessment Guidance, Office of Environmental Assessment, Soil Ingestion Rates.

Table 27
Excess Lifetime Cancer Risks
The Oeser Company Superfund Site

Scenario	Receptor	Medium	Range of Cancer Risks	Primary Contaminants of Potential Concern
Current	Off-Facility Residents	Soil	4E-06 to 4E-05	Benzo(a)pyrene equivalents, Dioxin equivalents
Current	On-Facility Workers	Soil	5E-04 to 1E-03	Dioxin equivalents
Current	Off-Facility Recreational Visitors	Soil	1E-06 to 4E-05	Benzo(a)pyrene equivalents, total petroleum hydrocarbons
Future	On-Facility Residents	Soil	2E-03 to 7E-03	Dioxin equivalents
Future	On-Facility Workers	Soil	6E-04 to 2E-03	Dioxin equivalents
Future	On-Facility Residents	Soil*	1E-06 to 5E-03	Benzo(a)pyrene equivalents, Dioxin equivalents
Future	On-Facility Workers	Soil*	5E-07 to 2E-03	Benzo(a)pyrene equivalents, Dioxin equivalents, total petroleum hydrocarbons
Future	Off-Facility Recreational Visitors	Soil*	1E-08 to 7E-08	NA
Current/Future	Off-Facility Recreational Visitors	Sediment	5E-07 to 8E-07	NA
Current	Off-Facility Workers	Groundwater	2E-04 to 4E-04	NA**
Future	On-Facility Residents	Groundwater	8E-04 to 1E-03	Benzo(a)pyrene equivalents, Dioxin equivalents
Future	On-Facility Workers	Groundwater	6E-06 to 1E-05	Benzo(a)pyrene equivalents, Dioxin equivalents
Current	Off-Facility Recreational Visitors	Surface Water	5E-04	Dioxin equivalents
Current	Off-Facility Residents	Air	3E-06 to 3E-05	Dioxin equivalents, benzene, pentachlorophenol
Current	Off-Facility Recreational Visitors	Air	8E-08 to 1E-06	NA

* - For some future scenarios, exposures to soil include surface and subsurface soil based on the assumption that future development may result in excavation and transport of subsurface soils to the surface.
** - Although risks were elevated, contaminants of potential concern were not listed because risks are based on detection limits.

Table 28
Hazard Indices
The Oeser Company Superfund Site

Scenario	Receptor	Medium	Range of Hazard Indices	Primary Contaminants of Potential Concern
Current	On-Facility Workers	Soil	0.0005 to 0.001	NA
Current	Off-Facility Recreational Visitors	Soil	0.5	NA
Future	On-Facility Residents	Soil	0.007 to 0.08	NA
Future	On-Facility Workers	Soil	0.001 to 0.01	NA
Future	On-Facility Residents	Soil*	0.006 to 70	Naphthalene, total petroleum hydrocarbons
Future	On-Facility Workers	Soil*	0.001 to 11	Naphthalene, total petroleum hydrocarbons
Future	On-Facility Residents	Groundwater	0.01 to 0.5	NA
Future	On-Facility Workers	Groundwater	0.0001 to 0.0002	NA
Current	Off-Facility Recreational Visitors	Surface Water	0.05	NA
Current	Off-Facility Residents	Air	0.06 to 5	1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, 2-methylnaphthalene, n-propylbenzene, naphthalene, pentachlorophenol, sec-butylbenzene, dibenzofuran
Current	Off-Facility Recreational Visitors	Air	0.003 to 0.2	NA

* - For future scenarios, exposures to soil include surface and subsurface soil based on the assumption that future development may result in excavation and transport of subsurface soils to the surface.

Table 29

Cleanup Levels For Soil and Groundwater

The Oeser Superfund Site

Contaminant of Concern	Site-Specific Cleanup Levels For Soil (mg/kg)	MTCA Cleanup Levels For Groundwater (Fg/L)
cPAHs[a]	8.9	0.012
Dioxins/furans[a]	0.000875[b]	0.000000583[c]
Pentachlorophenol	120	1
Naphthalene	262	160
TPH	1,100	500[d]

Notes:

a = Clean up levels for cPAHs and dioxins/furans are respectively based on benzo(a)pyrene and 2,3,7,8-TCDD equivalencies.

b = The soil cleanup level for dioxins/furans is based on MTCA Method C for industrial properties.

c = Since the CUL for dioxins/furans is below the lowest achievable PQLs, the PQL will represent the CLU.

d = The cleanup level for TPH is based on MTCA Method A and applies to diesel range and gasoline range organics.

cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.

mg/kg = milligrams of contaminant per kilogram of soil.

Fg/L = micrograms of contaminant per liter of water.

TPH = Total petroleum hydrocarbons.

Table 30
COMPARATIVE ANALYSIS SUMMARY
THE OESER COMPANY SUPERFUND SITE

Criterion	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Excavation	Alternative 4: Capping and Ex-Situ Groundwater Treatment	Alternative 5: Ex-Situ Soil and Groundwater Treatment	Alternative 6: Capping and Excavation
Overall Protection of Human Health and the Environment	Not protective	Protective	Protective	Protective	Protective	Protective
Compliance with ARARs	No	Yes	Yes	Yes	Yes	Yes
Long-Term Effectiveness and Permanence	Not Effective	Effective	Effective	Effective	Effective	Effective
Reduction of Toxicity, Mobility, or Volume Through Treatment	No Treatment	No Treatment	No Treatment	No Treatment for Soil. Some Treatment for Groundwater.	Some Reduction in Toxicity, Mobility, and Volume of Soil and Groundwater Contamination.	No Treatment
Short-Term Effectiveness	Not applicable	Effective	Moderately Effective	Effective	Moderately Effective	Effective
Implementability	Easily Implemented	Easily Implemented	Implementation Would Disrupt Current Operations.	Moderately Implementable	Implementation Would Disrupt Current Operations	Easily Implemented
Present Worth Cost[a]	No Additional Costs	$4.2 million	$13.7 million	$4.5 million	$7.2 million	$3.6 million

Key:

a = The Present Worth Cost for each alternative was calculated assuming a discount rate of 5% for a period of 30 years.
ARARs = Applicable or relevant and appropriate requirements.

Table 31
AREAS FOR CAPPING AND VOLUMES FOR EXCAVATION
THE OESER COMPANY SUPERFUND SITE

Subarea	Subarea Size	Proposed Cap Size	Proposed Excavation Volume
North Pole Yard	8.53 acres	None	929 cubic yards
South Pole Yard	3.93 acres	0.19 acres	845 cubic yards
Treated Pole Area	2.99 acres	None	351 cubic yards
North Treatment Area	4.53 acres	0.15 acres	503 cubic yards
West Treatment Area	0.41 acres	0.06 acres	None
East Treatment Area	0.63 acres	0.08 acres	None
Wood Storage Area	4.59 acres	1.05 acres	38 cubic yards
Total	25.61 acres	1.53 acres	2,666 cubic yards

Table 32
Capital Cost Estimate for Alternative 6: Capping & Excavation
The Oeser Company Superfund Site

CAPITAL COSTS	Unit Cost	Unit	Qty	Total
Mobilization/Demobilization				
Construction equipment	$500.00	LS	1	$500.00
Temporary Office 32'X8'	$239.68	mo	2	$479.36
Temporary Storage Trailer 28'X10'	$106.40	mo	2	$212.80
Temporary Utilities & Hookups	$300.00	mo	2	$600.00
Capping				
Existing Cap Improvements				
Seal Coating (3 coats) 0.28/sy each	$0.84	sy	28,943	$24,312.29
Asphalt Concrete 3" Wearing Course	$6.75	sy	28,943	$195,366.60
Cold-spray Applied Membrane and Fabric	$11.70	sy	28,943	$338,635.44
Tack Coat	$0.29	sy	28,943	$8,393.53
Additional Capping				
Seal Coating (3 coats) 0.28/sy each	$0.84	sy	7,415	$6,228.50
Asphalt Concrete 3" Wearing Course	$6.75	sy	7,415	$50,050.44
Cold-spray Applied Membrane and Fabric	$11.70	sy	7,415	$86,754.10
Tack Coat	$0.29	sy	7,415	$2,150.32
Asphalt Concrete 3" Wearing Course	$6.75	sy	7,415	$50,050.00
Paving Fabric	$2.00	sy	7,415	$14,829.76
3" Environmental Asphalt Concrete Paving	$9.39	sy	7,415	$69,625.72
2" Asphalt Stabilized Base Course	$1.85	sy	7,415	$13,717.53
10" Crushed Gravel Base	$6.60	sy	7,415	$48,938.21
6 oz. Non-Woven Geotextile	$1.06	sy	7,415	$7,859.77
Drainage Improvements over Capping Areas				
Wood Storage Area:				
Area drains with grates, 6' deep	$2,450.33	ea	1	$2,450.33
8" dia., Corrugated HDPE Type S piping with gaskets	$6.00	lf	500	$3,000.00
Excavation and Loading				
Excavate All Areas	$2.20	cy	2,666	$5,865.20
Digital Dust Sampler, Monthly Rental	$850.00	mo	6	$5,100.00
Backfill				
Haul, Place, and Compact	$13.60	cy	2,666	$36,257.60
Topsoil, 6" lifts, off-site source	$25.32	cy	807	$20,433.24
Seeding, Vegetative Cover	$3,480.00	acre	1	$3,480.00
Transportation & Disposal				
Excavated Soil	$110.00	ton	4,067	$447,400.00

Table 32 (Continued)
Capital Cost Estimate for Alternative 6: Capping & Excavation
The Oeser Company Superfund Site

CAPITAL COSTS	Unit Cost	Unit	Qty	Total
Sampling Crew	$150.00	hrs	104	$15,600.00
Dioxin Analysis (EPA 8290), Std Turnaround, Std. QC, soil	$740.00	sample	25	$18,500.00
Base, Neutral, Acid (EPA 8270C), Std Turnaround, Std. QC, soil	$253.00	sample	25	$6,325.00
Sampling Supplies	$20.00	sample	25	$500.00
Sample Shipment	$2.08	lb	150	$312.00
QA/QC Review and Reporting	$50.20	hr	10	$502.00
Capital Cost Subtotal:				**$1,484,400.00**
Direct Capital Costs				
Total Construction cost				$1,484,400.00
Subcontracting Overhead			10%	$148,440.00
Bid and Scope Contingency (15% + 15%)			30%	$489,852.00
Total Direct Capital Costs (rounded to $100)				**$2,122,700.00**
Indirect Capital Costs				
Legal Fees and License/Permit Costs			1%	$21,227.00
Engineering and Design			6%	$127,362.00
Project Management			5%	$106,135.00
Contractor Reporting Requirements			3%	$63,681.00
Construction Oversight			6%	$127,362.00
Total Indirect Capital Costs (Rounded to $100)				**$445,800.00**
TOTAL CAPITAL COSTS:				**$2,568,500.00**

Work Statement:
This cost estimated assumes that an expanded asphalt cap would be constructed consisting of (from top to bottom): 3 coats of seal coating, a 3-inch layer of Class B Asphalt Concrete Paving, cold-spray applied membrane and geotextile, another 3-inch layer of Class B Asphalt Concrete Paving, paving fabric, a 3-inch layer of environmental asphalt concrete paving, a 2-inch asphalt stabilized top course layer, a 10-inch crushed rock base placed on top of geotextile that overlies the native soil. This alternative also includes the excavation and off-site disposal of contaminated soil from the areas around the site where treated wood is not handled. Excavated soil was assumed to be shipped off site to a RCRA Subtitle C landfill.

Assumptions:
Accuracy: (-30% to +50%)
Base Year: 2003
Discount Rate: 5%
O&M : 30 years

Table 33
Cost Estimate for Operation and Maintenance
The Oeser Company Superfund Site

OPERATIONS & MAINTENANCE COSTS	Unit Cost	Unit	Qty	Total
Institutional Controls				
Total Annual Monitoring Cost for Years 1-5	$33,200.00	year	1	$33,200.00
Total Annual Monitoring Cost for Years 6 - 30	$16,600.00	year	1	$16,600.00
Repairs & Maintenance				
Top seal coating - once every 2 yrs	$0.35	sy	36,348	$12,720.00
Patching ACPs & Paving Fabric 3% annually	$17.44	sy	1,090	$19,010.00
Patching ACPs & Paving Fabric 6% annually	$17.44	sy	2,180	$38,020.00
Patching ACPs & Paving Fabric 10% annually	$17.44	sy	3,630	$63,310.00
NAPL Removal				
Crew	$150.00	hr	16	$2,400.00
Oil-only SOC (flexible absorbent tube)	$48.18	case	1	$48.18
Disposal of absorbent material	$0.36	lb	44	$15.84
Annual NAPL Removal Costs				$2,500.00

Assumptions:

Accuracy: (-30% to +50%)
Base Year: 2003
Discount Rate: 5%
O&M : 30 years

Table 34
PRESENT WORTH ANALYSIS FOR ALTERNATIVE 6: CAPPING & EXCAVATION
The Oeser Company Superfund Site

Year	Cost Factor	Capita l Cost	NAPL Remova	Cap Maintenan	Replace Top Seal	Environmenta l Monitoring	CERCLA Review	Total Annual	Discounted Annual
0	1	$256,850						$256,850	$256,850
1	0.952		$2,500	$19,010		$33,200		$54,710	$52,105
2	0.907		$2,500	$19,010	$12,720	$33,200		$67,430	$61,161
3	0.864		$2,500	$19,010		$33,200		$54,710	$47,261
4	0.823		$2,500	$19,010	$12,720	$33,200		$67,430	$55,475
5	0.784		$2,500	$19,010		$33,200	$25,000	$79,710	$62,455
6	0.746		$2,500	$19,010	$12,720	$16,600		$50,830	$37,930
7	0.711		$2,500	$19,010		$16,600		$38,110	$27,084
8	0.677		$2,500	$19,010	$12,720	$16,600		$50,830	$34,404
9	0.645		$2,500	$19,010		$16,600		$38,110	$24,566
10	0.614		$2,500	$19,010	$12,720	$16,600	$25,000	$75,830	$46,553
11	0.585		$2,500	$38,020		$16,600		$57,120	$33,397
12	0.557		$2,500	$38,020	$12,720	$16,600		$69,840	$38,890
13	0.530		$2,500	$38,020		$16,600		$57,120	$30,292
14	0.505		$2,500	$38,020	$12,720	$16,600		$69,840	$35,274
15	0.481		$2,500	$38,020		$16,600	$25,000	$82,120	$39,501
16	0.458		$2,500	$38,020	$12,720	$16,600		$69,840	$31,995
17	0.436		$2,500	$38,020		$16,600		$57,120	$24,921
18	0.416		$2,500	$38,020	$12,720	$16,600		$69,840	$29,020
19	0.396		$2,500	$38,020		$16,600		$57,120	$22,604
20	0.377		$2,500	$38,020	$12,720	$16,600	$25,000	$94,840	$35,744
21	0.359		$2,500	$63,310		$16,600		$82,410	$29,580
22	0.342		$2,500	$63,310	$12,720	$16,600		$95,130	$32,520
23	0.326		$2,500	$63,310		$16,600		$82,410	$26,830
24	0.310		$2,500	$63,310	$12,720	$16,600		$95,130	$29,497
25	0.295		$2,500	$63,310		$16,600	$25,000	$107,410	$31,718
26	0.281		$2,500	$63,310	$12,720	$16,600		$95,130	$26,754
27	0.268		$2,500	$63,310		$16,600		$82,410	$22,073
28	0.255		$2,500	$63,310	$12,720	$16,600		$95,130	$24,267
29	0.243		$2,500	$63,310		$16,600		$82,410	$20,021
30	0.231		$2,500	$63,310	$12,720	$16,600	$25,000	$120,130	$27,795

Present Worth $3,610,000

Present Worth of Annual Costs $1,042,000

Assumptions:
Accuracy: (-30% to +50%)
Base Year: 2003
Discount Rate: 5%
O&M : 30 years

APPENDIX C: RESPONSIVENESS SUMMARY

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APPENDIX C: RESPONSIVENESS SUMMARY

EPA held a 45-day public comment period for The Oeser Company Proposed Plan from December 11, 2002, through January 24, 2003 (the required minimum 30-day comment period was extended because of the holidays). A fact sheet describing the Proposed Plan and announcing the start of the comment period was mailed to individuals and organizations identified on EPA's Oeser Company Superfund mailing list on December 11, 2002. An announcement of the availability of the Proposed Plan, a summary of the plan and information on how to get more information was published in a display advertisement in the Bellingham Herald on December 13, 2002, and again on January 12, 2003. EPA held a public meeting on January 15, 2003, to discuss the proposed plan and EPA's preferred Alternative for cleanup.

EPA received numerous oral and written comments on the plan during the comment period. The comments are addressed in this Responsiveness Summary.

1. SUMMARY OF COMMENTS RECEIVED AND AGENCY RESPONSES

The EPA has received comments from many different parties regarding the Agency's work at The Oeser Company Superfund Site. In particular, the EPA has received comments on the following documents:

- *The Oeser Company Superfund Site Remedial Investigation (RI) Report*;
- *The Oeser Company Superfund Site Human Health Risk Assessment (HHRA)*;
- *The Oeser Company Superfund Site Ecological Risk Assessment*;
- *The Oeser Company Superfund Site Feasibility Study (FS) Report*; and
- *The Oeser Company Superfund Site Proposed Plan*.

The EPA's responses to the comments received regarding these documents are summarized in this section. Summary comments and specific comments from the interested parties are provided followed by the EPA's response in bold italics. Substantive comments received (both written as well as oral comments during the January 15, 2003 Public Meeting) from citizen's groups and individuals in the community, local officials, and the Washington State Department of Health (DOH) are grouped, summarized, and addressed in Section 2. Specific comments received from the Oeser Cedar Cleanup Coalition (OCCC) are addressed in Section 3. Finally, specific comments received from The Oeser Company are addressed in Section 4.

2. GENERAL PUBLIC/ CITIZEN'S GROUPS AND DOH COMMENTS

1. Odors from The Oeser Company are a nuisance.

EPA's Superfund program does not regulate air emissions from operating facilities. The Northwest Air Pollution Authority (NWAPA) is the appropriate agency to contact regarding noxious odors. Concerns were also expressed about the presence of odors in the creek area. Odors detected near or in the creek were not found to be related to any chemicals in the soil or sediments in the area. These odors may be traveling down the ravine. The NWAPA is authorized to conduct necessary air sampling if considered necessary.

2. Migration of vapors from subsurface soil and groundwater to indoor air should be considered a complete exposure pathway.

VOCs which generate vapors were not detected in residential soil; therefore, this is an incomplete exposure pathway for off-property residents. Naphthalene and TPH were the only VOCs detected on the Oeser property in subsurface soil and groundwater, but at low concentrations. Although inhalation of naphthalene in indoor air may be a complete exposure pathway for workers, it is insignificant relative to other pathways considered, such as dermal contact and ingestion of soil.

3. Will the cleanup levels (CULs) established for The Oeser Company Superfund Site be protective of groundwater?

The cleanup levels for the Oeser Superfund site are protective of groundwater and will allow unrestrictive use once they are attained. The selected remedy will protect groundwater through capping or removal of contaminated soil above the CULs. Furthermore, groundwater monitoring data indicate that concentrations of chemicals of concern (COCs) in the deep aquifer are declining and that migration of COCs in subsurface soil to the groundwater is minimal. Continued monitoring will confirm that concentrations of COCs are declining.

4. Several of the people commenting were concerned about their health and the health of their family and pets and asked if the EPA will conduct a health study of residents living near The Oeser Company.

Health studies for this site are being conducted by the Washington State Department of Health (DOH). The EPA's human health risk assessment estimated potential risks to residents, workers, and recreationists using a series of conservative assumptions and toxicity information about site-related chemicals. This assessment did not involve reviewing the health history of nearby residents. The purpose of the risk assessment is to provide the necessary information to EPA managers concerning cleanup of historical contamination

related to a Superfund site in order to prevent unacceptable exposures to residents, workers, and other receptors.

5. Air sampling was not conducted during "worst case" conditions.

People commenting indicated that sampling during times of stronger wind flow would have allowed for collection during "worst case" conditions. EPA sampled during fairly stagnant periods during the summer that generally are considered to be typical of "worst case" conditions near the Oeser property. Periods of stronger winds can actually lead to lower air particulate and vapor concentrations rather than higher concentrations near the Oeser property. The stronger winds are able to carry contaminants greater distances, distributing contaminants over a greater area. In reality, low wind periods likely would result in a majority of the contaminants being deposited at nearby properties at greater concentrations and would be more representative of a "worst case" or high average condition.

6. A source analysis for dioxins/furans and polynuclear aromatic hydrocarbons (PAHs) should be conducted at nearby residential properties.

Risks at nearby residential properties were within EPA's range of acceptable risks and do not justify a source analysis. Furthermore, EPA did conduct an analysis of the composition of dioxins/furans found at nearby and background residential properties. The results of this comparison indicated that there were no statistically significant differences between the properties adjacent to The Oeser Company and the background areas. However, significant differences were found between the dioxins/furans congeners located on the Oeser site and congeners found on nearby residences.

7. The existing body burden of dioxins/furans and pentachlorophenol was not addressed in the human health risk assessment.

The purpose of the baseline risk assessment is to quantify the incremental increase in cancer risk due to site-related contaminants. Current CERCLA risk assessment methodology does not consider the existing body burden of environmental contaminants. The magnitude of the body burden of environmental contaminants is highly variable and is influenced by lifestyle choices, such as diet, smoking status, body composition, and occupation.

8. EPA should protect salmon in Squalicum Creek.

It appears that there is confusion regarding the Little Squalicum Creek and nearby Squalicum Creek. Little Squalicum Creek has not historically contained salmon. Little Squalicum Creek has irregular daily flows as it is fed primarily by storm drains from the Birchwood neighborhood, The Oeser Company, and surrounding areas. In addition, EPA's

Ecological Risk Assessment report concluded that sediment in Little Squalicum Creek does not pose a threat to the local aquatic community or to salmon if they were introduced to the creek. The Washington State Department of Ecology is further evaluating the issue.

9. The number of soil samples collected along the edge of Little Squalicum Creek, sediment samples in the creek, and creek water samples were not sufficient.

Given the small size of the creek, EPA considers the number and placement of samples to be adequate for site characterization and risk assessment. Approximately 40 soil samples were collected on the north and south banks of the creek and analyzed for total petroleum hydrocarbons with a field test kit. Seven of the samples were subsequently laboratory analyzed. Creek sediment samples were collected from depositional areas and reflect the worst-case situation. Collection of additional sediment samples would not significantly improve or alter our current understanding of conditions in the creek area. Since there is very little impact to the Creek from unregulated groundwater from The Oeser Company property, the water quality in the creek is regulated by other agencies and programs. Overall, the sampling conducted for the RI was adequate to characterize the creek area.

10. An Oeser release incident involving sheet flow that crossed the railroad tracks near W. Illinois Street during a storm in the 1990s is not reported and no soil samples were collected.

During the Remedial Investigation, EPA collected soil samples from off-property areas of concern. Sample location RES-50 was located between the railroad tracks at the end of West Illinois Street, the area where sheet flow from the Oeser property crossed the tracks. There was nothing unusual about the levels of soil contamination at this location.

11. Widespread petroleum contamination that exceeds MTCA cleanup levels was detected in soils at the North Treatment Area as well as other areas of the site. However, these results are not presented in a figure.

Since petroleum contamination is co-located with other contaminants of concern, a figure showing these areas is not necessary.

12. Surface sample results do not support the boundaries selected for the proposed shallow excavation. Additional sampling should be conducted (e.g. in the wood storage area) to evaluate whether the excavation boundary should be expanded.

EPA agrees. During the remedial design and construction, EPA will conduct additional sampling to better define areas that need to be excavated or capped. As necessary, confirmation sampling also will be conducted.

13. Assessment of wildlife in wetlands near the creek has not been conducted..

EPA disagrees with the comment that wildlife in wetland areas along the creek were not evaluated during the RI. Figure 6 in the Springwood (1992)* report shows the size and location of wetlands in the Little Squalicum Creek ravine. In this figure, most of the creek channel and banks downstream from Marine Drive are classified as an Alder/Cottonwood Forested Wetland. Sediment samples (SD02, SD03, SD04) were collected from this reach of the creek during the RI (see Figure 4-1 in interim final ERA report). The resulting data were used in the ERA to assess risks to wildlife. It is true that some wetland cells in the ravine bottom were not sampled during the RI. However, these wetland cells are well removed from the creek channel and thus are not affected by contamination in the creek. Thus, there is no reason to suspect that wildlife using these wetland cells would be at risk from Oeser-related chemicals.

**** Springwood Associates. 1992. Little Squalicum Creek Off-Site Wetlands Mitigation Plan. Prepared for the Port of Bellingham, Bellingham, WA by Springwood Associates, Seattle, WA with assistance from Sheldon and Associates, Seattle, WA.***

14. To dismiss the creek as containing no fish is inappropriate. The failure to compare species diversity in the adjacent clean-water areas with the contaminated creek is inexcusable when it comes to characterizing the problem and impacts on future values.

Although use of the creek by fish is very limited, EPA did not dismiss fish being in the creek. The creek ecosystem and receptors it supports were evaluated as part of the ecological risk assessment. It is true that aquatic species diversity was not compared between the creek and nearby uncontaminated habitats, such as the small ponds at the north end of the ravine. Standing-water habitats support markedly different aquatic biota compared with flowing-water systems. Hence, differences in species diversity between the creek and ponds are likely to reflect habitat differences, not differences in levels of contamination.

15. Swimming and full-body immersion is traditional at the mouth of Squalicum Creek at high tide during summer and should be evaluated in the HHRA.

The HHRA estimated risks to recreational users of Little Squalicum Creek, not Bellingham Bay. The exposure assumptions selected for this receptor are sufficiently conservative to represent high-end estimates of any use at the creek. For example, the recreational user was assumed to visit the creek 2 days per week throughout the year (a total of 104 days per day) and to spend 4 hours at the creek during each visit. The recreational user's lower legs and feet were assumed to have contact with maximum concentrations of contaminants in creek water and sediment for the entire 4 hours of each visit because the majority of the creek is shallow and is not conducive to full-body submersion. It is highly unlikely that the average

individual would be fully immersed in the creek water for 4 hours per visit, 104 visits per year. This would not be a realistic representation of creek use for nearby residents.

Discharges to the Creek from The Oeser Company are already regulated by the Department of Ecology. To better protect swimmers, other uncontrolled sources of contamination to Little Squalicum Creek, such as neighborhood runoff, should also be addressed by the appropriate local and state government. It should be remembered that the creek receives run-off from several neighborhood sources and that even if The Oeser Company outfall were removed, the creek may not be suitable for wading. Run-off from neighborhood sources may include heavy oil, grease, and gasoline from roads and parking lots, as well as pesticides and fertilizers from residential and commercial properties.

3. OCCC GROUP COMMENTS

The Oeser Cedar Cleanup Coalition has submitted comments to the EPA regarding the Remedial Investigation (Section 3.2.1), the Human Health Risk Assessment (Section 3.2.2), the Ecological Risk Assessment (Section 3.2.3), the Feasibility Study (Section 3.2.4), and the Proposed Plan (Section 3.2.5).

3.1 Remedial Investigation Comments

3.1.1 General Comments

1. Connection between Aquifers. We believe there is a direct connection with the more contaminated shallow aquifer to the deeper aquifer, in places on site. The Tilbury wells have been identified as potential drinking water sources in the future (future residents) in the risk assessment. Consequently, an evaluation of the potential impact of contaminated groundwater in the discontinuous shallow zone to the lower aquifer should be completed (i.e., modeling). Additional wells along the western side of the site would help better understand the risk to down gradient "drinking" wells.

Also, the number of wells proposed in the work plans was more than actually constructed and sampled during the remedial investigation. One or two of these wells could have been placed along the west fence line of the site. We asked for more wells in this area of the site during our review of the work plans. EPA disagreed with our request.

A direct connection may exist between the shallow and deep aquifer as described in RI Section 3.1.2. However, data collected as part of the RI suggest that shallow zone contamination is not migrating to the deep aquifer (see RI Section 5.4). Any modeling effort likely would require significant effort but yield results no more detailed that those presented in RI Sections 2.4.2, 3.1.2, 4.3, and 5.5.

In regards to the second part of the comment regarding the installation of additional wells along the west fence line, the EPA responded to this comment in March 2002. The EPA

maintains that wells were placed as far west on the facility as proposed in the RI work plan. The EPA also maintains that groundwater flow in the area is adequately characterized.

2. Air Sampling Not Worst-Case Exposure Scenario. We think the air sampling periods were not representative of worst-case exposure scenarios because of the low winds observed. At least one 36-hour sampling period should have been completed for higher or even average wind speeds across the site. The lack of representative wind conditions significantly underestimates the assessment of nature and extent and human risk from the site.

EPA sampled during fairly stagnant periods during the summer that are more typical of worse case conditions near the Oeser property. Periods of stronger winds can actually lead to lower particulate and vapor concentrations near the Oeser property rather than higher concentrations. Stronger winds are able to carry contaminants greater distances, distributing contaminants over a greater area. Low wind periods are likely to result in a majority of the contaminants being deposited at nearby properties at greater concentrations and would be more representative of a "worst case" or high average condition.

3. Metals Contamination in the South Slope Area. We disagree with the conclusion that site historical activities could not have resulted in metals contamination of soils in the South Slope Area. This area could have been used by site workers for disposal of waste oils, solvent wastes, etc. that contained the same heavy metals detected in these soils. The nature and extent of contamination here should be evaluated further and soils should be cleaned up, if required. Recreational users of Little Squalicum Creek could be exposed to these contaminated soils.

There is no evidence that metal wastes were generated during historical activities. Nevertheless, south slope surface soil was analyzed for metals, in addition to TPH, SVOCs, and dioxins/furans. Although metals were detected in south slope soil, concentrations were in general, below PRGs (with one exception). Further, the absence of facility-related metal contamination coupled with the fact that waste oils or solvent wastes do not appear to be present in South Slope suggests that wastes were likely not disposed from the Oeser facility.

4. Metals Contamination in Little Squalicum Creek. We disagree with the conclusion that site historical activities could not have resulted in metals contamination of sediments in Little Squalicum Creek. Sediments could have been contaminated from historical discharges of waste oils, solvent wastes, etc. that contained the same heavy metals detected in these sediments. The nature and extent of contamination here should be evaluated further and sediments should be cleaned up, if required. Recreational users of Little Squalicum Creek could be exposed to these contaminated sediments. Please direct us to documents where it states that EPA is not required to identify sources and the nature of contamination for chemicals that MAY not be associated with the Oeser Company site.

Metal concentrations detected in creek sediment were comparable and in some cases less than, the upstream reference sample. Consequently, the contamination does not appear to be related to the Oeser Company. The EPA believes the stream has been adequately characterized within the context of the RI.

5. Source Evaluation for PAHs Required. A source evaluation using PAH concentrations detected in on-site soils compared with off-facility soils is an important step that should be done to determine "nature and extent." The procedure of "fingerprinting" the high molecular PAHs may be conclusive in understanding the source of PAHs off site.

Since PAHs are not a major concern at near off-property residences, a source evaluation was not conducted during the remedial investigation and is not considered necessary for the remediation of The Oeser Company site.

6. Additional Source Evaluation for Dioxins Required. An additional source evaluation completed for dioxins detected in on-site soils compared with off-facility soils is an important step that should be done to determine "nature and extent." The procedure of "fingerprinting" the dioxin congeners may help in further understanding the source of dioxins off site.

EPA conducted an analysis of the composition of dioxins/furans found on the Oeser property and on residential properties. A statistical evaluation of the dioxins/furans congener distributions indicated that the profiles for dioxins/furans found on and off the Oeser property were significantly different. See RI Section 4.2.4.6 for more details.

7. Perimeter Berm Verification Required. The perimeter berms that The Oeser Company installed in 1995 and additional berms a few months ago were constructed without permits from the City of Bellingham or Whatcom County. Because these berms were not sampled as part of the cleanup, has EPA identified and seen evidence of the source of this berm material to assure the public that contaminated scrapings were not used? Were neighbors or workers exposed to contaminated dust during berm construction?

As required under the City of Bellingham's non-conformance use permit, the original perimeter berms were constructed with fill that was brought on site. As part of the 1997/1998 Removal Action, a small section of the berm north of the North Treatment Area gravel cap was constructed. The most recent small section of the berm on the south side of the site, was constructed from material from swales outside of the treatment area and fill material brought onto the site. All of the berms around the site have been vegetated to minimize erosion and dust. EPA believes that the berms around the perimeter of the site do not represent an environmental threat to the neighborhood and additional studies are not warranted.

3.1.2 Specific Comments

1. P4-3 p2-3 Inorganic-base wood preservatives are not the only potential source of metals from an active industrial site. What about metals contamination as a result of disposal of waste oils, solvent wastes, etc. on site and off site?

Based upon sampling conducted during the remedial investigation, EPA has determined that metals contamination is not a major concern at the site. In addition there is no evidence that metal wastes were generated during historical activities.

2. P5-1 p1 An introduction paragraph for Section 5 should be included.

EPA agrees that an introduction paragraph would have been helpful but would serve little purpose at this stage.

3. P5-14 p2

A discussion on the potential fate and transport of contaminants from shallow groundwater to the lower aquifer should be included in this section. Why is this transport mechanism not important when the layer separating the two zones is discontinuous across the site?

An analysis of all the factors that may affect a system and the possible reactions of that system to these variables is called a conceptual model. In RI Section 5.6, vaporization, dissolution, volatilization, and sorption are all identified and described as factors potentially influencing the fate and transport of contaminants in the subsurface. Eight additional pages are dedicated to describing the potential impact each of these factors may produce in every phase of contamination.

4. P5-14 general

As mentioned above, a fate and transport conceptual site model for contaminants of concern would be helpful.

Discussion of the fate and transport of frequently detected contaminants at The Oeser Company site is included as RI Section 5.3. Primary transport and transformation mechanisms are presented in this section along with secondary transport mechanisms. Each of the contaminants detected at the site behave similarly. The behavior of these contaminants is dependent upon the phase and medium in which they were detected. The fate and transport of contaminants in the different phases and mediums are discussed in RI Sections 5.4 through 5.7.

5. P5-14 general

Also, there is no evaluation of the fate and transport of contaminants in Little Squalicum Creek. How chemicals of concern would likely behave in surface water, either dissolved or in NAPL phase, should be presented in this section.

The following chemicals of concern were detected in the surface water of Little Squalicum Creek during the RI: polynuclear aromatic hydrocarbons, pentachlorophenol, dioxins, and petroleum hydrocarbons. A description of how each of these chemicals of concern behaves in aquatic environments is provided in RI Section 5.3.

3.2 Human Health Risk Assessment Comments

3.2.1 General Comments

1. Many of the total risk results continue to be under-estimated or under-reported:

A. The risks for the residential scenario and the risks for the recreational scenario were not summed to evaluate the total risks for those individuals who both live in the vicinity of the site and visit Little Squalicum Creek recreationally.

Potential excess lifetime cancer risks for the resident and recreational user are presented for exposure to surface soil, surface water, and sediment. To sum these exposure pathways, exposure parameters for the resident would have to be adjusted downward to account for exposure at multiple locations during each visit to the creek area. A recreational user cannot be exposed simultaneously to soil at three different locations, in addition to sediment and 4 hours per week to surface water in the creek. Presenting risks separately allows for a conservative yet more realistic view of risks for each pathway and allows for evaluation of different exposure areas.

B. The risks for all of the exposure pathways in the recreational scenario were not summed to show the total risks associated with recreational exposures (i.e., dermal contact with surface soil, ingestion of surface soil, inhalation of particulates from surface soil, dermal contact with surface water in the creek, and dermal contact with sediments in the creek).

See answer to A above.

C. The risks associated with dermal contact with surface water and sediment in the recreational scenario were evaluated for an exposure period of only 11 years, rather than for the full exposure period of 30 years.

EPA believes that the recreational scenario in the HHRA is very conservative. Eleven years was used as the exposure duration because EPA assumed a school age child (ages 8-18) would be most likely to visit the creek for extended periods and have a high level of contact

with surface water and sediment. EPA also used the maximum chemical concentrations in surface water and sediment as chronic exposure point concentrations which is very conservative since concentrations would vary with storm events, flow rate, and the time of year. In addition, National Pollutant Discharge Elimination System (NPDES) permit limits for discharge to the creek by The Oeser Company have been lowered and a new storm water treatment system has been installed on the Oeser property to meet those new limits, after the surface water sampling was conducted for the RI.

D. The risks associated with inhalation of vapors from soil were evaluated for vapors accumulating outdoors, rather than vapors accumulating indoors.

Analysis of inhalation of vapors from soil was performed by using a chemical-specific volatilization factor and assuming release from soil into the breathing zone, even for VOCs detected in subsurface soils because those soils were assumed to be brought to the surface in future scenarios. This likely is more conservative than assuming that vapors released from soil migrate through the soil matrix to a house and enter via cracks in the foundation because the exposure pathway is direct (inhalation), versus indirect (inhalation following migration of vapors through a soil matrix into indoor air). EPA acknowledges that more vapors in indoor air may accumulate versus those in outdoor air, but direct release from soil likely results in higher concentrations than migration through the soil matrix into indoor air. It is to be noted that individual VOCs associated with TPH, such as benzene, were not identified as COPCs in soil or groundwater. Although inhalation of naphthalene (an SVOC found in soil and groundwater) in indoor air may be a complete exposure pathway for workers, it is likely insignificant relative to other pathways considered, such as dermal contact and ingestion of soil.

E. A fractional intake value of 0.5 was used for the worker inhalation scenarios, which means that these risks are under-estimated by a factor of 2.

Risks were not underestimated by a factor of two. A fractional intake value of 0.5 was used for the worker inhalation scenarios to represent a 12-hour exposure. If this fraction were removed, risks would be representative of a 24-hour exposure to on-facility air rather than a 12-hour exposure.

2. All Sources of Air Pollution should be considered. We agree that the inhalation risks calculated based on air sampling data are likely influenced by current releases from facility operations, other industrial operations in the area, and emissions from vehicles and wood burning. Some of these additional sources might be termed "area background." Nevertheless, they deserved to be recognized as real risks for local residents. Figures 5-1 and 5-2 in the Final HHRA are very informative.

The HHRA for The Oeser Company site evaluated potential risks to chemicals from the site

only. Exposure to "background" levels of contaminants is beyond the scope of the risk assessment.

3. Sum Residential and Recreational Risks. We understand that it is complex to sum the risks for the recreational scenario with the risks for the residential scenario but, as we show below, not summing the risks is NOT a more conservative approach.

EPA acknowledges that some individuals may reside near the site and also recreate in the Little Squalicum Creek area; however, when the exposure factors for the risk assessment were developed, EPA relied on best professional judgment to establish receptor-specific exposure factors to address RME and CT scenarios. EPA generally uses standard default exposure factors to describe a residential exposure scenario. If a recreational component were included as part of this scenario, then the standard assumptions would need to be modified downward to account for exposures to other media at other contact rates. Instead, a separate recreational scenario was developed to assess creek-related exposures. although doing this may have resulted in slightly less conservative overall risks, it provided risk results that clearly showed which media and exposure pathways resulted in the greatest risks. This information is more useful in risk management decisions.

4. Dermal Contact with Surface Water should be considered for Overall Risk. It might be appropriate to assume that young children and adults visit the creek less often than older children do and that adults contact less surface water and sediment than children. But in the case of cancer risks, the additional exposures during young childhood and during adulthood, albeit smaller, still serve to increase the lifetime cancer risk. If dermal contact with surface water had been evaluated over a 30-year period, rather than an 11-year period, the cancer risk results would have been higher than those stated in the Final HHRA. Since the reported cancer risk for dermal contact with surface water is quite high (5E-4), this is an important point.

The risk from contact with creek surface water must be considered carefully, as risks likely are overestimated. According to recent evaluation of dermal absorption values for dioxins/furans by EPA, risks may be overestimated by as much as 10 times. This means that contact with creek water may result in risks closer to 4E-05, within EPA's acceptable range. Due to these recent findings, the results of the risk assessment for contact with creek water should be interpreted with caution. In addition, The Oeser Company has implemented a new storm water treatment system and must comply with more stringent discharge standards since the surface water samples were collected from this risk assessment.

5. Vapor Concentrations Outdoors are Lower than Concentrations Indoors, so the Outdoor Approach is Not Sufficiently Conservative. It is true that SVOCs in soil will yield lower air concentrations than VOCs in soil. However, regardless of the type of chemical, indoor concentrations will always be higher than outdoor concentrations. SVOCs do not preferentially accumulate outdoors.

We agree that vapor concentrations for SVOCs are likely to be lower than vapor concentrations for VOCs, but if the vapor pathway is going to be evaluated at all, it should be evaluated for indoor air.

Individual VOCs associated with TPH, such as benzene, were not identified as COPCs in soil or groundwater. Although inhalation of naphthalene (an SVOC) in indoor air may be a complete exposure pathway for workers, it is insignificant relative to other pathways considered, such as dermal contact and ingestion of soil.

6. Inhalation Risks for Workers Remain Underestimated. For the worker scenarios, EPA used a fractional intake value of 0.5. With the exception of water ingestion, when this fractional intake value was combined with the other exposure assumptions they used, it resulted in exposure estimates that are lower than EPA default values. In the case of water ingestion, the combination of the 0.5 fraction intake value and the other exposure assumptions produced an exposure estimate consistent with default values.

The fractional value for groundwater ingestion is appropriate and will not be changed. The fractional value for dermal exposure to on-facility soil was not included in the final HHRA. For use of the fractional intake value for inhalation exposures, see response to Comment 1, letter E in this document.

7. There are differences between the values listed in Tables 4-1 through 4-22 for dermal exposure parameters and the values in RAGS E. The comment presented a table showing discrepancies between values for dermal exposure parameters recommended by EPA in an advance copy of RAGS E and the values used in the draft HHRA.

RAGS E was not used in the risk assessment because it was only in draft form. Dermal exposure risks may be slightly underestimated because the skin surface areas recommended for use by RAGS E are greater than what were used in the baseline human health risk assessment. However, the adherence factors recommended by RAGS E are slightly lower in most cases than what was used in the baseline human health risk assessment. Based on the overall conservative assumptions made with respect to the dermal exposure pathway evaluation the differences in these parameter values would not significantly change the risks calculated.

3.2.2 Specific Comments

1. Figure 3-1 Human Health Conceptual Site Model: The figure indicates erroneously that there is exposure to groundwater in the deep aquifer through ingestion, dermal contact, and inhalation of vapors for current residents.

Comment noted. Exposure of current residents to deep groundwater underlying The Oeser

Company site was not considered a complete pathway for this HHRA. Only risks for future residents to deep groundwater were quantified.

2. Section 5.3.1 Risk Management: ...EPA is making remedial decisions prior to the calculation of cleanup levels. It is national EPA policy that remedial actions must at least attain applicable or relevant and appropriate requirements (ARARs; EPA 1989). Washington State Model Toxics Control Act (MTCA) constitutes an ARAR in the State of Washington, and its risk goals should be recognized when making risk management decisions for this site.

EPA has established cleanup levels based on ARARs and on site-specific risk assessments. The ARARs that are applicable to this remedial action include RCRA, the Washington Dangerous Waste regulations and MTCA. The cleanup levels selected for this ROD considered the MTCA cleanup calculations, where available, and utilized other site-specific risk assessment methodologies and meet MTCA's target risk level of 1E-5. The cleanup levels for soils that were adopted in this ROD are generally more conservative than required by MTCA for industrial uses.

3. P5-7 p5 s1: The maximum cancer risk is misstated as 5E-3 when it should be 3E-3 (for ETA/WTA and NTA).

EPA agrees. However the corrected risks do not affect the risk results or removal/remedial action objectives since 5E-3 or 3E-3 are both unacceptable risk for on-site workers.

4. Table 5-8: The risk result reported for soil ingestion under future residential use of the NTA is 1.37E0, but the risk result for TPH alone reported in Table D-3 is 1.6E0.

EPA agrees. However the corrected risks do not affect the risk results or removal/remedial action objectives since 1.37E0 or 1.6E0 are both unacceptable risk for on-site workers.

5. Table 6-3: Two values reported in this table disagree with the values reported in Section 5 tables:

- The cancer risk for soils 0-6 feet bgs in the NTA is reported as 2E-3 in Table 6-3 and as 1E-3 in Table 5-3.
- The cancer risk for soils 6-12 feet bgs in the NTA is reported as 1E-3 in Table 6-3 and as 2E-4 in Table 5-5.

Comment noted. See response to comment number 3 (P5-7p5s1)above.

6. Section 7 Recommendations: This section was deleted from the Final HHRA. This is not an unreasonable change, since a baseline risk assessment is intended to evaluate risks, rather than recommend remedial measures.

Comment noted.

3.3 Ecological Risk Assessment Comments

1. Growth Results for Oligochaete Bioaccumulation Test Show Chronic Risk. Sediment samples from three stations in Little Squalicum Creek (SD-2, SD-5, SD-6) were evaluated using the 28-day bioaccumulation and growth test with a freshwater oligochaete. The data were used in the Final ERA to evaluate wildlife risks (modeling up the food chain from mosquitoes to Barn Swallows) but were not used to evaluate chronic risk to biological organisms in Little Squalicum Creek. The total growth of these organisms over a 28-day period in site sediments compared with a clean control sediment is a good indicator of chronic toxicity to biological organisms in the creek. A laboratory control sediment sample was included to verify the test system was suitable for oligochaete survival and compared to the site sediments. Average biomass in samples SD-2 (3.7 grams) and SD-5 (2.9 grams) was significantly less than the control biomass (8.9 grams), suggesting that adverse affects may be associated with these samples.

Why was this data not used in the Final ERA? The 28-day growth data and exceedances in sediment benchmarks clearly indicate a potential long-term risk to biological organisms living in Little Squalicum Creek. OCCC expects EPA to consider this data in evaluating cleanup of the site and Little Squalicum Creek in the Feasibility Study and Proposed Plan. The data suggests active cleanup of Little Squalicum Creek is warranted.

USEPA (2000) presents Method 100.3 as a bioaccumulation test only. The purpose of the test is to measure bioaccumulation of chemicals from sediments by a representative freshwater invertebrate, specifically, the oligochaete Lumbriculus variegatus. The test data were used to estimate food-chain exposure for wildlife that feed on invertebrates from the creek, as noted in the comment. OCCC suggests that the bioaccumulation test results also should have been used to evaluate chronic growth effects, based on the amount of oligochaete biomass recovered from the sediment samples at the end of the test. This is not the primary purpose of the test and the results were not evaluated from this perspective in the risk assessment. Nonetheless, based on the comment, EPA re-examined the biomass and chemistry data for the three sediment samples (SD-2, SD-5, SD-6) that were tested. A clean control sediment sample was also tested to ensure that the test system was suitable for oligochaete survival.

Less biomass was recovered from samples SD-2 (3.7 grams) and SD-5 (2.9 grams) than from the lab control (8.9 grams). Sample SD-6 (11.2 grams) produced more biomass than the lab control. The sample that produced the least oligochaete biomass (SD-2) was the cleanest of the three samples tested--no sediment benchmarks were exceeded in this sample. In contrast, the sediment sample that produced the greatest amount of oligochaete biomass (SD-6) was one of the more contaminated samples--the benchmarks for pentachlorophenol (PCP), total PAHs, and dioxins/furans were exceeded in this sample. When considered together, the

biomass and chemistry data suggest that a factor other than sediment contamination affected oligochaete growth in the bioaccumulation test. Other factors that can affect oligochaete growth include sediment texture and/or the amount and quality of sediment organic matter, which is the primary food source for the oligochaetes during the test.

Overall, the results of the 28-day bioaccumulation test suggest that current levels of sediment contamination in Little Squalicum Creek are not adversely affecting benthic life. The results of the 10-day growth and survival test with Hyalella azteca (amphipod) also indicated this. Consequently, based on the weight of evidence, EPA has determined that active cleanup of Little Squalicum Creek under Superfund is not warranted.

2. Amphipod Test is Not Good Indicator of Chronic Risk to Stream Organisms. The 10-day amphipod sediment toxicity test is an indicator of acute toxicity in freshwater sediments, not chronic toxicity. The length of time, 10-days, is not considered adequate to monitor growth and chronic toxicity. Growth over the duration of the test may be considered an chronic end-point in the method but this test is not considered an adequate test to evaluate chronic effects. A 28-day growth test (either oligochaete or amphipod) is a better indicator of chronic toxicity.

It is not strictly correct to state that the 10-day test with Hyalella azteca measures only acute toxicity. In this test, EPA considers the measure of growth to be a chronic endpoint (USEPA 1995). A 28-day test with H. azteca was not available at the time that the RI field work was conducted. A 28-day bioaccumulation test with an oligochaete was conducted for the RI. As noted above, there was a difference in growth between samples in the 28 day test, but the difference was not related to chemical concentrations in sediment.

Reference: ***USEPA. 1995. Engineering Bulletin: Biological Toxicity Testing. Office of Research and Development, Cincinnati, OH. EPA/540/9-95/501.***

3. No Formal Observations were made of Animal Life in Creek. In response to our previous comments regarding chronic toxicity and measurement of reproduction effects, EPA stated that there were numerous benthic invertebrate taxa, including caddis fly larvae, midge larvae, amphipods, and snails observed in Little Squalicum Creek during the RI field work. These observations suggest that the creek supports self-reproducing populations of benthic organisms. We requested the summary tables of these observations, including data on species diversity and populations at our meeting with EPA on March 13, 2002. We have not received this data as of this writing. This data is important in evaluating the potential ecological risks to Little Squalicum Creek and should be included in the report.

Abundance and diversity of benthic organisms in Little Squalicum Creek were not quantitatively evaluated during the RI field work. The brief description of creek benthic life quoted in this comment is based on observations made by an EPA contractor that participated in the RI field work. Detailed summary tables on species diversity and

populations were not prepared.

4. Further Evaluation Required of Surface Water in Little Squalicum Creek. The chemicals detected in surface water of Little Squalicum Creek (e.g., PCP) correlate with The Oeser Company site, not other non-point sources from urban runoff. The fact is the highest concentrations of these contaminants were detected during peak storm water flows (December 1999), and indicates a potential impact to the creek and further evaluation. We would not expect many contaminant hits during low flow periods (i.e., July). Since 9 months out of the year it rains, this sampling and testing may underestimate the ecological and potential human health risk from The Oeser Company activities.

The results of the surface water sampling conducted for the RI do not provide a compelling case for additional investigation of surface water in the creek. Only a single exceedance of a chronic criterion or benchmark for one compound (PCP) was observed in December 1999 (rainy season), and no exceedances were observed July 1999. Earlier site investigations also indicated that levels of surface water contamination in the creek were minimal. Given that the creek accepts a considerable amount of storm water runoff from a large neighborhood, an occasional exceedance of a criterion is not unexpected. Storm water releases from The Oeser Company are currently governed by a NPDES permit and would not be regulated under CERCLA. However, in addition to The Oeser Company, there are other potential sources of PCP to storm water in the area, such as wooden railroad ties and utility poles. Based on these considerations, EPA has determined that additional investigation of surface water in Little Squalicum Creek under Superfund is not warranted.

3.4 Feasibility Study Comments

3.4.1 General Comments

1. Remove Cracked Underground Stormwater Pipe. Something that was not included in the FS was removal and replacement of the underground stormwater pipe that runs through The Oeser Company Facility. Videotape of the pipe shows significant cracks and ruptures near the area of the facility with the most contaminated subsurface soils. This pipe may act as a conduit for contaminated groundwater from the site to Little Squalicum Creek. This pipe should be repaired or replaced as part of all alternatives in the FS.

As part of the EPA's 1997/1998 Removal Action, the section of the storm drain located in the area with the most contaminated subsurface soil was replaced. Stormwater monitoring data collected as part of the NPDES program indicates that the pipe is not acting as a conduit for transporting contaminated groundwater to Little Squalicum Creek.

2. Extent of Contaminated Areas Planned for Excavation Based on Cone Penetrometer Testing (CPT). Based on a review of the documents and figures, it is unclear how the lateral extent of the

excavation areas were established. The circular shapes and consistent dimensions indicate that each sample location with results exceeding the CULs were overlain with a radius of affected soil (approximate radius = 26 feet). Without adjacent sample locations and analytical results to support the lateral extent of contamination, significant variances in soil volume estimates are likely, and may exceed the -30%/+50% variance accounted for by the cost estimate. If CPT results were used to establish the extent of CUL exceedances, the variance may be even more.

The lateral extent of isolated contamination presented in the FS was approximated based on analytical results of soil samples collected during the RI. Each sample location that exceeded CULs was assumed to represent the conditions of soil surrounding that location for a radius of 25 feet. A radius of 25 feet was selected as this was the approximate mid-point between cone penetrometer testing-laser induced fluorescence-rapid optical screening tool (CPT-LIF-ROST) sample locations. The grid system used for the on-facility CPT-LIF-ROST sampling was based on 50-foot squares.

Although analytical data for many COCs at the site, such as PCP and dioxin, do not correlate well quantitatively with the screening data obtained during the CPT-LIF-ROST survey, the locations where contamination were identified both analytically and through CPT-LIF-ROST do compare well qualitatively. Comparing FS Figures 1-14 through 1-17 (Surface and Subsurface Soil Contamination Greater than Proposed Cleanup Levels) with RI Figures 4-18 and 4-25 (CPT-LIF-ROST Screening Results), it is apparent that much of the contamination identified using the CPT-LIF-ROST method is located in the same areas that contamination was identified through the installation of boreholes. Had a quantitative relationship been established between the analytical data and the CPT-LIF-ROST data, a smaller radius might have been warranted based on the characteristic size of continuous soil contamination at the site. However, because of the qualitative nature of the relationship, a radius of 25 feet was used.

3. Sample Confirmation Quantity Appears to be Low. FS Addendum Figure 1 presents 15 separate excavation areas. A conservatively low estimate of confirmation samples includes 4 sidewall samples and one bottom sample per excavation area, resulting in a total of 15x5 = 75 confirmation samples. The number of samples would increase if the CULs were exceeded, and additional excavation was required. Waste characterization and waste designation samples required by the receiving disposal facility may also affect sample quantity. Also, consider including sample costs for characterization of water generated during dewatering of excavated soil or excavation dewatering.

We require additional information on the following:

- Are confirmation samples going to be collected from both surface and subsurface excavations to make sure all contamination above cleanup levels is removed?
- Does EPA plan on collecting confirmation samples from each sidewall and bottom of each

excavation?

- C Will all confirmation samples be analyzed for dioxins and SVOCs including pentachlorophenol and PAHs, which are site-related contaminants?
- C For each excavation, if any one confirmation sample exceeds cleanup levels, will EPA continue excavating until all material above cleanup levels is removed?
- C Will additional confirmation samples be collected each time the excavation is expanded?

Additional sampling during the remedial design will be conducted to better define the areas that need to be excavated or capped. This additional sampling would reduce the need to conduct verification sampling after areas are excavated. Visual inspections and field testing with quick or real time turnarounds will also be used as EPA deems necessary.

Of the 15 proposed excavation areas identified on FS Addendum Figure 1, 11 of the areas proposed for excavation are surface soil excavations. Because these areas are surface soil excavations, it is unlikely that sidewall samples would be collected from them. As EPA determines necessary, confirmation samples from deeper subsurface soil excavations will be collected from the sidewalls and the floor of the excavation.

The cost estimates in the FS assumed that the confirmation soil samples from all excavation areas would be submitted for dioxin and SVOC analysis. SVOC analysis identifies PAHs and PCP. In order to simplify the cost estimate, it was assumed that additional excavation and confirmation sampling would not be necessary. If additional contamination is identified during excavation, it likely would be removed and additional confirmation samples would be collected to confirm complete removal of soil above cleanup levels. Dewatering costs were not included as part of the cost estimate for Alternative 6 because it was assumed that de-watering of these shallow excavations would not be necessary.

The FS cost estimate is intended to provide an estimate of significant costs involved with implementing a remedy to within +50% to -30%. Sampling and analysis is a significant cost, however, the additional amount of sampling that would be conducted for confirmation sampling and waste characterization sampling (that wasn't taken into account in the FS Cost Estimate) likely would fall within this range.

4. Remedial Action Objectives (RAOs) Should be Developed for Little Squalicum Creek Surface Water and Sediments. Based on the sample results for four water samples, EPA calculated risks for humans contacting the water in the creek. The cancer risk is above EPA's acceptable risk range and well above the Washington State MTCA target risk. The main chemicals driving the risk are dioxins, which are associated with the operations at The Oeser Company Facility.... Despite human risk results that exceed the acceptable range, and a sediment toxicity test that indicates concern for animals, EPA has not developed a remedial action objective for the surface water or sediment in Little Squalicum Creek.

See the responses to the following comments: Section 3.2.1 Comment 1 and Section 3.3 Comments 1 and 2.

5. Clean up of the Spoils Piles Required. The primary COPCs for the spoils pile were carcinogenic polynuclear aromatic hydrocarbons (cPAHs). The total cancer risks calculated for recreational exposures to surface soil in the spoils piles is 4E-5. The spoils pile exceeds the MTCA target cancer risk of 1E-5 even when not added to any of the other recreational exposure pathways, let alone the residential exposure pathways. MTCA is an ARAR and as such, EPA has committed to meet cleanup goals for exposures in exceedances. It doesn't make ecological sense to leave the spoils pile, with its disturbed vegetation, alone for the sake of lessening the ecological impact. Removing the spoils pile would improve the ecology of the area, as well as protect recreational users.

For the risk characterization of the spoils piles, the maximum detected concentrations were used as the exposure point concentrations (EPCs) because there were less than 10 data points. The result of use of the maximum concentration is that the risk estimates likely are biased high, but are uncertain based on limited data. However, based on the data available, the majority of the risk estimate (about 75%) is due to benzo(a)pyrene [B(a)P] equivalents, which is the weighted concentration of a group of carcinogenic PAHs. The maximum B(a)P equivalent concentration was used as the EPC; however, the range of concentrations was from 0.06 mg/kg to 135.9 mg/kg. It seems unlikely that an individual would spend 4 hours/day for 104 days/year for 11 years contacting soils from the spoils piles at a single location, so although the risks are slightly elevated above the MTCA target of 1E-05, they are within EPA's acceptable risk range of 1E-06 to 1E-04.

6. "Old Asphalt" Cap Construction and Upgrade Information is Missing. Will you properly line the treated log area where The Oeser Company previously paved without a permit? There is no information or illustration about the makeup of the "old" asphalt cap in the Feasibility Study (FS Figures 1-12 and 1-13). How will you know how to upgrade the old asphalt if it is not part of the investigation documentation?

Information regarding the construction of the asphalt designated as "Old Asphalt" on FS Figure 1-12 is not available. The Oeser Company does not have as-built information regarding the "Old Asphalt" other than it was likely constructed of 6 inches of standard mix asphalt. "Old Asphalt" will be replaced or enhanced consistently with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations.

7. "Existing Cap" Upgrade Information is Not Stated. There is no information about where "existing cap" upgrades will be. Is it exclusively the old asphalt or the 1995 or 1998 caps or a combination? The Proposed Plan and the Feasibility Study state 6 acres of existing cap are scheduled for upgrading but only 5 acres are budgeted in the cost estimate.

It was assumed in the Feasibility Study cost estimate that all six acres of asphalt pavement, including the 1995 cap, 1998 cap, and other asphalt existing at the site, would require upgrading.

In regards to the cost discrepancy, the cost estimate did assume that all 6 acres would require upgrading. Note that in the cost worksheets for Alternatives 2, 4, and 6, the existing cap improvements were priced for 28,943 square yards, which is equivalent to 5.98 acres (FS Appendix C). "Old Asphalt" will be replaced or enhanced consistently with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations.

3.4.2 Specific Comments

1. P1-8 (1.2.3.1 Surface Soil): Sampling beneath pavement is difficult, but not impossible. If the East or West Treatment Areas were used for pole treating before they were paved, there could be soil contamination beneath the pavement that was not sampled. Such soil contamination would pose a threat to human health through direct contact or wind-blown dust, if the pavement were compromised, or through ingestion of groundwater, if non-aqueous phase liquid (NAPL) were present and flowed downward under the force of gravity.

This scenario is true for any situation where there will be contaminated soil capped by either asphalt or concrete. If the concrete or asphalt in any area of contamination is compromised, the migration of surficial contamination is possible. Inspection of the caps and concrete containment areas will be included as part of the operations and maintenance plan.

2. P1-8 (1.2.3.1 Surface Soil): There is no discussion of surface soil contamination off the facility.

FS Section 1.2.3 focused on discussing the nature and extent of contamination found in the soil and groundwater identified on The Oeser Company property during the RI. Off-facility surface soil contamination is discussed in RI Section 4.2.4.

3. P1-13 (1.2.4.2 Air Transport): This section acknowledges that benzene is migrating off site at concentrations above the cleanup level, and that the site is a likely source for pentachlorophenol, dioxin, and noncarcinogenic polynuclear aromatic hydrocarbons (ncPAHs). This section does not mention wind-blown dust as a potential transport pathway; it was probably assumed that pentachlorophenol, dioxin, and PAHs were being transported via dust.

Comment noted.

4. P2-2 p2 (2.2.2.1 Near-Facility Residential Area): Although MTCA is listed as an applicable or relevant and appropriate requirement (ARAR), and although Section 4.1 (p 4-2) states that the substantive requirements of ARARs must be fulfilled, the MTCA cancer risk (CR) goal is not

mentioned. If the decision not to remediate near-facility surface soils is based on area background concentrations, MTCA requires a statistical evaluation of near-facility soil sample results with a minimum of 20 area background soil samples for each of the contaminants of potential concern. An area background evaluation was conducted for dioxins and furans. PAHs should be included in the area background evaluation before near-facility surface soils are eliminated from further consideration.

EPA evaluated potential risks to near-facility residents in the human health risk assessment. This assessment included an evaluation of PAHs in addition to other COPCs. The residential scenario developed by EPA includes more exposure pathways than the residential exposure scenario provided under MTCA. For example, MTCA provides for incidental ingestion of soil, inhalation of vapors, and sometimes dermal contact with soil, while the EPA's scenario included all of these pathways in addition to ingestion of home-grown vegetables (for dioxins and furans only) and inhalation of resuspended dust. Risks for near-facility residents did not exceed EPA's acceptable risk range; therefore, PAHs and other COPCs were eliminated from further consideration for the off-site residential evaluation. A comparison of the distribution of PAHs in near-facility residential soil and background soil was not considered necessary as risks for near-facility residences did not exceed EPA's acceptable risk range.

5. P2-5 p4 (2.2.2.5 On-Facility Soils): RAO 1 should be amended to include reduction of transport of soil contamination off site through wind-blown dust and reduction of transport of soil contamination to Little Squalicum Creek through surface run-off. No RAO was developed for near-facility soils, because EPA concluded the risks were acceptable. As discussed above in relation to FS Section 2.2.2.1, however, the high end of the range of CR results off site exceeds both the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) acceptable CR range and the MTCA target CR. An RAO should be developed for near-facility soils that exceed acceptable risks under CERCLA and MTCA.

By taking the actions associated with the preferred alternative, the off-site transport of contaminated soil through wind-blown dust and surface runoff will be minimized. For the remainder of the comment: See response to comments from OCCC on human health risk assessment (Section 3.2).

6. P2-6 p2 (2.2.2.6 On-Facility and Off-Facility Groundwater, Shallow Groundwater): This section notes that shallow groundwater does not qualify as a drinking water source according to either MTCA or Federal guidance. It is unclear why RAO 2 includes reduction of ingestion of shallow groundwater.

RAO 2 is designed to reduce the potential for incidental ingestion and dermal contact of current and future workers with the contaminated shallow groundwater and to reduce the migration of the contaminants to the deep groundwater which does qualify as a drinking water source.

7. P2-6 p4 (2.2.2.6 On-Facility and Off-Facility Groundwater, Deep Groundwater): The MTCA Method C groundwater CULs are referred to incorrectly as industrial.

Method C does include site specific cleanup levels for qualifying "industrial properties." However, the final groundwater clean up levels selected in the ROD were based on MTCA Method B (unrestricted use).

8. P2-8 p2 (2.3.1 Soil): In the last bullet, isn't it more accurate to say that treatment reduces the toxicity, volume, and/or mobility of the contaminants, rather than prevent exposure?

Yes, it is accurate to state that treatment reduces the toxicity, volume, and/or mobility of contaminants; however, by reducing the toxicity, volume and/or mobility of contaminants, the potential for exposure to contaminants is also minimized.

9. P2-22 Table 2-1 RAO Summary:

1) Note (a) indicates that chemicals of concern are identified as those with CRs greater than 1E-4 or hazard indices (HIs) greater than 1. Superfund risk assessment guidance clearly indicates that risks are to be summed across multiple chemicals and exposure pathways. COCs should be defined as those chemicals contributing significantly to a total CR greater than 1E-4 under CERCLA (1E-5 under MTCA) or a total HI greater than 1.

Comment noted.

2) There should be an RAO for near-facility surface soils exceeding the MTCA target CR of 1E-5.

See response to comments from OCCC on feasibility study, comment P2-2 p2 above.

3) COCs should be specified for near-facility residential air, and near-facility residential air should be addressed in RAO 1. The last line of the table should be labeled On-facility Air to distinguish it from Near-facility Residential Air.

Air pollution and odors caused from plant operations is regulated by the local air pollution control agency. However, the selected remedy also will address fugitive dust emissions from contaminated areas.

4) Although CERCLA does not regulate storm water discharges, as discussed in note (d), surface runoff should be addressed in RAO 1.

Storm water runoff is regulated by the State. Storm water that runs over potentially contaminated areas at the site is collected and directed to the storm water treatment system.

Several modifications have been made at the site to minimize surface water runoff from the site and include regrading areas and constructing berms at the north and south ends of the facility. Consequently, surface water runoff was not separately addressed as part of RAO 1.

5) Since shallow groundwater was not evaluated in the risk assessment, as discussed in note (f), it seems inappropriate to mention ingestion of shallow groundwater as an RAO.

See response to Comment P. 2-6 p2 (2.2.2.6 On-Facility and Off-Facility Groundwater, Shallow Groundwater).

10. P4-2 p2 (4.1 Evaluation Criteria): The first sub-bullet states that the equivalency method for dioxins and furans and carcinogenic PAHs is explained in Appendix B, but it is not explained there.

Refer to the HHRA text, provided as Appendix M in the RI, for an explanation of the equivalency method for dioxins/furans and cPAHs.

11. P4-18 p3 (4.2.10 Analysis of Alternative 5, Overall Protection of Human Health and the Environment): The first paragraph notes that bioremediation is less effective at destroying 5- and 6-ring compounds. Some of the carcinogenic PAHs, including benzo(a)pyrene, which is the most potent carcinogen among the PAHs, are 5-ring compounds. Bioremediation might not be very effective at reducing the number of benzo(a)pyrene equivalents in the soil.

There are microorganisms whose breakdown of benzo(a)pyrene and other fused ring compounds have been documented. As noted in the FS, a bench-scale test and field pilot study would be required in order to determine the effectiveness of bioremediation on the contamination present at this site.

12. Appendix A**.** PA-5 Table 3: The CULs for on-facility soil yield a total CR (1.6E-5) slightly above MTCA's target of 1E-5. The CULs for groundwater yield a total CR (8.0E-5) well above MTCA's target, but this is not of great concern since it is unlikely the groundwater will be used for drinking. Our greatest concern about the proposed soil CULs is that there are no CULs, and indeed no cleanup, proposed for off-facility surface soils.

See response to Section 3.4.2 Comment 4.

13. Appendix B**.** PB-4 (B.1.3 Federal Safe Drinking Water Act and Washington State Drinking Water Standards): In the second paragraph, it states that EPA considers Maximum Contaminant Level goals (MCLGs) as ARARs under CERCLA only if they are above zero. MTCA [WAC 173-340-740(3)(b)(ii)(B)] references MCLGs for noncarcinogens only. The wording of the text suggests that CERCLA and MTCA address MCLGs differently, but the requirements of CERCLA and MTCA are essentially the same.

Comment noted.

14. Appendix B**.** PB-6 (B.2.1 Preliminary ARARs for Soil): The second paragraph is confusing as written. A better summary of preliminary ARARs might be: MTCA Method C industrial soil CULs for direct human contact, MTCA Method B soil CULs that are protective of groundwater, and MTCA CULs for simplified terrestrial ecological evaluations (TEEs). This section says TEE CULs for industrial land use are shown in Table X-1, which could not be found. The TEE CULs shown in Table 4-2 are for unrestricted land use.

EPA agrees that the second paragraph is confusing. Final CULs and ARARs are further discussed in this ROD.

15. Appendix B**.** PB-7 (B.2.2 Preliminary ARARs for Groundwater): The second paragraph states that MTCA allows site-specific factors, such as distance to existing drinking water supply wells, to be taken into account when determining CULs. MTCA mentions distance to existing drinking water wells as part of the demonstration for nonpotable groundwater.

Comment noted.

16. Cost Worksheets in FS and FS Addendum. Excavation and Loading: The unit cost for excavation and the estimate of soil volume should include back sloping of deeper excavations to maintain slope stability. This unit cost for excavation should also address stockpiling, stockpile management, and re-handling of clean overburden material, and the potential for dewatering of soil removed from deeper excavations.

This level of detail and effort is not necessary for the initial cost estimates contained in the FS.

17. Cost Worksheets in FS and FS Addendum. Backfill: FS Figure 4-2 and FS Addendum Figure 1 indicates that several of the proposed excavation areas will affect facility rail lines. Do the costs for restoration include replacement of rail?

Replacement of facility rail lines was not included in the cost estimates. Replacement of the rail lines and its associated costs will be addressed during the RD/RA phase.

18. Cost Worksheets in FS and FS Addendum. These figures show an excavation area requiring removal of existing asphalt. Include costs associated with restoration of existing asphalt following backfilling of this area.

A feasibility study cost estimate is intended to provide an estimate of significant costs associated with implementing a remedy to within +50% to -30%. The cost of restoring and

backfilling this area would not significantly impact the cost estimates and likely would fall within this range.

19. Cost Worksheets in FS and FS Addendum. Transportation and Disposal: Transportation and disposal costs account for approximately 20% of the total capital costs. It is our experience that significant increases in soil volume may be encountered when excavating to achieve soil concentrations below CULs.

A more accurate estimate of the transportation and disposal costs would be obtained during the RD/RA phase after additional sampling is conducted.

20. Cost Worksheets in FS and FS Addendum. Consider including costs for treatment or transportation/disposal of water generated during dewatering process.

Dewatering costs were not included as part of Alternative 6 as it was assumed that dewatering would not be necessary in such shallow excavations. Dewatering costs were, however, included in the FS cost estimates for Alternatives 3 and 5.

21. Cost Worksheets in FS and FS Addendum. Confirmation Sampling: A conservatively low estimate of confirmation samples includes 4 sidewall samples and one bottom sample per excavation area. The number of samples would increase if the CULs were exceeded and additional excavation was required. Waste characterization and waste designation samples required by the receiving disposal facility may also affect sample quantity.

See response to Comment 3 in Section 3.4.1 that addresses the number of confirmation samples. Waste characterization and designation samples were not included as part of the cost estimate but would be included in cost estimates associated with the RD/RA phase of the project.

3.4.3 Specific Comments on Feasibility Study Addendum

1. P9 p1 s3: The annual operation and maintenance (O&M) costs are presented as $1,013,000 per year for 30 years. Revise to present correct annual O&M costs.

After recalculating the cap and excavation areas, the estimated average annual O&M cost was $73,000.

3.5 Proposed Plan Comments

3.5.1 General Comments

1. Proposed Plan Should Include Monitoring and/or Cleanup for Little Squalicum Creek Surface Water and Sediments.

See the responses to the following comments: Section 3.2.1 Comment 1 and Section 3.3 Comments 1 and 2.

2. What is the frequency of groundwater monitoring in the Proposed Plan? Is The Oeser Company required to pay for this monitoring? If EPA finds deep groundwater contamination during the monitoring period, how will they respond? Who will bear the long-term costs of such actions?

In the cost estimate prepared for the Feasibility Study, monitoring of the shallow and deep groundwater was assumed to occur twice a year for the first five years then decrease to once per year for the remainder of the project. Monitoring for NAPL was assumed to occur twice a year for the duration of the project. The actual frequency of groundwater monitoring will be determined during the preparation of the O&M Plan and will be coordinated with RCRA. The Oeser Company is responsible for the cost of the monitoring and future cleanup actions related to the company's operation.

3. Expand Excavation and Decrease Capping in the Proposed New Cap Area. Four surface CUL exceedances of dioxin are stated in Figure 4 that are in the new cap or in the edge of old asphalt (subarea Wood Storage Area). Is it prudent to do shallow excavation of these areas even with a subsequent cap. This new cap appears to be more for working area purposes than for abating contamination movement. What is the purpose of the thin strip design of the new cap especially on the east end?

Some excavation may be required to install the cap but generally areas requiring action under RAO 1 either will be capped or excavated but not both. The cap proposed in the north region of the Wood Storage Area was proposed based on the contamination identified there prior to and during the RI. Prior to the RI, NAPL was identified in shallow monitoring wells, MW-07S and MW-13S, both located at the northern edge of the Wood Storage Area. Additionally, diesel and creosote contamination was identified through CPT-LIF-ROST in subsurface soils throughout the area proposed for capping (See RI Figures 4-18 and 4-25).

4. Long-Term Provisions for Building and Structural Foundations. What are the provisions for the foundation joints between existing buildings or supporting structures and the caps and/or old asphalt? How will these areas be maintained to ensure no water or contaminant migration? How much of a bond will EPA require from The Oeser Company to improve these areas to proper standards once

these structures are removed or abandoned?

Long-term provisions for foundation joints between existing building and supporting structures and the caps are details that would be addressed during the RD/RA phase. It is anticipated that impermeable seals between caps and structures will be installed to prevent the infiltration of surface water at these joints.

EPA will require financial assurance in any Consent Decree for performance of the remedy, but has not determined the size of any financial assurance that might be necessary for constructing the remedy.

5. Notification and Compensation for Contamination-Caused Deed Restrictions. How many adjacent residential lots exceed acceptable risk levels? If someone wants to build or expand a house, barn, etc. on one of these lots, who is responsible for the cleanup? How will landowners be notified that their land is contaminated above acceptable levels? If it is found that any property must have permanent restrictions, what provisions will EPA demand of The Oeser Company to compensate these owners for their contaminated or potentially contaminated properties?

The only elevated concentrations of dioxins/furans found off the Oeser property was at Open Res-53. The calculated risk at that location is 2E-04. This property is currently an industrial property with no residence present. The levels of contamination at this property and the neighboring other properties (besides the Oeser property) do not present unacceptable risk for future residential use, so no future use restrictions are anticipated. However, sale or transfer of property requires full disclosure of any known contamination or potential contamination of environmental media. When industrial properties are sold, typically the buyer or seller must conduct a Phase I Environmental Site Assessment or comply with "Due Diligence" requirements to assure that the buyer is fully aware of any environmental liabilities associated with the property.

3.5.2 Specific Comments

1. P4 p3 (Subsurface Soil): What evidence has EPA presented that the cone penetrometer and laser-induced fluorescence screening data is valid and statistically significant, especially at greater depths in the soil? This screening data was the largest data set collected by EPA and was used to fill in the large holes left between the 26 soil borings drilled at the facility (averaging 1 boring per acre of the 26 acre site). Without adjacent sample locations and analytical results to support the lateral extent of contamination, significant variances in soil volume estimates are likely, and may exceed the -30%/+50% variance accounted for by the cost estimate.

The CPT-LIF-ROST method is discussed in RI Sections 2.3.1 and 2.3.2. A discussion of the RI data obtained through CPT-LIF-ROST and how it correlated to analytical data collected

during the RI is provided in RI Section 4.3.6. Additional information about correlating CPT-LIF-ROST survey data with analytical data is provided in the 1997 EPA Innovative Technology Report titled, "The Rapid Optical Screening Tool Laser-Induced Fluorescence System for Screening of Petroleum Hydrocarbons in Subsurface Soils".

Although analytical data for many chemicals of concern at the site, such as PCP and dioxin, do not correlate well quantitatively with the screening data obtained during the CPT-LIF-ROST survey, the locations where contamination were identified both analytically and through CPT-LIF-ROST do compare well qualitatively. Comparing FS Figures 1-14 through 1-17 (Surface and Subsurface Soil Contamination Greater than Proposed Cleanup Levels) with RI Figures 4-18 and 4-25 (CPT-LIF-ROST Screening Results), it is apparent that much of the contamination identified using the CPT-LIF-ROST method is located in the same areas that contamination was identified through the installation of boreholes.

2. P7 p3 (Air Assessment): It should be noted that the elevated non-cancer risks were due to facility-related contaminants.

Comment noted.

3. P9 p4 (Remedial Action Objectives): RAO 1 should address off-site transport of contaminants through wind-blown dust and surface runoff.

Wind-blown dust and surface water runoff are not major sources of contamination at this site. Little, if any, off-site transport of contaminants through wind-blown dust and surface water runoff was observed during the RI; however, by implementing the actions that meet the requirements of RAO 1, as written, the potential for the off-site transport of contaminants through wind-blown dust and surface water runoff will be significantly reduced.

4. P9 (Remedial Action Objectives): There should be an RAO for near-facility surface soils with CRs exceeding the MTCA goal of 1E-5.

EPA will not conduct cleanup actions in near-facility soil. See response to comments from OCCC on feasibility study (Section 3.4.2 Comment 4).

5. P9 (Remedial Action Objectives): There should be an RAO for continued monitoring of surface water in Little Squalicum Creek to verify that risks for contact with the water decrease after the cleanup. If risks do not decrease after the cleanup, additional studies of the contamination in the creek should be conducted to determine how best to protect the creek. Additional sampling and testing of sediment in Little Squalicum Creek is warranted to further evaluate the potential long-term impacts to benthic animals living in the sediments.

No further monitoring or evaluation of the creek under Superfund is considered necessary. See responses to Section 3.2.1 Comment 1 and Section 3.3 Comments 1 and 2.

6. P10 Table 1 (Proposed Cleanup Levels for Soil and Groundwater): This table is inconsistent with Table 3 of Appendix A of the Feasibility Study, in which no CUL is proposed for total petroleum hydrocarbons (TPH) in groundwater, because TPH was not identified as a COC in groundwater.

TPH was not considered a COC in groundwater; however a CUL was added for consistency between media.

7. P11-13 (Summary of Alternatives): The time frames discussed for Alternatives 2, 3, 4, 5, and 6 in the Proposed Plan are less than a year, approximately a year, 3-4 years, and approximately a year, respectively. The time frames discussed in the Feasibility Study are less than a month, within 3 months, approximately a year, possibly greater than 5 years, and about a month, respectively. Still different time frames are listed in 5 Short-Term Effectiveness (P17 of the Proposed Plan). EPA should be more consistent about the time frames for each alternative.

The time frames discussed in the FS and under Short-Term Effectiveness in the Proposed Plan refer to the estimated time to construct the remedy. The time frames discussed in the Proposed Plan refer to the estimated time to design and implement the remedy.

8. P15 p5 (Compliance with ARARs): Since none of the proposed actions addresses near-facility surface soils with CRs greater than the MTCA target of 1E-5, and since there is no RAO for Little Squalicum Creek, none of proposed actions complies with MTCA.

EPA will not conduct cleanup actions in near-facility soil. See response to Section 3.4.2. Comment 4.

9. P19 (Preferred Alternative): Figure 8 excavation areas do not correspond with the excavation amounts listed in Table 3. It appears that the subareas Treated Pole Area is overstated and the North Pole Yard and South Pole Yard are understated. These variances should be included in the Cost Estimate.

Figure 8 capping areas do not correspond with the capping acreage listed in Table 3. The North Treatment Area and South Pole Yard appear to have capping acreage. These variances should be included in the Cost Estimate.

Based on this comment, the proposed excavation volumes and capping areas were recalculated and are now included in the Record of Decision.

The initial estimate presented in the FS Addendum did not include the area of the cap shown

in the South Pole Yard on the west side of the West Treatment Area nor did it include the cap area shown northeast of the East Treatment Area. The initial estimate of the amount of soil to be excavated in the Treated Pole Yard was roughly 10 times greater than what is shown on FS Addendum Figure 1. This difference accounts for most of the difference between the excavation volumes. The change in proposed cap size and proposed excavation volumes does not significantly impact the estimated cost for the alternative; the total present worth cost is reduced by approximately 3%.

10. P20 p1 (Preferred Alternative): The last paragraph of this section states that Alternative 6 complies with ARARs. But Alternative 6 does not comply with MTCA, because it does not address near-facility surface soils with CRs greater than the MTCA target of 1E-5 and it does not address Little Squalicum Creek.

For near-facility surface soils, see response to comments from OCCC on feasibility study (Section 3.4.2 Comment 4). In regards to Little Squalicum Creek, see response to comments from OCCC on human health (Section 3.2.1 Comment A through C) and ecological risk assessments (Section 3.3 Comments 1 and 2).

4. THE OESER COMPANY COMMENTS

Comments on the Remedial Investigation, the HHRA, the Feasibility Study, and the Proposed Plan were submitted on behalf of The Oeser Company by Preston, Gates, and Ellis (PGE), the RETEC Group (RETEC), and Intertox. Section 4.1 addresses the comments from PGE and RETEC regarding the RI. Section 4.2 addresses the comments from Intertox regarding the HHRA and the proposed cleanup levels. Section 4.3 addresses the comments from PGE, RETEC, and Intertox on the FS, the FS Addendum, and the Proposed Plan.

4.1 Remedial Investigation Comments

4.1.1 Comments from PGE

The following comments focus on factual statements contained in the Reports with respect to various aspects of the site and The Oeser Company's operations that require clarification or correction. Italics denote The Oeser Company's proposed revised language.

1. Compliance with Local Zoning-RI, Section 1.3.2.1, page 1-5. Please remove the third sentence of the fourth paragraph: The Oeser Company's City of Bellingham nonconforming use certificate does not require re-application every five years.

Comment noted. The change is reflected in the ROD.

2. Number of Employees. RI, Section 1.3.5, page 1-10. Please revise the first sentence of the fifth

paragraph to read: "Twenty-four people work at The Oeser Company."

Comment noted. The ROD states that approximately 20-25 people now work at the Oeser Company.

3. No Evidence of Seeps-RI, Section 1.4.3, p. 1-12. Please remove the second sentence of the fifth paragraph concerning potential presence of seeps along the creek in the area of The Oeser Company outfall.

The Oeser Company's extensive research indicates that no such seeps exist in the immediate area near The Oeser Company outfall as EPA initially asserted. The Oeser Company has submitted extensive documentation in this regard, including a memorandum prepared by Michael Lloyd and Associates regarding the physical inspections documenting an absence of seeps along Little Squalicum Creek near The Oeser Company property. See Oeser's Comments, HHRA, submitted to EPA on July 30, 2001.

The response to the same PGE comment on the preliminary site characterization and summary report (PSCSR) is as follows. On June 3, 1999, during a site walk with The Oeser Company's General Manager E. L. Godfrey; Ecology and Environment, Inc. (E & E) personnel J. Wroble identified seeps along Little Squalicum Creek. Photographs of remedial investigation sample collection at a seep are included in the PSCSR.

4. No Bottom Sludge-RI, Section 1.5.3, p. 1-24. The last sentence of the second paragraph does not properly characterize The Oeser Company's 1998 104(e) response. Please revise to read: "With the escalating oil prices of the 1970s, operating procedures changed and no bottom sludge *has been removed nor generated since that time* (PGE 1998)."

Comment noted.

5. Sewer Operation-RI, Section 1.5.3, "Facility Operation History," page 1-24. The sixth sentence of the third paragraph does not properly characterize The Oeser Company's 1998 104(e) response. Please revise to read: "Since 1991, the sewer has been used only for sanitary uses *because The Oeser Company installed a closed-loop system in December 1990, thus obviating the need to release process water to the sanitary line*."

Comment noted.

6. Evaporation-RI, Section 1.5.3, page 1-25. Please revise the first sentence of the first paragraph to state: "Currently, The Oeser Company evaporates *approximately* 1,417,000 gallons of storm and process water per year . . ."

Comment noted.

7. Alleged Spill-RI, Section 1.6, page 1-34. Please remove the fourth paragraph of this section regarding an alleged December 1977 release to Little Squalicum Creek. Alternatively, please release EPA's cited source to The Oeser Company. The Oeser Company has no recollection of the incident described in the 5th paragraph, regarding an alleged December 1977 release to Little Squalicum Creek.

The response to the same PGE comment on the PSCSR is as follows. The information was taken from a December 8, 1977, Bellingham Herald newspaper report, including a photograph.

8. The discussion of odor issues contained on page 1-33, Section 1.5.5.2, of the RI seems unlikely to further an understanding of current site characteristics, nor to define sources, nature, and extent of contamination.

The response to the same PGE comment on the PSCSR is as follows. The discussion of odor and worker methods of unloading the retort characterize potential sources of contamination not extent of contamination.

9. Certain information regarding a 1975 spill described on page 1-34, Section 1.6, of the RI appears extraneous. The fact that former officers of The Oeser Company were fined $250.00 twenty-seven years ago has no bearing on characterization of the site to support remedy decisions.

The response to the same PGE comment on the PSCSR is as follows. Section 1.6, "Spills and Other Hazardous Substance Releases" was part of the history of The Oeser Company facility that was included in the PSCSR because such releases may have contributed to contaminants of concern in soil or water samples collected during the RI. The fine indicated that the nature of the release exceeded applicable regulations.

4.1.2 RETEC Comments

1. The RI includes a substantial amount of data concerning site hydrogeology and distribution of chemicals in groundwater. However, the RI fails to present an overall site model that integrates this physical and chemical data to define sources, contaminant migration pathways, and exposure points. Unless the reader puts significant effort into reviewing the documents, they are left with a disjointed and potentially incomplete understanding of site conditions and the effectiveness of the proposed remedy in addressing site issues.

The fate and transport of chemicals identified at the site is discussed in RI Section 5 with Section 5.6 focusing on the distribution of chemicals in groundwater. RI Section 5.8 summarizes the dominant factors impacting the fate and transport of contamination at the site, identifies contamination sources and migration pathways.

2. The classification of the uppermost soils as the "upper sandy zone" is misleading and should be revised to reflect the data in the report. This unit is described as fine- to medium-grained sand with lenses of silt and clay. However, soil descriptions, cone penetrometer testing, and cross-sections show that the upper 5 to 10 feet of soil is silt and clay across most of the site. Below this depth, silts and sands become more interbedded, and with depth, the soils become increasingly sandy. Hydrogeologic discussions indicate that groundwater is in isolated pockets, suggesting the presence of sand lenses in a silty unit. The distinction between an "upper sandy zone" and a unit consisting of interbedded silts and sands with an increasing abundance of sand with depth is significant. Infiltration rates, fluid migration patterns and the ability of soil to attenuate chemicals are significantly different. In a sequence of silts and interbedded silts and sands, the infiltration rates will be substantially lower, fluid migration pathways may be tortuous causing slower migration, and the soil will have a greater capacity to attenuate any releases before the main groundwater aquifer is affected.

See response to same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR. The response was as follows: The upper soils beneath The Oeser Company facility are described as "predominantly fine to medium sand with lenses of silt and clay." The EPA continues to believe this description is accurate.

3. The groundwater quality discussions compare water quality from various types of monitoring points that are not comparable. The text should acknowledge that, where sampling methods and equipment vary, variations in chemical concentrations may be associated with the sampling method and not the groundwater quality. For example, data collected from geoprobes and monitoring wells are compared, as well as groundwater samples likely collected by bailing versus samples collected using low flow sampling techniques (monitoring well sampling methods during the RI and previous events are not specified).

See response to same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR. The response was as follows: EPA acknowledges that different methods have been utilized for sample collection over the history of this site. However, all methods employed were standard methods generally used by the EPA. The EPA routinely utilizes data of differing quality, and the EPA believes these data meet the data quality objective for comparability. Data usability is assessed in PSCSR Section 1.7.

4. The RI appears to use two different base maps and two different datum making comparison and review of the data in the RI difficult. As an example, please compare Figures 1-8 and 1-9 with Figure 3-8. These maps are not on the same base, causing confusion on several points, as described below:

- The locations of the site features (buildings, tanks) do not match well from one figure to the next, making the comparison of potential source areas to subsurface information difficult.
- On Figure 1-8/1-9 (also see Figure 1-14), the sewer runs through the site west of the

area where the site extends northward (under the east side of the PCP warehouse). Figure 3-8 shows a similar feature, which is assumed to be the sewer but is not so labeled, located 30 to 40 feet to the east of where the site extends northward.

- Near stream gauge SG-2, Figure 3-8 indicates the stream elevation is 21.49 feet. However, based on Figure 1-8, the elevation in the vicinity of SG-3 appears to be about 30 feet.
- The elevation of railroad grade on Figure 1-8 differs 5 to 10 feet from the elevation of the LSC-MW-2 and LSC-MW-3 well logs.

In addition, the inclusion of different features on the various maps leads to significant confusion. Other difficulties in interpretation of the maps may be related to the figures being based on different base maps and different geographic datum. For clarity, the RI should be revised such that all maps have a consistent basis and can be directly compared.

Comment noted. Figure 3-8 is a comparison of boring logs and the results of cone penetrometer tests, it does not include stream gauge SG-2. The elevation of the railroad grade increases by ten feet from east to west across Figure 1-8, which may be the source of confusion regarding the agreement between the elevations of railroad grade and the well heads.

5. Section 1.4.1, 3.1.1.2, Figures 3-3 through 3-12, Section 3.1.2.1, Section 4.4.2 and 4.4.5.3: As indicated in general comment #2, RETEC believes describing the upper soils beneath The Oeser Company facility as an "upper sandy zone" is inaccurate and potentially misleading. While there are places that the silt is absent, the cross-sections included as Figures 3-3 and 3-4 show that the upper portion of the soil sequence is predominantly silt. CPT testing shows significant silt, clay and silty sand in the soil sequence (Figures 3-5 through 3-12). Furthermore, Sections 4.4.2 and 4.4.5.3 discuss groundwater occurring in discontinuous isolated pockets, supporting the presence of sand lenses in a silty unit. These data do not support the discussion in Section 1.4.1 and 3.1.1.2 that indicates that the upper 20 to 25 feet of soil is predominantly fine to medium sand with lenses of silt and clay. Based on the stratigraphic sequence, and likely depositional environments, it is likely that the soil is actually a coarsening downward sequence. Silts are present near the ground surface, grading downward into silts with interbedded sand layers and lenses, then sands with interbedded silt layers and lenses and further downward into sands. The presence of substantial silt in the upper unit, particularly near the surface, should not be downplayed; it will have a significant impact on attenuation associated with any releases, and on reducing rates of infiltration.

The response to the same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR is as follows*: *As previously stated, the upper soils beneath The Oeser Company facility are described as "predominantly fine to medium sand with lenses of silt and clay." The EPA continues to believe this description is accurate.

6. Section 3.1.2.1.1: This section is titled hydraulic conductivity tests, but the text does not discuss the hydraulic conductivity of the upper zone. Transmissivity values are included; however, the thickness of the intercepted sand lens is not estimated, and hydraulic conductivities are not calculated. The title should be changed or hydraulic conductivities should be estimated. This section should identify the limitations of a pump test conducted with a peristaltic pump for 30 minutes - namely, that it will only provide information on the soils immediately surrounding the well, and can potentially be influenced by well bore effects. In addition, the last sentence of this section is misleading, as it indicates that areas with higher transmissivity are expected to be areas with potentially higher rates of flow. The transmissivity indicates that fluid could flow more readily through soil, if other conditions were correct. However, the ability for potential flow is related to the interconnectedness of the sandier layers or lenses. The flow rate is also controlled by the gradient, and there is no information on gradients in the sand lenses. Finally, information on the stratigraphic interval screened in each well where a pump test was completed should be included for reference in the table in this section.

Comment noted.

7. Figures 3-27, 3-28, and 3-29: Groundwater levels in MW-24D are anomalously high and the data is not honored in the contouring. LSC-MW-4 is referenced in the text, but the location and groundwater measurements are not shown on these maps.

The response to the same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR is as follows: Groundwater levels in the well MW-24D are somewhat high; however, the EPA disagrees with the assertion that groundwater elevations in MW-24D are not honored in the contour scheme. Regardless, groundwater contours are subject to interpretation and minor changes in their locations are unlikely to alter interpretations of groundwater flow at The Oeser Company facility. LSC-MW-4 was dry and therefore was not included in the water level contour.

8. Section 3.1.2.3.1: This section overestimates site-wide infiltration rates. The section notes that the rates apply to unpaved areas, but does not indicate the actual extent of the unpaved area. An estimate of infiltration in paved areas should be included or it should be stated that it is assumed to be zero. The infiltration value analysis would most likely be applied to paved or covered areas beneath which the greatest subsurface impacts exist. Values used for soil physical properties in the model are not specified in this section.

In response to the same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR, text was added to the RI that addresses this concern. With respect to the remedial design of the final caps, the percolation through paved areas will be based on the properties of the construction materials and their long-term integrity.

9. Section 3.1.2.3.2: EPA's estimates of vertical flow velocity are based on oversimplified

assumptions, are highly speculative, and are likely overestimated. The assumption that the average soil texture beneath the site is considered a sandy loam is unsupported. If vertical flow rates are going to be used in the site conceptual model and in evaluating remedial actions, estimates need to consider finer grained layers which may control infiltration rates. Lateral migration along finer grained beds and perched water should be considered. In addition, the conceptual site model should consider whether the estimated vertical flow velocities are consistent with the timing of site operations that potentially resulted in releases, and with current groundwater quality.

The response to the same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR is as follows: ***Estimating vertical infiltration is inherently complex and requires that estimates and assumptions be made with the available data. Soil texture beneath the site is characterized from 0 to 20 feet below ground surface as fine to medium sand with highly variable silt and clay content, and from 20 to 40 feet as fine to medium sand with silt and clay lenses. For the purposes of assigning soil-water availability variables, this soil was considered a silt loam and assigned an average soil available water capacity of 0.15 inches per inch. Historic water quality data that indicates when groundwater was initially contaminated is unavailable and therefore cannot be used to evaluate whether the estimated vertical flow velocities are consistent with the timing of site operations. This issue is further complicated by the fact that until 1973, facility operations included injection of contaminated water into percolation beds located east of the treatment area.***

10. Section 3.1.2.2.2 and Section 3.1.2.4: Section 3.1.2.2.2 indicates that anomalous groundwater levels associated with LSC-MW-2 may be related to a natural overland flow path toward the creek, such as a channel for sugar processing wastes. Groundwater flowing down this channel feature is not necessarily discharges of deep groundwater at the site as indicated in the last sentence of Section 3.1.2.4. Rather, it could be near-surface recharge water flowing down a shallow, more permeable subsurface remnant channel feature.

The response to the same comment in letter from the EPA regarding ThermoRetec Comments on the PSCSR is as follows: ***The conclusion drawn in Section 3.1.2.4 is that because the elevation of the seep located near LSC-MW-2 is below groundwater elevation in LSC-MW-2, the seep water is likely derived from the deep aquifer.***

11. Section 4.0: Some subsections in Section 4.0 identify the number of samples exceeding the screening criteria as compared to the total number of samples collected, while other sections identify only the number of samples exceeding the criteria. Given the complexity of the sampling program, and the total numbers of samples, the text should consistently note the number of samples that were collected as well as the number of samples that exceeded criteria.

Comment noted, but no changes will be made.

12. Section 4.3.6: This discussion uses the term contamination. First, the term contaminated should either be redefined for this section, or another term should be used (e.g., fluorescence intensity greater than...). Elsewhere in the text, the term contamination refers to occurrence of a compound above the PRG or risk-based criteria. The LIF-ROST testing does not correlate to a specific concentration. It is not clear why a reading above approximately 2% of the standard is significant. What percent is usually representative of background at the site? Second, the meaning of the filters needs to be spelled out more clearly; if an area of fluorescence passes a filter for gasoline, is the signature similar to that of gasoline? Third, the discussion of sample locations needs a reference to a figure with legible labels on the CPT borings. In the comparison of CPT-LIF-ROST results to concentrations measured in various analytical results, it is not clear what LIF value was being compared to the analytical result. Is it the intensity, or something on the waveform plots? Fourth, as LIF-ROST has been a new and evolving technology over the past few years, uncertainty associated with the results (e.g., influence of organics in the samples) should be discussed, or the EPA 1977 paper referenced in Section 2.3 should be attached. Fifth, the cross-section labels on Figures 4-23 and 4-24 are inverted. This mislabeling of the final two cross-sections is significant, because this error may be the cause for EPA requiring paving near the office at The Oeser Company in the Proposed Plan. Finally, given the low R2 for all comparisons but PAH, the conclusion in the final sentence should be restricted to providing a good indication of PAH, not of wood-treating-related wastes.

Discussions of the significance of the CPT-LIF-ROST data is included as part of RI Sections 2.3.2 and 4.3.6. Comment noted regarding the cross-section labels on Figure 4-23 and 4-24. It should be noted that proposed capping locations were not determined based on information presented in Figures 4-23 and 4-24. Currently, it appears that old asphalt pavement is located next to the office. We assumed that all existing pavement, which includes existing caps and all "old" asphalt would require improvement. In any case, the areas proposed for capping in the FS and proposed plan are only approximations and do not represent a final design.

13. Section 4.4.4.3, Section 4.5.1, and the discussion of Well Points Along Little Squalicum Creek in Section 4.4.5.3: All these sections discuss groundwater quality data collected from temporary installations. These data are not comparable to data collected in wells. Several of the compounds detected are highly sensitive to the amount of turbidity in the sample, particularly cPAHs. These sample points were likely not developed to minimize fines, and sampling protocols may not have been the same. A qualifier should be added to each of these sections.

See response to Section 4.1.2 Comment 3, above.

14. Section 4.4.6: The sampling methods are not detailed for the historic data (1995, 1996, and 1997). If the groundwater samples were collected by means other than low flow sampling, the data should not be used as an indication of historic changes in groundwater quality. Based on the variability in historic results, especially with cPAHs, as compared to the consistent data collected as part of the

RI, variable detections are likely related to turbidity in the samples, not temporal changes in groundwater concentration.

See response to Section 4.1.2 Comment 3, above.

15. Section 5.3.6, first sentence: Given creosote use at the site, some TPH is likely derived from distillation of coal tar, as well as from crude oil (carrier oil).

EPA agrees with this comment.

16. Section 5.4: NAPL pools are limited in number at the facility, as indicated by thicknesses measurements and recovered volumes from the upper interbedded zone. However, on page 5-11, the first full paragraph incorrectly suggests that most NAPL exists as pools perched on top of low permeability lenses. On the contrary, given soil concentrations, CPT-ROST data and product recovery, most NAPL likely exists as a residual phase in soils and not as pools perched on lenses. As EPA acknowledges on page 5-12, this immobile residual NAPL would likely not be remobilized unless site conditions were altered (pumping or addition of cosolvent). Also on page 5-11, first full paragraph, the discussion indicates that the potential for NAPL to migrate downward primarily depends on whether the NAPL will migrate downward through the interbedded zone. Another major factor in the ability of NAPL to reach the continuous water table (gravelly zone) that was not mentioned is the amount of NAPL present. As NAPL migrates, residual NAPL is sorbed to the soil and trapped in pores. As such, any release would have to be of sufficient volume to migrate through the tortuous pathways in the interbedded zone and reach the continuous water table.

The thickness of free product and the amount of product recovered from the upper interbedded zone are unrelated to the actual number of pools present in that zone. The variables controlling the thickness of NAPL accumulating on a low permeability lens are well defined in the RI text; the number of pools in a given area is not one of these variables. Likewise, the amount of NAPL recovered from the interbedded zone is a function of many variables, such as pore size and connectivity, and the density and viscosity of the NAPL. The discrete number of pools from which the NAPL is extracted is not one of these variables, however, and therefore cannot be back calculated from the volume of NAPL recovered. EPA does, however, agree that NAPL may exist as residual saturation.

EPA confirms its statement that immobile residual NAPL likely would not be remobilized unless site conditions were altered (pumping or addition of cosolvent). Also on RI page 5-12, the EPA states that the mass of NAPL in the vadose zone will be decreased by vaporization of the NAPL and dissolution by infiltrating water. Dissolved contamination may reach the deep aquifer sooner than NAPL from the low permeability zones. Since residual NAPL has a much higher surface area than pooled NAPL, and the dissolution rate is slower for smaller surface areas, residual NAPL will likely dissolve more quickly than pooled NAPL and may

contribute more dissolved contamination to the deep aquifer than would pooled NAPL. RETECs purpose in suggesting high residual mass is therefore unclear.

EPA agrees that the amount of NAPL present is a major factor in the ability of NAPL to reach the continuous water table (gravelly zone).

17. Page 5-12, last paragraph: The NAPL in the upper interbedded unit is not necessarily DNAPL, it may be either LNAPL or DNAPL.

EPA agrees that the NAPL in the upper interbedded unit may be either LNAPL or DNAPL. DNAPL is mentioned specifically in the last paragraph on RI page 5-12 because the conceptual model discussed there applies only to DNAPL. The shallow groundwater at The Oeser Company property is characterized by discontinuous saturation that is perched on fine-grained material (RI page 1-11). If water and NAPL are both present above a low permeability lens, LNAPL will float on the water, making it impossible for water to flow over the contaminant pool as described by the conceptual model. Confusion may have been avoided had the sentence introducing the equation read "DNAPL pools" instead of "NAPL pools".

18. Section 5.5, page 5-13: A naphthalene odor suggests volatilization; however, this section should note that the concentration at which naphthalene can be smelled (odor threshold) is below health-based criteria for human exposure.

No conclusions regarding the concentrations of volatile compounds were made based on detection of odor. The purpose of documenting odor was to suggest the possible presence of a compound, not to quantify the concentration or the risk posed by it.

19. Section 5.6.2, page 5-16: In the first paragraph it should be noted that residual NAPL (as well as NAPL pools) are potential contaminant sources. The last sentence of the first paragraph ignores the processes of retardation discussed above in this section. Most chemicals of concern at the site have high retardation factors. In the second paragraph, destructive processes which degrade compounds are likely effective in decreasing chemical mass in both the water infiltrating through the unsaturated zone and the groundwater.

EPA agrees that residual NAPL also could have been listed along with NAPL pools as potential contaminant sources. The last sentence of the paragraph does not mention the processes of retardation because they will not significantly decrease plume concentrations when a source is present.

Retardation of the chemicals of concern is a function of both the chemical and the subsurface solids. A statement that most of the chemicals of concern have high retardation

factors is not strictly correct, as the retardation factor is not a property inherent to the chemical.

Natural attenuation is largely a function of redox state. Chlorinated compounds such as perchloroethylene and trichloroethylene degrade preferentially in anaerobic (low to no oxygen) environments, whereas petroleum compounds degrade preferentially in aerobic environments. The diffusion of oxygen into groundwater is often limited (depending on the depth to water and if the aquifer is confined), often resulting in saturated zones with lower oxygen contents than the unsaturated zones. Thus, destructive processes that degrade certain compounds in the groundwater may not degrade the compound in the infiltrating groundwater.

20. Section 5.7.1: This section states that the facility is the likely source of off-site PCP, dioxin and ncPAH. However, as EPA acknowledges elsewhere in the reports, there are several other potential sources of offsite PCP, dioxin and ncPAH. This broad statement should be revised to reflect these other sources.

As stated in RI Sections 4.5.2 and 4.5.3, air sampling data indicated that The Oeser Company was a probable source of PCP, dioxin, and ncPAH contamination found in ambient air off of the facility. It is unclear where the commenter infers that the EPA has acknowledged that "there are several other potential sources of off-site PCP, dioxin, and ncPAH" in ambient air.

21. Section 5.8: This section also focuses on NAPL pools as continuing sources. Again, site data indicate that the volume of NAPL pools at the facility is limited and NAPL primarily exists as a residual product (not as a free pool as suggested by the text). Given the limited volume and perching layers, the primary concern stems from potential dissolution by infiltrating water, whether the NAPL is residual or pooled. As demonstrated earlier in Section 5, these pools are not expected to migrate to the deep aquifer. This concept should be made clear for the reader.

The CPT-LIF-ROST data and contaminant concentrations in soil do not conclusively indicate that the majority of NAPL is present as residual. EPA does, however, agree that potential dissolution of infiltration water through residual or pooled NAPL may pose a threat to the deep aquifer.

4.2 Human Health Risk Assessment and Cleanup Level Comments

This section includes the comments from The Oeser Company's consultant, Intertox, regarding both the HHRA and the CULs developed from the results of the HHRA.

4.2.1 Intertox Comments on the HHRA

1. Multiple Individually Conservative Assumptions Were Used In The Risk Assessment Calculations. CUL calculations are based on the estimated risks for the on-facility worker. In our initial comments to the HHRA (Intertox, 2001a), we identified several factors that clearly result in substantial overestimates of risks to workers at The Oeser Company facility. Combined, the cumulative impact of these assumptions on the risk calculations is significant, yielding risk estimates that likely far exceed any true risks associated with the site. These issues continue to be of significant concern, specifically:

1. Soil sampling was biased.
2. The worker soil ingestion rate applied in the HHRA (200 mg/day) is excessively high.
3. The bioavailability assumptions used to estimate uptake of chemicals from soil likely significantly overestimate actual uptake since the primary COCs tend to bind tightly to soil.

The national and regional EPA guidance for preparing the HHRA was followed:

- ***Maximum concentrations are to be used when fewer than 10 samples are collected (EPA 1992)***
- ***A soil ingestion rate of 200 mg/day is recommended by EPA Region 10 for industrial scenarios.***
- ***Use of a bioavailability of less than 100% was not considered appropriate for this site due to the number of chemicals detected and lack of site-specific information regarding chemical and physical soil properties and chemical species.***

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

2. Exposure Point Concentrations Used in the Risk Assessment Are Biased High. In a baseline HHRA, exposure estimates are intended to be representative of an individual's exposure averaged over time since a primary goal of such an assessment is to evaluate risks associated with long-term exposures (i.e., chronic risks). In the HHRA for The Oeser Company site, however, EPCs for the worker soil exposure scenarios, in particular, likely significantly exceed concentrations workers would be exposed to over time (Intertox, 2001a). Several factors contribute to these overestimates:

- Soil samples taken on the facility were intentionally collected in a biased manner.
- Samples were screened based on physical evidence of contamination.
- Samples were screened using lower-cost dioxin and hydrocarbon screening methods prior to submission for full analyses.
- Non-detected COCs were assumed to be present at one-half their detection limit, even when these biased sampled revealed that a COC was not detected in a given sample (Intertox,

2001a).

- If fewer than 10 samples were collected in an area, the maximum concentration detected in the biased samples was used to estimate the area-wide risk (Intertox, 2001a).

Use of biased sampling data in risk assessments intended to support the calculation of cleanup levels is contrary to federal EPA risk assessment guidance. Unfortunately, Region 10 EPA has made no effort to quantify the potential magnitude of the overestimate in the RI or FS reports. Thus, it is impossible to use these estimates to assess the appropriateness of the proposed site-specific CULs.

Sampling and analysis and exposure point calculation practices were consistent with EPA guidance and are appropriate for this site. [EPA guidance (1992) was followed for calculation of exposure point concentrations. EPA guidance, <u>Risk Assessment Guidance for Superfund, Human Health Evaluation Manual</u> (1989) and <u>Guidance for Data Usability in Risk Assessment</u> (1992) were used to guide sampling and analysis plans and screen data for use in risk assessment.] Cleanup levels are not based on exposure point concentrations, but were back-calculated using site-specific risk estimates. Only locations greater than cleanup levels are proposed for remediation.

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

3. The Worker Soil Contact Assumptions are Overly Conservative and In Some Cases Inconsistent with Guidance. The parameters used in the HHRA to describe exposures are primarily default values from federal EPA guidance and likely significantly overestimate facility-related exposures for most individuals. Several factors support this assertion:

- Workers at The Oeser Company facility, however, do not engage in activities involving intensive contact with dirt on a daily basis. Information from The Oeser Company site managers indicates that worker tasks during normal production at the facility do not involve excavation or routine contact between the workers' hands and soil.
- This Region 10 EPA worker soil ingestion rate (200 mg/day) is not formally published nor documented, and has not undergone the peer review process required for most EPA guidance.

- The Region 10 guidance is clear that the 200 mg/day soil ingestion to reflect exposures to workers who repeatedly and intensively contact soils every working day. This scenario is not consistent with worker exposures at The Oeser Company site.

These combined conservative assumptions yield assumed soil contact rates that likely substantially exceed true exposure levels.

EPA Region 10's Supplemental Human Health Risk Assessment Guidance, Office of Environmental Assessment, Soil Ingestion Rates (January 25, 2000) was used to establish ingestion rates for different receptors.

4. Intake Estimates Do Not Reflect Differences in the Bioavailability of Chemicals in Soil. In the HHRA for The Oeser Company site, all contaminants in ingested soil are assumed to be 100% "bioavailable." As we indicated in our comments to the Interim Final HHRA (Intertox, 2001a), this assumption likely significantly overestimates uptake of most chemicals via ingestion of soil.

Although EPA and other agencies have accepted risk assessments where bioavailabilities less than 100% were applied, this is not a routine practice, especially for sites with a wide variety of contaminants and where site-specific information on bioavailability has not been collected. EPA Region 10 recognizes that the actual bioavailability of a chemical from soil may be less than 100%; however, this bioavailability is highly dependent on the chemical form, the chemical and physical properties of the soil, and individual receptor biochemistries.

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

5. Unrealistic Exposure Scenarios Have Been Retained in the HHRA. As we indicated in our comments to the Interim Final HHRA (Intertox, 2001a), several of the exposure scenarios that have been evaluated in the HHRA are unrealistic and unlikely to ever occur. We recommended that these scenarios be deleted from the HHRA, or grouped separately within the document to communicate their status. These recommendations, however, were not incorporated into the Final HHRA.

As discussed in the comment responses provided on May 31, 2001, and as reiterated in the meeting on June 8, 2001, EPA recognizes that several of the exposure scenarios evaluated are not likely to represent actual future exposures. Rather, these scenarios were included to provide information to risk managers about potential institutional controls needed (i.e., deed restrictions, groundwater use limitations, etc.). Scenarios that do not represent actual current or anticipated exposure were identified in the text of the HHRA.

Although The Oeser Company intends to continue to use the site for industrial purposes and will have institutional controls in place to prevent excavation underneath capped areas, it is possible that a future owner may excavate the site for redevelopment. Evaluation of a subsurface soil contact scenario was included to provide information about risks in the event that subsurface soil is brought to the surface. On-site residential development was similarly included to determine the risks in the event that future residential development occurred on site. The scenarios included in the risk assessment provide information to EPA about potential institutional controls needed.

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

6. Groundwater Contact Risks Are Likely Significantly Overestimated. Although most groundwater contact risks estimated in the HHRA are below U.S. EPA levels of concern, these risks are nonetheless overestimated because of compounding conservatism in many of the assumptions. To avoid misinterpretation of the results, the conservatism in these risk estimates needs to be clearly communicated.

It is noted in the HHRA, RI/FS, and Proposed Plan that future consumption of groundwater by workers and residents is not likely. However, this exposure pathway was evaluated to provide information to risk managers about the necessity for institutional controls. COPCs were screened and selected according to EPA risk assessment guidance (1989, 1992). Also note that the HHRA text states that risks associated with contact with groundwater at the Tilbury Cement Company are attributable solely to use of one-half of the detection limits.

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

4.2.2 Intertox Comments on CULs

1. CUL Calculations Rely on Overly Conservative Exposure and Risk Estimates. We note that the risk calculations were not revised in the final risk assessment documents (START-2, 2002a,b), and are presented without caveat in the FS report (START-2, 2002d). Because these over-conservative risk estimates ultimately drive the selection of proposed remedial alternatives and corresponding CULs, these issues of excessive conservativisms remain of significant concern.

CUL calculations are based on the exposure scenarios presented in the HHRA. These scenarios are based on standard EPA Region 10 guidance and are intended to be protective of current and future (industrial) land uses. Conservatism in the scenarios allows for adequate protection of future, unknown uses and potential exposures to multiple chemicals via multiple pathways.

2. CUL Calculations Rely on the Improbable Assumption that Workers Simultaneously Contact the Maximum-Detected Concentrations throughout their Working Lifetime. Specifically, to account for the potential additivity of risks posed by exposure to multiple chemicals, Region 10 EPA assumed the maximum-estimated risk for each COC within a given area. It is unlikely that a single on-site location exists where the maximum detected concentration of each of the COCs exists concurrently. In

addition, it is virtually impossible that anyone would remain at this location and be exposed to these concentrations for the duration of their time on-site. For these reasons alone, the risk estimates used in the CUL calculations are extremely unlikely to correspond with actual risks for any individual. When compounded with other conservative assumptions already applied in the risk calculations, these risk estimates yield CULs that are unnecessarily low.

Exposure point concentrations were calculated according to EPA guidance, Supplemental Guidance to RAGS: Calculating the Concentration Term (1992). Focusing sampling efforts on "hot spots" allows EPA to focus remediation on areas of greatest concern. It is not possible to determine the extent to which the site sampling data may over or underestimate actual average concentrations that workers may be exposed to over time. Therefore, EPA developed CULs based on the HHRA exposure scenarios to allow for adequate protection of current and future workers.

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

3. Impact of Region 10 EPA's Conservative Assumptions on CUL Calculations. As we indicated in our initial comments to the HHRA (Intertox, 2001a; Comment #10), taken together, the cumulative impact of the multiple conservative assumptions on the risk assessment calculations is significant. Multiplying the highly conservative assumptions used in the HHRA together gives an estimate of risk that likely significantly exceeds possible risks (i.e., >>> 90th percentile), an approach not consistent with U.S. EPA's goal of estimating exposures that fall within the distribution of actual expected exposures (U.S. EPA, 1995). When the goal of site cleanup is the protection of human health and the environment, basing risk management decisions on these results may result in unnecessarily high cleanup costs without an appreciable decrease in public health risks compared to application of somewhat less conservative assumptions.

We recommend in the presentation of proposed cleanup alternatives, Region 10 EPA quantify the probable impact these [overly conservative, sic] assumptions have on the proposed CULs. This measure of probable impact would provide more information to risk managers for assessing the true level of protection provided by different alternatives compared with associated costs. Further, with regard to the proposed remedial alternatives presented in the FS, we recommend that Region 10 EPA reconsider the necessity of capping or removing dirt from areas outside the WTA and NTA, since the soil screening data from samples not submitted for analyses suggests that average concentrations in these areas are low.

EPA does not agree that the worker scenario is overly conservative. Assumptions made for this scenario allow for adequate protection of current and future workers. Furthermore, exposure assumptions are consistent with EPA Regional guidance.

4.3 Feasibility Study, Feasibility Study Addendum, and Proposed Plan Comments

4.3.1 PGE Comments

1. Comments Regarding Proposed Soil and Groundwater Cleanup Levels. In summary, PGE states that establishing drinking water CULs for groundwater is inappropriate as it is unlikely that the groundwater will ever be used for drinking water. PGE requests that the EPA clarify that drinking water CULs need not be applied. Additionally, PGE feels that discussion of placing restrictions on the installation of drinking water wells is inappropriate. PGE suggests that this language be removed from the FS Addendum.

Although there are no current plans to develop deep groundwater for residential use, the deep aquifer remains a viable source for potable water. As such, the deep aquifer should be protected to preserve the potentiality of future development. Drinking water CULs were developed for groundwater at the site to preserve this potentiality and to serve as action levels should deep groundwater contamination at these levels be identified in the future. Groundwater data collected during future monitoring events would be compared to the established groundwater CULs to determine if action would be necessary. Until groundwater standards are attained, restrictions on its use will remain in place.

2. Little Squalicum Creek -- In summary, EPA's overly conservative assumptions diminish the message that the data clearly convey: there is overwhelming support for the "no action alternative" at the Creek and South Slope.

The assumptions are based on standard EPA Region 10 guidance and are intended to be protective of current and future land uses.

3. Capping/Excavation Alternative. EPA should allow for flexibility during remedial design and remedial action as to which remedy is most appropriate for a particular area.

The EPA intends to be flexible in the design of the final remedy. During the remedial design/remedial action phase (RD/RA) phase, the most protective and cost effective means of addressing each area where action is proposed will be investigated. Soil contamination at The Oeser Company property is proposed to be addressed either through capping or excavation. The specific type of remedial action for each of the areas of concern presented in the proposed plan will be determined by EPA as part of the design of the final remedy.

4. RCRA Cap Standards Apply only to RCRA Wastes. RCRA impermeability standards should apply to site caps only so long as they cover RCRA wastes. Dioxins in the North and South Pole Yards are not RCRA wastes; therefore, a RCRA cap is not required. Standard mix asphalt is adequate to meet the RAOs in these areas, particularly as groundwater conditions are better in the

shallow groundwater in these areas.

EPA has determined that a standard asphalt cap in the North and South Pole Yards (the non-treatment area) would be acceptable if excavation is not conducted . Contaminated soil that is capped in this area will be capped in a manner that prevents direct contact with surface soil contamination. RCRA and the Washington State Dangerous Waste Regulations are relevant and appropriate for designing a cap that is protective of direct contact with surface soil contamination in this area of the Site. Accordingly, the cap must be built on an appropriate foundation with a minimum of four inches of asphalt or concrete and a protective sealer must be applied to the surface in a manner that prevents exposure and minimizes maintenance. O&M plans will be developed to maintain the integrity of the caps. See Sections 11.2.1 and 12.2 of the ROD for further detail on EPA's ARAR determinations for the Oeser property.

5. Some Existing Caps Do Not Need Upgrading. EPA should not require an upgrade of the site capping it installed in 1997 as part of the interim removal action to meet RCRA standards for impermeability. This is a significant added cost that site conditions and risk do not justify.

The existing asphalt caps may need to be replaced or enhanced in coordination with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations. EPA has determined that the RCRA and Washington State Dangerous Waste Regulations closure requirements are applicable or relevant and appropriate to all or portions of the primary wood treating areas. The RCRA and Washington State Dangerous Waste Regulations closure requirements mandate specific performance criteria for areas that are being capped to prevent direct contact with surface soil and to reduce vertical contaminant migration. The performance standards for caps are specified under RCRA in 40 CFR §265.111 (Closure Performance Standards) and 40 CFR §265.310 (Landfill Closure).

The timing and implementation of the excavation and capping in the primary wood treating areas will be coordinated with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations. See Section 11.2.2 and 12.2 of the ROD for further detail on EPA's ARAR determinations for the Oeser property.

6. EPA Data-Gap Assumptions. Where EPA collected less than ten samples in a given area, it assumed that the maximum-detected level represents the entire area and ignored the other data. Further, where EPA did not detect a contaminant of concern in a sample, it nevertheless assumed that half of the detection limit was present. When a number of these assumed results are added together, they impact the estimate of risk even though there is no supporting data. The scenario for Tilbury Cement worker exposure to ground water is based entirely upon this assumed data as no contaminants were ever detected in this well water cross-gradient from The Oeser Company facility.

It is standard practice to use maximum concentrations when fewer than 10 samples were collected. Refer to EPA guidance, Supplemental Guidance to RAGS: Calculating the Concentration Term (1992) and Calculating Exposure Point Concentrations at Hazardous Waste Sites - Draft (2002).

Also note that this comment has already been addressed by EPA in an earlier letter (please see the administrative record) regarding previous Intertox comments on the PSCSR and HHRA.

4.3.2 RETEC Comments

1. The Oeser Company urges EPA to preserve a flexible approach to area-specific remedy decisions-that is, excavation or capping, as well as cap design-throughout the Record of Decision (ROD) process. Such decisions are more appropriately made during the remedial design/remedial action (RD/RA) phase of the cleanup, taking into account a precise economic analysis, as well as the Facility's daily operations and long-term plans.

The EPA intends to be flexible in the design of the final remedy. During the RD/RA phase, the most protective and cost effective means of addressing each area where action is proposed will be investigated. Soil contamination at The Oeser Company property is proposed to be addressed either through capping or excavation. The specific type of remedial action for each of the areas of concern presented in the proposed plan will be determined by EPA as part of the design of the final remedy.

2. The Oeser Company believes that a RCRA cap designed to prevent infiltration is not necessary to protect human health and the environment. In addition, a RCRA cap is not appropriate for portions of the facility. Moreover, the RCRA cap proposed by EPA exceeds RCRA Subtitle C requirements. Site data does not support the need to upgrade the existing cap and construct a very low permeability cap in other areas to limit infiltration. Rather, the primary objective of the proposed capping is to prevent direct contact with soils, which was conservatively shown to be a potential risk in the RA. This objective is adequately met using a design that meets EPA's selected Remedial Action Objectives (RAOs): in this case, a gravel cover or standard asphalt mix.

RAO 1 consists of two parts: reducing ingestion, inhalation, and direct contact with soil contaminants above industrial CULs and reducing migration of soil and shallow groundwater contaminants that would result in deep groundwater contamination exceeding groundwater CULs. Therefore, a cap designed to inhibit vertical contaminant migration by minimizing storm water infiltration is necessary in order to meet the remedial action objectives for the site and ARARs. See above responses to comments 3, 4, and 5 in Section 4.3.1.

The cap design described in the feasibility study is only one example of what may be implemented at the site to meet RAOs and ARARs while withstanding the impact of heavy equipment traffic associated with current activities at the site. The design requirements for the final remedy will be established during the RD/RA phase.

3. Proposed Plan, Page 1, INTRODUCTION: The type of cap described in Alternative 6 is well beyond what is necessary to protect human health and the environment. In addition, Alternative 6 should allow for excavation, but not necessarily require it in specified areas. Instead, the merits of excavation and/or capping of specific areas should be weighed on an area-specific basis during the RD/RA process.

See response to Comment 2 immediately above. The design of the final remedies will be established during the RD/RA phase.

4. Proposed Plan, Page 3, SITE BACKGROUND: Please revise the last sentence in the Early Cleanup Activity paragraph to state that The Oeser Company arranged to have 23,000 gallons of creosote removed from a tank at the site, not from the subsurface.

The proposed plan states that The Oeser Company also removed approximately 23,000 gallons of creosote products from the site. There is no reference to "subsurface".

5. Proposed Plan, Page 9, REMEDIAL ACTION OBJECTIVES: Paving completed by The Oeser Company at the site in the mid-1990s and interim capping installed by the EPA in the East Treatment Area have achieved the RAOs of reducing migration of contaminants from shallow groundwater to deep groundwater. EPA's statements in the Proposed Plan do not support the need for construction of additional very low-permeability caps, or modification of the existing caps to reduce permeability. Currently, deep groundwater only marginally exceeds drinking water standards directly under The Oeser Company property (and exceedances have been documented in only 3 of 18 wells), and this groundwater will not be used as drinking water. As a result, the RAOs should focus on maintaining the caps installed during the interim action that have reduced infiltration and improved groundwater quality.

The existing asphalt caps may need to be replaced or enhanced in coordination with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations. EPA has determined that the RCRA and Washington State Dangerous Waste Regulations closure requirements are applicable or relevant and appropriate to all or portions of the primary wood treating areas. The RCRA and Washington State Dangerous Waste Regulations closure requirements mandate specific performance criteria for areas that are being capped to prevent direct contact with surface soil and to reduce vertical contaminant migration. The performance standards for caps are specified under RCRA in 40 CFR §265.111 (Closure Performance Standards), and 40 CFR §265.310 (Landfill Closure).

The timing and implementation of the excavation and capping in the primary wood treating areas will be coordinated with the work conducted to satisfy the RCRA/Washington State Dangerous Waste Regulations.

6. Page 12, SUMMARY OF ALTERNATIVES, Alternative 3: Soil Excavation: Generally, the discussion severely underestimates costs and time associated with Alternative 3. The text assumes that soils with concentrations above ten times the universal treatment standard will be treated to levels acceptable for land disposal. However, the alternative does not include treatment costs, nor does it anticipate possible costs associated with incineration, as land treatment facilities such as Arlington have refused land treatment of impacted wood treating waste. Unit costs for soil incineration could be 6 to 8 times higher than the unit costs for landfill disposal. This would very quickly drive up the total costs for soil excavation if even small amounts of incineration were required. These two sets of costs are clearly required if this remedy were chosen; they would add millions of dollars to the cost of Alternative 3. Finally, the year-long time frame for completion of the remedy is very optimistic and does not appear to consider time required for plant demolition and replacement, and treatment of soils.

Agreed. Assuming a cost of $400 per ton for the transportation, treatment, and disposal of the amount of soil estimated for Alternatives 3 and 6, the increase in the present worth cost is over 200%.

However, it is unlikely that all of the soil excavated would require treatment before disposal. In-place analysis of the soil proposed for excavation in Alternatives 3, 5, and 6 indicates that much of the soil contains contaminants at concentrations less than ten times the universal treatment standard for F-032 waste according to 40 CFR 268.40. According to 40 CFR 268.49, if the concentration of each of the waste constituents is less than 10 times the universal treatment standard, treatment below this standard is not necessary prior to land disposal.

7. According to the Comparative Analysis Summary contained in Table 2 of the Proposed Plan, present worth cost is an evaluation criteria for remedy alternatives. However, it is impossible to determine costs associated with a particular remedy at this early stage. Final costs of implementing a remedy will vary, given uncertainties in FS cost estimates; the tendency for actual excavation volumes to be greater than estimated; the potential need for a RCRA cap over all of these areas; and the potential for incineration costs.

It is difficult to estimate costs associated with a remedy without a design; however, the cost estimates provided in the FS are intended to provide an accuracy of +50% to -30%. By using the information obtained during the RI and making conservative assumptions about probable designs to be implemented at the site, this type of accuracy can be obtained in the cost estimate.

8. Table 1, ESTIMATED AREAS FOR CAPPING AND VOLUMES FOR EXCAVATION: Proposed excavation volumes presented in Table 3, page 19 of the Proposed Plan and in Table 1, page 15 of the FS Addendum appear to be overestimated. RETEC presumes these volumes are based on the excavation areas presented on Figure 8 of the Proposed Plan and Figure 1 of the FS Addendum, and the associated depths shown on the figures. RETEC independently calculated volume estimates for the areas shown on Figure 8 using the depth of excavation shown on the figure. The results are presented in the following table.

The main discrepancy between the values stated in the Proposed Plan and in the RETEC calculation is in the Treated Pole Area, where the Proposed Plan value is 1,300 CY and the RETEC value is 360 CY.

RETEC's experience is that actual excavation volumes are generally larger than predicted, unless the excavation area has been closely constrained by sampling data. Estimation of potential final excavation volumes without understanding the rationale behind the areas shown on Figure 8 is difficult. The majority of the excavation areas appear to be sized the same (circular, about 50 feet in diameter). Although we recognize that Figure 8 is intended to be illustrative rather than precise, the FS should present a rationale for sizing the excavation areas shown on Figure 8 so that the potential risk of increasing excavation volumes can be evaluated. If flexibility were preserved in the Proposed Plan, this information could be used in an economic evaluation of whether to cap an area or excavate an area.

Based on this comment, the proposed excavation volumes and capping areas were recalculated and found to differ from the numbers presented in Table 1 of the FS Addendum. A revised table is included in the Record of Decision (see Table 17).

The initial estimate presented in the FS Addendum did not include the area of the cap shown in the South Pole Yard on the west side of the West Treatment Area nor did it include the cap area shown northeast of the East Treatment Area. The initial estimate of the amount of soil to be excavated in the Treated Pole Yard was roughly 10 times greater than what is shown on FS Addendum Figure 1. This difference accounts for most of the difference between the excavation volumes. The change in proposed cap size and proposed excavation volumes does not significantly impact the estimated cost for the alternative; the total present worth cost is reduced by approximately 3%.

Action is proposed for on-site areas where site-specific CULs have been exceeded. The lateral extent of isolated contamination presented in the FS, such as that found in the North Pole Yard, the South Pole Yard, the Wood Storage Area and in some areas of the North Treatment Area, was approximated based on analytical results of soil samples collected during the RI. Each sample location that exceeded CULs was assumed to represent the conditions of soil surrounding that location for a radius of 25 feet. A radius of 25 feet was selected as this was the approximate mid-point between CPT-LIF-ROST sample locations. The grid system used

for the on-facility CPT-LIF-ROST sampling was based on 50-foot squares.

Although analytical data for many chemicals of concern at the site, such as PCP and dioxin, do not correlate well quantitatively with the screening data obtained during the CPT-LIF-ROST survey, the locations where contamination was identified both analytically and through CPT-LIF-ROST do compare well qualitatively. Comparing FS Figures 1-14 through 1-17 (Surface and Subsurface Soil Contamination Greater than Proposed Cleanup Levels) with RI Figures 4-18 and 4-25 (CPT-LIF-ROST Screening Results), it is apparent that much of the contamination identified using the CPT-LIF-ROST method is located in the same areas that contamination was identified through the installation of boreholes. This is especially apparent in the Treated Pole Area, the South Pole Yard, and the North, East, and West Treatment areas. Had a quantitative relationship been established between the analytical data and the CPT-LIF-ROST, a smaller radius might have been warranted based on the characteristic size of continuous soil contamination at the site. However, because of the qualitative nature of the relationship, a radius of 25 feet was used.

9. FS Addendum, Section 3.1, Page 2, third and fourth paragraph, Attachment A, Section A.2.1: The planned method for excavation and sampling is insufficient and inconsistent with continued facility operation. Excavations cannot remain open during a two- to three-week sample turnaround period. In addition, if sampling is completed during excavation, excavation equipment will have to be remobilized to the site at an additional cost, or incur standby costs. In addition, railcars cannot remain on site pending waste characterization. Sampling to characterize the soil for disposal should be completed first by probing, augering, or test pits and collecting samples. The material to be removed should be defined in advance and the disposition determined. Then excavation equipment and railcars for disposal can be mobilized to the site and the removal work completed more efficiently.

EPA agrees that additional sampling during the RD phase would help to better define material to be removed or capped. The construction details and confirmation sampling strategies presented in the FS and FS Addendum were presented, in part, to assist with the development of the cost estimate and will be refined during the RD/RA.

10. FS Addendum, Section 3.1, Page 2, Third Paragraph, Attachment A, Section A.2.1, and Attachment B: Section 3.1: These sections should be revised to reflect that excavated areas will be backfilled with a coarse-grained fill, including gravel near the surface, and not with clean topsoil. Topsoil backfill and revegetation are inconsistent with continued industrial use of the property.

Because many of the areas proposed for excavation are located in outlying areas, the cost estimate conservatively assumed that each excavation area would be re-vegetated. However, re-vegetation likely would only occur in those areas such as the North Pole Yard where vegetation had been prior to the remedial action. The type of backfill for each excavation area would be established during the RD/RA phase.

11. FS Addendum, Section 3.1 and A.2.1: Excavation procedures should be kept flexible at this stage, so that excavation can be completed in a manner that minimizes disposal volumes. In areas where excavations occur under an interim cap, the gravel cap should be removed down to the geomembrane layer, stockpiled and reused (not disposed of). In areas where the surface soil to be removed is primarily gravel, the excavation remedy should allow for screening, washing (if necessary) and reuse of the gravel portion of the excavation.

EPA agrees that clean gravel can be reused. Excavation procedures would be determined as part of the remedial action phase of the project.

12. FS Addendum, Section 3.1, Page 3 Second Paragraph: Please revise to reflect that only drainage from caps in treating areas would be conveyed to the storm water treatment system.

Storm water management is an issue to be addressed as part of the RD/RA phase and will be coordinated with RCRA and other programs. No changes will be made based on this comment.

13. Section 3.1, Page 3 Fourth Paragraph: Please clarify the discussion regarding "operational use restrictions" and how these restrictions would apply to the facility operations at the site. It is important for The Oeser Company to understand the scope of these restrictions.

"Operational use restrictions" may include restrictions on traffic, weight limits, and other activities that could potentially damage the cap. Operational use restrictions would be established as part of the RD/RA phase and would depend on the cap design.

14. FS Addendum, Section 3.1, Page 4, Groundwater Monitoring, and Attachment A. Section A.3.2: Section A indicates that groundwater sampling will be conducted semiannually for the first five years and annually thereafter. Five years of semiannual sampling is not necessary. The greatest degree of contaminant mobilization and migration, if any, will be at the end of the rainy season. Therefore, an annual late spring sampling should be sufficient.

Monitoring frequency would be determined by EPA as part of the O&M Plan and will be coordinated with the RCRA monitoring requirements.

15. FS Addendum, Section 3.2, Page 6 4th Paragraph: Please revise this paragraph to be consistent with EPA's conclusions elsewhere in the reports. This paragraph states that compliance monitoring would be completed to confirm that the cap prevents further infiltration of precipitation and concomitant leaching of contaminants in the subsurface. EPA's selected RAOs for the site require only a reduction, not prevention of infiltration. As stated on page 8 of the Proposed Plan, RAO Nos. 1 and 2 state that the remedial action should reduce migration of soil contaminants.

Comment noted.

16. FS Addendum, Section 3.2, Page 9, First Paragraph: There appears to be a typographical error; the annual O&M costs and the net present worth of the annual costs are both listed as $1,013,000.

After recalculating the cap and excavation areas, the estimated average annual O&M cost was $73,000.

17. Proposed Plan, Figure 8: Figure 8 shows two areas as requiring both excavation and cap enhancements. One is at the very north end of the Treated Pole Area (as previously discussed), and the other is a portion of a 3-foot-deep excavation on the western end of the North Treatment Area. The figure shows both of these areas as being excavated, but they are also either within or partially within areas identified as requiring cap improvements. Again, the documents should allow the flexibility to either excavate or cap as deemed to be most appropriate during the RD/RA process.

The areas proposed for action presented on Figure 8 of the Proposed Plan are only approximations and do not represent a final design. Areas proposed for excavation and areas proposed for capping may be larger or smaller than what is presented on Figure 8. The proposed actions for certain areas (excavation versus capping) also may change from what was assumed in the Proposed Plan. Generally, areas requiring action under RAO 1 either will be capped or excavated but not both.

18. FS, Section 2.5.1.2, Page 2-11, 3rd Paragraph: The first sentence indicates that all capping options would reduce direct contact with contaminated soil, and all capping options except the gravel cap would inhibit the vertical migration of contaminated groundwater by reducing the infiltration of storm water. This indicates that all caps except a gravel cap would meet the RAOs. As a result, a RCRA cap is not necessary in all areas. Therefore, EPA should maintain flexibility with respect to cap design.

The third sentence indicates that RCRA requires the cap to be constructed to meet RCRA landfill substantive closure requirements, including impermeability, strength, and thickness requirements. However, RCRA Subtitle C neither mandates impermeability, nor prescribes specifications on strength or thickness.

This broad statement in the FS was only intended to clarify that all the caps except for the gravel cap provided some degree of reduction of infiltration of contaminated water into the groundwater. See response to Comment 5 in Section 4.3.1.

19. FS, Page 4-6, Section 4.2.3, Alternative 2: Capping: The cap prescribed in Alternative 2 (and Alternative 6) exceeds what is necessary to achieve the remedial action objectives. First, the capping requirements indicate that all soil from the site has been classified as a dangerous (hazardous) waste.

However, soils impacted with dioxin above cleanup levels in the North and South Pole Yards need not be classified as F032 or F034 dangerous (hazardous) waste. Second, the cap exceeds RCRA cap requirements.

Additionally, the capped area includes several railroad tracks. Railroad tracks are mobile structures and move (with something akin to a washboard effect) when trains move across the tracks. Because any sealant cap would experience this undulation regularly, EPA should recognize that sealing cap material against railroad tracks may not be consistent with continued facility operation.

Please see the response to Comments 4 and 5 in Section 4.3.1.

20. FS, Alternative 2, Figure 4-1: The rationale for requiring paving of the area northeast of the office but west of existing paving is unclear. Our review indicates that no samples have been collected here and the CPT-ROST data does not suggest impacts.

It is true that surface and subsurface soil contamination have not been identified in this particular area; however, shallow groundwater contamination has been identified in monitoring wells located in this area. Areas proposed for capping will be re-examined during the RD/RA phase.

21. FS, Section 4.2.7, Alternative 4 and Section 4.2.9, Alternative 5: The Oeser Company concurs with the EPA that the shallow groundwater extraction called for in these alternatives is not warranted. In addition, the ex situ soil treatment specified in Alternative 5 is not consistent with continued facility operation.

Comment noted. In FS Section 4.2.10 under the heading "Implementability" it is noted that Alternative 5 would require discontinuance of current operations at the facility.

4.3.3 Intertox Comments

1. A No Action Alternative for Off-Facility Areas is Justified. Based on our evaluation of media concentrations and risk calculations for each of these areas, including the South Slope/Little Squalicum Creek area and the near-facility residential areas, we believe Region 10 EPA's conclusions regarding selection of a No Action alternative for these areas are correct.

Comment noted. The EPA does not recommend remedial action for off-property areas.

2. A No Action Alternative for the South Slope and Little Squalicum Creek Area is Justified. Our review of the assumptions used to generate the risk estimates indicates that they are likely to be very conservative, and any actual risks to recreators would be much lower than those estimated. For these reasons, we believe Region 10 EPA correctly concluded that a No Action alternative for the South

Slope and Little Squalicum Creek Area is justified.

Comment noted. The EPA does not recommend remedial action for the South Slope or Little Squalicum Creek areas.

3. Other historical disturbances in the South Slope/Creek area likely contributed to measured concentrations in this area. The PSCSR describes numerous previous uses of the creek area that could have contributed to contamination in the South Slope/Little Squalicum Creek area (START-2, 2001c; Intertox, 2001c).

EPA agrees that there could be several sources of contamination in the South Slope and Little Squalicum Creek area.

4. Recreator soil contact risks are minimal. Like the soil contact risk estimates for on-facility soil and near-facility residential areas, risk estimates to recreators associated with soil contact in the South Slope and Little Squalicum Creek area, including in the slope area, along Little Squalicum Creek, and at the spoils piles, are also likely to be significantly overestimated.

The national and regional EPA guidance for preparing the HHRA was followed.

5. Recreator creek contact risks are minimal. In the HHRA, risks to recreators were also estimated assuming contact with surface water and sediment in Little Squalicum Creek. As with all other risk estimates in the HHRA, these estimates are based on a number of compounded conservative assumptions that indicate that risks are likely to be significantly overestimated. Despite this, maximum estimated risks associated with sediment contact in Little Squalicum Creek (i.e., 8E-07) are well within (below) U.S. EPA's acceptable risk range.

Comment noted. The national and regional EPA guidance for preparing the HHRA was followed.

6. Ecological risks are minimal. The Proposed Plan states, "For plant and soil-organism communities, risks were identified only at a single sample location on the north bank of the creek" (U.S. EPA Region 10, 2002; p. 9). This location (SP02, with a total PAH concentration of 900 mg/kg) was described by Region 10 EPA in the ERA as having an "oily/silvery appearance and a strong petroleum odor" (START-2, 2002b). As we stated in our comments to the ERA (Intertox, 2001b), available data suggest that The Oeser Company is not the source of these detected concentrations.

EPA acknowledges that the source of the PAH contamination at location SP02 has not been determined. Nonetheless, soil contamination is present at this location and cannot simply be omitted from the ecological risk assessment. As noted in the assessment, plants and soil fauna in the ravine area are not at risk from soil PAH contamination except perhaps in the

immediate vicinity of location SP02.

7. A No Action Alternative for the Near-Facility Residential Areas is Justified. As we have noted in our previous comments (Intertox, 2001a; 2003), even though the risk analyses for near-facility residents presented in the HHRA are extremely conservative, these conservative risk estimates fall below U.S. EPA levels of concern. Further, no non-carcinogenic COPCs were identified in near-facility residential surface soil samples at concentrations exceeding risk-based screening levels (START-2, 2001a). These findings should provide significant comfort to individuals who may be represented by the scenarios evaluated in this assessment.

Nonetheless, our review of the assumptions used to generate the risk estimates indicates that they are likely to be very conservative, and any actual risks to residents near The Oeser Company facility would be much lower even than those estimated. For these reasons, we agree with Region 10 EPA that a No Action alternative for the near-facility residential areas is justified.

No remedial actions for nearby residential areas are recommended by the EPA.

8. We Recommend That Region 10 EPA Reconsider the Necessity of Capping or Removing Dirt from Areas Outside the Treatment Areas. At a minimum, with regard to the proposed remedial alternatives presented in the Feasibility Study and Proposed Plan, we recommend that Region 10 EPA reconsider the necessity of capping or removing dirt from areas outside the West Treatment Area and North Treatment Area. As we discuss in Section 4, below, soil screening data from samples not submitted for analyses suggest that average concentrations in these areas are very low, and recalculation of CULs using more appropriate assumptions indicates that present concentrations in most areas of the site do not present a significant health risk and do not require remediation. Further, analytical data on contaminant concentrations in deep groundwater indicates that contaminants remaining in soil or shallow groundwater on the facility do not present a significant migration potential. These data show that any residual contamination present in these areas does not present a health risk under current or reasonably foreseeable future site conditions.

Comment noted. See responses to Comments 1 through 6 in Section 4.2.1; comments 1 and 2 in Section 4.2.2; and Comment 2 in Section 4.3.2.

9. Complete Excavation of On-Facility Soils is Not Justified. As described in Section 4, below, risks estimated by Region 10 EPA associated with The Oeser Company facility-related contaminants are likely significantly overestimated for each of the scenarios evaluated. Careful evaluation of Region 10's assumptions suggests that actual risks associated with facility-related contaminants under current and reasonably anticipated future conditions are likely to be minimal. As such, No Action alternatives for the on-facility, near facility residential, and Little Squalicum Creek and ravine area are justified.

For the above reasons, we urge that Region 10 EPA not consider complete excavation of the facility.

The "complete excavation" alternative is particularly objectionable because it calls for excavation of great volumes of deep soils that have least potential for human contact or risk but which are most expensive to remove.

See response to Comment 8 above. Complete excavation of soils is not the selected alternative.

10. A No Action Alternative for The Oeser Company Facility Site is Justified. The Proposed Plan outlines three remedial action objectives (RAOs) for The Oeser Company property. These RAOs are driven by Region 10 EPA's assumptions about the extent of contamination on the facility, estimates of facility-related human health risks, and concerns about migration of contaminants off-facility. As we have outlined in our previous comments on The Oeser Company site investigation documents, including the HHRA (Intertox, 2001a), the PSCSR (Intertox, 2001c), and the FS (Intertox, 2003), and as outlined by the RETEC Group (RETEC) in their comments on the RI/FS/Proposed Plan (RETEC, 2003), the Region 10 EPA has substantially overestimated current and future risks to on-facility workers and nearby residents, migration of contaminants off-facility has been minimal and will likely continue to be minimal, contamination of the deep groundwater beneath the facility is minimal, and contact with groundwater does not occur and will likely not occur in the future.

Based on EPA's human health risk assessment, risks for current and future workers are considered unacceptable. Therefore, remedial action is necessary.

11. Exposure to Groundwater Is Not a Complete Exposure Pathway and Migration of Contaminants to the Deep Aquifer Is Not Occurring. Groundwater CULs selected by Region 10 EPA are based on Washington Model Toxics Control Act (MTCA) Method B CULs (START-2, 2002d). According to MTCA, groundwater CULs are to be based on estimates of the "reasonable maximum exposure expected to occur under both current and potential future site use conditions" (WAC 173-340-720). Contaminants, however, in the shallow or deep aquifer below The Oeser Company facility do not pose a significant human health risk because contact with water from these aquifers does not occur, and it is highly unlikely to occur in the future (Intertox, 2001a). Further, no contaminants of concern have been detected in the deep aquifer since 1999, indicating that migration of contaminants to the deep aquifer is not occurring.

See response to Comment 2 in Section 4.3.2.

12. The shallow aquifer is not used as a drinking water source. Due to low yield of water on pumping, the shallow aquifer does not meet Washington State or federal guidelines for classification as a drinking water aquifer (Intertox, 2001a; U.S. EPA Region 10, 2002). Thus, this aquifer is not nor will be used as a drinking water source and exposure to shallow groundwater is not a complete exposure pathway.

The EPA acknowledges that the shallow groundwater is not intended to be a future drinking

water source.

13. The deep aquifer is not used as a drinking water source. Groundwater from the deep aquifer is not currently used as a residential drinking water source, and as such, exposure to deep groundwater is not a complete exposure pathway (Intertox, 2001a; U.S. EPA Region 10, 2002). Further, it is unlikely that future wells would be allowed: drinking water wells are generally not allowed within urban growth boundaries as a matter of state growth management policy, in order to encourage orderly development of infrastructure at appropriate densities and economies of scale. Hook-up to city water and prohibition of approval for future wells tends to be required as a matter of law within city limits.

EPA acknowledges that there are no plans to use the deep groundwater under the Oeser property as a drinking water source. However, CERCLA and MTCA requires cleanup of the groundwater for future potential use.

14. Lack of detects in deep groundwater show that significant migration of contaminants from shallow groundwater to the deeper aquifer is not occurring. As described in the RI (START-2, 2002c), carcinogenic polycyclic aromatic hydrocarbons (PAHs) were only detected in four deep groundwater wells above the MTCA cleanup levels for groundwater. In all subsequent sampling at these [sic] locations, including June, September, and December 1999 and February 2000, no carcinogenic PAHs were detected in any of the wells, nor were carcinogenic PAHs ever detected at other nearby wells including several down gradient and closer to Little Squalicum Creek

Other PAHs including 7H-dibenzo(c,g)carbazole, benzo(j)fluoranthene, dibenzo(a,e)pyrene, dibenzo(a,h)acridine, dibenzo(a,h)anthracene, dibenzo(a,h)pyrene, dibenzo(a,i)pyrene, dibenzo(a,i)acridine, dibeno(a,l)pyrene, and indeno(1,2,3-cd)pyrene, were never detected in the deep aquifer (which included samples collected from 1996 to 2000), but were nonetheless included as COCs for purposes of calculating risks from exposure to groundwater. Specifically, in the HHRA, these contaminants were assumed present at one-half their limits of detection, contributing significantly to the risk estimates. Exclusion of these PAHs from the risk calculations for MW03-D, for example, results in a 25% reduction in estimated risks.

Most dioxin congeners assumed in the HHRA to be present in the deep aquifer were never detected. Further, all detected dioxin congeners, converted to TCDD TEQ concentrations, were below the MTCA cleanup level for dioxins/furans in groundwater of 5.83 E-07.

For the Tilbury Cement Company "showering" scenario, it is assumed that workers are exposed to contaminants in groundwater while showering at the facility. No contaminants were ever detected in these wells (which are cross-gradient to The Oeser Company facility). The estimated cancer risk is entirely due to the assumption that all chemicals were present at one-half their detection limits.

Based on our findings, contact with shallow or deep groundwater beneath the facility is not a complete exposure pathway and significant migration of contamination from shallow groundwater to deep groundwater is not occurring, RAOs #2 and #3 are already achieved at the facility.

See response to Comment 2 in Section 4.3.2.

15. Contaminants in Soil at the Site Do Not Pose a Significant Human Health Risk. As we have outlined in our comments on the HHRA (Intertox, 2001a) and RI/FS (Intertox, 2003), Region 10 EPA has substantially overestimated risks to on-facility workers, and contaminants in on-facility soil do not pose a significant human health risk under current or reasonably foreseeable future site conditions.

On-site worker exposure scenarios were developed according to EPA Region 10 and headquarters risk assessment guidance. Risks were found to be unacceptable for the on-site worker. In addition, soil concentrations exceed MTCA and site-specific CULs. Therefore, development of remedial action objectives is necessary.

16. Average soil concentrations in most areas of the facility are likely to be significantly lower than estimated. Data from the soil screening methods used on The Oeser Company facility provide evidence that soil concentrations in samples not submitted for full analysis were likely very low, and thus that soil contact concentrations averaged across the site are likely to be minimal.

See responses to Comments 1 through 6 in Section 4.2.1.

17. Workers do not come in intensive contact with soil. Workers at The Oeser Company facility do not regularly engage in intensive contact with on-facility soils as part of their daily work activities (Intertox, 2001a). Information from The Oeser Company facility managers indicates that worker tasks during normal production do not involve excavation or routine contact between the workers' hands and soil. In addition, existing gravel and asphalt caps prevent direct contact with soil in most areas on the facility.

A soil ingestion rate of 200 mg/day is recommended by EPA Region 10 for industrial scenarios.

18. No contact with subsurface soil occurs under current or likely foreseeable future exposure conditions. Application of Region 10 EPA's soil CULs to subsurface soil assumes that workers intensively contact subsurface soils every day for a working lifetime. No contact, however, with subsurface soil occurs under current exposure conditions since excavation of soils is not a part of daily work activities (Intertox, 2001a). Further, excavation of and contact with subsurface soils is largely prevented under current site management conditions. Thus, it is extremely unlikely that subsurface soils will ever be excavated and distributed across the facility surface, resulting in daily exposure for the duration of a worker's employment.

While excavation of site soil may be infrequent or unlikely under current conditions, EPA must consider all potential future activities in order to make risk management decisions. It is possible that site excavation work may be necessary under future conditions, under the ownership of The Oeser Company or other owner. Therefore, excavation and subsequent contact with subsurface soil by workers must be considered a potential exposure pathway.

19. Estimated risks to workers associated with inhalation of soil particulates are very low and well below levels of concern. No significant risks to workers or off-site residents are associated with the inhalation exposure pathway under current exposure conditions. In the HHRA, estimated risks associated with inhalation of soil-derived particulates and vapors, even when the extremely conservative average soil concentration assumptions were used, are below 1E-07 for all on-facility areas (START-2, 2002a). This is well within (below) the U.S. EPA acceptable risk range of 1E-06 to 1E-04.

While risk to workers for one exposure pathway may be within EPA's range of acceptable risks, cumulative exposure to contaminants via all pathways must be considered.

20. Use of more appropriate assumptions to calculate site-specific soil CULs would eliminate most on-facility areas from consideration for remediation. Site-specific soil CULs were calculated based on risks estimated for the on-facility worker scenario, as presented in The Oeser Company site HHRA (START-2, 2002a). As we have commented previously (Intertox, 2001a; Intertox, 2003) and above, these risk estimates are excessively over-conservative. Because of this, the CULs are also excessively over-conservative. Use of more appropriate assumptions would eliminate most areas from consideration for remediation.

CUL calculations are based on the exposure scenarios presented in the HHRA. These scenarios are based on standard EPA Region 10 guidance and are intended to be protective of current and future (industrial) land uses. Conservatism in the scenarios allows for adequate protection of future, unknown uses.