The Oeser Company Superfund Site
Remedial Investigation Report
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Region 10

START-2

Superfund Technical Assessment and Response Team

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THE OESER COMPANY SUPERFUND SITE
REMEDIAL INVESTIGATION REPORT
BELLINGHAM, WASHINGTON

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LIST OF ACRONYMS

Acronym	Definition
%R	percent recovery
AOD	Assurance of Discontinuance
ARARs	applicable or relevant and appropriate requirements
ASILs	acceptable source impact levels
ASTM	American Society for Testing and Materials
AWQC	ambient water quality criteria
B(a)P	benzo(a)pyrene
BCFs	bioconcentration factors
bgs	below ground surface
BOD	biological oxygen demand
BTC	Bellingham Technical College
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
COCs	contaminants of concern
COPCs	contaminants of potential concern
CPAHs	carcinogenic polycyclic aromatic hydrocarbons
CPT	cone penetrometer testing
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DL	detection limit
DMP	Data Management Plan
DNAPLs	denser-than-water non-aqueous phase liquids
DO	dissolved oxygen
DOT	United States Department of Transportation
DQOs	data quality objectives
DW	dangerous waste
E & E	Ecology and Environment, Inc.

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
EPHs	extractable petroleum hydrocarbons
ERA	ecological risk assessment
ESA	Endangered Species Act
ESAT	Environmental Service Assistance Team
ESI	expanded site inspection
FS	feasibility study
FSP	field sampling plan
GIS	geographic information system
GMA	Growth Management Act
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
HAPs	hazardous air pollutants
H_{cc}	Henry's Law Constant
HDPE	high-density polyethylene
HHRA	human health risk assessment
HIs	hazard indices
HpCDD	heptachlorodibenzo-p-dioxin
HQ	hazard quotient
HSA	hollow stem auger
ID	inside diameter
IDW	investigation-derived waste
L/min	liters per minute
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LDR	land disposal restriction
LIF	laser-induced fluorescence

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
LNAPL	lighter-than-water nonaqueous phase liquid
LOAEL	lowest observed adverse effect level
MBTA	Migratory Bird Treaty Act
MCLGs	Maximum Contaminant Level Guidelines
MCLs	maximum contaminant levels
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
mg/kg	milligrams per kilogram
mph	miles per hour
MS	matrix spike
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
MTCA	Model Toxics Control Act
NAPL	nonaqueous phase liquid
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ncPAHs	noncarcinogenic polycyclic aromatic hydrocarbons
ng/kg	nanograms per kilogram
NHPA	National Historic Preservation Act
NOAEL	no observed adverse effect level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NSPS	New Source Performance Standards
NWAPA	Northwest Air Pollution Authority
NWI	National Wetland Inventory
OCDD	octachlorodibenzo-p-dioxin
OCDF	octachlorodibenzofuran
OSWER	Office of Solid Waste and Emergency Response

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
PAHs	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCDDs	polychlorinated dibenzo-p-dioxins
PCDFs	polychlorinated dibenzofurans
PCP	pentachlorophenol
pg/L	picograms per liter
pg/m^3	picograms per cubic meter
PID	photoionization detector
POTWs	publicly owned treatment works
ppm	parts per million
PRGs	preliminary remediation goals
PSCSR	preliminary site characterization summary report
PSLs	preliminary screening levels
PUF	polyurethane foam
PVC	polyvinyl chloride
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RA	removal assessment
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RME	reasonable maximum exposure
ROST™	rapid optical screening tool
RPD	relative percent difference
RPFs	relative potency factors
SDWA	Safe Drinking Water Act
SHA	site hazard assessment
SMA	Shoreline Management Act

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
SMCLs	secondary maximum contaminant levels
SOPs	standard operating procedures
SPCC	Spill Prevention Control and Countermeasure
SPLP	synthetic precipitation leaching procedure
SQAP	sampling and quality assurance plan
START	Superfund Technical Assessment and Response Team
SVOC	semivolatile organic compound
T	transmissivity
TBC	to be considered
TCDD	tetrachlorodibenzo-p-dioxin
TCLP	toxicity characteristic leaching procedure
TDD	Technical Direction Document
TDS	total dissolved solids
TEFs	toxicity equivalency factors
TEQ	toxicity equivalent quotient
TIC	tentatively identified compound
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TPH-D	total petroleum hydrocarbon as diesel
TPH-G	total petroleum hydrocarbon as gasoline
TSS	total suspended solids
U & I	Utah and Idaho Sugar Company
UGAs	Urban Growth Areas
USFWS	United States Fish and Wildlife Service
USTs	underground storage tanks
VOC	volatile organic compound
VPHs	volatile petroleum hydrocarbons
WAC	Washington Administrative Code
WCFD#8	Whatcom County Fire District No. 8

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
WCHD	Whatcom County Health Department
WDFW	Washington Department of Fish and Wildlife
WTPH-D	Washington total petroleum hydrocarbon as diesel
WTPH-G	Washington total petroleum hydrocarbon as gasoline

EXECUTIVE SUMMARY

The Oeser Company site includes an active wood-treating facility located in Bellingham, Washington, that has used organic treating solutions of creosote and pentachlorophenol (PCP) to preserve utility poles and pilings. The site which includes the facility and surrounding lands was placed on the United States Environmental Protection Agency (EPA) National Priorities List on October 27, 1997, because of known or threatened releases of hazardous substances, pollutants, or contaminants. At the direction of the EPA, a remedial investigation (RI) was initiated by the Ecology and Environment, Inc. (E & E) Superfund Technical Assessment and Response Team (START) under Contract No. 68-W6-0008 and Technical Direction Document (TDD) No. 97-08-0007 and START Contract No. 68-W6-0010 and TDD No. 09-00-09-0001; the RI has been continued under START-2 Contract No. 68-S0-01-01 and TDD No. 01-03-0016.

This RI report summarizes RI site investigation activities and presents data on the nature and extent of contamination at the site. Contaminants from wood-treating wastes (polycyclic aromatic hydrocarbons [PAHs; the majority of compounds that make up creosote], PCP, and dioxin [a contaminant found in PCP treating solutions], and other organic compounds) were identified in surface and subsurface soil, shallow and deep groundwater, air, surface water, and sediment. Concentrations of some chemicals exceeded preliminary risk-based screening levels in a portion of all samples collected from all media.

Contaminants were identified in areas outside of the boundaries of The Oeser Company facility. Surface water and sediment in Little Squalicum Creek, an open drainage channel for untreated stormwater to Bellingham Bay, appear to be the most impacted media in off-facility areas. The Oeser Company releases stormwater from its facility to Little Squalicum Creek under a National Pollutant Discharge Elimination System (NPDES) permit. Current impacts to air appear to be related primarily to active operations at the facility. The facility is a registered source with the Northwest Air Pollution Authority (NWAPA).

Contaminants detected in nearby off-facility residential areas are similar in both nature and concentration to area background levels of these contaminants found in areas of Bellingham, Washington, impacted by other residential, commercial, and industrial sources. The source of dioxin contamination

present in nearby residential areas is not attributable to The Oeser Company operations based on congener profile analysis.

In addition to active operations, surface and subsurface soil at the facility are ongoing sources of contamination to air and groundwater. Soil contamination is not continuous either horizontally or vertically beneath the majority of the 26-acre facility, but is located primarily around the main operational areas of the facility where it extends to depths greater than 20 feet below ground surface (bgs). Contaminants were also found in creek sediments and creek bank soils, in addition to creek surface water; however, sediment toxicity tests did not indicate a hazard to benthic life.

No evidence of facility-related contamination by metals was found which is consistent with historical information indicating that inorganic wood-treating solutions had not been utilized at the facility.

Data collected during the RI were used to conduct a human health risk assessment (HHRA) and an ecological risk assessment (ERA); both reports are included as appendices M and N to this report, respectively. For the HHRA, current and future exposure scenarios were evaluated for on-site workers, on- and off-site residents, and off-site recreational visitors. The potential excess lifetime cancer risks and potential noncarcinogenic hazard indices (HIs) for the reasonable maximum exposure (RME) case are summarized in this RI report. Risks were greatest for on-facility workers and potential future on-facility residents. The ERA included a sediment toxicity test for benthic invertebrates in Little Squalicum Creek; a baseline screening of contaminants of potential concern (COPCs) against benchmarks for plants and soil invertebrates; and an exposure assessment for songbird and small mammal populations. Results of the ERA indicate that overall, facility-related chemicals do not appear to pose a serious threat to ecological receptors that use the creek area and south slope. The results of the HHRA and ERA will be used to guide decisions regarding site remedial alternatives.

1. INTRODUCTION

The Oeser Company Superfund site consists of a wood-treating facility located in Bellingham, Washington, that has used organic treating solutions of creosote and pentachlorophenol (PCP) to preserve utility poles and pilings. The Oeser Company Superfund site was added to the United States Environmental Protection Agency (EPA) National Priorities List (NPL), effective October 27, 1997 (62 FR50 422, September 25, 1997). The site was placed on the NPL because of known or threatened releases of hazardous substances, pollutants or contaminants as required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 30).

This report reviews investigative activities and data generation that have taken place as part of the remedial investigation/feasibility study (RI/FS) performed in accordance with EPA Superfund Technical Assessment and Response Team (START) Contract No. 68-W6-0008 and Technical Direction Document (TDD) No. 97-08-0007, START Contract No. 68-S0-01-01 and TDD START Contract No. 68-W6-0010 and TDD No. 09-00-09-0001, and No. 01-03-0016.

1.1 PURPOSE AND OBJECTIVES

The objectives of the RI are to summarize site investigation activities and to describe and display site data documenting the location and characteristics of surface and subsurface features and contamination at the site, including affected media and the location, types, quantity, physical state, and concentrations of contaminants. Locations, dimensions, physical condition and varying concentrations of each contaminant throughout each source, and the extent of contaminant migration through each of the affected media are also documented in this report.

The purpose of the Preliminary Site Characterization Summary Report (PSCSR; E & E 2001b) was to provide the EPA with a preliminary reference for developing the risk assessment and evaluating the development and screening of remedial alternatives, as well as the refinement and identification of applicable or relevant and appropriate requirements (ARARs).

Information on the scope and objectives of the RI is available in the following previously-published documents: Remedial Investigation/Feasibility Study Interim Final Scoping Report (E & E 1999a),

Remedial Investigation/Feasibility Study Draft Final Work Plan (E & E 1999b), Remedial Investigation/Feasibility Study Draft Final Field Sampling Plan (E & E 1999c), Remedial Investigation/Feasibility Study Draft Final Quality Assurance Project Plan (E & E 1999d), Draft Sampling and Quality Assurance Plan for Continued Quarterly Groundwater Monitoring (E & E 1999e), Draft Sampling and Quality Assurance Plan for Off-Facility Residential and Background Surface Soil Sampling (E & E 1999f), and the PSCSR (E & E 2001b).

1.2 ORGANIZATION OF THE REPORT

The Executive Summary provides a brief summary of this report. There are six main sections and recommendations included in the body of this report.

Section 1 introduces The Oeser Company facility and surrounding area. Throughout this document, the term *facility* is used to describe property owned by The Oeser Company. The term *off facility* refers to those surrounding areas that are the focus of investigations and response actions. The term *site* refers to the dimensional extent of contamination deemed by EPA to require implementation of any response and or remedial action and includes facility and off-facility areas. Section 1 includes a description of the site; brief sketches of the physical setting (geology, hydrogeology, surface water hydrology, water use, and meteorology) of the site; and summaries of site history, past spills and releases, the public health assessment, and previous investigations.

Section 2 provides summaries of investigative procedures, field activities, data collection, analytical methods, quality control (QC), data management, and investigation-derived waste (IDW) management. The section updates ARARs and describes the land survey, geophysical investigation, and multimedia (soil, sediment, groundwater, surface water, air, and biota) sampling/analysis.

Section 3 describes the physical characteristics of the site based on data from previous investigations and the RI. This section provides detailed information on site geology and hydrogeology, surface water hydrology, ecology, and climate.

Section 4 characterizes the nature and distribution of contaminants measured in several media across the site including surface soil, subsurface soil, groundwater, air, surface water, sediment, and biota.

Section 5 includes discussion of fate and transport of site-related contaminants.

Section 6 summarizes the HHRA and ERA reports. The full reports are included as appendices M and N, respectively.

Section 7 provides recommendations based on the RI and risk assessments. Included in this section are recommended remedial action objectives (RAOs).

1.3 SITE DESCRIPTION

This section provides a general site description and/or summary of an operational history of The Oeser Company facility. The topographic setting of the site is presented in Figure 1-1. The study area, which includes the site and background areas, is shown in Figure 1-2. Facility and off-facility areas of the site are shown in Figure 1-3. Figure 1-4 presents an aerial view of The Oeser Company facility and nearby areas. Figure 1-5 depicts the general operational areas of the facility. The major sources of information for this section include: Facility Inspection Prioritization Report (URS 1994); information requested by the EPA and supplied by The Oeser Company on June 23, 1998 under CERCLA 42 USC 5904 (Oeser 1998); and other references as noted.

1.3.1 Preliminary Land Use Information

The State of Washington's Growth Management Act (GMA), passed in 1990, requires that the fastest growing counties and cities prepare comprehensive plans and development regulations to manage their growth and change over the next 20 years. Comprehensive plans are required to address a number of issues related to growth, including land use, transportation, housing, capital facilities, and utilities. In addition, plans must designate Urban Growth Areas (UGAs). UGAs are intended to accommodate a city's 20-year projected growth and reduce conversion of undeveloped land into sprawling, low-density developments. UGAs should provide for both urban and public services. The Oeser Company's facility and adjacent properties are located within the City of Bellingham's UGA. Figure 1-6 depicts the City of Bellingham's land use designations for on-facility and surrounding areas.

Land use determinations and regulations are developed in a two-step process. The first step is to identify land use types that should occur in an area through development of a comprehensive plan. Planning documents should consider existing issues, plan for accommodating future growth, and identify land use designations associated with land use activities. Often, neighborhood or subarea plans are written for a specific geographic locale and adopted as part of a city's or county's comprehensive plan.

The land use designations identified in a comprehensive plan are generally adopted as zoning ordinances and serve as the regulatory authority to implement comprehensive plans. Zoning ordinances delineate the land uses that are allowed under certain conditions and those that are strictly prohibited.

The following sections describe the applicable plans and zoning requirements for The Oeser Company's facility and surrounding area, as well as state and federal policies regarding the association between land use and appropriate decisions regarding remediation of hazardous substances.

1.3.1.1 Land Use

The Oeser Company's facility is surrounded by a mixture of land uses, including other industrial operations and residential units (Figure 1-7). Immediately adjacent to the north boundary of the facility is the Birchwood neighborhood of Bellingham. Birchwood is characterized by low-density (two to four units per acre), single residential units, with large, long, narrow lots divided evenly between mature landscaping and open fields.

The eastern boundary of the facility is located adjacent to Morse Industrial Park (occupied by Morse Hardware Company) and undeveloped property owned by the Washington State Board for Community and Technical Colleges.

The south boundary 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. An old railroad grade, currently used as a walking trail, exists along the creek's west bank. Approximately 700 to 800 feet from the southern property boundary and across Marine Drive lies the Seaview Subdivision, composed of single-family residential units, many with views of Bellingham Bay.

Adjacent to the west boundary 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. The cement company has operated at this location since 1911; its property boundaries extend to Bellingham Bay.

1.3.2 Zoning

Except for a portion of The Oeser Company's northern section located within the city limits of Bellingham, the majority of the facility is within Whatcom County's jurisdiction (Figure 1-6).

1.3.2.1 City of Bellingham

Land use designations for the incorporated areas adjacent to The Oeser Company's facility are contained within the Birchwood Neighborhood Plan (City of Bellingham 1982). The portion of the facility within city limits is designated as residential-single.

The City of Bellingham zoning code permits the following uses within residential-single developments:

- Single-family dwelling units with less than 5,500 square feet of total floor area,
- Publicly-owned parks and playgrounds,
- Private recreation facilities, and
- Attached accessory dwelling units.

Conditional uses that may be permitted in this zone include: school, church, neighborhood club or activity center; golf course or riding academy; medical care, daycare, and service care facilities; agricultural nursery; bed and breakfast facilities; and adaptive uses for landmark buildings. No industrial or commercial facilities are permitted in this zone.

The portion of The Oeser Company's facility that lies within the city's residential-single zone is considered a nonconforming use. Because the facility existed prior to passage of the city's 1982 zoning ordinance, The Oeser Company is not in violation. However, the zoning ordinance requires that nonconforming users apply for a Certificate of Nonconforming Use every five years for the duration of the established use.

The Oeser Company's facility received its last Certificate of Nonconforming Use in 1996, with specific conditions for continued operation stipulated. The City of Bellingham determined that continued use of the residentially-zoned Oeser Company property for existing industrial purposes would not have a probable significant adverse impact on the environment (Bellingham 1996).

1.3.2.2 Whatcom County

The Whatcom County Comprehensive Plan (Whatcom County 1997b) designates land use zones in the county's unincorporated areas by subarea. The Oeser Company facility's applicable subarea plan is the Urban Fringe Subarea Comprehensive Plan (Whatcom County 1997a). The Oeser Company's facility and surrounding area contain six land use designations. Figure 1-6 shows the relationship of the facility to each of these zones.

The majority of The Oeser Company's facility was zoned heavy impact industrial to acknowledge existing heavy industrial uses near Bennett Drive, Marine Drive, and Roeder Avenue; to endorse a diverse economic base; and to attain compatibility between industrial activities and adjoining residential land uses (Whatcom County 1997b).

This zoning allows all industrial uses including food processing; leather tanning and finishing; fabrication of metal products; bulk commodity storage facilities; heavy construction contractors; public uses and community facilities; and the manufacturing and processing of textiles, lumber and wood, cement, and glass. Allowable accessory uses include employee recreation and play areas; restaurants, cafes, and cafeterias; temporary construction buildings; and on-facility treatment and storage facilities for hazardous wastes associated with permitted uses.

Light-impact industrial areas, including warehouses, repair shops, several industrial businesses, and a restaurant and lounge, are located to the east and south of The Oeser Company's facility.

Little Squalicum Creek is located to the southeast, in a ravine downstream from the Bellingham Technical College (BTC), and extends from the college to the saltwater shoreline (Figure 1-7). Whatcom County owns approximately 200 lineal feet of shoreline in this area and is considering negotiations with other shoreline owners for a larger public beach area.

Approximately 25 acres of urban residential properties are located to the southwest, including the 9-acre Seaview Subdivision. The subarea plan allows for four residential units per acre.

Adjacent to the southwest corner, an approximate 2-acre area is identified as neighborhood commercial.

Adjacent to the northwest corner, an urban residential-mixed use area provides transition from rural to urban development, although the area is characterized as a single-family neighborhood.

1.3.2.3 Future Land Use

The City of Bellingham updated its comprehensive plan in 1995; Whatcom County adopted the land use designations for the Urban Fringe Subarea in late 1997 (described in Section 1.3.2). Neither the county (Batchelor 1997) nor the city (Koch 1997) 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 (Wahl 1997). The county concurs and recommends that the new city park include a paved trail system from the BTC

parking lot to the beach, limited multi-use open grass play areas, and picnic and restroom facilities (Whatcom County 1997b).

1.3.2.4 Land Use Consideration in the Model Toxics Control Act

The approach for determining soil and groundwater cleanup levels and implementing cleanup actions in the State of Washington is the Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] 173-340) which is administered by the Washington State Department of Ecology (Ecology). Under MTCA, site cleanup levels are based on the potential maximum exposure expected to occur under current and future land use of a site.

WAC-173-340 defines industrial properties as those "properties that are or have been characterized by, or are to be committed to, traditional uses" and that are either:

- Zoned for industrial use by a city or county conducting land use planning under the GMA; or
- Zoned for industrial purposes by counties not planning under the GMA and the cities within them.

MTCA bases industrial soil cleanup levels on an adult worker exposure scenario. Local governments use varying standards and definitions for identifying land use zones and allow varying uses within areas identified as industrial. Therefore, it is essential to evaluate land uses and zoning for compliance with the MTCA definition of industrial properties. Comprehensive plans and zoning ordinances specify allowed land uses within each zone of the jurisdiction and should be reviewed to evaluate the land use of a site.

If a particular land use does not fit the specific definition of industrial properties as found in WAC-173-340-200, MTCA provides additional characteristics that should be considered in making a determination. These characteristics are listed in WAC-173-340-745. However, MTCA rules state that Ecology expects any property zoned for heavy industrial or high-intensity industrial use by a county or city whose comprehensive plan is consistent with the GMA to meet the definition of industrial property.

WAC-173-340-745(b)(iii) discusses cleanup levels for industrial properties located adjacent to residential areas. Residential cleanup levels are expected in these situations; however, exceptions may be made based on site accessibility, hazardous substance characteristics, expected future land use, potential for future disturbances from site maintenance and construction activities, and exposure pathways.

1.3.2.5 EPA OSWER Directive No. 9355.7-04

The EPA Office of Solid Waste and Emergency Response (OSWER) issued a directive in 1995 regarding the applicability of land use in the CERCLA remedy selection process and NPL sites (EPA 1995). The directive had two primary objectives: (1) to promote early discussions with local land use planning authorities, local officials, and the public regarding anticipated future uses of the NPL property; and (2) to promote use of that information to formulate realistic assumptions regarding future land use and how projected uses will influence the baseline risk assessment, the development of alternatives, and the CERCLA remedy selection process. The directive recognizes that the future of land at NPL sites is an important consideration in determining the appropriate extent of remediation because land use assumptions affect the exposure pathways that are evaluated in the baseline risk assessment. The major points of OSWER Directive No. 9355.7-04 are:

- Begin discussions with local planning authorities, officials, and the public as early as possible in the RI/FS process to assist the EPA in understanding the reasonable anticipated future use of the land at the NPL site.
- Address environmental justice concerns of the community, if applicable. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 1994), requires that each federal agency must, to the extent practicable, make achieving "environmental justice" part of its mission by "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States." The order emphasizes incorporation of minority and low-income groups into the decision-making process and is directed primarily at preventing impacts related to human health and the environment.
- Remedial action objectives should reflect the anticipated future land use of the site.
- Future land use assumptions allow the baseline risk assessment and FS to be focused on developing practicable and cost-effective remedial alternatives.
- Land uses that will be available following completion of remedial action are determined as part of the remedy selection process (EPA 1995).

1.3.3 Facility Land Use

The Oeser Company facility is an active wood-treating plant located at 730 Marine Drive (formerly Marietta Road), in Whatcom County, Washington; a portion of the facility lies within the City of Bellingham. The facility comprises approximately 26 acres in the southwest quarter of Section 23,

Township 38N, Range 2E of the Willamette Meridian, at 48°46'13" N latitude and 122°30'52" W longitude (Figure 1-3).

The facility receives raw logs which are stored in the Wood Storage Area along the 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 (Figures 1-4 and 1-5). After drying for approximately 1 year, the logs are treated with a 5% PCP solution in a diesel-like carrier oil. After treatment, the poles are dried and stored in the Treated Pole Area prior to inspection and shipment to customers. The paved wood treatment area covers approximately 5.6 acres in the east-central portion of the facility. To be consistent with previous reports, the treatment area has been divided into three sections: the North Treatment Area, the West Treatment Area, and the East Treatment Area (Figure 1-5). The treatment areas comprise an array of above-ground tanks, retorts, drip pads, and underground piping. The pole storage areas and the Wood Storage area are not paved.

1.3.4 Little Squalicum Creek

Little Squalicum Creek and approximately 30 feet on either side of the stream bed are located entirely within Whatcom County and are zoned as recreational open space, just north and west of the City of Bellingham. The creek is located at the base of a ravine with steep sides and a level bottom. The ravine runs west-northwest for about 550 feet, then doglegs to the southwest for about 700 feet, goes south-southwest for about 950 feet beneath the Marine Drive bridge, and ends at a narrow beach on Bellingham Bay (Figure 1-8). Whatcom County owns approximately 200 linear feet of shoreline in this area. Tilbury Cement Company and the City of Bellingham Parks and Recreation Department each own narrow parcels approximately 50 feet wide between Marine Drive and the railroad along the shoreline. These parcels define the narrow, flatter slope at the base of the ravine that broadens north of Marine Drive. This broader slope area southeast of Little Squalicum Creek, both above and below Marine Drive, is owned by Whatcom County. The footpath/old rail bed west of the creek is owned by Tilbury Cement (URS 1994; EPA 1997a). The City of Bellingham is negotiating purchase of an approximately 3-acre parcel located immediately south of the railroad right of way, along the south side of The Oeser Company, and west of the foot path (Wahl 1998a).

The ravine is bounded on the south and east by the bay, residential-multiple, residential-single, and public (BTC) developed lands. The head of the ravine is bounded on the north by an undeveloped light impact industrial area. At the point where the ravine doglegs, the area is zoned heavy impact industrial (Morse Industrial Park) and is occupied by a warehouse owned by Morse Hardware Company, Inc. The

area northwest of the ravine to the Marine Drive bridge is mostly undeveloped, but zoned as light impact industrial. This area is referred to as the South Slope in this report (Figure 1-8). The area south and west of the bridge is a developed urban residential zone (Figure 1-6; City of Bellingham 1982).

An active rail line associated with The Oeser Company operations runs east-west just north of the ravine. 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 serves as a footpath and occasional horseback riding trail. A second trail along the east side of the ravine runs from the college to the bay. A short roadway into the ravine is located immediately north of the Marine Drive bridge. Signs describing the area are mounted on posts at the lower end of the ravine along the east side pathway.

Ravine side slopes are thickly vegetated by blackberry and alder and are relatively undisturbed. The ravine bottom is primarily open meadow with deciduous forest representing a relatively young riparian environment.

The City of Bellingham Parks and Recreation Department has prepared a conceptual master plan for creation of a park around Little Squalicum Creek. Plan elements include realignment of the creek and pond, wetlands, and meander construction. A picnic area is also planned (Wahl 1998b).

1.3.5 Demographics

The City of Bellingham was developed on the deep-water port of Bellingham Bay in Whatcom County. The city lies approximately 23 miles south of the Canadian border and is roughly 90 miles north of Seattle. According to the Bellingham Whatcom Economic Development Council, the total 2000 population of the 2126 square mile Whatcom County is approximately 164,600 with an estimated 65,900 individuals residing within the City of Bellingham. More than half of the workers in metropolitan Bellingham work in trade- and service-related industries. The median household income in Bellingham is $31,412 per year, and the mean cost of standard housing is $151,800 (BWEDC 2000).

Approximately 16 people work at The Oeser Company facility. The residential population is:

- 208 within 0.25 mile of the facility;
- 1,173 within 0.5 mile of the facility;
- 5,596 within 1 mile of the facility;
- 15,949 within 2 miles of the facility;
- 32,357 within 3 miles of the facility; and

- 49,551 within 4 miles of the facility (EPA 1996c).

1.4 PHYSICAL SETTING

Site geology, hydrogeology, and surface water hydrology are briefly introduced in this section together with discussion of site water use and area meteorology. Detailed discussions of site geology, hydrogeology, and hydrology are presented in Section 3.

1.4.1 Soils and Geology

Surface soils at The Oeser Company facility and in the Little Squalicum Creek ravine have been altered by development within the facility and use of the creek for open pit sand and gravel mining, log storage, and as a municipal landfill. Nearby, off-facility areas have also been altered to support residential and other uses. The sediments underlying The Oeser Company site are Pleistocene glacial outwash deposits resulting from a series of glaciations that occurred between two million and 10,000 years ago. Three geologic zones comprise the outwash deposits (Easterbrook 1994). 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 where it has been penetrated locally. A "lower sandy zone" is present below the gravelly zone. The top of this zone is encountered at depths of 40 to 50 feet bgs and is composed of poorly-graded fine to medium sand with silt and clay.

1.4.2 Hydrogeology

Groundwater occurs in two zones beneath the site. Shallow groundwater occurs at a depth of 4 to 15 feet bgs in the "upper sandy zone." Shallow groundwater is characterized by discontinuous saturation that is perched on fine-grained material and discharges downward to the deep aquifer. 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 Little Squalicum Creek and Bellingham Bay.

1.4.3 Surface Water Hydrology

Little Squalicum Creek is the dominant surface water feature near the site and flows, at least in its lower reaches, throughout the year (URS 1994). The creek flows from northeast to southwest and is

located 250 feet south of the facility at its closest point. 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. Flow in the upper reaches of the creek is not perennial, and during the dry season, the creek bed is exposed. Flow varies from 1 to 10 cubic feet per second (cfs). Creek effluent empties onto the beach at Bellingham Bay, where it typically infiltrates into the sand. The creek enters the beach through an approximately 36-inch diameter drain line just downgradient of a small depression in the creek bed. A series of pools above the headwaters of the creek (Figure 1-8) do not appear to discharge to the creek (URS 1994).

The sources of water to Little Squalicum Creek include baseflow from groundwater seeps, precipitation, and storm drain flow. Prior to development of the surrounding area, the creek was fed only by natural waterways and springs. Presently, the creek is also fed by local municipal/county stormwater drainage systems, including the Oeser outfall, which serves both The Oeser Company facility and the Birchwood neighborhood to the north, on the west side of the creek. The main source of water for the creek upstream of the Oeser outfall appears to be the Birchwood stormwater outfall, located on the east side of the creek. This outfall is located about 150 feet south of the ravine dogleg and 10 feet north of the Oeser outfall, and it currently delimits the upstream end of the creek. It serves a mixed industrial and residential neighborhood including the college parking lot.

Historically, the creek was longer and its flow greater prior to development of the area and diversion of its headwaters to Squalicum Creek (located to the south of Little Squalicum Creek) around 1907 (EPA 1997a).

Flow in the creek is enhanced from the Marine Drive outfall located on the west side of the creek about 50 feet upstream from where the Marine Drive bridge crosses the ravine. The old Marine Drive outfall, located about 75 feet south of the bridge on the east side of the creek, has been disconnected since it was replaced in 1992 by Whatcom County. Reportedly, several smaller storm drains enter the creek area along its eastern edge and possibly from the west. The locations of these drains have not been identified (URS 1994).

There are no cleanup systems (e.g., grassy swales) associated with any of the outfalls. Several seeps have been identified at different locations along the creek and may represent natural drainage or unidentified outfall releases (E & E 1987; URS 1994).

Two tapped springs have been identified on the west side of Little Squalicum Creek. One is approximately 50 feet upstream from the Marine Drive bridge and one is about 250 feet downstream from

the bridge. These naturally flowing springs were used by the nearby cement company until sometime in the 1950s when they were disconnected from the plant and allowed to drain directly down the side of the ravine into the creek (Bratz 2000a).

1.4.4 Water Use

Surface water and groundwater use are discussed in the following sections.

1.4.4.1 Surface Water Use

In evaluating surface water intakes, the area considered was determined to originate at what has been historically referred to as the Oeser Outfall into Little Squalicum Creek proceeding about 0.4 mile downstream to Bellingham Bay and ending in a 14.6-mile arc with its vertex at the mouth of Little Squalicum Creek. Site surface water is not used as a source of drinking water or for irrigation. There are no known surface water intakes within this area. (EPA 1996a)

1.4.4.2 Groundwater Use

The Oeser Company receives its water from the City of Bellingham and has no on-site potable or industrial water supply wells. There are no known potable or industrial water supply wells downgradient of The Oeser Company facility. Two cross gradient wells are located on Tilbury Cement (formerly the Columbia Cement Company) property, approximately 1,875 feet west-southwest of the retort on the facility. Tilbury pumps groundwater from two wells, identified in this report as TC-5 and TC-6 (Figure 1-9). Prior to the late 1980s, the Columbia Cement Company supplied drinking water to approximately seven employees and 14 nearby residences (Bratz 1987). The practice of supplying water service to nearby homes was discontinued in early 1988 and Tilbury personnel do not utilize the well water as drinking water. Use of two tapped springs located on the north side of Little Squalicum Creek was halted in the 1950s. Water flowing from the springs is released into Little Squalicum Creek (Bratz 2000a).

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 The Oeser Company facility and only one well is located within a 2-mile radius of the facility (URS 1994).

1.4.5 Meteorology

The climate of Bellingham is influenced largely by its location between the Olympic Mountains and Vancouver Range to the west and the Cascade Mountain Range to the east, as well as its location on the Georgia Strait. The source of most air masses is over the Pacific Ocean which has a moderating effect on both summer and winter climate. The monthly average maximum temperature for December, historically the coldest month of the year, is 43.9°F. The average December minimum is 29.7°F. August, the warmest month of the year, has an average maximum of 73.9°F with an average minimum of 47.2°F (WSU 1966).

Precipitation averages 0.99 inch per month in July, the driest month, and 4.89 inches in the wettest month, December. Average annual precipitation is 33.59 inches. The greatest monthly precipitation recorded was 11.71 inches, and the lowest monthly total was 0 inches. The greatest 24-hour rainfall event was 2.95 inches. Measurable snowfall occurs between November and March and totals an average of 9.7 inches per year. Summer winds are predominantly from the southwest, with winter winds more variable from the south and east. The average annual winds are predominantly (approximately 48% of the time) from the southwest to southeast and generally range from 4 to 15 miles per hour (mph). Winds are calm (less than 3 mph) about 21% of the time. Wind speeds in excess of 15 mph occur less than 10% of the time. (WSU 1966)

1.5 SITE HISTORY

Section 1.5 describes the history of the site from the period prior to development to its current character.

1.5.1 Area History

The first report of development in the area was when it was homesteaded in 1853 by Edward Eldridge under the 320 acre Eldridge Donation Claim. The railway that runs along the coast was first developed around 1888. Hugh Eldridge deeded the Olympic Cement Company uplands and tidelands for what is now the Tilbury Cement Company in 1911. This included land for the pier and former railbed that runs along the west side of the Little Squalicum Creek ravine. (EPA 1997a)

The Olympic Portland Cement Company shipped its first product in May 1913. The plant occupied 97 acres and produced cement using a wet process to grind and mix the raw materials of clay and limestone followed by pyroprocessing in a rotary kiln at nearly 2,800°F. Approximately 500 to 600 barrels of fuel oil, used per day as the heat source, were delivered to the plant by rail from the

cement plant pier after being delivered there by ship. The plant rarely shut down, operating three shifts, seven days per week. (Bellingham Herald 1953)

Other information indicates that the plant utilized coal from Utah and Canada to heat its kiln during early operations (Boening 1999). The Columbia Cement Company took over operations of the plant in 1973. In 1984, the Columbia Cement Company deeded the land to the Columbia Northwest Corporation, who subsequently deeded the land to the Tilbury Cement Company in 1987, the current owner/operator of the plant (EPA 1997a). Tilbury ceased all cement production in 1987 and since that time has utilized the facility only for crushing kiln-dried materials, transported by rail from Canada, into gypsum (calcium sulfate) powder. The powder is then shipped to market (Boening 1999).

While in operation, the cement plant never burned hazardous wastes. Two hazardous waste trial burns took place during 1986, and, according to Tilbury officials, emissions were closely monitored and no contaminant exceedences were noted. No details regarding these trial burns were provided (Boening 1999).

In 1925, Hugh Eldridge sold the property now occupied by The Oeser Company to the Utah and Idaho Sugar Company (U & I). Sale included an easement for construction of a drain to convey sugar-processing wastes through Little Squalicum Creek into the tidelands of Bellingham Bay. No information regarding drain construction was identified; however, historical notes refer to "Sugar Waste Gulch," a draw located about 300 feet east of Marine Drive bridge on property currently owned by Mr. Gordan Parberry (Figure 1-8). The disposal of sugar wastes to the creek was testified to during a 1936 lawsuit between Marietta Township and the City of Bellingham together with the City Sanitary Service, Josie Razore, and Agostino Razore (EPA 1997a). U & I constructed a $1,000,000 sugar beet processing plant at the site in 1925. The plant was operated seasonally to coincide with the fall harvest until 1940 when it was closed due to problems related to obtaining adequate sugar beets from the surrounding counties (Bellingham Herald 1953). The Polk City Directory indicates that the plant remained open in Bellingham in 1941 but was closed by 1942 (Polk 1923, 1925, 1941, 1942). Although specific information related to beet processing at this plant has not been identified, the process, with minor variations, has been the same across much of the United States for some time. After washing to remove extraneous material (e.g., dirt), the beets are sliced into thin cossettes which are extracted with 160 to 170°F water. The water content of the dried pulp is reduced from 95% to less than 80% by pressing. This dried pulp was often enriched with molasses and sold as cattle feed. The water containing about 12% sucrose is treated with lime (calcium oxide) and carbon dioxide, which precipitates out non-sucrose products. The sucrose liquor is heated under vacuum to remove water and precipitate out the sugar. This

process may be repeated several times to increase sugar yields. The liquid product remaining after the final extraction is called molasses (Kirk-Othmer 1985). It is likely that coal was used as the energy/heat source in this process.

In 1932, Eldridge granted the Marrietta Township mining rights to the gravel within the ravine. Sand and gravel were mined by the Eiford Company until the late 1960s. Some of the ditches dug to facilitate drainage remain in place today. Much of the creek's original course has been diverted along these ditches. Access to the beach was closed by the Eiford Company during some of its operations. The entire ravine has been altered substantially from natural conditions with rerouting of the original creek bed and significant changes to the soils and lithology (e.g., backfilling of gravel pit excavations, release of log storage debris, landfilling activities, temporary road maintenance, rail bed and track placement and subsequent track removal, and filling and paving of some areas). Temporary basins were dug for gravel washing; these were reportedly filled seasonally, and in some cases year-round, with water. The land was subsequently leased by Mt. Baker Plywood for log storage during the early 1970s. (Springwood 1992b; URS 1994; EPA 1997a)

In 1943, Eldridge sold a portion of the upper area of Little Squalicum Creek to the Tiscornia family who used the land for farming and grazing livestock. The land was obtained by the Bellingham School District in 1955, which subsequently deeded the land in 1993 to the Washington State Board for Community Colleges and Technical Colleges (EPA 1997a). BTC (formerly the Bellingham Vocational Technical Institute established here in 1957), with a student population of nearly 10,000, is currently located on this 21-acre site (BTC 2000). The School district had previously deeded a portion of the land on the west side of their property to the Whatcom County Park Board (EPA 1997a).

Various portions of Little Squalicum Creek, including areas extensively mined for sand and gravel and used for log storage, have been deeded to the Whatcom County Park Board by several individuals as well as the school district. Hugh Eldridge deeded the tidelands onto which Little Squalicum Creek flows to the Port of Bellingham in 1927. The former U & I right-of-way along the creek was deeded back to the Port of Bellingham in 1956. Currently, an agreement between the City of Bellingham Parks and Recreation Department and Whatcom County Parks Department calls for the City of Bellingham to manage and operate the area as a park site for 35 years (to about 2025). The beach at the mouth of the ravine is currently open to the public and is used for swimming as well as other recreational activities (Whatcom County 1997a).

J. Elmer Seaman, president of the Oeser Cedar Company, purchased the U & I property on November 18, 1942. Seaman transferred title to the Oeser Cedar Company on February 17, 1943. A

number of residential lots north of the current facility were deeded to individuals during the 1940s. Land to the west of the current facility was transferred from the Oeser Cedar Company to the Trim-Set corporation in 1949. This land was transferred through a series of owners until it was purchased by the current deed holder, Ershigs, Inc. in 1966 (EPA 1997a).

Ershigs fabricates sheet metal products and manufactures fiberglass-wrapped products using a variety of solvents for numerous industries including pulp and paper, power, and mining/smelting.

The area east of the current Oeser Company facility was purchased by Morse Steel in 1968, and a warehouse was constructed on the property in 1969 (EPA 1997a). The warehouse is used for wholesale distribution of hardware (Morse 1999).

Beginning in 1936, the City of Bellingham contracted with City Sanitary Service Company for garbage collection and operation of a landfill in the Little Squalicum Creek ravine. The landfill was operated until approximately 1947 when the city chose a new landfill location. Residential and commercial garbage and refuse were dumped into the landfill. The exact location of the landfill is unknown; however, the most likely location of the landfill is the area currently used as the north parking lot for BTC and/or the area south of the Morse Steel warehouse (EPA 1997a).

There are undocumented reports that the area south of the current Oeser facility, owned by the Burlington Northern Railroad Company, was used for cleaning out railroad coal cars and coal storage (Edde 1994).

Coal has been mined in the Bellingham area since the 1850s. A series of companies operated mines that included the area beneath The Oeser Company facility until 1951. The main portal was located near Northwest and Birchwood Avenues with the main washing plant located nearby. It is likely that waste released in this area would have been released into Squalicum Creek approximately 1 mile northwest of The Oeser Company facility (EPA 1997a). Mine shafts are deep with the main shaft elevation at -1,170 feet (Moen 1969).

1.5.2 Summary of Aerial Photographic Analysis

An analysis of aerial photographs taken of The Oeser Company was completed by Lockheed Martin in 1998 (Mack 1998a). Seven photographs were reviewed specifically to identify contaminant sources, liquid waste management units, potential spill areas, effluent outfalls, and drainage patterns. Aerial photographs included in this review were taken:

- September 7, 1943;

- June 4, 1949;
- August 6, 1955;
- June 7, 1966;
- March 13, 1979;
- June 5, 1989; and
- May 29, 1998.

In addition, E & E obtained and reviewed additional photographs from:

- July 2, 1950;
- July 12, 1961;
- March 20, 1969;
- March 27, 1975;
- March 10, 1981;
- March 16, 1988; and
- April 2, 1992.

The aerial photographic reviews substantiate the historical information presented earlier. Several key findings are noted below.

1943

No chemical wood treating operations could be discerned, and only the southern half of the facility appears to be used for untreated wood and pole storage. Much of the area south and east of the facility is undeveloped or appears to be farmland. Overland drainage appears to be from the north, through the facility, and then to the creek. The ditch through which the Oeser Outfall empties into Little Squalicum Creek is visible in the northeast corner of the South Slope Area. The only structures visible on the South Slope are the building which today houses the Cocoanut Grove Restaurant and some small outbuildings. Little Squalicum Creek Ravine appears scarified south of Marine Drive, and the creek itself appears to be located on the east side of the ravine. The area used for municipal waste disposal could not be discerned.

1949 and 1950

Wood-treating equipment appears to have been installed in the area where it is presently located; however, poor photograph resolution precludes positive identification of storage or processing tanks. Surrounding area land use appears relatively unchanged since 1943. Evidence of farming and a small building, believed to be what is now the Parberry residence, appear in the lower portion of the South Slope. The creek ravine has been scarified to a larger extent than in 1943 and the creek still appears to be on the east side of the ravine until it passes beneath the Marine Drive Bridge.

1955

Vertical storage tanks are visible, and additional wood treating equipment appears to have been installed in the current treatment area. There is still evidence of excavation in the creek ravine and the creek still appears to be on the east side of the ravine until it passes beneath the Marine Drive Bridge.

1961

Log and wood storage at the facility has increased and now occupies essentially all of the current facility area. The Oak Harbor Freight Lines building is visible in the South Slope. There is no evidence of continued farming in the South Slope. Sand and gravel mining appears to be ongoing with roads and excavated areas throughout much of the creek ravine. Buildings now appear in the area of what is today BTC. The creek still appears to be on the east side of the ravine until it passes beneath the Marine Drive Bridge.

1966

Additional treating facilities appear to have been installed in the present treatment area. Smoke was observed emanating from the old U & I sugar beet processing plant stack at the facility. Stained soils appear around the treatment area. The South Slope appears unchanged from 1961. Sand and gravel mining appears to be ongoing with roads and excavated areas throughout much of the creek ravine. Debris appears to have been dumped at the eastern end of the creek at what is now the west end of the BTC parking lot. The creek still appears to be on the east side of the ravine until it passes beneath the Marine Drive Bridge.

1969

Additional buildings have been installed in the present treatment area. Treated wood is visible on what is now the Treated Pole Area as well as along the southern fenceline north and east of the current office. The South Slope appears unchanged from 1961. Construction of the Morse Hardware warehouse is in progress. Additional buildings now appear in the area of what is today BTC. Debris appears to have been dumped at the eastern end of the creek at what is now the west end of the BTC parking lot. Logs are stacked along the west side of the creek ravine and a channel now appears to have been created where the current creek bed exists. Additional log piles appear south of Marine Drive and east of the creek.

1975

The facility and South Slope appear relatively unchanged from 1969. Additional buildings are visible at what is now the Ershigs facility. Debris appears to have been dumped at the eastern end of the creek at what is now the west end of the BTC parking lot. Except for the debris, no evidence of continued creek ravine use appears likely.

1979

The facility and South Slope appear relatively unchanged from 1969. The area at the east end of the creek ravine, noted in 1975 as covered by debris, has now been paved and serves as the parking lot for BTC. Additional buildings are in place on the north and west sides of the BTC area. No evidence of continued use of the creek ravine could be identified.

1981, 1988, 1989, and 1992

No significant changes at the facility could be identified when compared to the 1969 aerial photograph. The South Slope and creek ravine show increasing vegetative cover with time.

1998

The aerial photograph shows the EPA removal action excavation (see section 1.9) in progress. A berm is in place along the northern perimeter of the north pole yard and treated pole area. A second berm is present along the southeast perimeter of the wood storage area. The site appears much as it does today, relatively unchanged from 1969, except for the thick vegetative cover that obscures much of the ravine and creek.

Aerial Photographs Summary

Based solely upon interpretation of aerial photographs, contaminant sources appear to be limited to treatment buildings and some limited stained soil area abutting the treatment buildings. No liquid waste management units were identified. No potential spill areas or effluent outfalls were identified. Early drainage patterns of surface water flow across the facility from north to south now appear to have been eliminated by the construction of berms along the north and south perimeters of the facility.

1.5.3 Facility Operational History

As previously noted, J. Elmer Seaman purchased the U & I property on November 18, 1942, and transferred title to the Oeser Cedar Company on February 17, 1943. The company manufactured poles for utility companies. In 1953, the process included segregating poles by length and class, incising some or all of the poles, and subjecting them to "oil treatment." This treatment included a 6-hour period in tanks with oil heated to 230°F. The oil was then cooled to 150°F, at which the poles remained for some unspecified time. The final step was for the poles to soak in "cold oil" for six hours. Finished poles were shipped off site by rail. Twenty-six production and five office/executive staff were employed for this work (Bellingham Herald 1953). A review of the Polk directories shows that the Oeser Cedar Company was not listed at the current location in 1942, but was at its current address in 1945 (the directory was not published during 1943 or 1944; Polk 1942, 1945).

The Oeser Company, formerly known as the Oeser Cedar Company, facility has been and is currently used to treat wood for use as utility poles and fence posts. The facility currently includes both a retort and a butt tank (Figure 1-10). 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 in the North Treatment Area and treated using the Boultonizing process. Boultonizing involves heating poles in a cylinder while immersed in a preservative bath of oil and 5% PCP in oil. A vacuum is then drawn, causing water vapor to leave the wood. The vapor is condensed and discharged to the oil/water separator (Ecology 1993). This pressure-treating technique is called the "Empty Cell Treating Process." The retort requires approximately 2,300 cubic feet (17,200 gallons) of preservative-laden oil during one cycle.

The thermal plant has two PCP (also called penta) butt tanks, three PCP storage tanks (40,000 gallons each), one stormwater storage tank (180,000 gallons), and an evaporator system (URS 1994). Until 1983, to preserve the entire length of the pole, The Oeser Company utilized the horizontal thermal treatment process, submerging whole poles in the open thermal creosote tank in the

East Treatment Area. Current thermal PCP treatment is conducted within the PCP enclosure in the West Treatment Area and involves thermal treatment of only the pole's end or "butt" (referred to as "dip butt treating").

Both butt and thermal tanks are constructed on concrete pads with sumps. An open, horizontal thermal tank, approximately 93 feet long, was used until 1983; the START removed all sludge and debris from the tank in late 1997. After the tank was cleaned, it was returned for use as a water collection vessel, and is still in place. A butt tank was destroyed in a September 1994 fire and was replaced by a modern steel structure in May 1995 (Oeser 1998). In 1994, the out-of-service equipment included two creosote storage tanks (URS 1994).

Wood was treated with creosote until 1965, at which time The Oeser Company also started processing wood using 5% PCP in an oil-based solvent. The creosote was delivered by truck and pumped into tanks in the contained creosote storage area. Drip pads were not in use during the period of time that creosote was used at the plant. (Oeser 1998)

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 and was sold to Reilly Industries, Inc. (E & E 1999g; Oeser 1998). Creosote is an EPA restricted-use product used as a preservative for wood, typically on marine pilings, railroad ties, and cross arms. Creosote is obtained through distillation of coal tar. The composition of creosote is highly dependent on coal composition, design and operating conditions of the coke oven, and design and operation of the distillation process. Based on data provided by The Oeser Company (Oeser 1998), the composition of creosote used during past operations included greater than 5% each of the following compounds: naphthalene, acenaphthene, dibenzofuran, fluorene, phenanthrene, and fluoranthene. Lesser percentages of other polycyclic aromatic hydrocarbons (PAHs) make up most of the remaining compounds in creosote. In general, PAHs account for 85% by weight of the chemical constituents in creosote (EPA 1992a). Average usage estimates indicate that The Oeser Company received 40,000 to 50,000 gallons of creosote per year (Oeser 1998).

Solid PCP is delivered by truck and stored in a controlled-access warehouse (Oeser 1998). The oil solvent is unloaded from trucks or rail cars at paved Resource Conservation and Recovery Act (RCRA)-regulated drip pads and pumped directly into work tanks. The aboveground tanks are situated on concrete pads within a concrete-walled containment area. Underground pipelines transport chemicals as needed. On average, 50,000 gallons of oil are used each month. Any PCP oil that remains after processing is returned to the PCP oil storage tanks for reuse (URS 1994). A process diagram is presented in Figure 1-11.

PCP, currently the only preservative in use at the facility, is an EPA restricted-use product used to protect wood from insect attacks and decay. PCP is also used as an herbicide or fungicide. Both creosote and PCP in diesel oil are believed to have been used for weed control at the facility prior to 1962 (Oeser 1998). To form a 5% PCP solution, The Oeser Company uses 1-ton solid blocks of PCP mixed with a commercially available carrier oil similar to light diesel. Mixing is conducted within the pressure retort. Approximately four PCP blocks are added to 20,000 gallons of oil each time a preservative solution is mixed; approximately 130 pounds per day of PCP preservative are used (URS 1994). During calendar year 2000, The Oeser Company utilized 103,300 pounds (dry weight) of PCP and 258,235 gallons of P-9 Carrier Oil (Godfrey 2001). PCP is formed by stepwise chlorination of phenols in the presence of catalysts. Impurities formed during the manufacturing process include chlorodiphenylethers, dibenzofurans, dibenzodioxins, and various phenol isomers. Commercial-grade PCP contains approximately 85 to 90% PCP, 4 to 8% tetrachlorophenol, 2 to 6% higher molecular weight chlorinated phenols, and 0.1% dioxin (EPA 1992a). Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are by-products formed during production of PCP and can be formed by incomplete combustion of PCP. The primary PCDD/PCDF congeners found in commercial-grade PCP include: octachloro-(OCDD), heptachloro-(HpCDD), and hexachloro- substituted dibenzo-p-dioxins and dibenzofurans (EPA 1997b). Average penta usage at The Oeser Company's facility ranges from 160,000 to 200,000 pounds per year (Oeser 1998).

The solvent or carrier oil used in the PCP treatment process is described in its Material Safety Data Sheet as "Diesel No. 2," a complex (C9 to C20) organic petroleum (hydrocarbon) mixture containing less than 1% naphthalene with a specific gravity of 0.85 to 0.87 (Oeser 1998).

Approximately 40,000 gallons of oil containing PCP preservative are required to fill the PCP tanks. On average, 50,000 gallons of oil per month are used and then recycled. The oil is stored in the PCP oil storage tanks. For each process, the oil is transferred by pipe as needed. The remaining oil is placed back into the PCP storage tank for reuse.

The PCP fill line carries the PCP solvent mixture from the work tanks to the retort, a distance of approximately 100 feet. From 1964 to 1995, the line was a 6-inch single-walled steel pipe. In 1995, the line was replaced with a double-walled 6-inch-by-8-inch steel line with leak detection indicators. The creosote fill line was also single-walled 6-inch steel pipe; when it was installed in 1964 along with the retort steamline, the two were encased in 16-inch tile (Figure 1-10; Oeser 1998). It is likely that the retort was also installed in 1964.

In 1973 or 1974, two diesel fuel underground storage tanks (USTs; 4,000 gallons each) were installed approximately 160 feet northeast of the facility office. These tanks provided a three-week supply of fuel for equipment used at the facility. These were excavated in approximately 1994 and an above-ground storage tank located within the bermed PCP enclosure area is now used for storage of a two-day supply of diesel fuel. No evidence of a release from these tanks, was noted. (Oeser 1998)

The byproducts from the wood-treating process are wastewater, primarily from drying logs in the retort, and sludge. The sources for the latter included container tank bottoms, settling tanks, and thermal treating tanks. Some 4,000 to 6,000 gallons of sludge were removed biannually in the 1960s and 1970s by a company which disposed of the waste in Arlington, Oregon. With the escalating oil prices of the 1970s, operating procedures changed and no bottom sludge, if any has been generated, has required removal. (Oeser 1998)

Until 1973, wastewater and boiler waste (non-contact cooling water) from both PCP and creosote processes were routed through an oil/water separator which discharged to a drywell sump which, in turn, released the effluent to gravel percolation beds east of the treatment area. According to a January 24, 1975 Ecology report, minor process lines discharged directly to the surface. In 1973, The Oeser Company hooked up to the sanitary sewer line to handle process wastewater and sanitary sewer from the plant. It comes in from the north side of the plant and includes a pump station. From 1973 to 1991, wastewater from both the PCP and creosote processes was discharged to an oil/water separator, then to a sanitary sewer system. Since 1991, the sewer has been used only for sanitary uses (URS 1994; Oeser 1998). In 1998, EPA contractors removed the oil/water separator that had been a part of the 1973-1991 process treatment (E & E 1999g).

In February 1991, a zero-discharge evaporator system was put in place to evaporate all processed wastewater on site. Previously existing tanks and vessels, including the butt and PCP storage tanks, were incorporated into the system. The creosote butt tank was converted into an open tank evaporator with heating coils in the bottom of the tank. The large PCP storage tank was converted into a stormwater storage reservoir. The storage tank is designed to overflow into the separator tank. The underflow from the separator tank is piped to an oil/water separator; its effluent is directed to the evaporator. Overflow from the separator tank is directed to a tank that contains steam coils for evaporating residual water in the collected oily waste; oil recovered from this system is reused. This eliminated previous off-site discharge of PCP to the sanitary sewer. The system was expected to generate 50 to 100 gallons of sludge annually (classified as K001 by The Oeser Company); however, the first year produced no accumulated waste materials. (URS 1994)

Currently, The Oeser Company evaporates 1,417,000 gallons of storm and process water per year (2.7 gallons per minute [gpm] or 3,890 gallons per day [gpd]; Oeser 1998). A schematic diagram of the evaporator system is presented in Figure 1-12. A piping diagram for the system is presented in Figure 1-13.

There is no evidence that any types of water-based preservatives such as chromated copper arsenates (CCA) were ever used at The Oeser Company facility.

1.5.4 Stormwater

This section discusses stormwater issues related to The Oeser Company site and, briefly, to properties in the vicinity. The history of the Little Squalicum Creek drainage basin leads to a specific discussion of The Oeser Company's stormwater contribution and drainage pathway modifications that have been made in the last five years. The facility operational history has been described in Section 1.5.3, and this section is followed by the permitting history. These two subjects are closely linked to each other and to the environmental awareness that spawned the changes. Finally, spill events related to The Oeser Company facility are described.

The Oeser Company facility 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. The site is not located within a 100-year floodplain (URS 1994).

1.5.4.1 Little Squalicum Creek Drainage Basin

The Oeser Company lies in the drainage basin to Little Squalicum Creek which, historically, was longer with greater flow (Figures 1-1 and 1-8). Sometime between 1910 and 1915, the upper portion of Little Squalicum Creek was diverted to Squalicum Creek via a 42-inch stormwater drain near the Northwest Avenue Bridge. (EPA 1997a)

According to title records, the cement plant acquired an easement and right-of-way in 1911 along Little Squalicum Creek which included the rights to the water in the creek and springs in the ravine. An old pumphouse (Tapped Spring 1 in Figure 1-8) that supplied water from a spring along the creek to the cement plant is located downstream of the old Marine Drive outfall (EPA 1997a). According to Wayne Bratz, chemist at Tilbury Cement, pumping spring water was discontinued in the 1950s. He was uncertain as to how the water was used, but suggested it may have acted as a lubricant in the grinding process. He noted that there had been many wells on site but no records exist regarding water usage—both in terms of quantity and application (Bratz 2000b). Tapped Spring 2 in Figure 1-8 may be a second, unique tapped

spring or could be connected to Tapped Spring 1. No information is available regarding this second spring.

The city operated a landfill in the Little Squalicum Creek ravine beginning in 1936. According to a July 21, 1936 Bellingham Herald article reporting on a lawsuit, landfill owner Jose Razore testified that approximately 25 to 30 cubic yards were dumped daily by the company, and that others used the landfill as well (Bellingham Herald 1936). The article stated that there was drainage into the creek from roads, the sugar plant, and nearby residences, and that refuse from the sugar plant was also being dumped into the ravine. Although it is not known how long the landfill operated at that site, the Whatcom County Board of Health selected a new site for sanitary fill in November 1947 (EPA 1997a).

In the past, Burlington Northern Railroad disposed of waste material (possibly oil wastes) into the spring field upstream from the Oeser outfall. The 1994 URS report suggested that these wastes may be migrating via the groundwater to emerge into the Little Squalicum Creek ravine downstream from the Oeser outfall. Burlington Northern and its predecessor, the Great Northern Railroad, have historically used the track south of The Oeser Company and adjacent to the Little Squalicum Creek ravine to clean and paint tank cars. This track had also been used to service railroad equipment and to stage coal cars for the nearby mine. (Edde 1994; Oeser 1998)

The City of Bellingham and Whatcom County use the Little Squalicum Creek and ravine as an outlet for their storm drain system. Storm drains located north and east of The Oeser Company facility drain part of the Birchwood district and the properties adjoining Little Squalicum Creek, such as Morse Steel and BTC. The Birchwood storm drain system previously drained the whole Birchwood residential subdivision, but was partially diverted to drain into the larger Squalicum Creek sometime in the 1970s (EPA 1997a). Runoff from the Birchwood neighborhood, including The Oeser Company facility, is released to the creek via the Oeser and Birchwood outfalls. The Marine Drive outfall collected runoff from areas south and west of The Oeser Company facility and flows into the creek above the Marine Drive bridge. In addition to stormwater drainage, the creek is fed by springs (E & E 1987; URS 1994).

Several small, apparently perennial ponds lie adjacent to the north wall of the ravine between the Birchwood outfall and BTC parking lot. Ponds were likely created decades ago by gravel operations to alleviate flooding on the ravine bottom and are not part of Little Squalicum Creek (Springwood 1992b; URS 1994; EPA 1997a).

On March 28, 2000, Sally Manifold, of the City of Bellingham Parks and Recreation Department, noticed a milky white substance in Little Squalicum Creek, traced it to the Oeser outfall, and called 911 (Wahl 2000; Manifold 2000). The Whatcom County Fire District No. 8 (WCFD#8) responded to the call

and located the source at Ershigs, Inc., 742 Marine Drive. Gary Crawford, from WCFD#8, completed Incident Report No. 00-800106 after responding to this call. At the source, employees were cutting a hole in a fiberglass tank and shavings were being washed into the storm drain along with the cooling water. A storm drain drawing from Ershigs (Smith 2000), however, shows no connection to the storm drain on The Oeser Company facility. The visual observations are not consistent with the drawing information.

1.5.4.2 Facility Stormwater

Historical City of Bellingham documents show a storm drain that originates north of the facility and bisects The Oeser Company facility in a north-south direction (Figure 1-14). The storm drain was constructed in the 1920s (Oeser 1998). A September 1999 camera survey of the drain indicates that it is 24 inches in diameter as it crosses the Oeser property. The storm drain is a municipal/county pipe that drains a residential area to the north and outfalls to Little Squalicum Creek south of the facility. The concrete outfall pipe is 36 inches in diameter. Approximately 30 feet upstream, it joins a 6- by 6-foot concrete vault that is 25 feet in length. An inspection report indicated that the floor of the vault was dirt, but suggested that concrete may exist underneath the sediment. (Gelco 1999)

Currently, The Oeser Company has three inputs to the storm drain (Figure 1-14). The first (upstream or northernmost) input is south of the penta storage building. The immediate stormwater input at this point is the effluent from the paved storage depression. Besides surface runoff into the depression, three catch basins located in the North and East Treatment Areas collect runoff and direct it to the depression. The ponded water flows under a metal hood designed to keep large and floating particulate matter out of the effluent. The stormwater then flows into a coalescing plate filter followed by an oil/water separator. These units are contained in an approximate 20- by 30-foot open concrete vault, which was sized to accommodate future downstream treatment system expansion. In the fall of 2000, The Oeser Company installed an 800-gallon surge tank and associated pump, two stainless steel 5-micron bag filters, and two Calgon Cyclesorb FP2 Granular Activated Carbon (GAC) filters. The Oeser Company has signed a lease agreement with Calgon Carbon Corporation for the maintenance of the GAC system. The treated stormwater flows directly south to a manhole, where the piping makes a 90-degree turn. From the manhole, the stormwater flows east to intersect the storm drain.

The second Oeser input into the main storm drain comes from a collection system on the west side of the facility in the north pole yard. A catch basin SDCB-1 collects runoff and directs it west, where it is released to a swale that is approximately 50 feet long. The Oeser Company constructed the

swale in 1997 as a NPDES compliance measure (Oeser 1998). The grassy swale slopes to an open catch-basin sump in a grassy depressed area between two sets of tracks. During storm events, the depression fills and stormwater is forced into an elbowed polyvinyl chloride (PVC) pipe that drains to SDCB-2. The stormwater is then piped east to the storm drain.

The third and final Oeser input is from a catch basin, SDCB-3, which was installed in 1997 to accommodate flows in the unpaved northern part of the North Treatment Area. Modifications were made to the catch basin to minimize the amount of silt entering the storm drain; flows to the catch basin pass through a graveled area. (Godfrey and Durbin 2000; Durbin 2002).

These inputs meet the storm drain before any storm drain manhole is encountered on the 24-inch line within the facility boundaries. The first manhole, SDMH-1, is located in the North Treatment Area. SDMH-2 and SDMH-3 were installed during removal and are located at the north and south ends of the East Treatment Area respectively. The manholes represent the transition between the existing concrete storm drain and the high-density polyethylene (HDPE) pipe that replaced the storm drain in the excavated area. SDMH-4 is sited in the Wood Storage Area. Historically, there was a manhole in front of the retort tank, but it was removed when the drip pad was installed. Three catch basins on the site have been rerouted. Instead of being directly tied to the 24-inch storm drain, they are now pumped to the stormwater collection pond (Figure 1-14).

A camera survey in 1999 provided visual information as to the current condition of the storm drain (Gelco 1999). Cracks and offset joints were visible, but are to be expected in aging storm drains. Although approximately six services (pipe connections) were identified as the camera moved downstream from the first manhole (SDMH-1), none could be correlated with the current on-site system. The site has been modified over the years to address stormwater issues and most of the services are probably remnants of abandoned/rerouted systems.

The Oeser Company is responsible for maintenance of the storm drain system located on the site. The stormwater pollution prevention plan assigns personnel to maintain the system on a scheduled basis (Durbin 2002). Due to extensive berming at the site perimeter and on-site regrading, there are no stormwater pathways to adjacent properties.

In addition to the storm drain system, five sumps with numerous surface drains are located throughout the paved treating area. The sumps are self-contained concrete vaults beneath the ground surface. The wastewater and stormwater that collect in the sumps is pumped to the stormwater storage tank and subsequently introduced into the zero-discharge evaporator system (Figure 1-12). All contact, non-contact, and process water is also collected and evaporated in this closed loop process. (Oeser 1998)

1.5.4.3 Site Surface Water Drainage Modifications

In 1995 and 1996, The Oeser Company regraded the pole storage area to achieve stormwater control. The purpose of the modification was to isolate the untreated pole storage yards from the treated storage area. In addition, the Treated Pole Area was contoured to direct surface flow to a large depression (a stormwater collection pond) which, at the time, permitted infiltration into the gravel. This modification required removing 230 feet of railroad track for elevation correction and re-installation at the modified height (Oeser 1998). In 1997, all but the northwest corner of the Treated Pole Area was paved (Figure 1-15) and the ponded water in the depression was directed to a newly constructed on-site filter system which had a capacity of 30 gpm (Figure 1-14). The filter system was upgraded in October 1999 to accommodate 100 gpm flows. (Godfrey and Durbin 2000)

In September 1997, The Oeser Company constructed a berm north of the North Pole Yard to minimize surface water runoff from the facility. In January 1998, EPA contractors constructed a geotextile/gravel cap over a small portion of the North Pole Yard and Treated Pole Area so as not to alter the surface water runoff flow to the south of the facility (Figure 1-15; E & E 1999b).

In December 1997, construction of the South Pole Yard geotextile/gravel cap was completed. The ground surface was graded to account for the addition of a 6-inch-thick gravel cap without altering surface water runoff to the southeast of the facility. (E & E 1999b)

In the North Treatment Area, an asphalt cap was installed in accordance with The Oeser Company's NPDES permit in the vicinity of the retort drip pad during the 1997/1998 removal action. A gravel cap was placed over geotextile fabric east of the asphalt cap in an area that is not included in the NPDES permit and is not considered a heavy-traffic area. The caps were constructed so as to not alter stormwater runoff patterns. To do so, existing soil was excavated to the depth required for placement of the new materials. The excavated soil was used to construct a berm north of the gravel cap. Clean soil was then placed on top of this berm and seeded (E & E 1999b).

Removal activities at the East Treatment Area included excavation below and around the 24-inch storm drain. Approximately 80 feet of the storm drain was removed and replaced by HDPE profile-wall pipe. The new pipe was connected to the existing concrete storm drain via a manhole at each end. Before fill was placed in the excavated area, it was lined with a geotextile fabric to isolate the groundwater in that area. Dry sumps (catch basins with no outlet) were placed at the corners of the geotextile. The sumps are fed by a French-drain-type system within the excavated area. Any drainage in

the sumps eventually evaporates. The depth of water in each sump is noted on a periodic basis during E & E monitoring activities.

Berms located on the southeast edge of The Oeser Company facility act as a noise buffer in addition to providing drainage containment.

1.5.5 Permit History

This section addresses wastewater, air, and RCRA permits.

1.5.5.1 Wastewater Discharge Permits

From 1963 to 1973, Oeser operated under waste discharge permits administered by the Washington Pollution Control Commission. In each of the two five-year permits, "waste" referred to the total volume of cooling and contaminated water to be discharged. The permit issued in 1963 indicated that the discharge was limited to 10,000 gpd to Little Squalicum Creek, and that effluent limits included a pH range between 6.5 and 8.5, less than 5 parts per million (ppm) phenol, and less than 10 ppm total oils. The permit issued in 1968 increased the quantity of permitted discharge to 14,000 gpd; the other requirements remained unchanged. (Oeser 1998)

In spring 1973, Ecology inspected The Oeser Company facility and subsequently issued a letter regarding renewal of the company's Industrial Waste Discharge permit. The letter noted that possible discharge criteria might be based on proposed EPA guidelines which included temperature, pH (with a range of 6.5 to 8.5), and oils and grease (to be less than 10 milligrams per liter). The letter also discussed the recent inspection and listed requirements to renew the Industrial Waste Discharge permit including:

- Pave areas of oil drips/cleansing oil-handling equipment (i.e., temporary storage area for cooling of logs from pressure cylinder, area in front of pressure cylinder, areas around current oil/water separators, equipment storage areas) with concrete and direct runoff through an oil/water separator before discharge.
- Dike and floor tank farms.
- Store barrels containing oils, waste oils, solvents and chemicals in roofed and diked area.
- Dispose of oily sludge in an approved manner (other than ground surface disposal).
- Discharge boiler blowdown to surge tank-drainfield system or to local sanitary sewer. (EPA 1997a)

According to an Ecology memo, NPDES permit number WA-000210-1 was issued to The Oeser Company on October 25, 1974. In a June 23, 1981 Ecology letter, The Oeser Company was notified that it was required to cease the discharge of processed wastewater to the municipal sewer system. (EPA 1997a)

The Oeser Company maintained an NPDES permit until its expiration in 1991 and did not renew the permit because the zero-discharge system eliminated releases to the sanitary sewer. In the summer of 1992, The Oeser Company initiated procedures for obtaining a new stormwater discharge permit under new NPDES laws. NPDES permit number WA-003081-3(I) was issued in June 1993, modified January 13, 1997, and expired June 30, 1998. Ecology granted a permit extension due to EPA investigations (Oeser 1998). Ecology issued NPDES permit number WA-003081-3, which took effect on July 1, 2001, and which expires on June 7, 2006.

The Oeser Company's NPDES permit requires sampling at points along the storm drain system. Initially, two samples were required; these were taken at catch basins SDCB-2 and CPCB-1 (Figure 1-14). A third sample was collected voluntarily at the Oeser outfall. As the facilities were modified, a fourth sample site was added at the coalescing plate filter-oil/water separator system. Further modifications made sampling at CPCB-1 unnecessary because it was rerouted through the stormwater treatment system that was already being sampled. The 1997 NPDES modification made sampling at the Oeser outfall mandatory. The three current sample points are at SDCB-2 (sample point 001), at the filter/separator system effluent (002), and at the outfall to Little Squalicum Creek (003; Figure 1-14).

The current permit has an interim PCP effluent limit for sample point 001 of 50 Fg/L. On July 1, 2002, the PCP limit becomes 9 Fg/L which is the limit for sample point 002, and the interim limit for sample point 003. After June 31, 2002, sample point 003–the outfall at Little Squalicum Creek–is sampled only for pH. The outfall is off-site and Oeser's contribution to the flow total is approximately 2.5 percent. At the end of the interim period, sample points 001 and 002 will be sampled for oil and grease and PCP and monitored for pH. In addition, the current permit requires the following:

- Acute toxicity characterization and reporting for an initial period. The results will be used to determine any follow-on activities.
- Dioxin and furan analysis on two specified occasions. On the basis of the results, Ecology will determine if additional requirements will be imposed.
- Operations and maintenance manual for any facilities or systems that are installed to achieve NPDES requirements.
- Update to the existing Spill Control Plan.

- Update to the existing Stormwater Pollution Prevention Plan upon permit reapplication.

1.5.5.2 Air Emissions

The Oeser Company maintains an NWAPA source registration (047-B-W). The Oeser Company has registered the following process equipment with NWAPA:

- Hog fuel boiler;
- Barker;
- Three treating tanks (two butt and one open thermal);
- One retort;
- Six storage tanks (three approximately 40,000-gallon PCP tanks, one 180,000-gallon water tank, one 50,000-gallon creosote tank, and one 100,000-gallon creosote tank);
- One hog fuel hopper;
- One log yard;
- Two incising sheds;
- One portable saw mill; and
- One wastewater treatment system.

NWAPA regulates The Oeser Company for visual emissions, discharge of odor-producing air contaminants, and prevention of particulate matter from becoming airborne. The company implemented the following measures to reduce air emissions (NWAPA 1997):

- A boiler-forced draft fan was installed in 1991;
- Retort drip pads were sealed with ceramicoat;
- A water spray is used at all times in the saw mill to reduce potential particulate emissions; and
- A final vacuum cycle is used in the retort to cool treated material before opening the vessel.

The Oeser Company discontinued use of the open horizontal thermal tank in 1983 and all sludge and debris were removed from the tank in 1997, thus eliminating possible fugitive emissions from this device. However, the butt tanks are still in use. The Oeser Company has taken steps to reduce the odor from the tanks (Sheldrake 1998). The Oeser Company installed a fluid-bed scrubbing tower together with

a series of covers and fans above the butt tanks. When the tanks are in operation, the system draws emissions through the fluidized bed capturing pollutants in water. This water is transferred to the evaporator system (Durbin 2001).

NWAPA cited The Oeser Company for an odor nuisance violation on November 4, 1994, and again in January 1998. Nearby residents made numerous complaints to NWAPA about odors emanating from The Oeser Company's facility; however, when NWAPA responded to the complaint, the odors had dissipated (Franzman 1997). Additional complaints were received by the Whatcom County Health Department (WCHD) following a butt tank fire in September 1994. Subsequent to the fire incident, NWAPA issued an Assurance of Discontinuance (AOD) for The Oeser Company's facility. The AOD specified that The Oeser Company must:

- Review its safety procedures and make changes as needed,
- Provide copies of the revised safety procedure and the safety violation notices to NWAPA, and
- Pay the unsuspended portion of the penalty.

Based on review of company documents currently on file with NWAPA, The Oeser Company has satisfied the AOD (Keel 1995).

In February 1995, NWAPA performed on-facility air sampling in support of a hazardous air pollution screening project. A complete discussion of the sampling methodology, results, findings, and NWAPA's recommendations can be found in Appendix A, *Hazardous Air Pollution Screening Project, Oeser Company* (Keel 1995). One volatile organic compound (VOC) grab sample was collected immediately after opening the retort door. A semivolatile organic compound (SVOC) sample was collected over a 24-hour period at ground level below a load of treated timbers recently removed from the retort. The analytical results showed a 24-hour average PCP concentration of 0.74 microgram per cubic meter ($\mu g/m^3$) directly below the treated logs and indicated the presence of six aromatic VOCs that are typical constituents of the diesel-like carrier oil at the retort door. NWAPA concluded that the potential risk to public health from fugitive PCP emissions and VOCs is small. However, NWAPA did make retort-unloading recommendations to avoid the possibility of workers inhaling unhealthy levels of VOCs.

1.5.5.3 RCRA Permits

While The Oeser Company does not require a RCRA permit, the facility is regulated under RCRA as a generator of hazardous (dangerous) waste. The facility has been assigned the EPA identification number WAAD008957243 (Oeser 1998).

1.6 SPILLS AND OTHER HAZARDOUS SUBSTANCE RELEASES

The Oeser Company documented spills of PCP preservative in 1971 and 1975. The potential release of air contaminants also occurred during an on-facility fire in 1994. No other releases of hazardous substances from The Oeser Company facility have been reported. The following spills and incidents are known to have occurred at the facility:

On May 26, 1971, evidence of an oil spill appeared in Little Squalicum Creek. A concerned citizen reported the presence of oil in Little Squalicum Creek to the WCHD. The creek was investigated by both WCHD and Ecology, and oil accumulations were noted at several places along the creek. Ecology tracked the source of the oil to The Oeser Company. The company cleaned up the release, which was believed to be at least 50 gallons of a solution composed of 5% PCP in carrier oil (Oeser 1998).

On January 15, 1975, approximately 10 to 15 gallons of 5% PCP oil was released when a sump pump connected to the oil/water separator failed to shut down. The spill found its way to a nearby storm drain and ultimately discharged to Little Squalicum Creek. At the time of discovery, The Oeser Company made an effort to clean up the spill, but did not report it to Ecology. The following day, the spill was reported to WCHD by a concerned citizen, and The Oeser Company was fined $250 for not reporting the spill (Ecology 1975).

In December 1977, a spill from the Oeser facility entered Little Squalicum Creek and reached Bellingham Bay. Oeser hired a company to clean up the oil. (EPA 1997a)

On September 27, 1994, a fire occurred at the PCP butt tank. WCHD concluded that adverse health effects to the public due to PCP exposures were unlikely. (The Oeser Fire Incident Report and Oeser Cedar Fire Phone Log contain additional detail regarding this incident [WCHD 1994].) In May 1995, the damaged PCP butt tank and wood scaffolding were replaced. Damage from the fire was surveyed during the EPA Spill Prevention Control and Countermeasure (SPCC) inspection performed in February 1995. The SPCC inspection concluded that secondary containment of all facility tanks appeared to be adequate.

On January 15, 1997, a PCP oil spill of 4 to 5 gallons occurred. The process line expansion joint for the retort had a seal failure and spilled onto the retort roof, the drip pad, and the ground north of the retort. Most of the spill was contained on the drip pad. The little contamination that reached the frozen soil was drummed up for disposal and the remainder captured in containment areas and recycled into the facility's treatment system (Oeser 1998).

As part of the EPA removal action (see Section 1.9), contaminated surface and subsurface soil was excavated from an area east of the evaporator. A rainstorm occurred on the night of July 11, 1998, while the operation was in progress. Stormwater and stormwater runoff from around the excavation began filling the open excavation and action was taken to prevent catastrophic failure of the sidewalls as the pit filled. The stormwater from the pit was pumped to the storm pipe downstream of the excavation. The action was also taken to prevent any product (lighter-than-water nonaqueous phase liquid [LNAPL]) that could have leached from the unlined pit floor and walls from rising to the level of the open storm pipe located within the upper portion of the pit sidewall. To avoid pumping LNAPL, the stormwater was pumped from beneath the water surface.

The stormwater captured in the pit came in contact with contaminated soils and so was likely to have become contaminated. The actual contaminant concentration in the released stormwater is unknown. Given the short duration of time in which stormwater was in contact with contaminated soil (on the order of a few hours) as compared to shallow groundwater contact with contaminated soil for decades, it is unlikely that the PCP concentration in the stormwater exceeded the maximum measured concentration in shallow groundwater.

The CERCLA reportable quantity for PCP is 10 pounds of PCP in a 24-hour period. Based on the pumping rate for the 4-inch pump used to remove the stormwater (400 gpm) and the approximate duration of the pumping (30 to 40 minutes), it is estimated the 12,000 to 16,000 gallons of potentially contaminated stormwater from the excavation were introduced into the storm pipe, which empties in Little Squalicum Creek. To be reportable, the PCP concentration in the released stormwater would have had to have been between 70 and 100 ppm. For comparison purposes, the highest measured concentration of PCP in a shallow on-site monitoring well has been 58 ppm. Therefore, it is extremely unlikely that a reportable quantity of PCP was released from the pumping action.

Little Squalicum Creek was walked by the START from the Oeser outfall to the Marine Drive Bridge on July 13, 1998. There was no evidence of oil or a sheen on the water or vegetation, and no petroleum-type odor was noted.

Although it could not be empirically determined that oil or a reportable quantity of a CERCLA hazardous substance was released, as a precautionary measure, notifications were made to the National Response Center (#445976) and Ecology (#N29774). Detailed information on this event was provided to The Oeser Company in the incident-specific pollution report dated July 21, 1998 (E & E 1999g).

Ecology Notice of Violation DE 95WQ-N109 dated February 17, 1995, indicated that The Oeser Company had exceeded the Interim Daily Maximum permit limit for PCP concentration in discharged stormwater four times between May and December 1994. Ecology Order DE 96WQ-N112 dated March 18, 1996, reported that the Interim Daily Maximum permit limit for PCP concentration in discharged stormwater was exceeded at two sampling points in October 1995. Ecology Order DE 96WQ-N113 has the same March 18, 1996, date as the previous order but noted that exceeding the effluent limitation for PCP in discharge to Little Squalicum Creek occurred as The Oeser Company was upgrading its stormwater system by regrading portions of the site. (Oeser 1998)

A 1998 Water Compliance Inspection Report (Ecology 1998) notes that sampling point 002 exceeded permit limits during most of 1997 while the facility was being regraded for stormwater control. It also states that May 1998 exceedences at sampling points 002 and 003 (Figure 1-14) were due to the ongoing removal action at the facility. The report also addresses the July 1998 "spill" event discussed above. The reports provides data for PCP analyses of stormwater collected upstream and downstream from The Oeser Company's input to the storm drain on February 18, 1998 and May 28, 1998. No sampling or analytical QC data or specific locational data was available. The report states that upstream PCP concentrations ranged from 0.38 to 1.07 µg/L, while stormwater collected downstream of The Oeser Company's inputs into the storm drain were all less than 0.1 µg/L. The report speculates that upstream contamination may have resulted from ground or surface water runoff.

The current NPDES permit notes that the facility was last inspected on March 4, 1999. The permit also notes violations of PCP stormwater limits under the previous permit. NOVs were issued on February 10, 1999, for violations in November and December of 1998 and on April 28, 2000 for violations in October and November of 1999 and January and February of 2000. A Notice of Penalty was issued July 26, 2000, for these violation. (Ecology 2001b)

The EPA performed a RCRA inspection of The Oeser Company facility on June 27, 1996 (EPA 1996e). The EPA issued a Notice of Violation was issued October 3, 1996 citing "failure to meet drip pad requirements" and "failure to hold treated wood on the drip pad until drippage has ceased" (EPA 1996d). In a letter dated November 26, 1996, the EPA accepted The Oeser Company's response/ corrective action to remedy the problems (EPA 1996b).

1.7 PREVIOUS INVESTIGATIONS

This section describes previous investigations conducted at the site and along Little Squalicum Creek that involved sample collection and analysis. The resulting analytical data were evaluated for quality and usability during the RI/FS process, then incorporated into a relational database for evaluation. This section describes the results of that evaluation.

1.7.1 Data Collection Events

The data collection events include:

- E & E, October 1987, *Site Investigation;*
- Parametrix, July 1991, *Site Hazard Assessment*;
- Landau Associates, April, 1992, Technical Memorandum to the Port of Bellingham, *Soil Quality Conditions and Recommended Additional Activities Proposed Little Squalicum Creek Wetlands Compensation Project*;
- WCHD, February 1992, *Little Squalicum Creek Sample Results*;
- Edde, 1993;
- URS, 1994, *Site Inspection Prioritization Report*;
- NWAPA, May 1995, *Hazardous Air Pollution Screening Project*;
- E & E, April 1996, *Expanded Site Inspection*;
- E & E, 1998, *Removal Assessment Report, Phase I*;
- E & E, 1998, *Removal Assessment Report Phase II*; and
- E & E, 1998, *Removal Action Report*.

A series of sample location maps showing site sampling points and matrices by data collection event are included in Appendix B. Data points for which only screening tests (i.e., field analyses conducted using less rigorous quality assurance (QA)/QC procedures than standard laboratory methods) were performed are not included on either map. Cone penetrometer testing-laser-induced fluorescence-rapid optical screening tool (CPT-LIF-ROST™) sampling points from the RI are shown in a separate figure (Figure 2-1).

1.7.2 Data Usability

Usability of sample results from previous investigations is based on criteria found in Part A of EPA OSWER Directive 9285.7-09A, *Final Guidance for Data Usability in Risk Assessment* (EPA 1991c) and the revised draft version of the EPA document *Technical Approach to Risk Assessment (TARA*; EPA 1998). Separate data usability worksheets for each matrix from each sample collection event are provided in Appendix C. A summary of usability is provided below.

1.7.2.1 Facility Investigation (E & E 1987)

Sediment, surface water, and groundwater samples were collected as part of the 1987 facility investigation performed for the EPA. VOC and SVOC analyses were performed using EPA Contract Laboratory Program methods. Minor problems affecting data usability are described below:

- Some sediment sample quantitation limits were elevated above the Contract Required Quantitation Limits, and one sediment sample was analyzed at medium level rather than low level; therefore, non-detected analytes from these samples may not be useable for risk assessment purposes. The sediment sample analyzed at medium level was also a field duplicate sample analyzed at low level; therefore, direct comparison of these samples is difficult. The groundwater SVOC field duplicate sample results were qualified as estimated quantities because the applicable holding times were exceeded. Water results for 4-nitrophenol are considered low-biased due to low matrix spike (MS) recoveries. None of these issues are considered significant data quality problems.

1.7.2.2 Site Hazard Assessment (Parametrix 1991)

Soil and groundwater samples were collected as part of the 1991 site hazard assessment (SHA) performed for Ecology (Parametrix 1991). The SHA assessed the site using Washington Ranking Method guidelines (Ecology 1991). SVOC, phenolic compounds, and total petroleum hydrocarbon (TPH) analyses were performed using EPA Methods. Several problems affecting data usability are described below:

- A brief QA/QC summary is provided; however, the data validation procedures used are not clearly described. The holding times for all but one sample were significantly exceeded, and detection limits (DLs) for the phenols method blank were significantly higher than DLs for samples, making comparison of results difficult. The report recommended using the data with extreme caution. Significant holding time exceedence may warrant significant qualification of sample results, especially sample quantitation limits, although no formal validation was performed. These results may be used for

future sample collection decisions; however, data validation, following EPA guidelines, should be performed prior to use of this data for risk assessment purposes.

1.7.2.3 Proposed Little Squalicum Creek Wetlands Compensation Project (Landau Associates 1992)

As part of the 1991-1992 Little Squalicum Creek compensation project for the Port of Bellingham, sediment and stormwater samples were collected to summarize existing soil quality data, interpret the probable source and distribution of soil quality criteria exceedences, and recommend additional activities for the project. SVOC, PAH, phenolic compound, selected metal, and TPH analyses were performed using EPA methods. Problems that may affect data usability include:

- A QA/QC summary is not provided; the data validation procedures used are not clearly described. These results may be used for future sample collection decisions, but data validation, following EPA guidelines, should be performed prior to using this data for risk assessment purposes.

1.7.2.4 Little Squalicum Creek Soil Sampling (WCHD 1993)

Sediment samples were collected as part of the 1992 Little Squalicum Creek soil sampling field event to determine the presence or absence of sediment contamination. SVOC and TPH analyses were performed using EPA methods. Problems that may affect data usability include:

- A QA/QC summary was not provided; the data validation procedures used are not clearly described. These results may be used for future sample collection decisions, but data validation, following EPA guidelines, should be performed prior to using this data for risk assessment purposes.

1.7.2.5 Howard Edde Company Samples (Edde 1993)

Soil samples were collected as part of the Little Squalicum Creek soil sampling project for The Oeser Company in 1993. This project was performed to determine the presence of contaminants in Little Squalicum Creek. SVOC and TPH analyses were performed using EPA methods. The following problems, which significantly affect the data usability for risk assessment, were encountered:

- A trip report was not provided;
- PCP quantitation limits in two samples were approximately three times higher than potential regulatory values; and

- Data validation qualification was not performed. These results may be used for future sample collection decisions, but data validation, following EPA guidelines, should be performed prior to using this data for risk assessment purposes.

1.7.2.6 Site Inspection Prioritization Report (URS 1994)

As part of the 1994 site inspection prioritization project completed for the EPA, soil samples were collected to document threats to public health or the environment posed by the site, to document presence or absence of uncontrolled hazardous substances on site, and to confirm site characteristics and other information obtained during previous studies. SVOC analyses were performed using EPA methods. No problems were encountered that significantly affected data usability for risk assessment purposes.

1.7.2.7 Hazardous Air Pollution Screening Project (NWAPA 1995)

Air samples were collected as part of the Hazardous Air Pollution Screening Project completed for the NWAPA to document fugitive emissions from the retort and treated timber storage areas. VOC and SVOC analyses were performed using EPA Methods TO-14 (VOCs) and TO-13 (SVOCs). The problems that may affect data usability include:

- A QA/QC summary is not provided; the data validation procedures used are not clearly described. The SVOC sample collection flow was measured at the beginning of the 24-hour sample collection period but was not measured at the end of the collection period. Calculations for these SVOC results were made assuming the flow rate was constant for the 24-hour period, which may not be accurate. The quality assurance project plan (QAPjP) was not provided for this sampling event; therefore, data quality objectives (DQOs) were not determined for this project. Sample quantitation limits were not provided; therefore, it is not known if the quantitation limits are adequate for risk assessment purposes. These results may be used for future sample collection decisions, but the QAPjP should be reviewed; sample quantitation limits should be provided for all results; and data validation, following EPA guidelines, should be performed prior to using this data for risk assessment purposes.

1.7.2.8 Expanded Site Inspection (E & E 1996)

Air, product (nonaqueous phase liquid [NAPL]), soil, and water samples were collected as part of the expanded site inspection (ESI) completed for the EPA in order to more thoroughly document Hazard Ranking System factors, provide additional information for on-site characteristics, and organize the data for evaluation of possible future actions. VOC, SVOC, and inorganic element analyses were performed

using EPA methods. Field analytical results were used to guide sample collection and conserve analytical resources; field results will not be used for risk assessment purposes. No problems were encountered that significantly affected data usability for risk assessment purposes.

1.7.2.9 Removal Assessment-Phase 1 (E & E 1998a, 1998b)

Process material, soil, and water samples were collected as part of the 1997 Phase 1 removal assessment (RA) performed for the EPA to determine the presence or absence of contaminants in various media on The Oeser Company's facility and nearby property. VOC, SVOC, and polychlorinated biphenyl (PCB) analyses were performed using EPA methods. The toxicity characteristic leaching procedure (TCLP) extraction also was performed in conjunction with several of these analyses. Petroleum and benzene, toluene, ethylbenzene, and xylenes (BTEX) analyses were performed using Ecology methods. Dioxin laboratory-screening, using an American Society for Testing and Materials (ASTM)-approved P450 Reporter Gene System method, was used to guide sample collection and conserve analytical resources; screening results were used to support time-critical risk decisions for the removal action. Selected samples were submitted for EPA Method 8280 dioxin analysis based on the P450 results. Field screening was performed for total PAHs, carcinogenic PAHs (cPAHs), and PCP; field-screening results will not be used for risk assessment purposes. No problems were encountered that significantly affected data usability for risk assessment purposes.

1.7.2.10 Removal Assessment-Phase 2 (E & E 1998a, 1998b)

Soil and water samples were collected as part of the Phase 2 RA performed for the EPA in 1997. Samples were collected to fill data gaps noted after the Phase 1 assessment. VOC and SVOC analyses were performed using EPA methods. No problems were encountered that significantly affected data usability for risk assessment purposes.

1.7.2.11 Removal Action (E & E 1999g)

PCP Enclosure Data

Soil, water, and solid samples were collected as part of the 1998 PCP enclosure RA performed for the EPA (E & E 1998a, 1998b). Analyses occurred for PCP (Environmental Service Assistance Team [ESAT] standard operating procedures [SOPs] FASP-030 and FASP-035 and EPA Methods 1312 and 8270), extractable petroleum hydrocarbons (EPHs; Ecology), dioxins/furans (EPA Method 8290), inorganics (EPA Methods 6010 and 6020, as well as the 7000 series), and SVOCs (EPA Methods 1312

and 8270). The ESAT PCP results were used to guide sample collection and conserve analytical resources but will not be used for risk assessment purposes. The following problem may affect data usability:

- Due to low continuing calibration response factors, several of the soil and water PCP results were qualified as estimated quantities (J) for positive results and were rejected (R) for sample quantitation limits.

Removal Data

Air, oil, groundwater, and soil samples were collected as part of the 1998 Oeser removal action performed for the EPA (E & E 1998a, 1998b). Analyses for SVOCs, PAHs, VOCs, dioxins/furans, TCLP, and synthetic precipitation leaching procedure (SPLP) VOCs and SVOCs were performed using EPA methods. Dioxin laboratory screening for soil samples, using an ASTM-approved P450 Reporter Gene System Method, was used to guide sample collection and conserve analytical resources; the screening results were used to support time-critical risk decisions for the removal action but will not be used for risk assessment purposes. Selected samples were submitted for EPA Method 8280 analysis based on the P450 results. The following problem may affect data usability:

- The PCP quantitation limit in sample 97120622 was rejected (R).

Groundwater samples were analyzed for VOCs and SVOCs and inorganic elements using EPA methods. No problems were encountered that significantly affected data usability for risk assessment purposes except:

- The SVOC acid-fraction results in sample 98040312 (April 1998) and the PAH results in samples 98010516 and 98010517 (January 1998) were qualified as estimated quantities (J) for positive results and were rejected (R) for sample quantitation limits.

1.8 PUBLIC HEALTH ASSESSMENT

A public health assessment for The Oeser Company was released for comments on February 8, 1999 (USDHHS 1999). The report was prepared prior to the RI and was based solely on data presented in the 1996 ESI report (E & E 1996). The health assessment concluded that the site does not appear to pose a public health hazard to workers, trespassers, nearby residents, or recreational users

of Little Squalicum Creek. The report recommends that any future development be carefully monitored to prevent exposure and possible health concerns during excavation or construction and possible use of shallow groundwater.

1.9 REMOVAL ACTION

The following description is from The Oeser Company 1998 Removal Action Report (E & E 1999g).

In September 1997, The Oeser Company 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 surface water runoff from the site. In December 1998, The Oeser Company transferred 23,000 gallons of creosote from the creosote storage tank to rail tank cars. The creosote was sold and transported off facility to Reilly Industries, Inc.

1.9.1 North and South Pole Yards

In December 1997 and January 1998, geotextile/gravel caps were constructed over the most contaminated portions of the North and South Pole Yards (Figure 1-15). The existing ground surface was graded to account for the addition of a 6-inch thick gravel cap without altering surface water runoff to the southeast of the facility. Once the ground surface was leveled to grade, a polypropylene, non-woven, needle-punched geotextile was placed over the contaminated soil. A 6-inch thick gravel cap using $^{5}/_{8}$-inch and 1.25-inch crushed rock was placed over the geotextile and compacted. The gravel cap was designed and constructed in accordance with Ecology's *Storm Water Management Manual (SWMM) for the Puget Sound Basin and Source Control Best Management Practice* (Ecology 1992).

Debris, such as wood and metal, was removed from the horizontal thermal tank and stockpiled prior to off-facility disposal. In order to dispose of the remaining tank sludge in a RCRA class C landfill, the free liquid was solidified by placing the sludge in a metal box containing wood ash from a past fire that occurred at The Oeser Company facility. This mixture was disposed of with the contaminated soil removed in the excavations discussed below. After the contents of the thermal tank were removed, it was steam cleaned and the liquid generated from the cleaning was pumped to the Baker® tank staged on site for later disposal. An out-of-service oil/water separator located just north of the east end of the thermal tank was removed during the excavation of contaminated soil described below because the soil around the abandoned structure was highly contaminated. Liquid from the abandoned oil/water separator also was pumped to the Baker® tank.

1.9.2 West Treatment Area

A significant removable soil source was not identified based on the results of the analytical data from 61 soil samples that were collected from twelve boreholes installed in and around the PCP enclosure in May 1998 (E & E 1998b).

1.9.3 East Treatment Area

The conclusion from The Oeser Company Removal Assessment conducted in 1997 by the START was that the contaminated soil near the former drywell and gravel infiltration bed was contributing to ongoing contamination of the shallow perched groundwater as well as the deep aquifer and, possibly, Little Squalicum Creek. The START determined that in order to minimize contamination to the deep groundwater aquifer, the contaminated soil (to a depth of 20 feet [approximately 4000 cubic yards in volume]), should be removed. Contaminated soil was excavated and disposed of at a RCRA Class C landfill (E & E 1998a). Although areas of contamination were known to exist beyond the planned excavation footprint, the excavation was designed to remove the greatest volume of contaminated soil in a time- and cost-effective manner.

1.9.3.1 Sheetpile Installation

A sheetpile shoring system was required to support soil excavation to 20 feet bgs. Because sloping the side walls was only an option for the east wall of the excavation, sheetpile was vibrated into the subsurface, causing soil particles to become tightly packed around the sheetpile, thus minimizing downward contamination.

Site preparation included abandoning monitoring wells MW11-S and MW12-S, removing the abandoned oil/water separator, and checking for obstructions below ground surface. Two separate areas (the large and small excavations; Figure 1-10) were shored in order to protect the storm drain pipeline, the creosote enclosure, the evaporator, and the railroad tracks. The sheetpile for the four walls of the small excavation and the west and north walls of the large excavation were driven to a depth of 45 feet bgs. The sheetpile for the south wall of the large excavation was driven to a depth of 35 feet bgs. Sheetpiling was not used on the east wall of the large excavation, which was instead ramped back using a 1:1 slope. Access for personnel and equipment to the large excavation was gained via the ramped east wall. Sheetpile installation began in late April 1998 and was completed on June 4, 1998.

1.9.3.2 Oil/Water Separator Removal and Drywell Excavation

Excavation of the contaminated soil was broken into three separate areas: the large excavation, the small excavation, and the storm pipe excavation. The two sheetpiled areas were excavated first. Contaminated soil was stockpiled and immediately loaded into gondola railcars for transport to Envirosafe Services of Idaho, Inc., in Grandview, Idaho. During the removal of soil from the large excavation, product was observed draining from soil lenses between 10 and 15 feet bgs and from isolated lenses at approximately 17 feet bgs near the north wall. Strong odors and soil staining occurred in the excavations at varying depths. The maximum depth of the excavation was 20 feet bgs based on the shoring design. Once the contaminated soil was removed to depth from both excavations, clean backfill was brought to the site. A 30-millimeter PVC liner was placed on the floor of both excavations and kept in place using a layer of hydrated bentonite below and above the edge of the liner. Clean backfill was then placed over the liner.

Because groundwater has the potential to flow through the connected sections of the sheetpile, a collection sump was placed in each excavation. Each sump was constructed of 4-inch diameter, schedule 40, perforated PVC pipe installed horizontally and connected to an 8-inch diameter, schedule 40, PVC riser pipe. The sumps were constructed such that any liquid entering the excavated areas would flow toward the perforated pipe and then be removed via the PVC riser pipe. The sumps were constructed in the southwest corner of the large excavation and in the southeast corner of the small excavation (Figure 1-14).

The excavations were backfilled using 0.75- to 1-inch crushed rock with pea gravel from 18 to 10 feet bgs to increase compaction.

1.9.3.3 Storm Pipe Excavation

Once the two excavated areas were backfilled and compacted, a 60-foot section of the storm pipe running parallel to the west wall of the large excavation was removed. The storm pipe was visibly deteriorated with holes in the top of two different sections of the pipe. The northernmost section of the storm pipe, approximately 25 feet long, and the overlying contaminated soil were removed. Contaminated soil to a depth of approximately 15.5 feet bgs was excavated. A 4-foot diameter concrete catch basin was fitted to the upgradient end of the in-situ storm pipe.

Because of the close proximity of the creosote enclosure wall to the excavation, the next 15-foot section of storm pipe and contaminated soil to be excavated could not safely go beyond a depth of approximately 10 feet bgs. The final 30-foot section of storm pipe and contaminated soil were excavated

to a depth of 15.5 feet bgs. As each section was excavated, a concrete/polymer mixture was placed on the floor to prevent any liquid from migrating vertically. The floor of the northernmost section and the southernmost section of the excavation sloped to a collection basin in the northwest and southwest corners, respectively (Figure 1-14). The collection basins were constructed in the same manner as the collection basins installed in the sheetpiled excavations.

Pea gravel was used from about 15 to 6 feet bgs. A geotextile fabric was placed over the pea-gravel and approximately 2 feet of crushed rock was placed over the geotextile as bedding for the storm pipe. Once the bedding material was compacted, the storm pipe was placed and secured to the newly placed manholes in the south and north ends of the excavation. After the storm pipe was secured, 0.75- to 1-inch crushed rock was used to complete backfilling the remainder of the storm pipe excavation. The backfilled excavation areas were graded in preparation for the 6-inch asphalt cap.

1.9.4 North Treatment Area

Screening data indicated there was dioxin contamination above the action level of 6.9 micrograms per kilogram (µg/kg) for surface soil near the retort. To minimize worker and trespasser exposure to the contaminated soil, the area was capped. Two different capping materials were utilized: an asphalt cap near and around the retort drip pad; and a gravel cap east of the asphalt cap (Figure 1-15).

The asphalt cap installed near the retort was designed and constructed in accordance with The Oeser Company's NPDES permit (Ecology 1993). The Oeser Company replaced the existing railroad track leading to the retort drip pad and the railroad track leading to the drip pad north of the retort. When the tracks were in place, the EPA contractor began regrading the surface for the asphalt cap. Soil near and around the railroad tracks had to be excavated in order to compensate for the 6-inch cap, including 2 inches of base course and 4 inches of asphalt. The excavated contaminated soil was used to construct a berm north of the gravel cap in the north treatment area. A clean soil cap was placed over the contaminated soil berm and seeded to prevent erosion.

East of the asphalt cap, a gravel cap was placed over geotextile fabric. A gravel cap was used in this area rather than an asphalt cap because the area is not included in The Oeser Company's NPDES permit and is not considered a heavy-traffic area. The gravel cap was designed and constructed in accordance with the *Storm Water Management Manual (SWMM) for the Puget Sound Basin and Source Control Best Management Practice* (Ecology 1992). Existing ground surface was graded to account for the 6-inch gravel cap without altering stormwater runoff.

1.9.5 Removal Action Summary

On-site removal work action was conducted from September 1997 through November 1998. To protect workers and trespassers, caps were designed and placed over 4 acres of dioxin-contaminated soils. The most contaminated soils at the facility were excavated to a depth of 20 feet bgs in the area of the former dry well located east of the east treatment area. Some 8,456 tons of contaminated soil wastes designated F032 - F034 were transported via rail for disposal at Envirosafe Services of Idaho, Inc., in Grandview, Idaho. Some 26,948 gallons of F032 - F034 liquid waste were transported by vacuum truck to Burlington Environmental in Kent, Washington, for treatment and disposal.

Figure 1-1

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

USGS Topographic Map
Area Coverage

THE OESER COMPANY FACILITY

LITTLE SQUALICUM CREEK

BELLINGHAM BAY

N
W E
S

0 1500 3000 4500 6000
Feet

MAP SOURCE

USGS Topographic Maps. Scale 1:24000
Eliza Island Quadrangle, 1997
Bellingham South Quadrangle, [1954], 1972b
Bellingham North Quadrangle, [1954], 1972a
Ferndale Quadrangle, [1954], 1994

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Seattle, Washington

/data1/oeser/rifs/fig1-1.aml

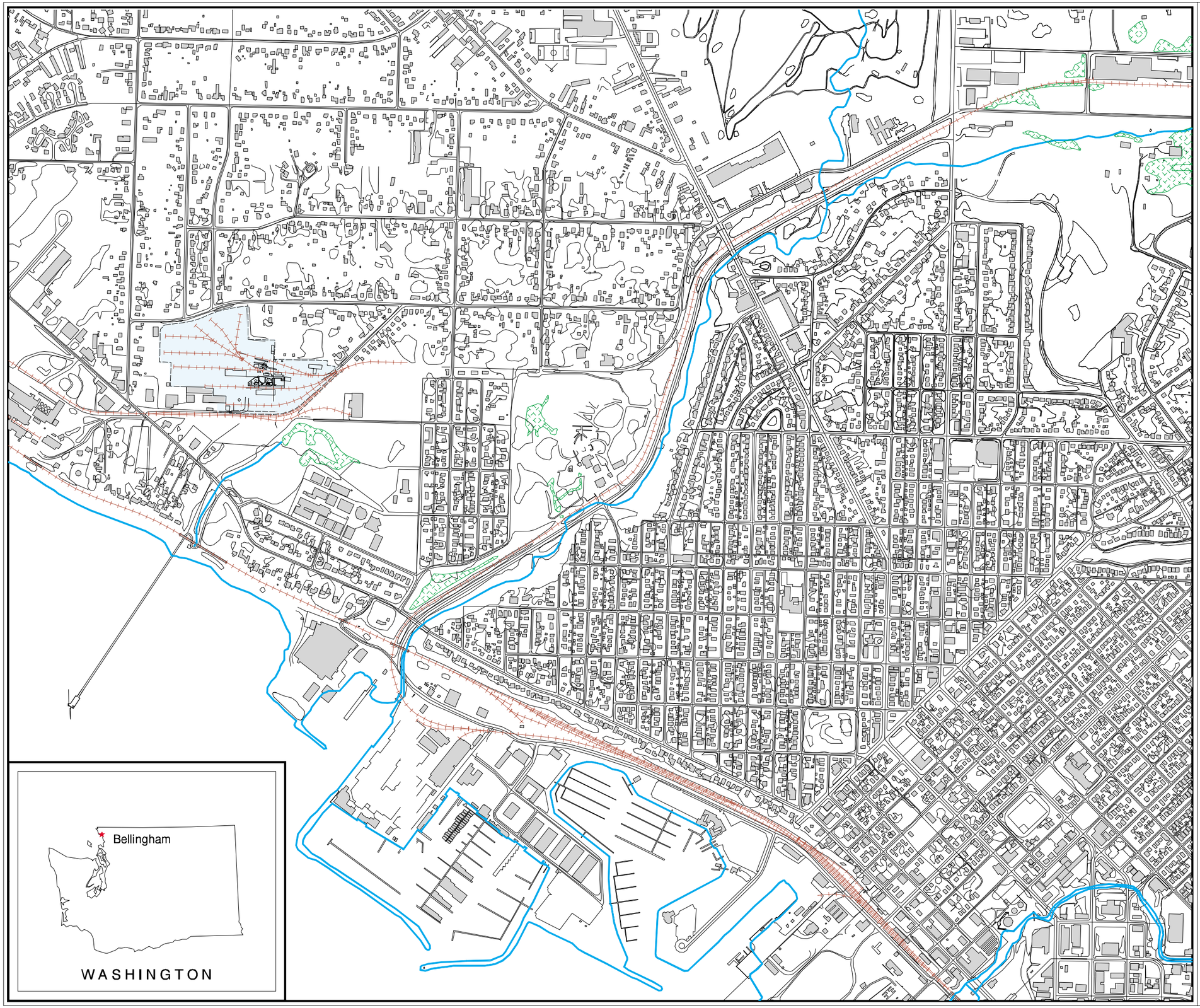
Figure 1-2

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Study Area



Legend

- The Oeser Company Facility
- Wetlands
- Building/Residential Structure
- Shoreline and Waterways
- Railroad Line

N
W E
S

0 500 1000 1500 2000

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

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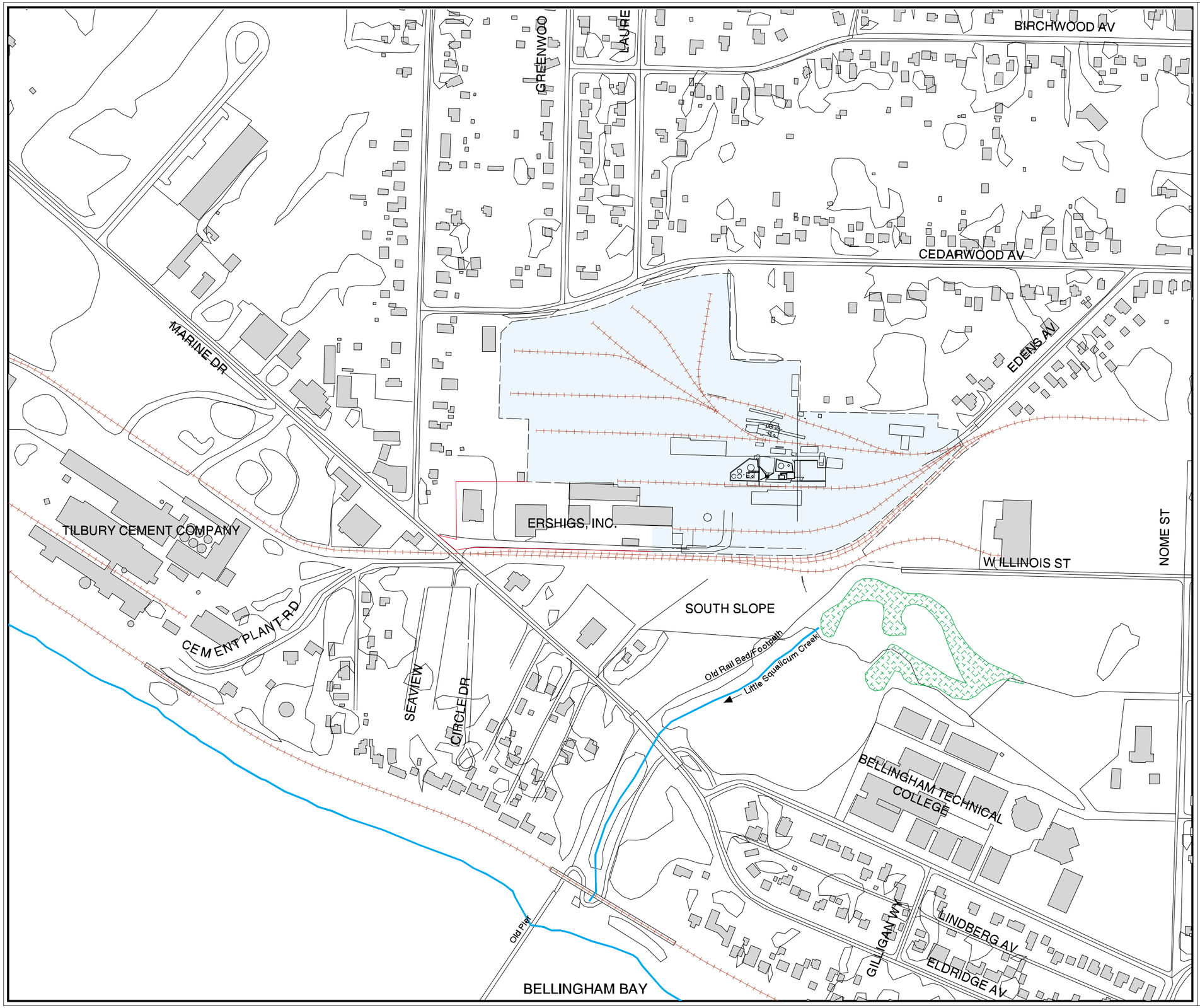

Figure 1-3

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Site Map

Legend

- The Oeser Company Facility
- Wetlands
- Building/Residential Structure
- Shoreline and Waterways
- Railroad Line
- Flow Direction

N
W E
S

0 250 500 750 1000

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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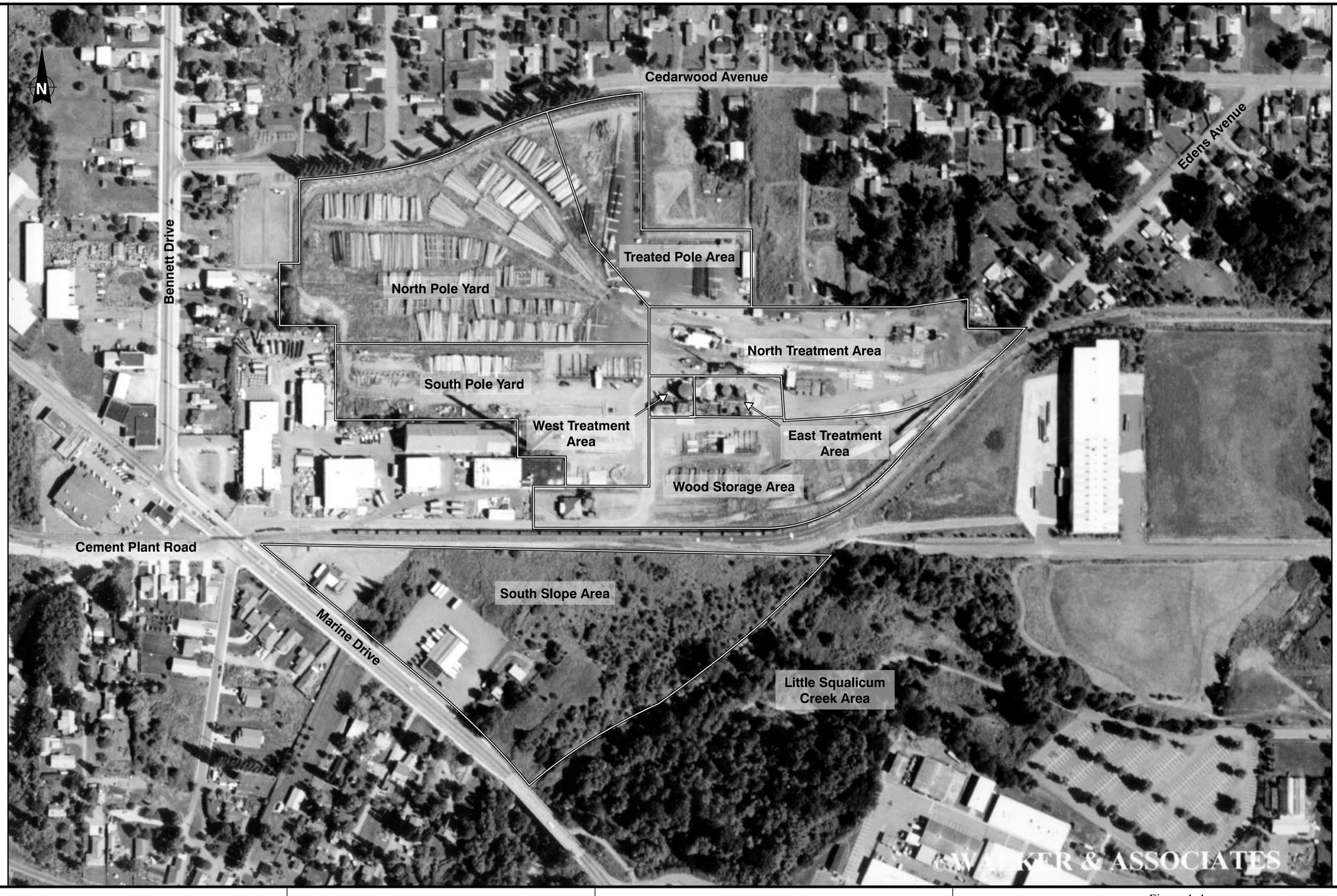

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SOURCE: Walker & Associates, 1997.

Base Figure:
02: KJ0103_BH0701SRDO\Facility Areas.CDR 5/12/98

THE OESER COMPANY SUPERFUND SITE
REMEDIAL INVESTIGATION
Bellingham, Washington

Figure 1-4
FACILITY AREAS (AERIAL)

Date:	Drawn by:	TDD No.:	Pan No.:	Dwg.No.:	Pubs. No.
11/17/00	BUFF	09-00-09-0001	0566OCSTT0	0566 1-4	S567

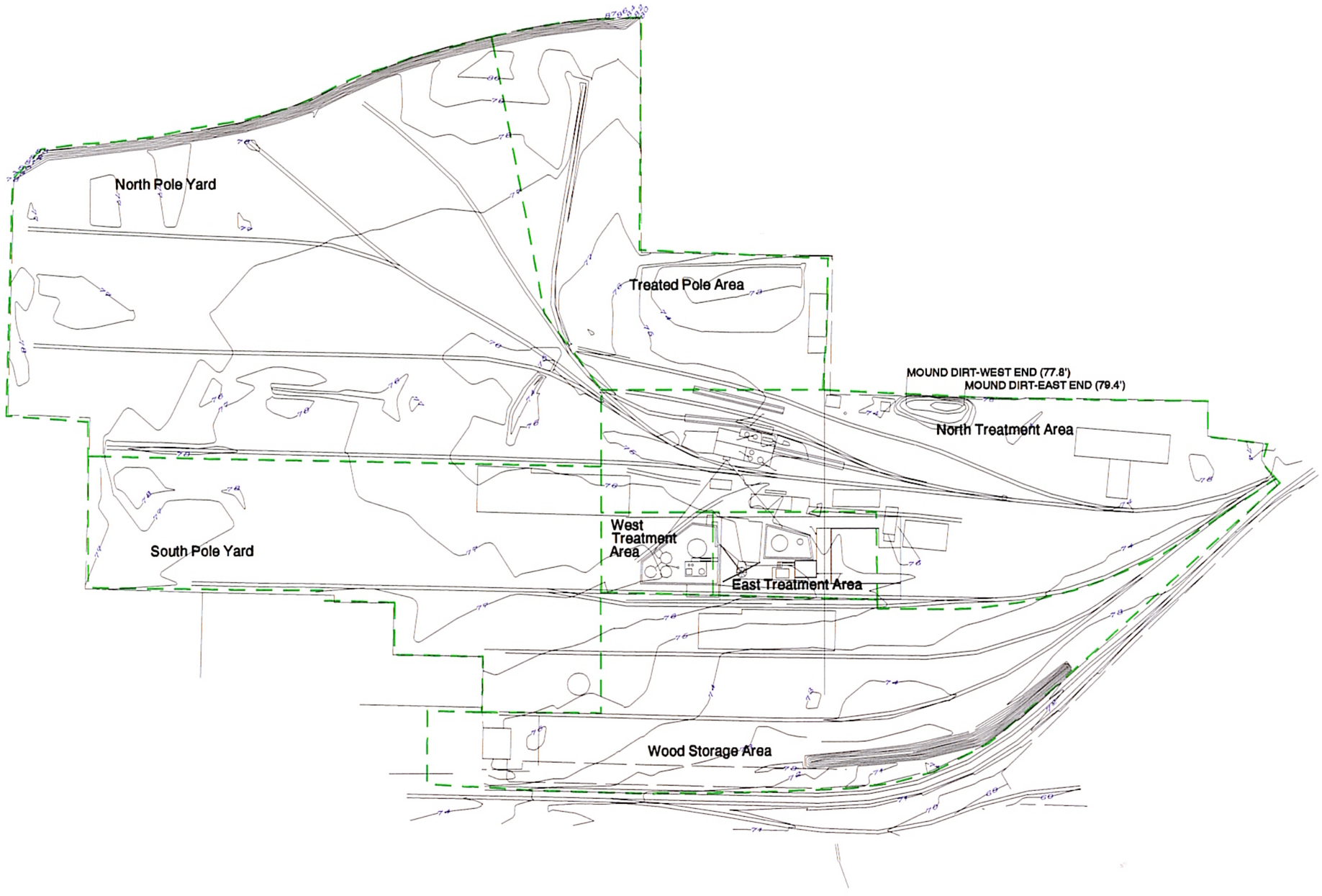
Figure 1-5

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Facility Topographic and Subarea Map



Legend

- Subarea Perimeter
- Contour Line
- Contour Interval = 1 foot

N
W E
S

0 100 200 300

Feet

MAP SOURCE

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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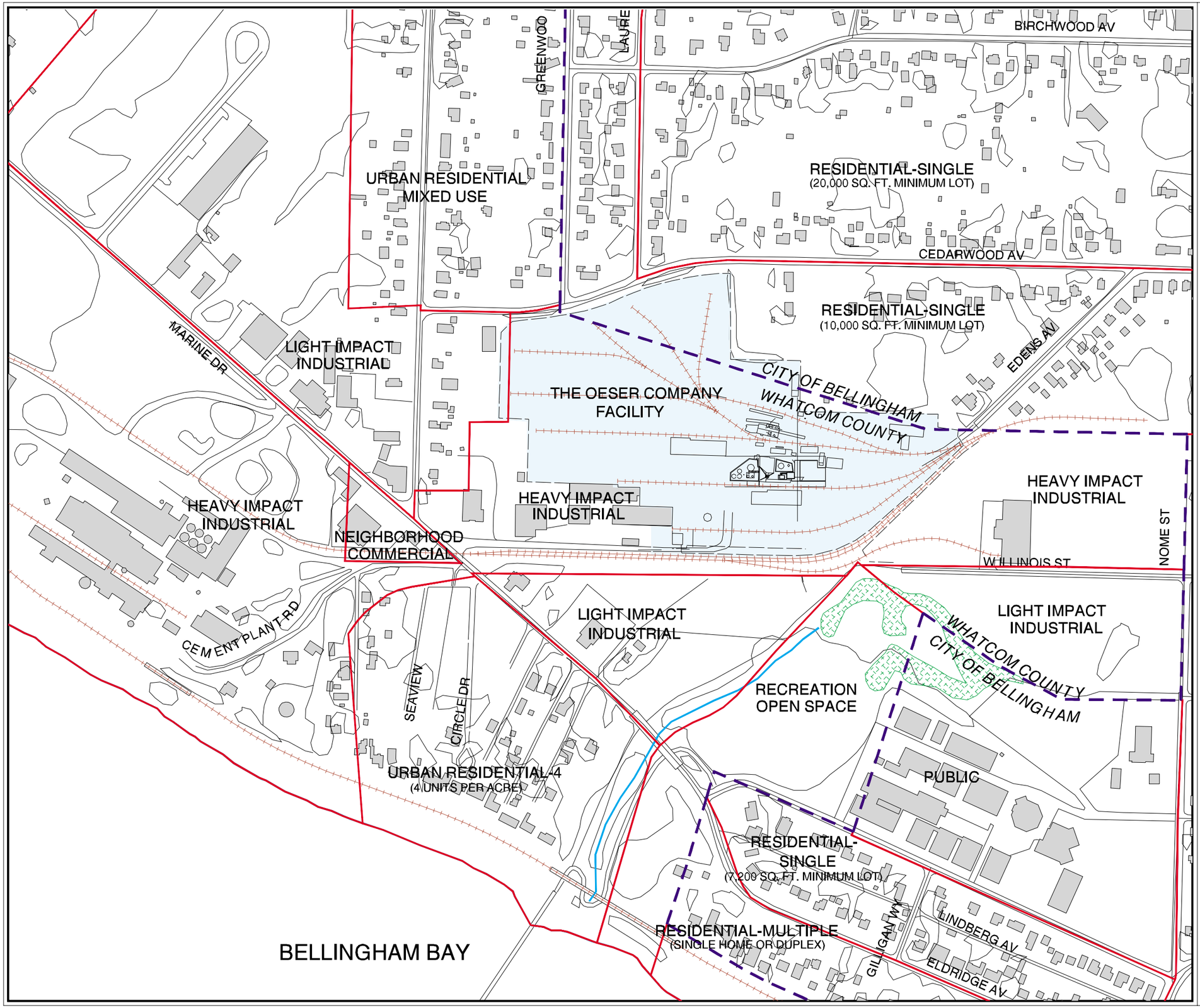

Figure 1-6

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

City of Bellingham and Whatcom County Zoning Designations

Legend

- The Oeser Company Facility
- City/County Jurisdictional Boundary
- Zone Boundary

N
W E
S

0 250 500 750 1000

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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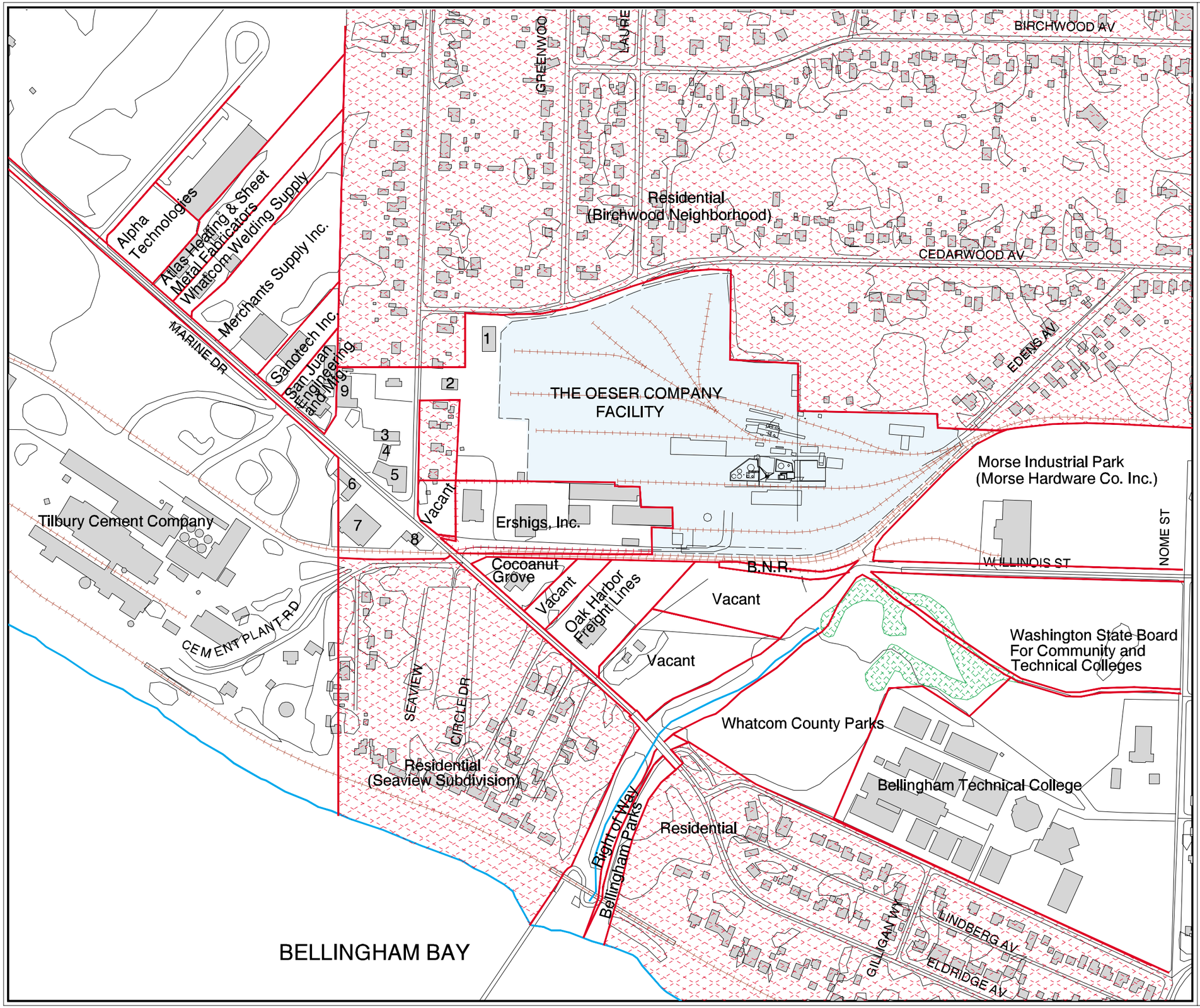

Figure 1-7

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Land Use

Legend

- Landuse Boundary
- The Oeser Company Facility
- Wetlands
- Residential
- 1 Bennett Storage
- 2 B & B Paint Company
- 3 Headquarters-Whatcom Fire District #8
- 4 Interstate Batteries (Vacant for Lease)
- 5 Marine Drive Market/Echo Free Ad Paper
- 6 Northshore Student Center
- 7 Northshore Church
- 8 Marine Drive Auto Service
- 9 U.S. Customs

N W E S

0 250 500 750 1000

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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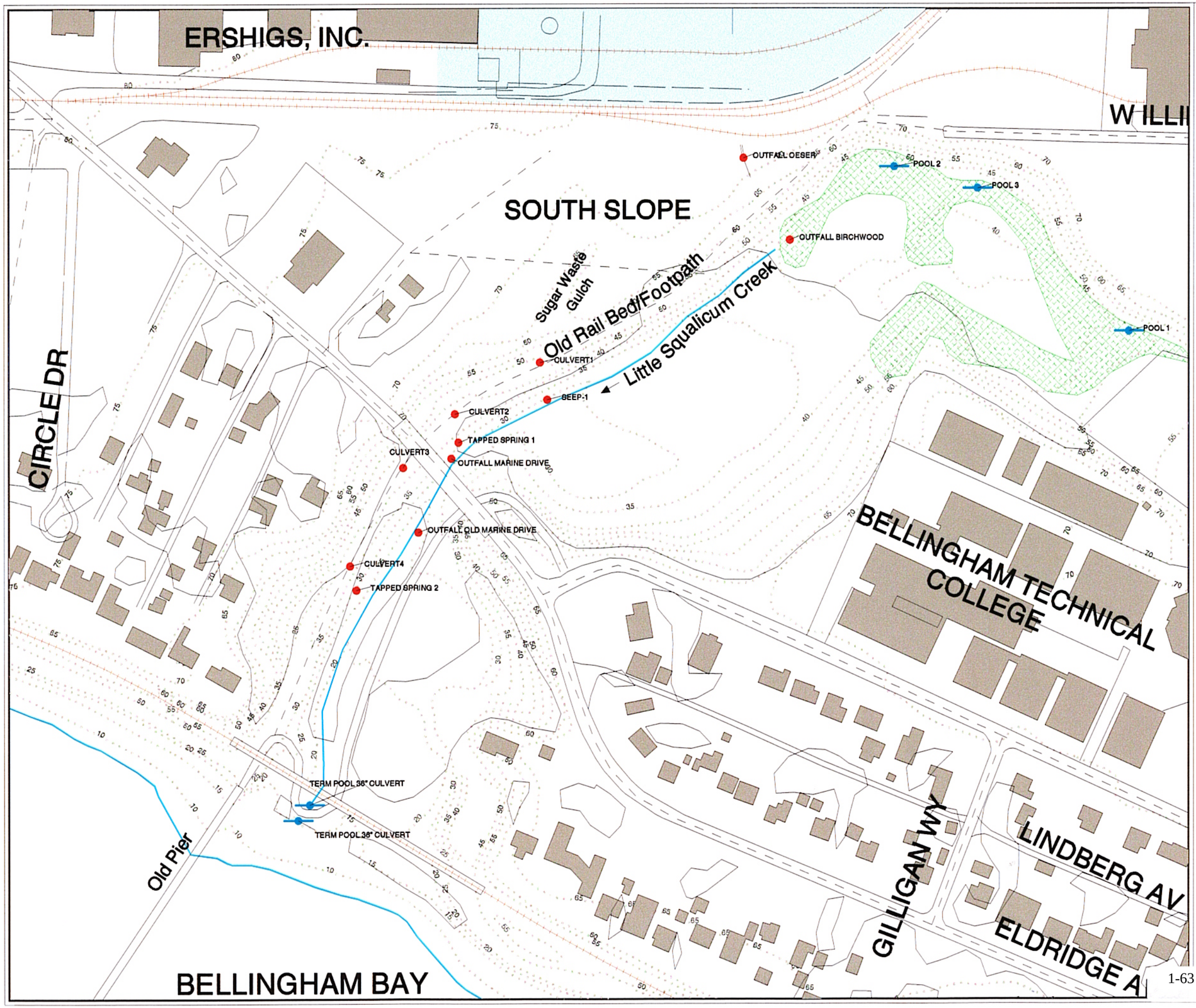

Figure 1-8

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

South Slope and Little Squalicum Creek

Legend

- The Oeser Company Facility
- Wetlands
- Building/Residential Structure
- Shoreline and Waterways
- Railroad Line
- Contour Interval
- Flow Direction

N, W, E, S

0 100 200 300 400 500

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

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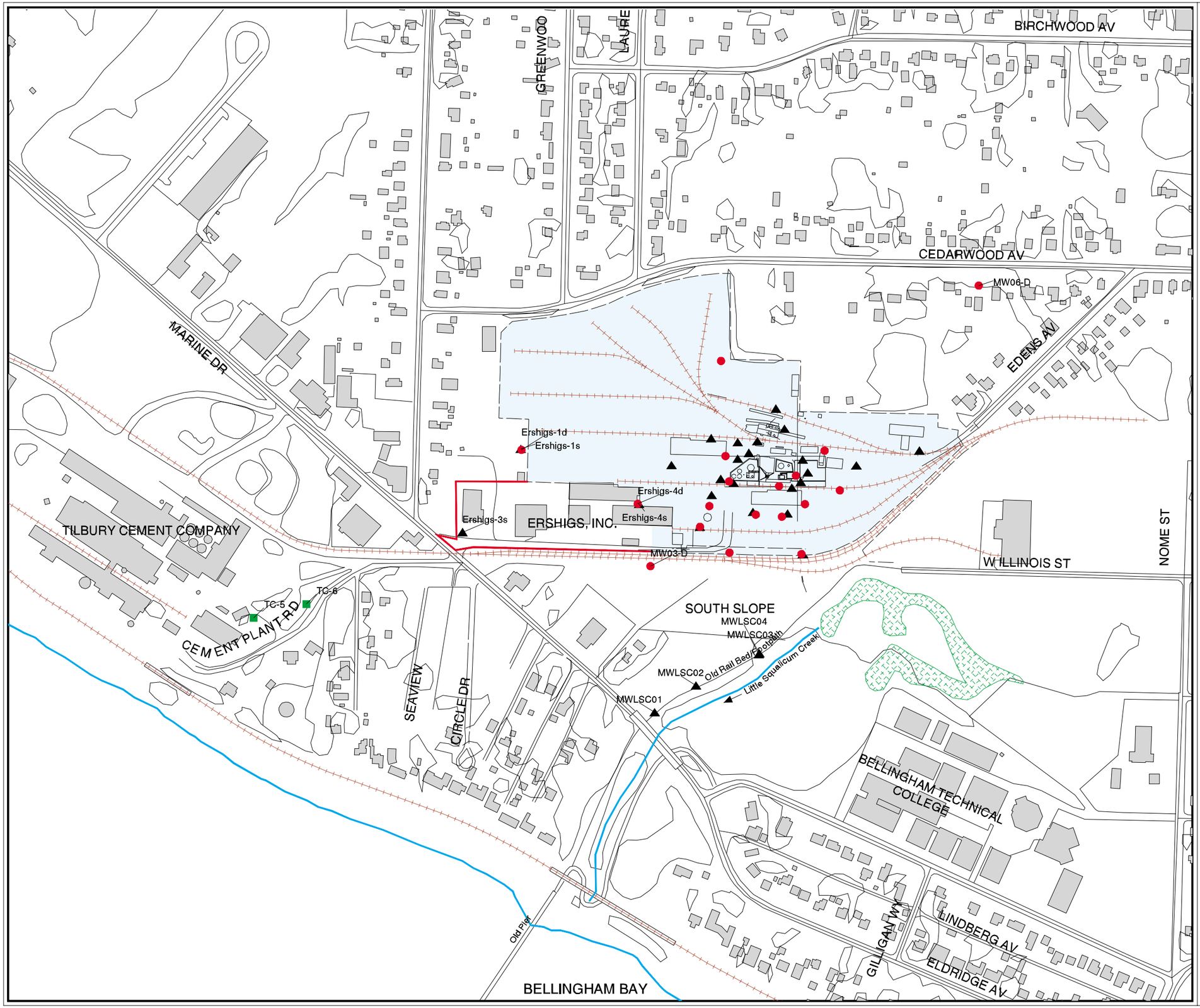

Figure 1-9

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Site Well Location Map

Legend

- The Oeser Company Facility
- Wetlands
- Deep Monitoring Well Location
- Shallow Monitoring Well Location
- Tilbury Cement Company Active Production Well
- Flow Direction

N
W E
S

0 250 500 750 1000

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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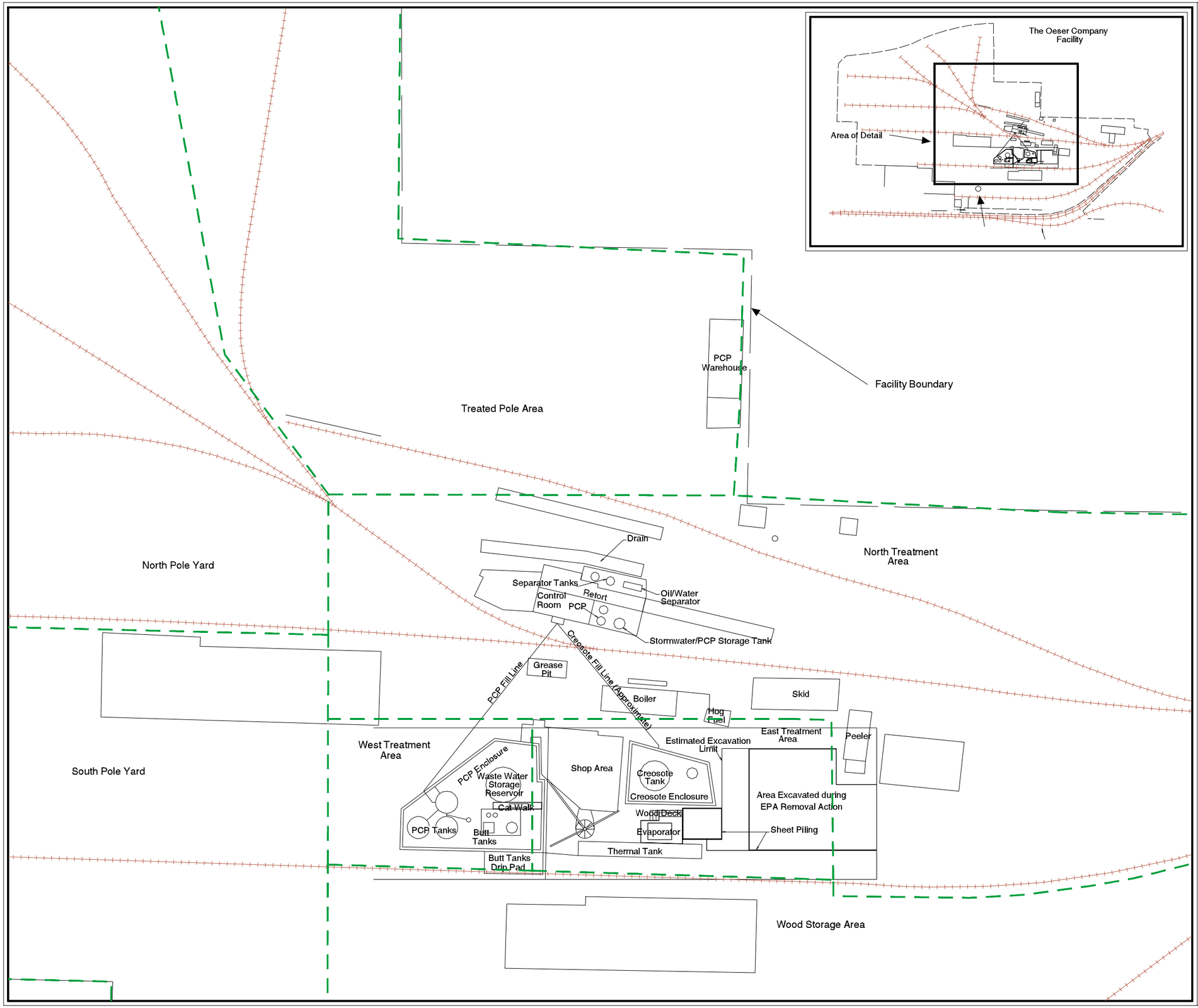

Figure 1-10

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Facility Operations Layout

Legend

Subarea Boundaries

PCP Pentachlorophenol

N

W E

S

0 50 100 150 200

Feet

MAP SOURCE

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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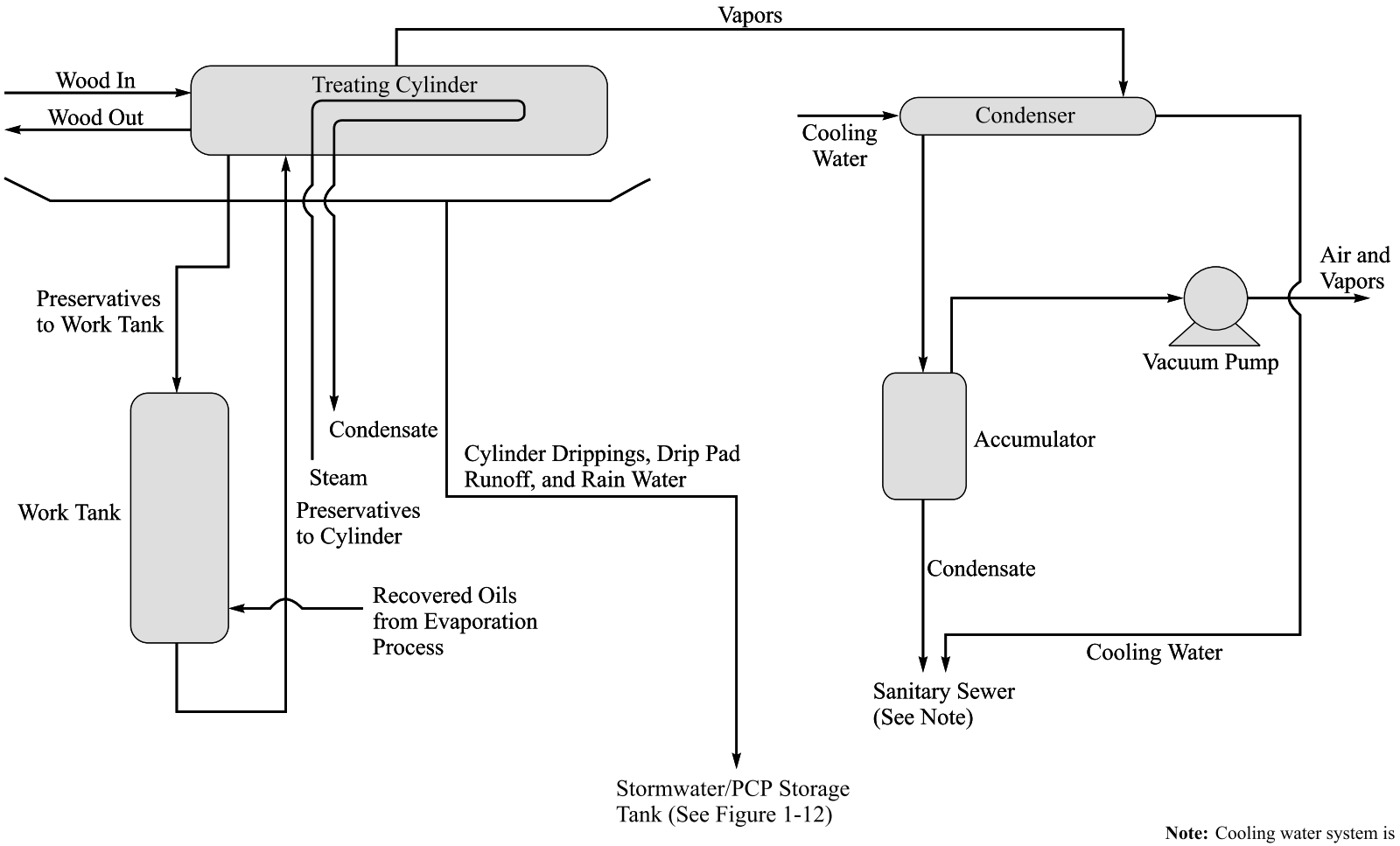
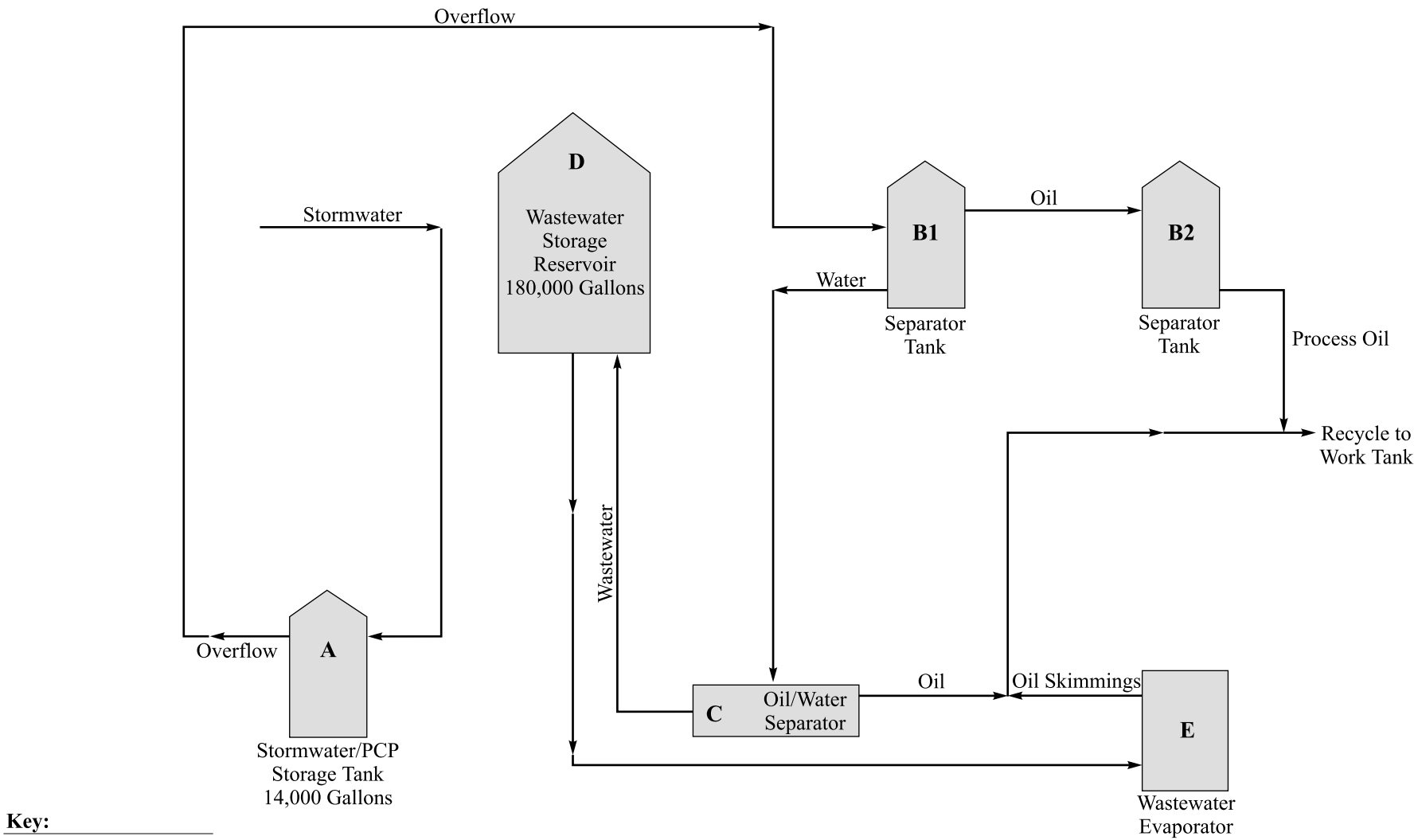


Key:

PCP Pentachlorophenol

Note: Cooling water system is typically a closed system. Under freezing conditions, city water is used, then discharged to the sanitary sewer.

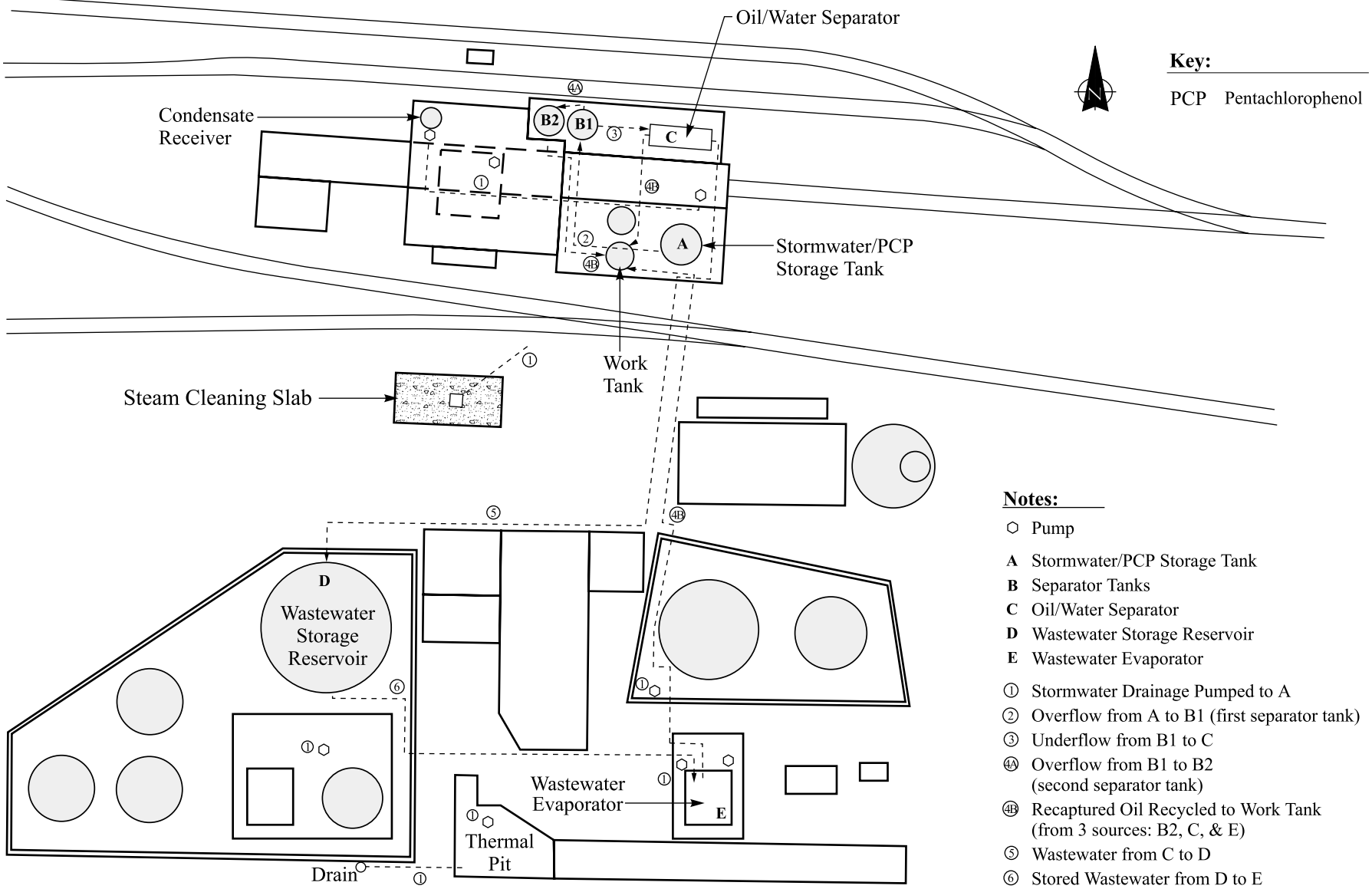
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	THE OESER COMPANY SUPERFUND SITE REMEDIAL INVESTIGATION Bellingham, Washington	Figure 1-11 TREATMENT PROCESS DIAGRAM				
	Not to Scale	Date 11/17/00	TDD No. 09-00-09-0001	Pan No. 0566OCSTT0	Dwg. No. 0566 1-11	Pubs. No. S567



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	THE OESER COMPANY SUPERFUND SITE REMEDIAL INVESTIGATION Bellingham, Washington	Figure 1-12 EVAPORATION PROCESS SCHEMATIC				
	Not to Scale	Date 11/17/00	TDD No. 09-00-09-0001	Pan No. 0566OCSTT0	Dwg. No. 0566 1-12	Pubs. No. S567

AES

Source: URS 1994.



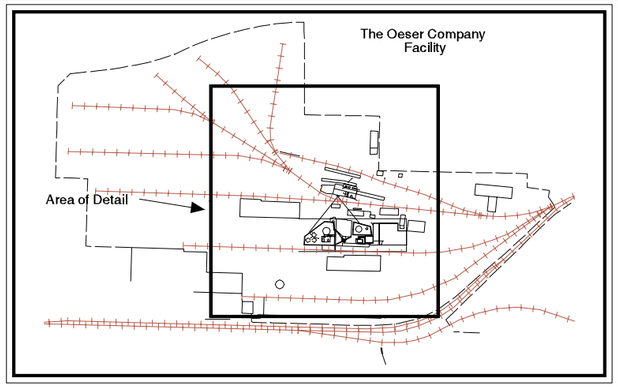
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	THE OESER COMPANY SUPERFUND SITE REMEDIAL INVESTIGATION Bellingham, Washington	Figure 1-13 CONCEPTUAL PIPING LAYOUT FOR EVAPORATION PROCESS				
	Not to Scale	Date 11/17/00	TDD No. 09-00-09-0001	Pan No. 0566OCSTT0	Dwg. No. 0566 1-13	Pubs. No. S567

Figure 1-14

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Stormwater System



Filter System and Concrete Enclosure
Stormwater Collection Pond
NPDES Sample 002
To Cedarwood Ave
SSMH (Lift Station)
SDCB-2 and NPDES Sample 001
Open CB Sump
Treated Pole Area
SDMH-1A
CB Shut-Off Valve
SDCB-3
North Pole Yard
Swale
Drain
SDMH-1
North Treatment Area
B
C
Separator Tanks
CPCB-2
Oil/Water Separator
SSMH
Oil/Water Separator Pump
SDCB-1
A
CPCB-1
Creosote Fill Line (Approximate)
PCP Fill Line
CPCB-3
SDMH-2
West Treatment Area
South Pole Yard
PCP Enclosure
D
Wastewater Storage Reservoir
SPX-CS1
Area Excavated during EPA Removal Action
E
Evaporator
XC2-CS
Sheet Piling
XC1-CS
Thermal Tank
SPX-CS2
East Treatment Area
SDMH-3
Wood Storage Area
24-Inch Storm Drain
SDMH-4
NPDES Sample 003 is located approximately 100 feet to the south at the Oeser Outfall

Legend

- Stormwater System
- Sanitary Sewer
- Manhole
- Catch Basin
- Dry Sumps in Removal Action Excavation

SDMH	Storm Drain Manhole
CB	Catch Basin
SD	Storm Drain
SSMH	Sanitary Sewer Manhole
CP	Collection Pond
CS	Collection Sump
NPDES	Natl. Pollutant Discharge Elimination System
PCP	Pentachlorophenol
A	Stormwater/PCB Storage Tank
B	Separator Tanks (2)
C	Oil/Water Separator
D	Stormwater Storage Reservoir
E	Evaporator

Notes:
1. A Through E = Process for Contact, Non-Contact, and Process Wastewater.
2. CPCB Discharged to SCP

N W E S

0 50 100 150 200
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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Seattle, Washington

/data1/oeser/rifs/fig1-14.aml

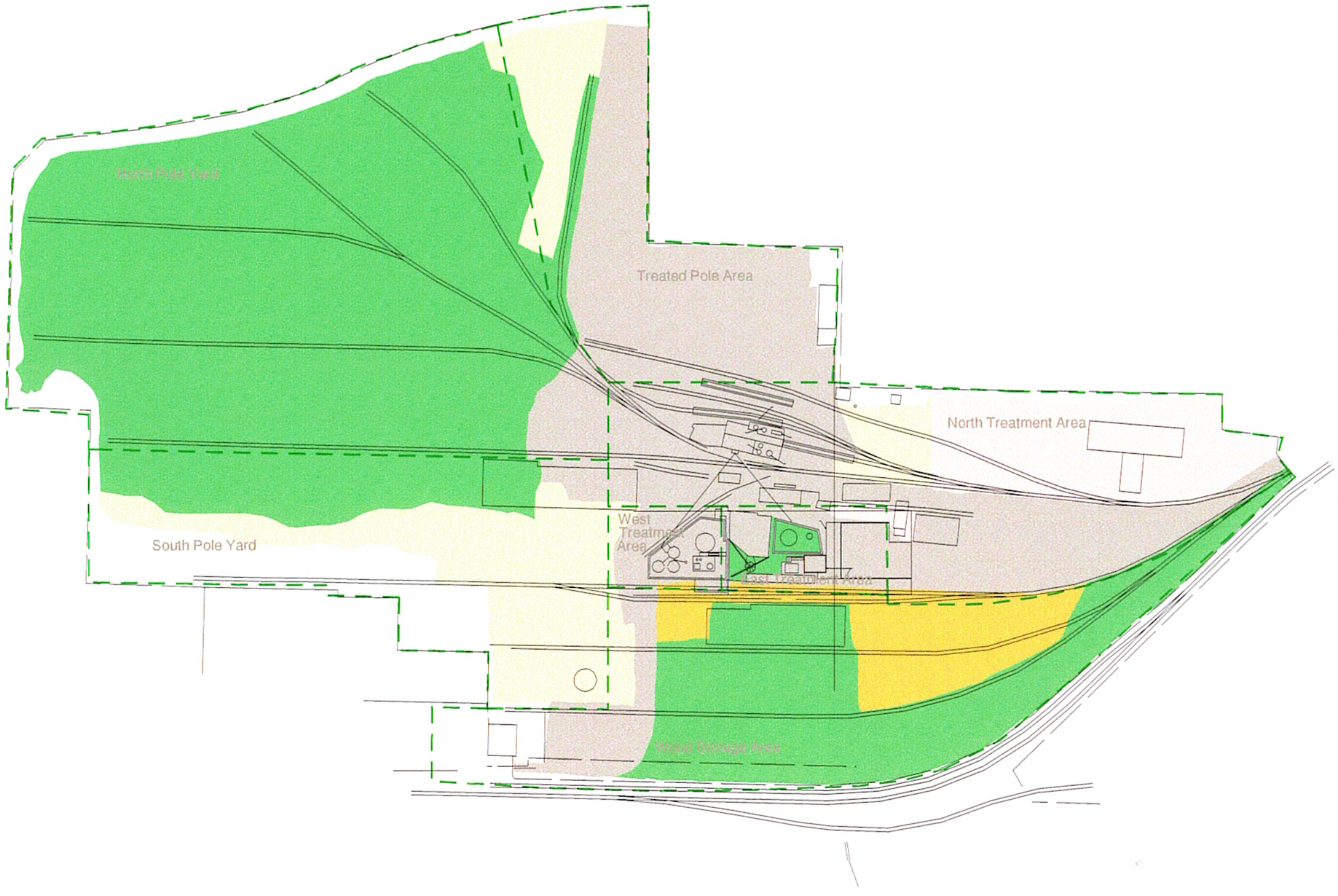
Figure 1-15

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Facility Surface Cover Map
as of July 2000



Legend

- Vegetation
- Asphalt
- Exposed Soil
- Sawdust
- Gravel Cap

N
W
E
S

0 100 200 300

Feet

MAP SOURCE

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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/data1/oeser/rfs/fig1-15.aml

2. INVESTIGATIVE PROCEDURES

Section 2 presents a summary of background research methods, data collection procedures, field activities, and sampling protocol associated with The Oeser Company RI. Field activities were conducted to evaluate the composition and extent of contamination, to determine potential and future risk, and to develop information to evaluate the need and potential options for early or long-term action(s) or both at the site.

The following site-specific activities were conducted:

- Research of historical data;
- Review of regulatory guidance;
- Update of current facility operations, including materials usage and waste handling;
- Global Positioning System (GPS) grid, topographic, and camera surveys;
- Geophysical (CPT-LIF-ROST) investigation;
- On- and off-facility surface soil investigations;
- On- and off-facility subsurface soil investigations;
- Hydrogeologic investigation/groundwater monitoring well installation and sampling;
- On- and off-facility ambient air investigation;
- Collection of on-site meteorological data;
- Surface water sampling;
- Sediment sampling;
- Berry sampling;
- QC/QA;
- Data management; and
- IDW management.

2.1 BACKGROUND RESEARCH

2.1.1 General

Numerous resources were identified and contacted during the facility history investigation and the subsequent development of The Oeser Company Scoping Report (E & E 1999a). These sources included federal, Washington state, Whatcom County, and City of Bellingham agencies; public libraries, archives, and universities; and individuals familiar with the site and facility history. Information provided by these sources included reports, aerial photographs, maps, engineering drawings, and verbal communications concerning facility operations. A list of background resources consulted during the development of the RI study design is included in the references section of The Oeser Company Scoping Report (E & E 1999a).

2.1.2 Applicable or Relevant and Appropriate Requirements and To-Be-Considered Criteria

This section identifies applicable or relevant and appropriate (ARARs) and other standards, criteria, and guidance "to be considered" (TBC) for remedial activities at the site. ARAR/TBC determinations were made in accordance with Section 121(d) of CERCLA as amended by the Superfund Amendments and Reauthorization Act, 40 CFR 300, and EPA's two-part guidance document entitled *CERCLA Compliance with Other Laws Manual* (EPA 1989).

An ARAR may be either "applicable" or "relevant and appropriate." Applicable requirements are those substantive environmental protection standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those substantive environmental requirements promulgated under federal or state law that, while not legally applicable to the circumstances at a CERCLA site, address situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. Administrative requirements such as obtaining permits and agency approvals, record keeping, and reporting are not ARARs and, therefore, do not need to be complied with during on-site remedial actions. The determination of whether a requirement is applicable versus relevant and appropriate involves consideration of a number of site-specific factors.

TBC criteria are federal or state advisories, guidance, or proposed rules that are not binding legally. TBC criteria do not have the status of a potential ARAR, but are useful in determining the necessary level of cleanup for protection of human health and the environment in situations where ARARs are not available.

Identification of ARARs and TBC criteria is an iterative process conducted throughout the RI/FS process. Preliminary identification of ARARs/TBC criteria began during the development of The Oeser Company scoping report and work plan (E & E 1999a, 1999b), continued through the RI, and will remain ongoing through the development of the FS. ARARs and TBC criteria identified in this report will be subject to change until the ROD is signed.

There are three different types of potential ARARs and TBCs:

- Chemical-specific requirements that may define acceptable exposure levels and may be used to establish preliminary remediation goals (PRGs);
- Location-specific requirements that may set restrictions on activities within specific locations, such as flood plains or federally designated wetlands; or
- Action-specific requirements that may set controls or restrictions for particular treatment and disposal activities associated with the management of hazardous wastes.

This section includes an overview of potential chemical-specific ARARs and TBC criteria for contaminated media at The Oeser Company site followed by location- and action-specific requirements.

2.1.3 Major Legislation Pertaining to Cleanup Actions

The following sections describe legislation that provide regulations and cleanup levels for contaminated sites and are applicable to The Oeser Company site.

2.1.3.1 CERCLA; National Contingency Plan (NCP) (40 CFR 300)

CERCLA and its major implementing regulation, the NCP, require that remedies at CERCLA sites be protective of human health and the environment and meet ARARs. The NCP establishes risk based criteria for establishing cleanup requirements that are protective of human health. For carcinogens, acceptable exposure levels are generally levels that represent an excess upperbound lifetime cancer risk to an individual of between 1×10^{-4} and 1×10^{-6}. For systemic toxicants, acceptable exposure levels represent concentrations to which the human population, including sensitive subgroups, may be exposed without adverse effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety.

These criteria for exposure levels will be used in evaluating the risks associated with The Oeser Company site during the RI/FS process; but are not duly promulgated standards, and therefore not necessary. There are a number of guidance documents developed by the EPA to implement the CERCLA program such as the “Role of Baseline Risk Assessment” memorandum, and guidance on the

selection of presumptive remedies for wood treatment sites and groundwater, which also are not ARARs or TBCs, but may be useful in the selection of a remedy. The EPA's CERCLA off-site disposal policy requires that any remedial wastes containing hazardous substances from this site be treated or disposed of at a permitted facility in compliance with all permit requirements.

2.1.3.2 Model Toxics Control Act (WAC 173-340)

The Washington MTCA was established to create a fund and a process for the cleanup of hazardous wastes sites in the State of Washington. Pursuant to MTCA authority, Ecology has promulgated media cleanup standards for soil, groundwater, surface water, and air (WAC 173-340-700 through 760) which are ARARs for The Oeser Company facility. Major revisions to the MTCA became effective on August 15, 2001.

WAC 173-340-700(5) specifies three alternative methods that may be used for establishing cleanup levels for groundwater, surface water, soils, and air at a site: Methods A, B, and C. The method to be used for a particular site depends on the complexity of the site and the expected future use. Cleanup levels for individual hazardous substances must be at least as stringent as concentrations established under applicable state and federal laws. For those hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, cleanup levels for protecting human health are determined using the values or formulas presented in the regulation for each affected media. All cleanup actions in the State of Washington are required to meet identified cleanup standards for a particular hazardous substance at a site and the specific area or pathway (e.g., soil, groundwater).

Method A (ARARs and tables; WAC 173-340-704) cleanup standards apply to routine cleanups or to sites with relatively few hazardous substances and are specified in tables 720-1, 740-1, and 745-1 of WAC 173-340-900.

Method B (Universal Method; WAC 173-340-705) cleanup levels are applicable to all media at all sites (unless one or more of the conditions for using Methods A or C are demonstrated, and the person conducting the cleanup elects to use that method). These cleanup levels must be as stringent as cleanup levels for individual hazardous substances established under applicable state and federal laws. Risk equations provided in the regulations are used to calculate the constituent concentrations that would result in no adverse human health effects due to acute or chronic toxicity or carcinogenicity. These equations use a number of variables including average body weight, unit conversion factors, averaging time, duration

and frequency of exposure, and target hazard quotient for noncarcinogens and target cancer risk level for carcinogens.

Method C (Conditional Method; WAC 173-340-706) provides for less stringent cleanup levels to be set in situations where cleanup levels under Method A or B are technically impossible to achieve or may cause more environmental harm than good, or for sites that meet specified uses and conditions, such as industrial properties.

Other MTCA requirements which are potential ARARs at The Oeser Company site include selection of cleanup actions (WAC 173-340-360), compliance monitoring (WAC 173-340-410), and institutional controls (WAC 173-340-440).

2.1.3.3 Federal Safe Drinking Water Act and Washington State Drinking Water Standards (40 CFR 141-147; WAC 246-290-310)

The federal Safe Drinking Water Act (SDWA) protects public health by establishing primary and secondary drinking water standards for public and community water supplies; the Washington State Department of Health implements drinking water standards in Washington. State regulations have adopted federal drinking water standards for organics by reference. For inorganics, they have adopted the federal Maximum Contaminant Levels (MCLs), but have included some additional chemicals (e.g., nickel and methylene chloride) for which there are no federal standards. The primary drinking water standards address toxicity and are called MCLs and Maximum Contaminant Level Goals (MCLGs). MCLs are designed to be attainable technically, while MCLGs are set at levels that would result in no known adverse health effects regardless of technical feasibility.

CERCLA mandates that both the MCLs and the MCLGs be considered as potential chemical-specific ARARs at sites where groundwater and surface water are potential sources of drinking water; however, it is the EPA's policy to consider MCLGs as potential ARARs for the cleanup of groundwater or surface waters that are current or potential sources of drinking water only where the MCLG is established at a level above zero. Under the MTCA, carcinogenic contaminants with an MCL which exceeds a 1×10^{-6} cancer risk level, and non-carcinogens, with a hazard quotient of greater than 1, are not considered protective of human health cleanup levels for these contaminants. However, the deep aquifer underlying The Oeser Company site likely will not be used as a drinking water source in the future because the City of Bellingham, including residences in the vicinity of The Oeser Company site, obtain drinking water from Lake Whatcom. Shallow groundwater underlying the site is discontinuous and cannot produce a sufficient or consistent quantity of water to be used as drinking water.

The SDWA also establishes requirements for underground injection wells and requires permits for injection of contaminated materials in certain circumstances (40 CFR Part 144). The State of Washington's underground injection control (UIC) program under the SDWA is found at RCW 90.48.020, .080, .160, and .162 and WAC 173-218-010 to 110, WAC 344-12-001 to 262, and WAC 173-160. These requirements may be action-specific ARARs if, for example, contaminated groundwater contaminated stormwater, or hazardous waste is disposed of through a french drain or other injection well.

2.1.3.4 Clean Water Act, Washington State Water Pollution Control Act, Washington State Water Resources Act, and Water Quality Standards for Surface Waters (40 CFR 129, 131; WAC 173-201A)

The objectives of the Clean Water Act (CWA) and Washington State's Water Pollution Control Act and Water Resources Act are to restore and maintain the chemical, physical, and biological integrity of the nation's waters. To achieve these objectives, generic and water body-specific ambient surface water quality criteria have been set at the federal level (National Toxics Rule, 40 CFR 131). Water quality criteria have been established by the EPA for water bodies in Washington with various use classifications. The State of Washington also has established surface water quality standards for a number of contaminants (WAC 173-201A). However, the state criteria are not considered potential ARARs at The Oeser Company site because the water quality standards do not apply to cleanup actions under MTCA or CERCLA (WAC 173-200-010(3)(c)).

The CWA also establishes a National Pollutant Discharge Elimination System (NPDES) permitting program (40 CFR Parts 122-125) which establishes discharge limits and monitoring requirements for direct discharges to surface waters and establishes pretreatment requirements for discharges to sewers going to publicly owned treatment works (POTWs). The NPDES program has been delegated to the State of Washington, and the pretreatment requirements for discharge to POTWs are implemented by the City of Bellingham. NPDES discharge and monitoring requirements, including stormwater management requirements, may be action-specific requirements at The Oeser Company site if a discharge is made to surface water during cleanup.

2.1.3.5 The Clean Air Act (42 USC § 7401 et seq.) and the Washington Clean Air Act (WAC 173-460 through 491)

The Clean Air Act (CAA) protects the quality of air resources by regulating emissions into the air. Pursuant to the CAA, the EPA has promulgated National Ambient Air Quality Standards (NAAQS), standards for Hazardous Air Pollutants (HAPs), and New Source Performance Standards (NSPS).

Washington has adopted the state Air Pollution Control Act with authority to implement the CAA; the Northwest Air Pollution Authority (NWAPA) is authorized by Ecology to implement these regulations in Whatcom County.

NAAQS are established for six criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, sulfur oxides). Primary standards are set at levels to protect public health. Secondary standards are set at levels to protect public welfare, including wildlife. Washington air regulations use ambient standards for criteria pollutants to establish source-specific emission limits for "major sources." HAPs are contaminants for which no NAAQs exist, but which cause or contribute to air pollution. Emissions standards for HAPS also are established for specified sources. NSPS also established emissions standards for designated pollutants from certain classes of sources. WAC 173-460, Controls for new Sources of Toxic Air Pollutants, implements the CAA by establishing acceptable source impact levels (ASILs) for toxic air pollutants emitted from new sources. Emissions standards established pursuant to the CAA and WAC 173-460 have the potential to be action-specific ARARs at The Oeser Company site. These standards would apply if a new major source or major modification to a source were installed at The Oeser Company facility (e.g., installation of an incinerator for treatment of contaminated soil).

2.1.4 Preliminary Chemical-Specific ARARs

Chemical-specific ARARs and TBCs for The Oeser Company site are addressed in this section by affected or potentially affected media: soil, groundwater, surface water, air, and sediment. The potential chemical-specific ARARs for The Oeser Company site are presented in the form of tables of numeric values.

2.1.4.1 Preliminary ARARs for Soil

The majority (greater than three-quarters) of The Oeser Company facility is located within Whatcom County's Heavy Impact Industrial zone except for a portion zoned "single residential." The facility has a "Certificate of Nonconforming Use" from the City of Bellingham allowing it to continue operations although a small portion of the site is zoned "single residential." Residential properties abut a portion of The Oeser Company site. Therefore, The Oeser Company Site meets the definition of an industrial property provided that access to the property by residents is restricted and that the selected remedy prevents migration of contaminants off site.

MTCA Method C industrial cleanup levels and EPA Region 9 industrial PRGs are presented as preliminary ARARs in Table 2-1 for COPCs determined to be present in soil during the risk evaluation described in Section 6 of this report. The MTCA Method C soil cleanup levels and EPA Region 9 PRGs provided in Table 2-1 are protective of direct contact (e.g., ingestion, dermal contact) with soil for an adult worker. Also provided in Table 2-1 are MTCA Method B soil cleanup levels that are protective of contaminants in soil leaching to groundwater and MTCA soil cleanup levels that are protective of terrestrial ecological receptors.

2.1.4.2 Preliminary ARARs for Groundwater

Groundwater is not currently a source of drinking water for the City of Bellingham; the City's drinking water supply is Lake Whatcom. Under federal groundwater classification guidelines, the deep groundwater under the site would likely be classified as either Class II (water currently being used or water that might be used as a drinking water source in the future) or Class III (groundwater that cannot be used for drinking water due to insufficient quality or quantity). 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.

Although groundwater is not currently a drinking water source and is not expected to be a drinking water source in the future, deep groundwater underlying The Oeser Company falls under the MTCA definition of potable groundwater. However, the MTCA states that site-specific factors, such as distance to existing water supply wells, may be taken into account when determining cleanup levels (WAC 173-340-720). Method B groundwater cleanup levels for potable water are presented in Table 2-1 as preliminary ARARs for deep groundwater. Method C potable groundwater cleanup levels are provided in Table 2-1 for use in the event that site-specific factors and/or technical considerations lead to the determination that Method B cleanup levels are inappropriate or impractical. EPA Region 9 PRGs and Federal MCLs also are provided in Table 2-1.

2.1.4.3 Preliminary ARARs for Surface Water

Little Squalicum Creek is intermittent and is not used for drinking water. It is not specifically identified and assigned a use class under WAC 173-201A-120. Otherwise unclassified surface waters of the state are classified as Class A (excellent) under WAC 173-201A-120. Class A waters are used for water supply, stock watering, fish and shellfish, wildlife habitat, recreation, and commerce and navigation. Little Squalicum Creek would be a likely candidate for removal of a designated use which is not an

existing use as allowed under 40 CFR 131.10(g). Under this provision, it could be demonstrated that many of the designated uses described above, including water supply, are not feasible because low flow conditions would prevent attainment of the uses. Therefore, the cleanup levels for surface water used as drinking water likely are over-protective. Table 2-1 provides the surface water quality ARARs, including the federal MCLs and EPA Region 9 PRGs for tap water (both listed under groundwater), as well as national recommended water quality criteria (EPA 1999) and ambient water quality criteria for protection of ecological receptors (EPA 1994e).

2.1.4.4 Preliminary ARARs for Sediment

COPCs at The Oeser Company site may reach the sediments of Little Squalicum Creek through groundwater and stormwater runoff from the site. No sediment cleanup standards for freshwater sediments have as yet been promulgated by EPA or Ecology. Therefore, NOAA quick screening values (Buchman 1999) based on protection of ecological receptors are provided in Table 2-1 for guidance and interim sediment quality criteria for the protection of aquatic life, set by the Canadian Council of Ministers of the Environment (2001), are included as TBCs.

2.1.5 Action- and Location-Specific ARARs

Potential action- and location-specific ARARs are discussed generally in this section. The applicability of these requirements to The Oeser Company site will be evaluated as additional information is obtained and cleanup strategies are identified. A discussion of regulatory issues associated with the most significant action- and location-specific ARARs that will need to be addressed during the FS process is presented below.

2.1.5.1 Waste Management

The federal RCRA Subtitle "C" regulations contain requirements for the "cradle to grave" management of materials that meet the RCRA definition of hazardous waste and are potential ARARs at The Oeser Company site (RCRA Subtitle C, 40 CFR 260-266; Washington State Hazardous Waste Management Act, Washington State Dangerous Waste Regulations, WAC 173-303). The major RCRA requirements would be action-specific ARARs and include standards that govern hazardous generators; transporters; treatment, storage, and disposal facilities; and the land disposal of hazardous waste.

Washington's dangerous waste (DW) regulations parallel the federal RCRA regulations, although they are more stringent in certain respects (e.g., the state's definition of "dangerous waste" is broader

than that found in RCRA regulations, and the state includes the DW criteria categories of toxicity or persistence). The EPA has authorized Washington state to implement its DW regulations in lieu of RCRA. RCRA and DW regulations are potential action-specific ARARs at The Oeser Company site.

State solid waste landfill requirements incorporate the RCRA Subtitle "D" regulatory requirements for solid waste handling facilities statewide and may be considered action-specific ARARs if an on-site landfill were constructed for the disposal of solid waste or for closure of any onsite disposal areas (RCRA Subtitle D, Solid Waste Regulations, 40 CFR 258; Washington State Solid Waste Management Act — Washington State Minimum Functional Standards for Solid Waste Handling Regulations, WAC 173-304; Municipal Landfill Standards, WAC 173-351). Washington State has delegated the regulation of municipal waste landfills to county health departments.

2.1.5.2 Well Construction

The Washington State Water Well Construction Act (RCW 18.104) requires that provisions be made for the regulation of water well construction and for the regulation and licensing of water well contractors. The regulations governing the minimum standards for construction of wells (WAC 173-160) include requirements for both water supply wells and resource protection wells (e.g., monitoring wells). The regulation consists of design and construction requirements regarding surface protective measures, casing, well screen, filter pack, development, and abandonment. The regulations governing regulation and licensing of well contractors and operators (WAC 173-162) consist of the requirements (examinations, fees, and licenses) by the State of Washington for well contractors and operators. These regulations will may be action-specific ARARs if any wells are constructed or abandoned at The Oeser Company site.

2.1.5.3 Waste Water Discharges/Stormwater Runoff

Substantive NPDES permit regulations and City of Bellingham POTW sewer use requirements may be action-specific ARARs if waste waters are discharged as a result of remedial activities. In addition, any substantive requirements of a temporary water quality modification may need to be obtained from Ecology for discharges that would cause surface water quality standards to be exceeded on a temporary basis (e.g., runoff from remedial operations that would increase turbidity levels).

Potential action-specific ARARs under the NPDES stormwater program include covering practices such as filter fabric fences, mulching, and hydroseeding, as well as structural measures, such as berms to control drainage and detention basins to trap runoff and sediments.

2.1.5.4 Air Emissions

Substantive NWAPA, state, and federal air permitting requirements may be action-specific requirements for air emission sources constructed for site remediation. A new hazardous substance source in air such as a treatment system (e.g., thermal desorber) may need to comply with the substantive requirements of the NWAPA Notice of Construction process. As part of this process, it may need to be shown that a treatment system can meet the ASILs at the site boundary. ASILs may be ARARs for on-site treatment systems such as air strippers.

2.1.5.5 Wetlands/Streambeds

Remedial activities that will have an impact on wetlands or stream beds may trigger action-specific ARARs pursuant to Section 404 of the CWA.

2.1.5.6 Endangered Species

The Endangered Species Act (50 CFR 10, 13, 17, 222, 226, 402, 424, 450-453) provides for the designation and protection of animal and plant species threatened with extinction and for the protection of critical habitat necessary for the protection of these species. ESA requirements are not location-specific ARARs at The Oeser Company because no threatened or endangered species were determined to be present (E & E 2001).

2.1.5.7 Transport of Hazardous Materials

The USDOT has promulgated regulations that govern the transportation of hazardous materials, including communications and emergency response requirements, shipping, and packaging requirements (40 CFR 171-180). If hazardous materials are transported off site, these USDOT requirements will be action-specific ARARs.

2.2 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

facilitywide grid system established with a geographic information system (GIS), and both pre- and post-field work topographic surveys using traditional surveying methodologies. In addition, the START performed a camera survey of the stormwater sewer system underlying the facility to determine the integrity of the sewer pipe and to identify the presence of any breaks that could be a past source of contaminant releases to the subsurface.

2.2.1 Grid System and Sample Location Identification

A facilitywide grid system was established prior to the initiation of field work to orient the positioning of sample locations. The grid system was designed with GIS, using historical facility maps and aerial photographs geo-referenced to four on-facility points with previously established Washington State Plane-North coordinates. The grid system consisted of 50-foot squares within the fenced boundaries of the facility and 100-foot squares on the South Slope. Each grid square had a unique center point (way point) with an associated latitude-longitude coordinate. The grid system is illustrated in Figure 2-1.

During the first week of field work, and prior to the collection of samples or the installation of borings, the GIS way points from the grid system were marked in the field with pin flags and marking paint. The way points were identified in the field using a Trimble Pathfinder GPS using North American Datum (NAD) 27. In some cases, facility-related obstructions (e.g., log piles, equipment, buildings, and topography) necessitated that the way point location be adjusted from the center of the grid square; in other cases, entire grid squares were eliminated based on obstructions.

During the RI field work, all on- and off-facility sample, boring, and monitoring well locations were resurveyed with the GPS to determine the actual horizontal coordinates of the locations investigated. These data were downloaded to a database and have been utilized in the preparation of the sample location maps presented in this report.

2.2.2 Topographic Survey

The site base map utilized in the preparation of this report was created using data from the 1997 facility and Little Squalicum Creek land survey conducted for CET Environmental Services by Larry Steele and Associates (1997) and was supplemented by topographic and other data provided by the City of Bellingham Department of Public Works (City of Bellingham 1988). Horizontal coordinates and vertical elevations for all soil borings, monitoring wells, and several sampling points within the Little Squalicum Creek area were surveyed by a licensed surveyor under subcontract to the START. The

horizontal coordinates are accurate to the nearest foot, and the vertical coordinates are accurate to the nearest 0.1 foot. These horizontal and vertical coordinates were used for the sample location maps in this report in preference to the GPS data. Elevation data for monitoring wells were used to support the hydrogeological interpretations for the site.

2.2.3 Storm Drain Camera Survey

A specialty camera firm subcontracted by the START utilized a self-propelled camera unit to videotape the inside of the stormwater drain system running north to south beneath the facility (Figure 1-14). A narrated videotape and written report were provided to document the condition of the storm drain pipeline (Appendix D).

2.3 GEOPHYSICAL INVESTIGATIONS

Geophysical investigations were conducted during the RI using CPT to characterize the subsurface stratigraphy at the facility. In addition, the CPT was coupled with LIF technology to provide a screening tool for the identification of hydrocarbons in subsurface soils. These technologies and the procedures used in the field are described below.

2.3.1 Cone Penetrometer Theory and Procedures

CPT technology is used to determine soil type and stratigraphy, geotechnical properties of subsurface soils, and the presence of groundwater in the subsurface. CPT is an effective means to gather these data because it gathers data relatively fast, produces no soil cuttings, and provides a continuous log of subsurface conditions.

The CPT investigations were conducted by Gregg In Situ, Inc. under subcontract to the START. The CPT soundings were performed in accordance with ASTM Standard D 3441. The cones used during the program recorded the following parameters at 5-centimeter depth intervals: tip resistance, sleeve friction, and dynamic pore pressure.

Stratigraphic profiling is accomplished by analyzing the relationships between these parameters. Correlation of existing databases of CPT data to actual soil conditions has allowed the development of a CPT soil classification chart (Figure 2-2). In general, tip resistance is high in sands and gravels, but low in clays, and the ratio of sleeve friction to tip resistance is low in sands and gravels, but high in clays. The pore water pressure sensor increases the reliability of the soil classification, and can be used as an indicator of the presence of groundwater. In clays, pore water pressures are relatively high; however, in

silts and sands, pore water pressures are relatively low or negative. In sandy soils, a relatively high pore water pressure that is stable during a pause in the probe penetration process suggests the presence of groundwater.

The first five CPT soundings were conducted at locations where soil borings had been drilled during previous investigations of the facility. A START geologist and Gregg In Situ, Inc. personnel qualitatively compared the CPT data from these soundings to the existing boring logs to calibrate the CPT parameter data to known soil types. The CPT results from all five of these initial "calibration" points compared well with the existing soil boring logs. A more detailed presentation of CPT versus conventional geologic logs is included in Section 3.1.1.

Following the initial calibration of the CPT, soundings were conducted at each of the on-facility grid squares where no access limitations existed. CPT soundings were conducted at a total of 315 locations during the RI (Figure 2-1). 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. An attempt was made to push a minimum of five CPT points to a depth of 40 feet bgs; however, on-facility soil conditions precluded this depth of investigation.

Results of the CPT investigation are presented in Section 3.2.

2.3.2 Laser-Induced Fluorescence Theory and Procedures

LIF is used to collect real-time, screening level data regarding the presence of hydrocarbons in subsurface soils. It is deployed as a "second stage" sensor with the CPT probe. Similar to CPT, LIF collects real-time data and yields a continuous log of relative hydrocarbon concentrations in the soil horizon. A LIF technology description and a full explanation of the method applicability and limitations are presented in an EPA Innovative Technology Report prepared by the Office of Research and Development (1997c).

The LIF was operated by Fugro Geosciences, Inc. under subcontract to the START. The system consisted of a tunable laser mounted in the CPT rig which is connected to the down-hole sensor. The down-hole sensor is mounted as a second stage to the CPT sensors; it consists of a small-diameter sapphire window mounted flush with the CPT probe. The laser transmits 50 pulses of light per second to the sensor through a fiber optic cable. The excitation light wavelength used for this project was 290 nanometers.

The laser light passes through the sapphire window and is absorbed by aromatic hydrocarbon molecules in contact with the window as the probe is advanced. This addition of light energy to the

aromatic hydrocarbons causes them to fluoresce. A portion of the fluorescence emitted from the aromatic hydrocarbons is returned through the sapphire window and is conveyed by a second fiber optic cable to a detection system within the CPT rig. The emission data resulting from the pulsed laser light are averaged into one reading per second, resulting in approximately one reading per 2 centimeters of vertical travel by the probe.

The emitted fluorescence is measured simultaneously at four monitoring wavelengths of 340, 390, 440, and 490 nanometers, respectively. These four monitoring wavelengths cover the range of light produced by the fluorescence of light fuels through heavier hydrocarbons, such as coal tar and creosote. The emission data are reported continuously as a total of the fluorescence intensity recorded at each of the four wavelengths. The total fluorescence intensity data are presented in real time on a computer monitor as a graph of fluorescence intensity versus depth.

The relative percentage of fluorescence measured at each of the monitoring wavelengths is plotted continuously on the LIF logs as four continuous "color bands." The width of each color band represents the relative percentage of fluorescence emitted by the contaminant at each of the monitoring wavelengths. For general interpretation purposes, lighter aromatic hydrocarbon molecules emit fluorescence at shorter wavelengths and heavier hydrocarbons emit fluorescence at longer wavelengths. The fluorescence intensity is used to infer the relative concentration of the hydrocarbon encountered.

During testing, waveforms, which are "spectral signatures" of the encountered hydrocarbons, are displayed on the computer monitor. The waveforms are compared with waveforms typical of common hydrocarbon signatures of various petroleum products and creosote to determine the type of hydrocarbon encountered. Figure 2-3 illustrates the spectral signatures of several petroleum products and creosote.

Prior to each test, a reference solution was placed on the sapphire window of the LIF probe to ensure that the performance of the system was within specifications. The reference solution also allowed for normalization of data from different test locations for variation in laser power, operating conditions, and monitored emission wavelength. The reference solution used for this project was a standardized solution containing a known concentration of PAHs.

LIF measurements were collected at a total of 296 of the CPT sounding locations at the facility. These data are discussed in Section 4.3.6 of this report.

2.4 SOIL SAMPLING

This section describes the number, locations, and field collection procedures for soil samples collected during the RI. The sections below address both surface soil and subsurface soil sampling activities.

2.4.1 Surface Soil Sampling

Surface soil samples were collected from off-facility background locations, off-facility residential yards, on-facility soils, South Slope Area soils, and along Little Squalicum Creek.

2.4.1.1 Background Surface Soil Samples

In accordance with the Ecology Toxic Cleanup Program's *Guidance on Sampling Data and Analysis Methods* (1995), 20 surface soil samples were collected from background areas (Figure 2-4). Background samples are used to identify and quantify nonsite-specific COCs (e.g., contaminants from automobile exhaust) that would be found if The Oeser Company site did not exist. Ten of these were collected from open areas (primarily parks), and 10 were collected from residences. The samples were analyzed for SVOCs, metals, and dioxin. Background samples collected from open areas were grab samples, while background samples from residences were composites from several locations at each residence. Table 2-2 shows which locations were residential samples and which were open area grab samples. Prior to sample collection, a questionnaire addressing factors that could influence sample results was completed by each participating resident. A summary of responses is provided as Appendix E.

Background samples from each of the 10 open areas were collected as close to predetermined locations as possible. The field team used GPS to locate each background open area sample. If this sample location was in a roadway, on a slope, or in a similarly nonrepresentative location, a nearby location was selected. Once located, the actual GPS coordinates were recorded for the exact sample location. Surface soil samples from background locations were collected from depths of 0 to 2 inches over a maximum area of 6 by 6 inches. If vegetation (i.e., grass or other ground cover) was present, a flat spade was used to remove the uppermost layer of vegetation prior to collection of the soil sample. Following sampling, any sod removed was replaced immediately and tamped into place. The spade was decontaminated between sampling locations. A decontaminated, dedicated stainless steel spoon was used to collect each sample. Soil was placed into decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. If natural vegetation was

present in the sample (i.e., roots or other plant material), it was removed prior to placement of the soil into the sample containers.

Single, composite background samples from each of 10 residences were collected as follows (ideally, the following subsampling locations were collected for each composite sample):

- **Drip Line/Downspout Subsample.** At homes with gutters, a surface soil subsample was collected at each downspout and composited into one sample. At homes without gutters, a drip line sample was collected. In cases where downspouts were diverted to the subsurface or where drip line or downspout samples were close to gardening beds with nonnative material, household/yard chemicals, or other potential interferences (e.g., treated timbers), these samples were not collected.
- **Front Walkway Subsample.** A surface soil sample was collected adjacent to the front walkway (or in the front walkway if native material was present) near the main entrance of the home. Three locations along the walkway were used to make up this subsample. If a front walkway was not present, then a location along a driveway or alternate entrance may have been used for this subsample. In cases where front walkway samples were close to gardening beds with nonnative material, household/yard chemicals, or other potential interferences (e.g., treated timbers), these samples were not collected.
- **Secondary Entrance.** A single grab sample near the secondary entrance of the home was used to make up this subsample. In cases where secondary entrance samples were close to gardening beds with nonnative material, household/yard chemicals, or other potential interferences (e.g., treated timbers), these samples were not collected.
- **Front and Back/Side Yard.** One surface soil grab sample was collected in each of the front and back (or side) yards to make up two additional subsamples. Exposed soil areas were sampled preferentially to grass-covered areas unless the vegetation appeared to be missing because of chemical treatment, burning, or other potentially interfering means. Surface runoff areas or play areas were sampled preferentially.

The field logbooks describe exactly which subsamples were collected for each residential composite sample. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company field sampling plan (FSP) and QAPjP (E & E 1999c, 1999d). A summary of residence subsampling locations is presented in Table 2-3. Table 2-4 includes a summary of the number, location, and analytical parameters for background surface soil samples.

2.4.1.2 Off-Facility Surface Soil Samples

The off-facility surface soil investigation provides data on the nature and extent of COPCs at properties adjacent to the facility and provides a measure of assessing the impacts of long-term aerial

deposition from facility operations. Data also has been used in the RI risk assessment. Sixty-one surface soil samples were collected from off-facility locations in the study area surrounding The Oeser Company facility. These locations were identified by dividing the area around the facility into 16 sectors and dividing each of these sectors into three segments, based on distance from the site boundary. Within many of these sectors a residence was not present, and a residential sample therefore could not be collected. In sectors without a residence, a single grab open field sample was collected to represent that sector. Samples could not be collected from all sectors because access was denied by some of the property owners. In sectors where a residence was present, single biased composite samples were collected by composting soils collected from locations expected to have elevated concentrations of potential contaminants, including along walkways, underneath eaves or adjacent to downspouts, or along entryways, as described in Section 2.4.1.1. Table 2-2 shows which locations were residential samples and which were open area grab samples. The locations of both residential and open field surface soil samples collected around The Oeser Company facility are shown in Figure 2-5. Twenty-eight open area samples and 27 residential samples were collected within the study area. Six additional composite samples were collected from two areas of interest.

The field logbooks describe precisely which subsamples were collected for each residential composite sample. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d). A summary of residence subsampling locations is presented in Table 2-5.

As described in Section 2.4.1.1, grab samples were collected at open areas while subsamples from several locations were combined into a composite sample at residences. In addition, six biased samples were collected from two areas of interest. Three samples were collected along the east side of Edens Road, which serves as the secondary entrance to the facility. Three samples were collected from a former drainage pathway east of the treated pole storage area north of the facility. Each biased sample was a composite. The samples were analyzed for SVOCs, metals, and dioxin. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d). Table 2-2 shows which locations were biased samples. Table 2-4 includes a summary of the number, location, and analytical parameters for off-facility surface soil samples.

2.4.1.3 On-Facility Surface Soil Samples

Because data are available from previous investigations, the nature of soil contamination at the facility is understood. Therefore, only a limited number of on-facility surface soil samples were necessary to fill data gaps identified in the work plan (E & E 1999b). Data has been used to assess the extent of contamination and support preparation of the risk assessment. Twenty-four surface soil samples were collected from on-facility locations (Figure 2-6). Eighteen of the samples were collected from soil boring locations, and six of the samples were collected from monitoring well locations. The samples were analyzed for volatile petroleum hydrocarbons (VPHs), EPHs, SVOCs, metals, and dioxin. In addition, three of the surface soil samples also were analyzed for TOC, grain size, and SPLP. Table 2-6 includes a summary of the number, location, and analytical parameters for the on-facility surface soil samples.

Surface soil samples from on-facility locations were collected from depths of 0 to 2 inches over a maximum area of 6 by 6 inches. All of the on-facility surface soil samples were collected from drilling locations (soil borings or monitoring wells) and accordingly were collected prior to the placement of drilling equipment and vehicles at the sampling location. Many of the on-facility surface soil samples were collected beneath existing asphalt surfaces. For these samples, asphalt material was removed from the soil prior to sample collection. A decontaminated, dedicated stainless steel spoon was used to collect each sample. Soil intended for VPH analyses was collected first and placed directly into prelabeled sample containers. For all other analyses, soil was placed into decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.4.1.4 South Slope Surface Soil Samples

Samples were collected because no information was available on potential contamination of the South Slope. South Slope data has been used to assess the nature and extent of contamination from migration or deposition or both. This data has been combined with Little Squalicum Creek data and has been utilized to assess human health and ecological risk in both areas. Twenty-one surface soil samples were collected from the South Slope Area. The samples were collected from each of the South Slope grid centers that were accessible in the field. All of the samples were analyzed in the field laboratory for petroleum hydrocarbons. Six of the samples were analyzed at the off-facility fixed laboratories for EPHs,

SVOCs, metals, and dioxin. Table 2-6 includes a summary of the number, location, and analytical parameters for the South Slope surface soil samples.

Surface soil samples from the South Slope were collected from depths of 0 to 2 inches over a maximum area of 6 by 6 inches. All of the South Slope surface soil samples were collected from locations with dense vegetation on the surface. Prior to collection of the samples, all grass, leaves, and other nonsoil material were removed. A decontaminated, dedicated stainless steel spoon was used to collect each sample. Soil was placed into decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.4.1.5 Little Squalicum Creek Surface Soil Samples

Samples were collected because only incomplete information was available on surface soil contamination in the area of the creek. Little Squalicum Creek data has been used to assess the nature and extent of contamination from migration or deposition or both. These data has been combined with South Slope soil data and has been utilized to assess human health and ecological risk in both areas. Fifty-six surface soil samples were collected from the Little Squalicum Creek area (Figure 2-7). The samples were collected from four monitoring well locations and from 52 locations along the banks of Little Squalicum Creek between the pond near the college parking lot and Bellingham Bay. The four samples collected from the monitoring well locations were analyzed at the laboratories for EPHs, SVOCs, metals, dioxin, and TOC. All of the Little Squalicum Creek bank samples were analyzed in the field laboratory for petroleum hydrocarbons. Six of the Little Squalicum Creek bank samples also were analyzed at the off-site laboratories for VPHs, EPHs, SVOCs, metals, dioxin, TOC, and grain size. Table 2-6 includes a summary of the number, location, and analytical parameters for the Little Squalicum Creek surface soil samples.

Surface soil samples from the four monitoring well locations were collected from depths of 0 to 2 inches over a maximum area of 6 by 6 inches. Prior to collection of the samples, all grass, leaves, and other nonsoil material were removed. A decontaminated, dedicated stainless steel spoon was used to collect each sample. Soil was placed in decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers.

Surface soil samples collected from the banks of Little Squalicum Creek were collected from depths of 0 to 12 inches. Samples collected at locations longitudinal to the creek bed were obtained within

a 24-inch lateral distance of the apparent high water level of the creek. All of the samples were collected with a decontaminated stainless steel hand auger. Soil intended for VPH analyses was collected with dedicated, decontaminated stainless steel spoons and was placed directly into prelabeled sample containers. For all other analyses (including field laboratory fractions), soil was placed in decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.4.2 Subsurface Soil Sampling

The primary objectives of the subsurface soil sampling program were to confirm the absence of contaminants in areas where COPCs were not expected and to further characterize areas of known contamination for remedial consideration. Subsurface soil samples were collected from on-facility soil borings and monitoring wells, South Slope Area soil borings, monitoring wells in the Little Squalicum Creek area, and from a test trench adjacent to Little Squalicum Creek.

2.4.2.1 On-Facility Subsurface Soil Samples

Subsurface soil cores were collected continuously during drilling of all on-facility soil borings and monitoring wells (Figure 2-6). A total of 119 subsurface soil samples was selected from the cores for laboratory analyses. Selection of cores for laboratory analyses and testing was based on the following criteria:

- The core samples from the bottom of all soil borings and monitoring wells were submitted for laboratory analyses when sufficient soil recovery was achieved in the split tube samplers;
- The core samples were submitted for laboratory analyses if they exhibited visual signs of contamination or produced positive responses with a photoionization detector (PID) in the field (assuming sufficient recovery); or
- The core samples were selected for laboratory analyses if they exhibited obvious changes in soil stratigraphy (assuming sufficient recovery).

The samples were analyzed for VPHs, EPHs, and SVOCs. Selected subsurface soil samples also were analyzed for metals, dioxin, TOC, grain size, and SPLP. These additional analyses were performed on the subsurface soil samples collected from the base of the soil borings and monitoring well

borings and on samples that exhibited signs of contamination in the field. Table 2-7 includes a summary of the number, location, and analytical parameters for the on-facility subsurface soil samples.

Subsurface soil samples were collected using a decontaminated stainless steel, 24-inch-long split tube sampler. The sampler was deployed from the drill rig and was driven continuously ahead of the auger bit or air rotary casing to collect relatively undisturbed soil samples with a standard, 300-pound hammer dropped from a height of 30 inches. Samples were described in terms of moisture content, color, texture, odor, and organic matter content for the geologic logs. Soil texture was described using a modification of the Unified Soil Classification System. After the split spoons were opened, any indication of odor or NAPL (as sheen or as isolated ganglia) was noted. In addition, samples were screened with a PID for the presence of VOCs.

The decontamination procedure for all split-spoons was as follows:

- Physically remove adhered soils;
- Scrub with nonphosphate detergent wash solution;
- Rinse with potable water;
- Rinse with ultrapure hexane;
- Rinse with ultrapure methanol;
- Rinse with deionized water; and
- Air dry.

Decontaminated, dedicated stainless steel spoons were used to transfer soil from the split tube sampler. Soil intended for VPH analyses was collected from the sampler first and was placed directly into prelabeled sample containers. For all other analyses, soil was moved from the sampler into new decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.4.2.2 South Slope Subsurface Soil Samples

Subsurface soil cores were collected continuously during drilling of all South Slope soil borings (Figure 2-6). Eleven subsurface soil samples were selected from the cores for laboratory analyses. Selection of cores for laboratory analyses and testing was based on the following criteria:

- The core samples from the bottom of all soil borings and monitoring wells were submitted for laboratory analyses when sufficient soil recovery was achieved in the split tube samplers;
- The core samples were submitted for laboratory analyses if they exhibited visual signs of contamination or produced positive responses with a PID in the field (assuming sufficient recovery); or
- The core samples were selected for laboratory analyses if they exhibited obvious changes in soil stratigraphy (assuming sufficient recovery).

The samples were analyzed for VPHs, EPHs, and SVOCs. Selected subsurface soil samples also were analyzed for metals, dioxin, TOC, grain size, and SPLP. These additional analyses were performed on the subsurface soil samples collected from the base of the soil borings and monitoring wells and on samples that exhibited signs of contamination in the field. Table 2-7 includes a summary of the number, location, and analytical parameters for the South Slope subsurface soil samples.

Subsurface soil samples were collected using a decontaminated stainless steel, 24-inch-long split tube sampler. The sampler was deployed from the drill rig and was driven continuously ahead of the auger bit or air rotary casing to collect relatively undisturbed soil samples with a standard, 300-pound hammer dropped from a height of 30 inches. Samples were described in terms of moisture content, color, texture, odor, and organic matter content for the geologic logs. Soil texture was described using a modification of the Unified Soil Classification System. After the split spoons were opened, any indication of odor or NAPL (as sheen or as isolated ganglia) was noted. In addition, samples were screened with a PID for the presence of VOCs. Decontaminated, dedicated stainless steel spoons were used to transfer soil from the split tube sampler. Soil intended for VPH analyses was collected from the sampler first and was placed directly into prelabeled sample containers. For all other analyses, soil was moved from the sampler into decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.4.2.3 Little Squalicum Creek Monitoring Well Subsurface Soil Samples

Subsurface soil cores were collected continuously during drilling of all of the Little Squalicum Creek monitoring wells (Figure 2-6). Ten subsurface soil samples were selected from the cores for laboratory analyses. Selection of cores for laboratory analyses and testing was based on the following criteria:

- The core samples from the bottom of the monitoring wells were submitted for laboratory analyses when sufficient soil recovery was achieved in the split tube samplers;
- The core samples were submitted for laboratory analyses if they exhibited visual signs of contamination or produced positive responses with a PID in the field (assuming sufficient recovery); or
- The core samples were selected for laboratory analyses if they exhibited obvious changes in soil stratigraphy (assuming sufficient recovery).

The samples were analyzed for VPHs, EPHs, and SVOCs. Selected subsurface soil samples also were analyzed for metals, dioxin, TOC, grain size, and SPLP. These additional analyses were performed on the subsurface soil samples collected from the base of the soil borings and monitoring wells and on samples that exhibited signs of contamination in the field. Table 2-7 includes a summary of the number, location, and analytical parameters for the South Slope subsurface soil samples.

Subsurface soil samples were collected using a decontaminated stainless steel, 24-inch-long split tube sampler. The sampler was deployed from the drill rig and was driven continuously ahead of the auger bit or air rotary casing to collect relatively undisturbed soil samples with a standard, 300-pound hammer dropped from a height of 30 inches. Samples were described in terms of moisture content, color, texture, odor, and organic matter content for the geologic logs. Soil texture was described using a modification of the Unified Soil Classification System. After the split spoons were opened, any indication of odor or NAPL (as sheen or as isolated ganglia) was noted. In addition, samples were screened with a PID for the presence of VOCs. Decontaminated, dedicated stainless steel spoons were used to transfer soil from the split tube sampler. Soil intended for VPH analyses was collected from the sampler first and was placed directly into prelabeled sample containers. For all other analyses, soil was moved from the sampler into decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.4.2.4 Little Squalicum Creek Test Trench Subsurface Soil Samples

Three subsurface soil samples were collected from a test trench excavated adjacent to Little Squalicum Creek (Figure 2-7). The samples were collected from the bottom (6 feet bgs) and two of the back- and sidewalls (2.5 and 4 feet bgs, respectively) of the test trench. The samples were analyzed for SVOCs. One of the samples (taken from 2.5 feet below the surface of the back wall) additionally was

analyzed for VPHs, EPHs, metals, dioxin, TOC, SPLP, and grain size. Table 2-7 includes a summary of the number, location, and analytical parameters for the test trench subsurface soil samples.

The subsurface soil samples from the test trench were collected from soil brought to the surface in a backhoe bucket. Care was taken not to collect any soil material that was in contact with the backhoe bucket. Dedicated, decontaminated stainless steel spoons were used to transfer the soil from the backhoe bucket into prelabeled sample containers. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E &E 1999c, 1999d).

2.4.3 Ash/Soot Sampling

The work plan (E & E 1999b) specified collection of ash/soot samples from the hog fuel boiler and abandoned U & I sugar refinery stack (Figure 1-10). The interior of the 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. Ash was taken from the unit using dedicated, decontaminated stainless steel spoons and was placed into decontaminated, dedicated stainless steel bowls; was homogenized thoroughly; and was placed into prelabeled sample containers. The sample was submitted for dioxin and metals analysis. Analytical methods, container specifications, preservation requirements, and other pertinent details are provided in The Oeser Company FSP and QAPjP (E & E 1999c, 1999d).

2.5 HYDROGEOLOGIC INVESTIGATION

The hydrogeologic investigation associated with the RI at The Oeser Company facility in Bellingham, Washington, 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.

2.5.1 Existing Monitoring Well Installation

Twelve shallow monitoring wells and 11 deep monitoring wells existed on The Oeser Company facility at the beginning of the RI. All preexisting monitoring well locations are shown in Figure 2-8. These wells were installed as part of the ESI (E & E 1996) and phases 1 and 2 of the RA (E & E 1998a)

performed by E & E between 1995 and 1997. Monitoring well completion details are provided in Table 2-8.

2.5.1.1 Shallow Monitoring Wells

Shallow monitoring wells are present both on The Oeser Company facility and at the neighboring Ershigs facility.

2.5.1.1.1 The Oeser Company

All pre-RI on-site shallow wells (MW-7S, MW-8S, MW-9S, MW-10S, MW-13S, MW-14S, MW-15S, MW-16S, MW-19S, MW-21S, MW-22S, and MW-26S) were constructed with 2-inch-diameter PVC risers and 5-foot-long, 0.010-inch-slot PVC screens. All shallow wells were drilled using the hollow stem auger (HSA) drilling method. During the RI hydrogeologic investigation the well caps were replaced with new compression caps, and cracked monuments were drilled-out and repoured.

2.5.1.1.2 Ershigs

There are four shallow monitoring wells (MW-1 [1S], Well 2 [2S], Well 3 [3S], and Well-4 [4S]) on the adjacent Ershigs property. All Ershigs shallow monitoring wells were drilled using the HSA drilling method. All wells were fitted with 10-foot-long, 2-inch-diameter, size 0.010-inch-slot PVC screens.

2.5.1.2 Deep Monitoring Wells

Pre-RI deep monitoring and production wells existed on The Oeser Company facility and at the neighboring Ershigs and Tilbury facilities.

2.5.1.2.1 The Oeser Company

All pre-RI deep wells (MW-1D, MW-2D, MW-3D, MW-5D, MW-6D, MW-17D, MW-18D, MW-20D, MW-23D, MW-24D, and MW-25D) were constructed with 2-inch-diameter, 0.010-inch-slot PVC screens with PVC risers. Deep well screens were all 10 feet long. All deep wells were drilled using the HSA drilling method, except MW25-D, which was drilled using the air rotary drilling method. During the RI hydrogeologic investigation the well caps were replaced with new compression caps, and cracked monuments were drilled out and repoured.

2.5.1.2.2 Ershigs

There are two deep monitoring wells (Well 1A [1D] and Well 4A [4D]) on the adjacent Ershigs property. All Ershigs deep monitoring wells were drilled using the HSA drilling method except for MW-4A, which was drilled using the cable tool drilling method. All wells were fitted with 10-foot-long, 2-inch-diameter, size 0.010-inch-slot PVC screens. (Strickler 1996)

2.5.1.2.3 Tilbury

There are two deep production wells on the Tilbury property (Well 5 and Well 6). Well construction logs are not available for the Tilbury wells; therefore, the drilling method used and well construction specifications are not known.

2.5.2 Groundwater Screening Samples

Groundwater screening samples were collected from some CPT borings to define the plume extent before monitoring wells were installed. These samples were used to provide analytical data on a quick-turnaround basis (48 hours) to facilitate the placement of new monitoring wells. If a CPT boring encountered shallow groundwater, a temporary piezometer was installed. Locations of temporary piezometers are shown in Figure 2-9. All temporary piezometers were constructed using new 1-inch-diameter, schedule 40 PVC risers with 5-foot-long screens. A groundwater screening sample was collected from each temporary piezometer using new 0.25-inch inside diameter (ID) Teflon-lined polyethylene tubing and a peristaltic pump. Groundwater screening samples were collected in accordance with the groundwater sampling SOP given in the RI work plan (E & E 1999b). Upon completion of groundwater sampling, each temporary piezometer was abandoned by backfilling with bentonite grout using a tremie tube in accordance with requirements in WAC 173.160.

If concentrations of screening COCs were above MCLs, another screening sample was collected farther from the treatment areas to assess the extent of groundwater contamination and to optimize the location of permanent monitoring wells installed as part of the RI.

2.5.3 RI Monitoring Well Installation

Samples from all of the shallow wells and many of the deep wells installed as part of the ESI and RA had measurable concentrations of site-derived contamination. Therefore, additional wells were required under the RI to define the extent of contamination.

The RI work plan (E & E 1999b) called for the installation of 12 new shallow monitoring wells and five new deep monitoring wells. Wells were installed as originally slated with the following exceptions:

- Four shallow and two deep monitoring wells planned for installation in the East and West Treatment areas were not be completed because the areas could not be accessed safely with a drill rig;
- The deep well planned for installation in the North Treatment Area south of the retort was not installed. Contamination extended below the shallow perched horizon in this area. Therefore, the boring was terminated before reaching deep groundwater;
- One of three shallow wells planned for the North Treatment Area was not installed because perched groundwater was not encountered in the boring;
- The shallow well of the shallow/deep well pair planned for the Treated Pole Area was not installed because shallow perched groundwater was not encountered in the boring; and
- An additional shallow/deep well pair, which was not originally slated, was installed in the Wood Storage Area. This location was selected based on the observation of contamination in the area during the CPT investigation.

Wells installed as part of the RI included seven shallow (MW-28S, MW-29S, MW-31S, MW-32S, MW-33S, MW-35S, and MW-36S) and four deep monitoring wells (MW-30D, MW-33D, MW-34D, and MW-35D) on site. In addition, four monitoring wells were installed between the site and Little Squalicum Creek (LSC-MW-1, LSC-MW-2, LSC-MW-3, and LSC-MW-4). All RI monitoring well locations are shown in Figure 2-9. RI monitoring well completion details are provided in Table 2-8.

All monitoring wells were constructed with 2-inch-diameter, schedule 40 PVC with 2-inch-diameter PVC screens. Well screens were installed to straddle the water table. Monitoring wells were installed in accordance with the Monitoring Well Installation SOPs provided in the RI work plan (E & E 1999b). Wellheads were completed at the surface with 8-inch flush-mount protective steel casings.

Continuous soil samples were collected by driving 2-inch-diameter, 2-foot-long split spoons ahead of the auger bit. The split-spoon samplers were advanced using a 140-pound hammer. Information recorded on the boring log includes blow counts, water content, color, grain size distribution, and sample recovery. IDW was drummed and stored on site and is further discussed in Section 2.10.

Monitoring wells installed during this phase of the investigation were developed to ensure removal of fines adjacent to the well screen and to allow for the free flow of water from the formation into the

well. Development was performed consistently with the Well Development SOP given in the RI work plan (E & E 1999b). A minimum of 24 hours elapsed between well installation and development to allow the grout to set. Monitoring wells were developed by surging with a bailer and over-pumping with a submersible pump. This process was repeated until the water was relatively clear and sediment free. All discharge water generated during development was contained in 55-gallon drums and stored on site. All equipment used in development was decontaminated after use in each well. Disposal of drummed developmental and decontamination water is discussed in Section 2.10.

2.5.3.1 Shallow Monitoring Wells

The HSA method was used for all on-facility shallow monitoring wells and the Little Squalicum Creek wells. Environmental West, Inc. of Spokane, Washington, drilled the wells using 4-inch ID (9.5-inch outside diameter) augers. Continuous soil samples were collected by driving 2-inch-diameter, 2-foot-long split spoons ahead of the auger bit. IDW was contained in 55-gallon open head drums and stored on site. All down-hole equipment was steam-cleaned between borings. IDW disposal is discussed in Section 2.10.

The shallow monitoring wells were installed in the first saturated zone encountered, typically 5 to 10 feet bgs. On-site shallow wells were completed with 10-slot screens of varying lengths and 20-40 sand filter pack. Screen lengths and other completion details are listed in Table 2-8. For some shallow wells, manufactured screens were cut to shorter lengths to avoid screening across perching horizons. Little Squalicum Creek monitoring wells were completed with 10-foot-long screens and either 20-slot screens with filter packs of size 10-20 sand or with 10-slot screens with filter packs of size 20-40 sand. Screen slot sizes and filter packs were selected based on aquifer material texture. Monitoring well construction details for each well are provided in Appendix F.

2.5.3.2 Deep Monitoring Wells

The air rotary drilling method was used for all deep borings and deep monitoring wells. Environmental West, Inc. of Spokane, Washington, drilled the borings and wells. Soil samples were collected relatively undisturbed by driving 2-inch-diameter, 2-foot-long split spoons continuously ahead of the air rotary bit and casing.

A telescoping-casing method was used to minimize drag down of contamination from shallow contaminated zones to the deep aquifer. Eight-inch casing was advanced through the contaminated zone (into a silty layer, if present). The 8-inch casing was flooded with bentonite grout, was pulled back

between 5 and 10 feet, and then was redriven to the original depth. Thus, a bentonite seal was created between the outer casing and the formation, impeding the leakage of contaminated groundwater down the outside of the 8-inch casing. Six-inch casing was telescoped inside the 8-inch casing and advanced to the final boring depth. A reservoir of grout was maintained in the annular space between the 6- and 8-inch casings during drilling to maintain the seal between the casing and the formation. When the boring was completed and the well was installed, both casings were pulled back while backfilling with bentonite grout. IDW was contained in 55-gallon open head drums and stored on site. All down-hole equipment was steam-cleaned between borings. IDW disposal is discussed in Section 2.10.

The deep aquifer typically was encountered at 35 to 45 feet bgs. Deep monitoring wells generally were completed to straddle the water table with 5-foot-long, 20-slot screens in size 10-20 sand. Table 2-8 summarizes RI well completion details. Monitoring well construction details for each well are provided in Appendix F.

2.5.4 Groundwater Sampling

Groundwater samples were collected from all wells 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-facility 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 RI wells. A summary of sample numbers, locations, dates, and analytical parameters is presented in Tables 2-9 through 2-12.

On the first day of each event, depth to groundwater was measured in each well using a Waterline Envirotech water level indicator dedicated to the site. All wells were opened and allowed to equilibrate for about half an hour prior to measuring depth to groundwater. The thickness of LNAPL and the depth to water in wells with product was measured using a metal engineer's tape coated with LNAPL and water-indicating pastes.

2.5.4.1 Facility

2.5.4.1.1 Shallow

Shallow wells were sampled once each quarter using a peristaltic pump powered by a 12-volt battery. Short lengths of Tygon or silicon tubing were used at the drive head of the peristaltic pump. Teflon-lined polyethylene tubing was connected to the tubing at the drive head and used from the drive

head to the sampling depth. The bottom of the tubing was located as close to midway between the bottom of the screen and the water table as possible.

Low-flow sampling techniques were used as specified in the sampling and quality assurance plan (SQAP; E & E 1999b) following guidelines developed by the EPA (EPA 1996f). These techniques were employed in order to collect groundwater samples most representative of mobile contaminant loads at ambient flow conditions. Monitoring wells generally were pumped at a low rate (between 0.1 and 0.5 liters per minute [L/min]), selected to maintain minimal drawdown (less than 0.3 foot). Some shallow wells could not be pumped without generating more than 0.3 foot of drawdown.

A Solinist flow-through cell with a Horiba U-10 Water Quality Meter and Cole Palmer ORP probe were used to monitor water quality parameters for stabilization while purging. Water quality parameters and depth to water were monitored every three to five minutes until stabilization was achieved. In general, the order of stabilization was pH, temperature, and specific conductance; these were followed by oxidation-reduction potential, dissolved oxygen (DO), and turbidity. Stabilization was defined as three consecutive readings within the following criteria:

- Turbidity 10%
- DO 10%
- Specific conductivity 3%
- Temperature 3%
- pH $\pm$ 0.1 pH unit
- Oxidation Reduction Potential (ORP) $\pm$ 10 millivolts

The flow-through cell was removed before sampling began. The bottles were filled in the following order:

- SVOCs;
- VPHs;
- EPHs;
- VOCs;
- Dioxin/furan;
- Total organic carbon (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).

2.5.4.1.2 Deep

Deep wells were sampled once each quarter using dedicated Teflon-coated polyethylene tubing and dedicated 12-volt, Whale-brand, submersible pumps powered by a 12-volt marine battery. The pump intake was located as close to midway between the bottom of the screen and the water table as possible.

Low-flow sampling techniques were used as specified in the SQAP (E & E 1999b) following guidelines developed by the EPA (EPA 1996f). Deep monitoring wells generally were pumped at a rate between 0.5 and 1.0 L/min, selected to maintain less that 0.3 foot of drawdown.

A Solinist flow-through cell with a Horiba U-10 Water Quality Meter and Cole Palmer ORP probe were used to monitor water quality parameters for stabilization while purging. Water quality parameters and depth to water were monitored every three to five minutes until stabilization was achieved. In general, the order of stabilization was pH, temperature, and specific conductance; these were followed by oxidation-reduction potential, DO, and turbidity. Stabilization was defined as three consecutive readings within the same criteria designated for the shallow wells.

The flow-through cell was removed before sampling began. The bottles were filled in the same order as listed for the shallow wells in Section 2.5.4.1.1.

2.5.4.2 Little Squalicum Creek Well Points

Well points were installed between the spoils piles and the creek to assess the impact, if any, of leaching from the spoils piles on groundwater. Two temporary well points with continuous screens were installed adjacent to Little Squalicum Creek near the spoils piles that exist along the north side of the creek. The stainless steel well points were driven approximately 2 feet bgs. Construction details are presented in Table 2-8. Well point locations are shown in Figure 2-9. Water samples were collected

using a peristaltic pump powered by a 12-volt battery. A short length of silicon tubing was used at the drive head of the peristaltic pump. Teflon-lined polyethylene tubing was connected to the tubing at the drive head and was used from the drive head to the sampling depth. The bottom of the tubing was located about 1 foot from the bottom of the well point. One groundwater water sample was collected at each location and analyzed for SVOCs, VPHs, and EPHs.

2.5.4.3 Ershigs

Monitoring wells located at the adjacent Ershigs property were sampled to characterize off-site groundwater quality. The four shallow monitoring wells on the property were sampled according to the same procedures and protocol for the shallow on-site wells. The two deep monitoring wells on the property were sampled according to the same procedures and protocol for the deep on-site wells.

2.5.4.4 Tilbury

Two production wells operated by the Tilbury Cement Company, located west of the site, were sampled to characterize off-site groundwater quality. The Tilbury wells were sampled once in September 1999 during the second quarterly groundwater monitoring event. The wells are equipped with submersible pumps, which were operated for 15 minutes before sample collection. Samples were collected from a sampling port at the wellhead. Sample bottles were filled in the order listed previously for other wells.

2.5.5 Water Level Measurement

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 this investigation. Depth to the top of liquid from the top of the PVC casing was measured using the site-dedicated well sounder or a stainless steel engineering measuring tape. All wells were uncapped and allowed to equilibrate with atmospheric pressure for at least 30 minutes before the depth to liquid was measured. For wells containing product, depth to LNAPL and water was measured using a steel tape with LNAPL- and water-finding pastes. All measurements were made to an accuracy of 0.01 foot.

2.5.6 Stream Stage Measurement

Little Squalicum Creek stage measurements were made to facilitate description of the hydraulic connection between deep groundwater and the creek. Two stream stage gages, SG-1 and SG-2, were constructed along the bank of Little Squalicum Creek in July 1999. Concrete pads were poured in cylindrical forms at two locations along the stream. Once the concrete was dry, the bank of the stream was excavated away from the side of the cylinder, allowing the depth-to-stream stage to be manually measured relative to the top of the pad. Two stilling wells (LSC-SW-1 and LSC-SW-2) were installed adjacent to the existing surface water stage gages (SG-1 and SG-2) in October 1999. Stilling wells were installed to allow the installation of a transducer/datalogger to measure stream stage. Stilling well locations are shown in Figure 2-9. The stilling wells were constructed by laterally imbedding a slotted PVC pipe across the stream channel and by connecting it by an elbow to a stilling well on the bank of the stream. Figure 2-10 is a schematic representation of stilling well construction.

2.5.7 Seep Sampling

The seep located along Little Squalicum Creek near the downstream stilling well (LSC-SW-2) was sampled once during the first quarterly groundwater sampling event and both surface water sampling events (see Section 2-7) to characterize the seep discharge. The seep sample was collected by using a hexane-rinsed aluminum pan bent into a "v" shape to direct flow from the seep into sample bottles.

2.5.8 Hydraulic Conductivity Testing

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 using a peristaltic pump and in seven deep wells using purge pumps and/or a submersible Grundfos pump.

2.5.8.1 Shallow

On September 22 and 23, 1999, tests were conducted on MW-9S, MW-15S, MW-22S, MW-35S, and MW-36S. After opening each well and allowing about 10 minutes for equilibration, the prepumping static water level was measured. A pressure transducer and datalogger then were installed, and rigid polyethylene tubing was advanced down the well to about 3 feet below static water level. The polyethylene tubing was attached at the wellhead to flexible silicon tubing that fed to a peristaltic pump. The test was started after making several manual water level measurements to ensure water levels had

returned to static. The wells were pumped at a constant rate, and the resulting changes in water level (drawdown) were recorded. Flow rates were measured using a stopwatch and graduated beaker. The pumped water was discharged to 5-gallon buckets and was transferred to on-site drums for storage and disposal (IDW disposal is addressed in Section 2.10.). After approximately 30 minutes of pumping, the pump was turned off, and the recovery of water levels was recorded. The discharge line was sealed during recovery to prevent water from draining back down into the well. Recovery data were recorded for approximately 20 minutes. Water levels in the well were monitored throughout the testing and recovery period using a pressure transducer and data logger. In addition, backup measurements were obtained manually with an electric water level sounder.

2.5.8.2 Deep

On September 2 and 3, 1999, tests were conducted on MW-5D, MW-17D, MW-23D, and MW-24D using a Grundfos submersible pump. On October 7 and 13, 1999, tests were conducted on MW-25D, MW-33D, and MW-35D using a submersible DC purge pump. After opening each well and allowing about 10 minutes for equilibration, the prepumping static water level was measured. A pressure transducer and datalogger then were installed, and a submersible pump was lowered to about 3 feet below static water level. The test commenced after making several manual water level measurements to ensure that water levels had returned to static. The wells were pumped at a constant rate for approximately 30 minutes, and drawdown was recorded. Flow rates were measured using a stopwatch and graduated beaker. The pumped water was discharged to 5-gallon buckets and was transferred to on-site drums for storage and disposal (IDW disposal is addressed in Section 2.10.). After approximately 30 minutes of pumping, the pump was turned off. The pumps were not equipped to prevent backflow of water down the well when the pump was turned off. Therefore, recovery data from the deep well tests were not useful for calculating aquifer properties and were not recorded. Water levels in the well were monitored throughout the testing period with a pressure transducer and data logger. In addition, backup measurements were obtained manually with an electric water level sounder.

2.5.9 Creek Flow Mass Balance

In order to identify the significance of measurable 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 using a calibrated bucket and a watch with a second hand to estimate flows. In cases of higher flows, estimates are considered to be very approximate. Flows were

estimated at the terminal outfall onto the beach at Bellingham Bay, the Marine Drive Outfall, the Oeser Outfall, the Birchwood Outfall, the Tapped Spring 1 above Marine Drive, the Tapped Spring 2 below Marine Drive, and the seep (Figure 1-8).

2.6 AIR INVESTIGATION

RI air sampling at The Oeser Company site was used to determine peak and annual average airborne COPC concentrations that has been used to calculate both short-term and annual exposure rates in the human health risk assessment (HHRA). The FSP called for the collection of samples in each of four sampling quarters during a one-year period. Sampling began in the second quarter of 1999 (July 7 to July 13), and a second sampling event was conducted in the third quarter (September 27 to October 2). During both events, conditions were dry and dusty, and the facility actively was treating wood products; consequently, peak airborne concentrations of volatile and semivolatile COPCs, associated with particulates (dust), were expected. Following the September 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 COPC concentrations were conservative (biased high) for the annual exposure rates.

For each of the two events, sampling was conducted during three discrete time periods ranging from 24 to 36 hours each, depending upon the type of sampling. There were two exceptions to this sampling scheme. VOC samples taken at the retort (AS21) on July 8 and 12, 1999, were each collected within approximately 30 seconds, following the opening of the retort at the conclusion of two separate treating cycles. This resulted in six sets of temporally unique sample data for the RI. Within each of these six periods, samples were collected from multiple locations using different techniques as specified in the FSP (E & E 1999c). As a result, a total of 235 air samples was collected: 102 in July and 133 in September. All samples were analyzed for the following COPCs: metals (arsenic and chromium), SVOCs, dioxin, and nonchlorinated VOCs according to the FSP and QAPjP (E & E 1999c, 1999d). Exceptions are noted below.

2.6.1 Air Sampling Program

Ten air sampling stations were established as described in the FSP. These locations (shown in Figures 2-4, 2-11, and 2-12) included the following:

- On-facility stations to characterize airborne contaminant distributions and concentrations at facility-related emission sources;
- Perimeter and off-facility residential stations to assess migration of contaminants in air from the facility to nearby residential areas; and
- A background location selected to characterize typical urban emissions upwind of The Oeser Company facility.

Source samplers were placed at stations AS21 through AS23 near the retort, the evaporator, and the tank farm/dip tank, respectively (Figure 2-4). Because the emissions from these sources were not from discrete locations, the samplers were placed as close to, and downwind of, the source as possible.

Perimeter stations were placed primarily on the north and south sides of the facility to provide upwind and downwind locations dependent on prevailing wind patterns during each sample periods as described below. In July (first air sampling event), six perimeter and residential stations were used, designated AS24 through AS29 (Figure 2-11). Four of these locations, AS25 through AS28, were used during the ESI (E & E 1996) or the removal action (E & E 1998a) or both. In September (second air sampling event), sampler location AS24 was moved from the on-facility location described in the QAPjP to an off-facility location west-southwest of the facility at the WCFD#8 office. The purpose of the move was to position a sampler location between Tilbury Cement and The Oeser Company facility to measure potential migration of contaminants toward The Oeser Company facility from sources west-southwest of the facility (including the Tilbury Cement plant) during sample collection. AS24 originally was placed on the south side of The Oeser Company facility to measure contaminant migration in that direction. AS28, at Oak Harbor Freight on the south side of the facility, provided a replacement for AS24. AS29 was added to characterize emissions downwind from treated poles stored in the North Pole Yard. September sampling locations are shown in Figure 2-12. When winds were from the south (the predominant direction recorded at the facility for approximately two years prior to the July sampling event), AS25, AS26, AS27, and AS29 were downwind on the north side of the facility, and AS24 and AS28 were upwind on the south side. If winds were northeasterly (historically, a secondary wind direction at the facility), AS24 and AS28 were downwind, and the four north-side locations were upwind from the facility. One background air sample station (AS30) was located approximately 1 mile east of the facility at the Columbia School (Figure 2-4) to ensure that background conditions would be evaluated even in the event of variable or unusual wind directions or speeds. This location was the same as one of the background off-facility surface soil sample locations.

In September (second air sampling event), the AS23 station (downwind of the tank farm/dip tank) was relocated to a residence north of the North Pole Yard (AS32) in order to obtain additional information on releases to nearby residences. The off-facility sampler location AS26 was moved to another residence (AS33) located approximately 400 feet to the east in the same neighborhood because the property owner at the original residence rescinded consent for access (Figure 2-12). Tables 2-13 and 2-14 include a summary of the number, location, and analytical parameters for both air sampling events.

2.6.2 Sampling Period Wind Characteristics

Prevailing wind direction and the direction of maximum wind gust for each sample period were evaluated to determine the appropriate upwind and downwind sample location(s). A meteorological station, located at the west end of The Oeser Company facility (Figures 2-11 and 2-12), supplied wind speed and direction data that was used to construct a wind rose for each sample period. In Figures 2-13 through 2-18, 36-hour sample period wind roses are presented. Use of the two different sample periods (36- and 24-hour periods) is explained in Section 4 with the results. Each wind rose displays the percentage of wind from each of 16 direction sectors and the associated range of wind speeds. The direction with the highest wind speed and percentage of wind was chosen as the prevailing wind direction. If the highest wind speed was from multiple direction sectors, the median sector was chosen as the prevailing wind direction.

Prevailing winds were light (less than 3 meters per second) and southerly during all sample periods except the 36-hour sampling period beginning on October 1, 1999, when prevailing winds switched to a northerly direction (ranging from northeast to northwest). North-side stations (AS25, AS27, AS29, AS32, and AS33) were designated as downwind, and south-side stations (AS24 and AS28) were designated as upwind when prevailing winds were southerly; these were switched when winds were northerly.

The direction of the maximum wind speed, a factor in determining whether or not dust would be generated from undisturbed on-facility surface soils, also was evaluated. Light winds can move gases (VOCs) or mechanically generated dust in the direction of prevailing wind; however, the minimum wind speed required to generate dust from undisturbed surfaces is dependent on the physical characteristics of the surface soil and the dust generated from it (e.g., particle size distribution, particle density, or percent moisture). These physical characteristics may vary across an area of soil, as well as with meteorological changes during the day. For example, dust would more easily be generated from surface soil having a distribution of smaller particle sizes and a lower density than soil comprised of larger, heavier particles.

By the same token, the quantity of dust generated from wet soil would tend to be less than that from dry soil.

Maximum wind speeds typically occurred in the afternoon hours and were from the same prevailing direction. During two sampling periods (beginning on September 27 and October 1, 1999) the direction of wind gusts differed from the prevailing direction as shown in Tables 2-15 and 2-16.

Table 2-17 provides a summary of sample locations and types (e.g., source, upwind, or downwind). Air sampling results are discussed in Section 4.

2.7 ECOLOGICAL INVESTIGATION

Surface water, sediment, soil, and berries were collected to support the ecological risk assessment (ERA) and other objectives for The Oeser Company RI. Sections 2.7.1 through 2.7.3 describe sampling locations and methods for collection of surface water, sediment, and berries. Soil sampling is described in Section 2.4. The ecological survey of the South Slope and Little Squalicum Creek is presented in Section 3.

2.7.1 Surface Water Sampling

On July 26 and 27, 1999, surface water samples were collected from five locations in Little Squalicum Creek, a groundwater seep, a "tapped" spring on the north bank of the creek, and a pond near BTC. Locations are shown in Figure 2-19 and are described in Table 2-18. During the field work, there was flow at all locations except the pond near the college. At all locations except the seep, samples were collected for the following parameters: dioxin, 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 dioxin as indicators of contamination. All samples were collected as unfiltered grab samples. A second surface water sampling event was added to the work plan and took place between December 6 and 11, 1999. Samples were collected from the same locations and following the same protocols as utilized in the July 1999 event. One additional sample was added for a tapped spring found on the hillside above the creek, downstream from Marine Drive (Tapped Spring 2 in Figure 2-19). This sample was analyzed for the same parameters as the other spring samples. Tables 2-19 and 2-20 include a summary of the number, location, and analytical parameters for the two surface water sampling events. Results for both surface water sampling events are presented in Section 4.

2.7.2 Sediment Sampling

On July 28 and 29, 1999, sediment was collected from nine locations in Little Squalicum Creek, one location in the channel leading from the Oeser Outfall to the creek, and a pond near BTC. Locations are shown in Figure 2-19 and are described in Table 2-21. The samples were collected from depositional areas and were sandy or mucky in texture. As per the sampling plan (E & E 1999c), sediment was collected for the following parameters at each location: SVOCs, EPHs, dioxin, metals, TOC, acid volatile sulfides/simultaneously extracted metals, grain size, and sediment toxicity. At three locations (SD-02, SD-05 and SD-6), sediment also was collected for a bioaccumulation test with an aquatic oligochaete. Sediment at each station was collected with a dedicated stainless-steel spoon, was homogenized in a dedicated stainless-steel bowl, and then was spooned into the individual sample jars. Only surficial sediment (the upper 10 centimeters) was collected. Table 2-22 includes a summary of the number, location, and analytical parameters for the sediment sampling event. Results of the sediment sampling and testing are presented in Section 4.

2.7.3 Berry Sampling

Ripe, edible berries (Himalayan blackberry [*Rubus discolor*]) were collected on August 20 and 21, 1999, at three locations within the South Slope/Little Squalicum Creek area (Figure 2-19) and one background location (Figure 2-4). Berries were collected by hand while wearing clean disposable gloves and were placed directly into sample bottles (unwashed samples). Co-located samples were collected, but were rinsed were three times with distilled/deionized water, drained, and then placed into sample bottles (washed samples). All samples were analyzed for dioxin, SVOCs, and VOCs. Table 2-23 includes a summary of the number, location, and analytical parameters for the berry sampling event. Results of berry testing are discussed in Section 4.

2.8 QA/QC PROCEDURES

This section summarizes the QA/QC measures taken during the RI and provides an evaluation of the usability of the data presented in this report. The field and laboratory QA/QC procedures employed were used to verify that project DQOs identified in the QAPjP (E & E 1999d) were met and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents.

Within this report, all data are presented with data validation qualifiers to reflect their reliability. Eleven common laboratory and/or field blank contaminants are not included in summary tables or

discussions of results. These contaminants are acetone (2-propanone), chloroform, methylene chloride, 2-butanone, carbon disulfide, bis(2-ethylhexyl)phthalate, diethylphthalate, dimethylphthalate, butylbenzylphthalate, di-n-butylphthalate, and di-n-octylphthalate; they have been reviewed on a sample/analyte-specific basis and have been judged not to be site related. Instead, these contaminants are the result of sampling and/or analytical testing (as noted above).

2.8.1 Field QA/QC Samples

All samples were collected following the guidance specified in the FSP and QAPjP (E & E 1999c, 1999d) for field activities. Field QC samples included trip blanks, field blanks, and rinsate blanks. Field QC also included collection of adequate sample volumes to support laboratory QC testing (e.g., matrix spikes).

Twenty-two trip blanks (for VOCs and VPHs) were collected and sent with groundwater/surface water/seep/spring water samples to the laboratories to monitor for VOC contamination from all possible sources except ambient field conditions.

Twelve field blanks (six SUMMA canisters and six polyurethane foam [PUF] samplers) were submitted for testing during the two air sampling events. Field blanks were precleaned (by the laboratories) sample collection containers and/or sample media brought into the field, but not used for sample collection.

Rinsate blanks were collected from four different types of soil sampling and handling equipment: a stainless-steel spoon, a stainless-steel mixing bowl (Both were utilized to homogenize soil/sediment samples and for berry washing.), one of the split spoon sample tubes used to collect subsurface soil samples, and one of the hand augers used to collect surface soil samples. No rinsate blanks were required for groundwater samples since each well had dedicated sampling equipment installed and/or utilized for sampling. Surface water samples were collected directly into sample containers; therefore, no blanks were required.

2.8.1.1 Trip Blanks

Eight analytes were identified in the trip blanks, one of which (1,2-dichloroethane) was not detected in any water samples and has been dismissed from further consideration (Table 2-24). Of the remaining seven analytes, four (benzene, ethylbenzene, — and p-xylene, and o-xylene) were identified in all 22 trip blanks only once and at levels well below preliminary screening levels (PSLs) presented in Table 2-1. The potential impact of these blank results on the RI and risk assessment is negligible;

therefore, no action has been taken. Naphthalene was detected in only one sample at the laboratory's reported DL; therefore, no action has been taken based on a single detection at this level. Tetrachloroethene was detected in three of 24 trip blanks, but at levels well below the PSL. No action has been taken since the potential impact on risk calculations would be negligible. Chloroform was detected in eight of 24 samples. Chloroform may form when the method-required preservative, hydrochloric acid, is added to samples. While chloroform generally is not considered by the EPA to be a common laboratory/field blank contaminant, it is likely that this is the case for The Oeser Company RI water samples. Therefore, chloroform will not be addressed further in this report.

2.8.1.2 Field Blanks

Fourteen analytes were detected in the 12 field blanks (six SUMMA canisters for VOCs and six PUF samplers for SVOCs and dioxin; Table 2-25). The average sample volume collected during all sampling events (approximately 400 liters) was used to determine an approximate concentration for SVOCs and dioxin since no air was drawn into these field blanks. When concentrations were compared against the PSLs (Table 2-1), all field blank concentrations were at least three orders of magnitude below the PSLs for analytes with published values. The potential impact of these blank results on the RI and risk assessment is negligible; therefore, no action has been taken. The same lack of impact on the RI and risk assessment for analytes without PSLs is expected; therefore, no action has been taken with regard to these compounds. The toluene blank result is directly comparable to the PSL and is more than 500 times below that level. The potential impact of this blank result on the RI and risk assessment is negligible; therefore, no action has been taken.

2.8.1.3 Rinsate Blanks

Eleven analytes were detected in the four rinsate blanks (Table 2-26). When concentrations were compared against the PSLs (Table 2-1), all rinsate blank concentrations were at least four orders of magnitude below the PSLs for analytes with published values. The potential impact of these blank results on the RI and risk assessment is negligible; therefore, no action has been taken. The same lack of impact on the RI and risk assessment for analytes without PSLs is expected; therefore, no action has been taken with regard to these compounds.

2.8.2 Laboratory QA/QC

Laboratories subcontracted to conduct analyses used a number of QC sample types to monitor laboratory performance. The QAPjP (E & E 1999d) provides a detailed list of methods, including QA/QC requirements, employed in the analyses of samples collected during the RI. Laboratory method performance was monitored by evaluating the following general criteria, as well as other method/laboratory criteria, against QA limits established in the method by the laboratory and the laboratory statement of work identified in the QAPjP. General criteria included sample identification, holding times, initial and continuing calibration standards, method DLs, practical quantitation limits, method blanks, surrogate recoveries, laboratory control sample (LCS) recoveries, MS and matrix spike duplicate (MSD) recoveries and relative percent differences (RPDs), qualitative identification, and quantitation of sample concentrations. Laboratory QA/QC results and data were evaluated by EPA chemists to ensure that appropriate QA/QC practices were followed and to determine data usability.

2.8.3 Data Validation

Data from analyses performed at the analytical laboratories were reviewed and validated by EPA chemists. Data qualifiers were applied as necessary according to the following guidance:

- *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (1994a);
- *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (1994b); and
- *EPA Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures* (1990).

In the absence of other QC guidance, method-specific QC limits also were utilized to apply qualifiers to the data. Detailed memoranda were prepared documenting the finding and usability of the data on a per analyte and sample basis. Copies of the memoranda and data forms are provided in Appendix G. All EPA data validation memoranda subsequently were reviewed by an E & E chemist to ensure the appropriateness and accuracy of the assigned data qualifiers. An E & E memorandum was attached to the EPA report which listed any discrepancies found and subsequent action taken.

The following sections describe the laboratories' abilities to meet project DQOs for precision, accuracy, and completeness and the field team's ability to meet project DQOs for representativeness and comparability. A QA review of the analytical data found that less than 6% of the RI data were qualified

based on analytical QC outliers. Qualifiers do not necessarily represent a failure by the laboratory to meet QC criteria for an analysis.

The bulk of the qualifiers were "J," indicating a positive identification of the analyte with the reported concentration flagged as estimated. All data with concentrations between the laboratory method DL and the laboratory quantitation limit were annotated as "J" values to indicate the overall limit on accuracy inherent in estimating concentrations near minimum detectable levels. Data were flagged where QC test results were outside established criteria, but still were usable per EPA guidance as referenced above. The QA review of the analytical data found that less than 1% of RI data were totally outside of QC criteria for acceptability. These data were flagged "R" and were rejected from any further use.

2.8.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory precision is measured using the RPD between either laboratory duplicate sample analyses, the RPD value between the MS/MSD samples analysis, and/or the RPD value between the LCS/laboratory control sample duplicate (LCSD) sample analyses.

The RPD values were reviewed for all laboratory duplicate, MS/MSD, and LCS/LCSD analyses. Most RPD values for the laboratory duplicate samples, MS/MSD, and/or LCS/LCSD samples were within laboratory QC criteria. Less than 1% of the data was qualified based on recovery values and RPD values found outside QC limits. Overall, the project DQOs for precision were met.

2.8.3.2 Accuracy

Accuracy is the difference between the measured value and the "true" value when the "true" value is either known or assumed. Laboratory accuracy is measured using surrogate spike percent recovery (%R) values for each analysis; MS and MSD %Rs and/or LCS and LCSD %Rs.

The surrogate %R values were reviewed for all appropriate sample analyses. The %R values were reviewed for all LCS/LCSD and MS/MSD analyses. Less than 1% of the data were qualified as estimated (J or UJ) or unusable (R) based on surrogate, LCS/LCSD, and MS/MSD recovery values. Overall, the project DQOs for accuracy were met.

2.8.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data usability. Less than 1% of the project data was considered unusable by either the laboratory or data reviewer. Overall, the project DQO for completeness of 90% was met.

2.8.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. Data from previous studies were evaluated and utilized to identify the number of samples and selection of sample locations necessary to delineate the nature and extent of contamination at The Oeser Company site. The RI work plans addressed anticipated variations (site matrix-specific homogeneity) in the types and levels of contaminants expected in the field. Except for minor variations noted in earlier sections of this chapter, the field work was completed as planned; therefore, the sampling and analytical results are considered to be a fair and reasonable depiction of site conditions. The project DQOs for representativeness were met.

2.8.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this RI were collected following standard field sampling techniques and analytical methodologies. The project DQOs for comparability were met.

2.8.4 Data Usability

Validated analytical precision and accuracy show that more than 99% of all target compound and target analyte data were acceptable for use. The combination of grid sampling (South Slope, sediment, transect, CPT, etc.) and biased random sampling (off-facility soils, air, and groundwater) provided sufficient data to statistically describe the nature and extent of contamination. The sampling and analytical methods utilized for this investigation are EPA-accepted standard methods, and the data generated can be reproduced and/or compared with data generated by previous investigations using the same or similar sampling and analytical methods. All precision, accuracy, representativeness, completeness, and comparability goals were achieved for the RI field investigation.

2.9 DATA MANAGEMENT

This section summarizes the work conducted following the Data Management Plan (DMP) presented in the RI work plan (E & E 1999b). The DMP standardized the procedures and formats for all documents and data generated during the project. The DMP ensures the accuracy, comparability, and usability of the analytical database.

2.9.1 Data Coordination

When each field sample was collected, the sampler or a field team member recorded the sample into a logbook or on a field record form. Each sample collected was identified with a unique sample identification number. This sample number was either an EPA-assigned or an E & E-assigned number. Additional information was collected for each sample, including time, location, date, depth, sampler, and analytical parameters. The sample information then was recorded on chain-of-custody forms and delivered to the analytical laboratories.

Every laboratory was required by E & E to deliver all analytical data in both hard-copy and electronic format. The hard-copy analytical data were reviewed, validated, and qualified by EPA chemists. The EPA validation memoranda were reviewed, and the qualifiers were added to the electronic database by E & E. The electronic data was reviewed by E & E chemists to ensure the accuracy of the analytical results and qualifiers.

Latitude and longitude and state plane coordinates were obtained for all sampling and field measurement locations using a GPS unit or conventional surveying techniques as noted in Section 2.2. A station number or a location correlating to each sample is associated with each GPS/survey location.

2.9.2 Data Entry

Field data (records, observations, sampling, etc.) were recorded by field team members in logbooks, field record forms, and chain-of-custody forms. The field data identify field conditions, activities, and observations to aid in assessing the analytical data. After all of the field work was completed, each sample number was entered into a single Microsoft Access® database. The database incorporated field sampling information for each sample identification number.

After the laboratory analytical electronic data was reviewed, validated, and qualified, the electronic data were incorporated into another Microsoft Access® database. This database compiles analytical data and field data; it has been used to standardize data input, query the data, and create maps and reports.

2.9.3 Statistical Analysis

ArcView®, a GIS software program, was used with the Microsoft Access® database and GPS/survey data for spatial analysis and map production. The database is accessible in ArcView® through an open database connectivity connection. The spatial data can be queried and modeled based on the database.

The database was queried to determine potential COCs and their distributions and concentrations. These concentrations then can be used to determine potential human health and ecological risks.

2.10 INVESTIGATION-DERIVED WASTE MANAGEMENT

IDW generated during the RI sampling effort consisted of nonhazardous wastes (e.g., uncontaminated cardboard boxes, packing materials, and noncontact trash) and potentially hazardous wastes. Hazardous wastes were generated during soil boring and sampling activities, well installation, and groundwater sampling work. Wastes also were generated during decontamination of sampling equipment. Nonhazardous waste was placed in a dumpster and was transported to a local landfill by a commercial waste-hauling service. DOT-approved 55-gallon drums were used to contain all hazardous wastes generated during the RI. Sixty-seven drums of soil cuttings, 81 drums of decontamination water, new monitoring well development water, deep monitoring well purge water, and shallow monitoring well purge water were generated during the RI.

Each drum was properly labeled with the matrix, type of waste (purge, decontamination, etc.), date, and sample location. Groundwater from the monitoring wells sampled during the quarterly groundwater sampling events was segregated by sampling depths. Purge waters were combined into separate drums based on the well designation (shallow or deep). Development water from new shallow and deep wells similarly was segregated and drummed. Soil cuttings from all depths at locations where soil wastes were generated were placed in separate, labeled drums for each location.

Calibration solutions (e.g., pH buffers) used to calibrate field testing equipment during the quarterly groundwater sampling events were added to the deep monitoring well water drums.

All groundwater sampling was performed with dedicated sampling equipment; therefore, no solid IDW was created except for nonhazardous disposable items.

All decontamination water produced by the sampling teams during the surface soil, subsurface soil, and sediment sampling events was stored in drums. The sampling for surface soil, subsurface soil,

and sediment samples utilized disposable, dedicated sampling equipment (spoons and bowls) which was decontaminated and placed into plastic bags prior to disposal with other nonhazardous wastes.

All drums were stored on pallets and were covered with plastic in one area of the facility. Initially, the drums were scheduled to remain on site until the FS was completed and the wastes could be disposed of with remediation wastes, if any. At the request of The Oeser Company, a subcontract was issued for removal and disposal of all drummed RI wastes. Wastes were properly transported off site, tested, treated when necessary, and disposed of by an approved hazardous waste hauling/disposal company.

2.11 SITE PHOTOGRAPHS

Photographic documentation of the work conducted during the RI is presented as Appendix H.

Table 2-1

APPLICABLE, RELEVANT, AND APPROPRIATE REQUIREMENTS*
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

		Soil (mg/kg)				Groundwater (µg/L)				Surface Water/Seepwater (µg/L)			Freshwater Sediment (mg/kg) (Dry Weight)	
Chemical*	CAS	EPA [aa] Risk-Based Industrial	MTCA [1] Method C [bb] Industrial	MTCA Terrestrial Ecological [ff] Unrestricted Land Use	MTCA Method B Protection Of Groundwater [ff]	EPA [aa] Risk Based Tap Water	MTCA [1] Method B Potable	MTCA [1] Method C [bb] Potable	Federal MCL [3]	Ecotox Screening Thresholds [cc]	Federal Water Quality Criteria Human Health [hh]	State Water Quality Criteria Aquatic Organisms [hh]	Federal Aquatic Screening [gg]	Canadian ISQGs TBCs [ee]
PAHs														
Acenaphthene	83-32-9	3,800 (n)	210,000 (n)	NA	284	370 (n)	960 (n)	2,100 (n)	NA	23	1,200	520	0.29	0.0067
Acenaphthylene	208-96-8	NA	NA	NA	284	NA	NA	NA	NA	NA	NA	NA	0.16	0.0059
Anthracene	120-12-7	100,000 (max)	1,050,000 (n)	NA	6,780	1,800 (n)	2,400 (n)	5,250 (n)	NA	NA	9,600	NA	0.26	0.047
Benzo(a)anthracene	56-55-3	2.9 (c)	18 (c)	NA	23.2	0.092 (c)	0.012 (c)	0.12 (c)	NA	NA	0.0044	NA	0.5	0.032
Benzo(a)pyrene	50-32-8	0.29 (c)	18 (c)	30	2.32	0.0092(c)	0.012 (c)	0.12 (c)	0.2	0.014	0.0044	300	0.7	0.032
Benzo(b)fluoranthene	205-99-2	2.9 (c)	18 (c)	NA	23.2	0.092 (c)	0.012 (c)	0.12 (c)	NA	NA	0.0044	NA	NA	NA
Benzo(e)pyrene	192-97-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	191-24-2	NA	NA	NA	1,960	NA	NA	NA	NA	NA	NA	NA	0.3	NA
Benzo (j) fluoranthene	205-82-3	NA	NA	NA	23.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	207-08-9	29 (c)	18 (c)	NA	232	0.92 (c)	0.012 (c)	0.12 (c)	NA	NA	0.0044	NA	13.4	NA
2-Chloronaphthalene	91-58-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,700	NA	NA	NA
Chrysene	218-01-9	290 (c)	18 (c)	NA	2,320	9.2 (c)	0.012 (c)	0.12 (c)	NA	NA	0.0044	NA	0.8	0.057
Dibenzo(a,e)pyrene	192-65-4	NA	NA	NA	2.32	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	53-70-3	0.29 (c)	NA	NA	2.32	0.0092 (c)	0.012 (c)	0.12 (c)	NA	NA	0.0044	NA	0.1	0.0062
Dibenzo(a,h)pyrene	189-64-0	NA	NA	NA	0.232	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,i)pyrene	189-55-9	NA	NA	NA	0.232	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,j)acridine	224-42-0	NA	NA	NA	23.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	206-44-0	30,000 (n)	140,000 (n)	NA	6290	1,500 (n)	640(n)	1,400 (n)	NA	8.1	300	NA	1.5	0.11
Fluorene	86-73-7	33,000 (n)	140,000 (n)	NA	305	240 (n)	640 (n)	1,400 (n)	NA	3.9	1,300	NA	0.3	0.021
Indeno(1,2,3-cd)pyrene	193-39-5	2.9 (c)	18 (c)	NA	23.2	0.092 (c)	0.012 (c)	0.12 (c)	NA	NA	0.0044	NA	0.33	NA
1-Methylnaphthalene	90-12-0	NA	NA	NA	23.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-6	NA	NA	NA	23.5	NA	NA	NA	NA	NA	NA	NA	NA	0.020
Naphthalene	91-20-3	190 (n)	70,000 (n)	NA	23.5	6.2 (n)	160 (n)	350 (n)	NA	24	NA	620	0.6	0.035
Perylene	198-55-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	NA	NA	NA	6,760	NA	NA	NA	NA	6.3	NA	6.3	0.8	0.042
Pyrene	129-00-0	54,000 (n)	105,000 (n)	NA	1,960	180 (n)	480 (n)	1,050 (n)	NA	NA	960	NA	1.0	0.053
Retene	483-65-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenols														
4-Chloro-3-methylphenol	59-50-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	240 (n)	17,500 (n)	NA	2.07	30 (n)	80 (n)	175 (n)	NA	NA	120	NA	NA	NA
2,4-Dichlorophenol	120-83-2	2,600 (n)	10,500 (n)	NA	1.54	110 (n)	48 (n)	105 (n)	NA	NA	93	NA	NA	NA
2,4-Dimethylphenol	105-67-9	18,000 (n)	70,000 (n)	NA	9.34	730 (n)	320 (n)	700 (n)	NA	NA	540	NA	NA	NA
2,4-Dinitrophenol	51-28-5	1,800 (n)	7,000 (n)	NA	0.128	73 (n)	32 (n)	70 (n)	NA	NA	70	NA	NA	NA
2-Methylphenol	95-48-7	44,000 (n)	NA	NA	11.7	1,800 (n)	NA	NA	NA	NA	NA	NA	NA	NA
3&4 Methylphenol	NA	4,400 (n)	NA	NA	1.06	180 (n)	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	106-44-5	4,400 (n)	NA	NA	1.06	180 (n)	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	11 (c)	1,090 (c)	11	0.077	0.56 (c)	0.729 (c)	7.29 (c)	1	13 (24)	15	13	0.048	NA
Phenol	108-95-2	100,000 (max)	2,100,000 (n)	NA	80.6	22,000 (n)	9,600 (n)	21,000 (n)	NA	NA	21,000	2560	NA	NA
Tetrachlorophenols [8]	NA	26,000 (n)	NA	NA	25.8	1,100 (n)	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	220 (c)	11,900 (c)	NA	0.391	6.1 (c)	7.95 (c)	79.5 (c)	NA	NA	2.1	NA	NA	NA
Dioxins/Furans														
2,3,7,8-TCDD	1746-01-6	0.000027 (c)	0.000875 (c)	0.000005	0.000314	0.00000045 (c)	0.000000583 (c)	0.00000583 (c)	0.00003	NA	0.000000013	<0.00001	0.0000088	0.00000085 TEQ
Other Organics														
Benzene	71-43-2	1.5 (c)	2,390 (c)	NA	0.00941	0.35 (c)	0.795 (c)	7.95 (c)	5	NA	1.2	NA	NA	NA
Benzidine	92-87-5	0.011 (c)	0.571 (c)	NA	NA	0.00029 (c)	0.00038 (c)	0.0038 (c)	NA	NA	0.00012	NA	NA	NA
Benzoic acid	65-85-0	100,000 (max)	14,000,000 (n)	NA	263	150,000 (n)	64,000 (n)	140,000 (n)	NA	NA	NA	NA	NA	NA
Benzyl alcohol	100-51-6	100,000 (max)	1,050,000 (n)	NA	29.0	11,000 (n)	4,800 (n)	10,500 (n)	NA	NA	NA	NA	NA	NA
Bis(2-Chloroethyl)ether	111-44-4	0.62 (c)	119 (c)	NA	0.00052	0.0098 (c)	0.0398 (c)	0.398 (c)	NA	NA	0.031	NA	NA	NA
Butylbenzene	104-51-8	240 (s)	NA	NA	21.0	0.61 (n)	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	86-74-8	120 (c)	6,560 (c)	NA	NA	3.4 (c)	4.38 (c)	43.8 (c)	NA	NA	NA	NA	NA	NA
Chloromethane	74-87-3	2.7 (c)	10,100 (n)	NA	0.0333	1.5 (c)	3.37 (c)	33.7 (c)	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	150 (n)	35,000 (n)	NA	0.684	61 (n)	80 (n)	175 (n)	70	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	5,100 (n)	NA	NA	29.9	24 (n)	NA	NA	NA	20	NA	NA	5.1	0.00000085 TEQ
1,2-Dichlorobenzene	95-50-1	370 (s)	315,000 (n)	NA	35.7	370 (n)	720 (n)	158 (n)	600	14	2,700	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	52 (n)	NA	NA	0.357	5.5 (n)	NA	NA	NA	71	400	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	5.5 (c)	292 (c)	NA	0.0346	0.15 (c)	0.194 (c)	1.94 (c)	NA	NA	0.04	NA	NA	NA
1,2-Dichloroethane	107-06-2	0.76 (c)	1,440 (c)	NA	0.0041	0.12 (c)	0.481 (c)	4.81 (c)	5	NA	0.38	20000	NA	NA
1,1-Dichloroethene	75-35-4	0.12 (c)	219 (c)	NA	0.0010	0.046 (c)	0.0729 (c)	0.729 (c)	7	NA	0.057	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	1,800 (n)	7,000 (n)	NA	0.454	73 (n)	32 (n)	70 (n)	NA	NA	0.11	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	880 (n)	3,500 (n)	NA	0.198	36 (n)	16 (n)	35 (n)	NA	NA	NA	NA	NA	NA
Ethylbenzene	100-41-4	230 (s)	350,000 (n)	NA	23.2	1,300 (n)	800 (n)	1,750 (n)	700	290	3,100	NA	NA	NA
Hexachlorobenzene	118-74-1	1.5 (c)	82 (c)	31	0.875	0.042 (c)	0.0547 (c)	0.547 (c)	1	NA	0.00075	3.68	NA	NA
Hexachlorocyclopentadiene	77-47-4	5,900 (n)	24,000 (n)	NA	214	260 (n)	96 (n)	210 (n)	50	NA	240	5.2	NA	NA
Isopropylbenzene	98-82-8	520 (n)	NA	NA	92.5	660 (n)	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butylether	1634-04-4	NA	NA	NA	NA	20 (c)	NA	NA	NA	NA	NA	NA	NA	NA
N-nitrosodi-n-propylamine	621-64-7	0.35 (c)	18.8 (c)	NA	0.0000925	0.0096 (c)	0.0125 (c)	0.125 (c)	NA	NA	0.005	NA	NA	NA
N-nitrosodiphenylamine	86-30-6	500 (c)	26,800 (c)	NA	1.24	14 (c)	17.9 (c)	179 (c)	NA	NA	5	NA	NA	NA
P-isopropyl toluene	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propylbenzene	103-65-1	240 (s)	NA	NA	27.6	6.1 (n)	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	135-98-8	220 (s)	NA	NA	21.1	6.1 (n)	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100-42-5	1,700 (s)	4,380 (c)	NA	182	160 (n)	1.46 (c)	14.6 (c)	100	NA	NA	NA	NA	NA
Tert-butylbenzene	98-06-6	390 (s)	NA	NA	21.0	6.1 (n)	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	19 (c)	2,570 (c)	NA	0.031	1.1 (c)	0.858 (c)	8.58 (c)	5	120	0.8	840	NA	NA
Toluene	108-88-3	520 (s)	700,000 (n)	NA	34.0	72 (n)	1,600 (n)	3,500 (n)	1,000	130	6,800	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	3,000 (s)	35,000 (n)	NA	16.3	19 (n)	80 (n)	175 (n)	70	110	260	NA	NA	NA
1,2,4-Trimethylbenzene	95-63-6	170 (n)	NA	NA	180	1.2 (n)	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	108-67-8	70 (n)	NA	NA	41.1	1.2 (n)	NA	NA	NA	NA	NA	NA	NA	NA
m&p-Xylene	136777-61-2	210 (s)	7,000,000 (n)	NA	449	140 (n)	16,000 (n)	35,000 (n)	10,000	1.8	NA	NA	NA	NA
o-Xylene	95-47-6	210 (s)	7,000,000 (n)	NA	449	140 (n)	16,000 (n)	35,000 (n)	10,000	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	210 (s)	7,000,000 (n)	NA	449	140 (n)	16,000 (n)	35,000 (n)	10,000	NA	NA	NA	NA	NA
Fuels														
TPH (Diesel)	NA	NA	2,000[7]	460	2,000[7]	NA	500[7]	500[7]	NA	NA	NA	NA	NA	NA
TPH (Gasoline)	NA	NA	30[7]	200	30[7]	NA	800[7]	800[7]	NA	NA	NA	NA	NA	NA

Preliminary Screening Levels

aa - Derived from EPA Region 9*Preliminary Remediation Goals (PRGs), 2000* , Prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
bb - Derived from MTCA (CLARC 3.1) Updated November 2001.
cc - Derived from EPA*Ecotox Threshold Criteria,* January 1996 and Ontario Ministry of the Environment, 1993.
ee - Derived from Canadian*Interim Sediment Quality Guidelines* , Canadian Council of Ministers of the Environment, updated 2001.
ff - Derived from MTCA Chapter 173-340 WAC August 2001.
gg - Derived from*NOAA Screening Quick Reference Tables* , September 1999.
hh - Derived from EPA*National Recommended Water Quality Criteria* , April 1999 and National Toxics Rule, 40 CFR Part 131.

Footnotes

* The list of chemicals were detected at concentrations exceeding screening levels in at least one sample in one medium at The Oeser Company site. The comparative values will be used for screening site data and will be considered for selection of remediation goals depending on the determination of complete exposure pathways.

[1] Values are based on revised MTCA (August 2001)
[2] Based on RI, MTCA Method C cleanup levels are recommended as ARAR-based PRG
[3] MCLGs are substituted for MCLs when MCLGs are above zero*Drinking Water Standards and Health Advisories* , EPA 2000).
[4] (n) indicates the level is based on a hazard quotient of 1.
[5] (s) indicates the screening level is based on the saturation level in soi
[6] (c) indicates that the screening value and MTCA value correspond to an excess lifetime cancer risk of 1 x^{-6}.
[7] MCTA Method A value.
[8] Value for 2,3,4,6-tetrachlorophenol

Key:

AET = Apparent effects threshold.
AL = Action Level at tap.
AWQC = Ambient Water Quality Criteria.
CAS = Chemical abstracts service.
EPA = United States Environmental Protection Agency.
ISQG = Interim Sediment Quality Guidelines.
MAX = Based on an arbitrary ceiling limit.
MCL = Maximum Contaminant Level.
MCLG = Maximum Contaminant Level Goal.
µg/L = Micrograms per liter.
µg/m³ = Micrograms per cubic meter.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not available.
NOAA = National Oceanic and Atmospheric Administration.
pAET = Probable apparent effects threshold.
PAHs = Polycyclic aromatic hydrocarbons.
SMCL = Secondary MCL.
TBC = To be considered.

Table 2-2

OFF-FACILITY RESIDENTIAL AND BACKGROUND SURFACE SOIL SAMPLE SUMMARY (MAY/JUNE 1999)
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Open Area Locations–Study Area	Residential Sample Locations–Study Area	Biased Sample Locations–Study Area
2, 5, 7, 8, 11, 12, 16, 18, 28, 32A, 36, 38, 41, 42, 42A, 43, 46, 47A, 48, 49, 50, 51, 52, 53, 54, 55, 56, and 57.	1, 3, 4, 6, 9, 10, 13, 14, 15, 17, 19, 20, 21A, 22, 23, 24, 25, 26, 29, 30, 31, 33, 34, 35, 37, 44A, and 58.	Road Border 1, Road Border 2, Road Border 3, Old Drainage Path 4, Old Drainage Path 5, and Old Drainage Path 6.
Samples could not be collected as proposed initially at locations: 21, 27, 32, 39, 40, 45, 44, and 47.		
Background Open Area Locations	**Background Residential Sample Locations**	
B1A, B2, B3, B6, B7, B12, B13, B18, B19, and B20.	B1, B4, B5, B8, B9, B10, B11, B15, B16, and B17.	
Soil at location B14 was collected, but was not submitted for analysis because this location reportedly consisted of recently placed fill.		

Table 2-3

OFF-FACILITY RESIDENTIAL BACKGROUND
SURFACE SOIL COMPOSITE SUBSAMPLE LOCATIONS (MAY/JUNE 1999)
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Background Residence Location	Drip Line and/or Downspout	Front Walkway	Secondary Entrance	Front Yard and Back Yard
Background 1			Yes	Yes
Background 4	Yes	Yes	Yes	Yes
Background 5	Yes	Yes	Yes	Yes
Background 8	Yes	Yes		Yes
Background 9		Yes	Yes	Yes
Background 10	Yes	Yes		Yes
Background 11		Yes	Yes	Yes
Background 15	Yes	Yes		Yes
Background 16	Yes	Yes	Yes	Yes
Background 17	Yes	Yes	Yes	Yes
TOTALS	7 (70%)	9 (90%)	7 (70%)	10 (100%)

Table 2-4

OFF-FACILITY SURFACE SOIL SAMPLING SUMMARY (5/24/99 TO 6/3/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Sample Date	Analysis		
99224000	RES-1	5/24/99	SVOCs	Metals	Dioxin
99224001	RES-2	5/24/99	SVOCs	Metals	Dioxin
99224002	Road Border 1	5/24/99	SVOCs	Metals	Dioxin
99224003	RES-36	5/24/99	SVOCs	Metals	Dioxin
99224004	RES-5	5/24/99	SVOCs	Metals	Dioxin
99224005	RES-6	5/24/99	SVOCs	Metals	Dioxin
99224006	RES-7	5/24/99	SVOCs	Metals	Dioxin
99224007	RES-8	5/24/99	SVOCs	Metals	Dioxin
99224008	RES-9	5/24/99	SVOCs	Metals	Dioxin
99224009	Road Border 2	5/24/99	SVOCs	Metals	Dioxin
99224010	Road Border 3	5/24/99	SVOCs	Metals	Dioxin
99224011	RES-3	5/24/99	SVOCs	Metals	Dioxin
99224012	RES-10	5/25/99	SVOCs	Metals	Dioxin
99224013	RES-13	5/25/99	SVOCs	Metals	Dioxin
99224014	Old Drainage Path 4	5/25/99	SVOCs	Metals	Dioxin
99224015	Old Drainage Path 5	5/25/99	SVOCs	Metals	Dioxin
99224016	Old Drainage Path 6	5/25/99	SVOCs	Metals	Dioxin
99224017	RES-11	5/25/99	SVOCs	Metals	Dioxin
99224018	RES-12	5/25/99	SVOCs	Metals	Dioxin
99224019	RES-16	5/25/99	SVOCs	Metals	Dioxin
99224020	RES-4	5/25/99	SVOCs	Metals	Dioxin
99224021	RES-43	5/25/99	SVOCs	Metals	Dioxin
99224022	RES-46	5/25/99	SVOCs	Metals	Dioxin
99224023	RES-17	5/25/99	SVOCs	Metals	Dioxin
99224024	RES-14	5/25/99	SVOCs	Metals	Dioxin
99224025	RES-18	5/25/99	SVOCs	Metals	Dioxin
99224026	RES-19	5/26/99	SVOCs	Metals	Dioxin
99224027	RES-20	5/26/99	SVOCs	Metals	Dioxin
99224028	RES-44A	5/26/99	SVOCs	Metals	Dioxin
99224029	RES-22	5/26/99	SVOCs	Metals	Dioxin
99224030	RES-23	5/26/99	SVOCs	Metals	Dioxin
99224031	RES-25	5/26/99	SVOCs	Metals	Dioxin
99224032	RES-24	5/26/99	SVOCs	Metals	Dioxin
99224033	RES-26	5/26/99	SVOCs	Metals	Dioxin
99224034	RES-48	5/26/99	SVOCs	Metals	Dioxin
99224035	RES-49	5/26/99	SVOCs	Metals	Dioxin
99224036	RES-47A	5/26/99	SVOCs	Metals	Dioxin
99224037	RES-15	5/27/99	SVOCs	Metals	Dioxin
99224038	RES-28	5/27/99	SVOCs	Metals	Dioxin
99224039	RES-29	5/27/99	SVOCs	Metals	Dioxin
99224040	RES-30	5/26/99	SVOCs	Metals	Dioxin
99224041	RES-31	5/25/99	SVOCs	Metals	Dioxin
99224042	RES-33	5/27/99	SVOCs	Metals	Dioxin
99224043	RES-32A	5/27/99	SVOCs	Metals	Dioxin
99224044	RES-34	5/27/99	SVOCs	Metals	Dioxin
99224045	RES-35	5/27/99	SVOCs	Metals	Dioxin
99224046	RES-38	5/28/99	SVOCs	Metals	Dioxin

Table 2-4

OFF-FACILITY SURFACE SOIL SAMPLING SUMMARY (5/24/99 TO 6/3/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Sample Date	Analysis		
99224047	RES-41	5/28/99	SVOCs	Metals	Dioxin
99224048	RES-42	5/28/99	SVOCs	Metals	Dioxin
99224049	RES-42A	5/28/99	SVOCs	Metals	Dioxin
99224050	RES-56	5/28/99	SVOCs	Metals	Dioxin
99234000	RES-B-11	6/1/99	SVOCs	Metals	Dioxin
99234001	RES-50	6/1/99	SVOCs	Metals	Dioxin
99234002	RES-51	6/1/99	SVOCs	Metals	Dioxin
99234003	RES-53	6/1/99	SVOCs	Metals	Dioxin
99234004	RES-54	6/1/99	SVOCs	Metals	Dioxin
99234005	RES-55	6/1/99	SVOCs	Metals	Dioxin
99234006	RES-B-4	6/1/99	SVOCs	Metals	Dioxin
99234007	RES-B-17	6/1/99	SVOCs	Metals	Dioxin
99234008	RES-B-18	6/1/99	SVOCs	Metals	Dioxin
99234009	RES-B-19	6/1/99	SVOCs	Metals	Dioxin
99234010	RES-B-20	6/1/99	SVOCs	Metals	Dioxin
99234011	RES-B-1A	6/2/99	SVOCs	Metals	Dioxin
99234012	RES-B-1	6/2/99	SVOCs	Metals	Dioxin
99234013	RES-B-12	6/2/99	SVOCs	Metals	Dioxin
99234014	RES-B-13	6/2/99	SVOCs	Metals	Dioxin
99234015	RES-B-3	6/2/99	SVOCs	Metals	Dioxin
99234016	RES-B-2	6/2/99	SVOCs	Metals	Dioxin
99234017	RES-B-15	6/2/99	SVOCs	Metals	Dioxin
99234018	RES-B-5	6/2/99	SVOCs	Metals	Dioxin
99234019	RES-B-16	6/2/99	SVOCs	Metals	Dioxin
99234020	RES-B-6	6/2/99	SVOCs	Metals	Dioxin
99234021	RES-B-8	6/2/99	SVOCs	Metals	Dioxin
99234022	RES-B-9	6/2/99	SVOCs	Metals	Dioxin
99234023	RES-21A	6/2/99	SVOCs	Metals	Dioxin
99234024	RES-B-10	6/2/99	SVOCs	Metals	Dioxin
99234025	RES-B-7	6/3/99	SVOCs	Metals	Dioxin
99234026	RES-37	6/3/99	SVOCs	Metals	Dioxin
99234027	RES-58	6/3/99	SVOCs	Metals	Dioxin
99234028	RES-52	6/3/99	SVOCs	Metals	Dioxin
99234029	RES-57	6/3/99	SVOCs	Metals	Dioxin

Key:

ID = Identification.
SVOCs = Semivolatile organic compounds.

Table 2-5

NEAR-FACILITY RESIDENTIAL
COMPOSITE SURFACE SOIL SUBSAMPLE LOCATIONS (MAY/JUNE 1999)
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Near-Facility Residence Location	Drip Line and/or Downspout	Front Walkway	Secondary Entrance	Front Yard and Back Yard
Residence 1	Yes	Yes	Yes	Yes
Residence 3	Yes	Yes	Yes	Yes
Residence 4	Yes	Yes	Yes	Yes
Residence 6	Yes	Yes		Yes
Residence 9	Yes	Yes	Yes	Yes
Residence 10	Yes	Yes	Yes	Yes
Residence 13	Yes	Yes	Yes	Yes
Residence 14	Yes		Yes	Yes
Residence 15		Yes	Yes	Yes
Residence 17	Yes	Yes	Yes	Yes
Residence 19	Yes	Yes	Yes	Yes
Residence 20		Yes	Yes	Yes
Residence 21A	Yes	Yes	Yes	Yes
Residence 22	Yes	Yes	Yes	Yes
Residence 23	Yes			Yes
Residence 24		Yes	Yes	Yes
Residence 25	Yes	Yes	Yes	Yes
Residence 26	Yes	Yes	Yes	Yes
Residence 29	Yes	Yes	Yes	Yes
Residence 30	Yes		Yes	Yes
Residence 31		Yes	Yes	Yes
Residence 33	Yes	Yes		Yes
Residence 34	Yes		Yes	Yes
Residence 35	Yes	Yes	Yes	Yes
Residence 37	Yes	Yes		Yes
Residence 44A		Yes	Yes	Yes
Residence 58	Yes			Yes
TOTALS	22 (81%)	22 (81%)	22 (81%)	27 (100%)

Table 2-6

ON-FACILITY, SOUTH SLOPE, AND LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLING SUMMARY (8/3/99 TO 8/20/99) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99070511	MW-LSC1	8/5/99		EPH	TOC			SVOCs	Metals	Dioxin
99070512	MW-LSC2	8/5/99		EPH	TOC			SVOCs	Metals	Dioxin
99070513	MW-LSC3	8/5/99		EPH	TOC			SVOCs	Metals	Dioxin
99070514	MW-LSC4	8/5/99		EPH	TOC			SVOCs	Metals	Dioxin
99070532	SB-01B-AA2	8/3/99		EPH				SVOCs	Metals	Dioxin
99070533	SB-02B-AA4	8/3/99		EPH				SVOCs	Metals	Dioxin
99070534	SB-03B-AA6	8/3/99		EPH				SVOCs	Metals	Dioxin
99070535	SB-04B-BB3	8/3/99		EPH				SVOCs	Metals	Dioxin
99070536	SB-05B-BB5	8/3/99		EPH				SVOCs	Metals	Dioxin
99070537	SB-06B-CC4	8/3/99		EPH				SVOCs	Metals	Dioxin
99070549	SS-N3	8/3/99	VPH	EPH				SVOCs	Metals	Dioxin
99070552	SS-J2	8/3/99	VPH	EPH				SVOCs	Metals	Dioxin
99070556	SS-F3	8/3/99	VPH	EPH				SVOCs	Metals	Dioxin
99070560	SS-D7	8/3/99	VPH	EPH				SVOCs	Metals	Dioxin
99070567	SS-B13	8/4/99	VPH	EPH				SVOCs	Metals	Dioxin
99070573	SS-J20	8/4/99						SVOCs	Metals	Dioxin
99070578	SS-L25	8/4/99	VPH	EPH				SVOCs	Metals	Dioxin
99070579	SS-Q26	8/4/99	VPH	EPH				SVOCs	Metals	Dioxin
99070583	SS-R18	8/4/99	VPH	EPH				SVOCs	Metals	Dioxin
99070598	B-L17	8/8/99							Metals	Dioxin
99070604	B-Q20	8/8/99	VPH	EPH				SVOCs	Metals	Dioxin
99070605	B-Q27	8/8/99	VPH	EPH				SVOCs	Metals	Dioxin
99070611	MW-32s	8/8/99							Metals	Dioxin
99070615	B-013	8/9/99	VPH	EPH				SVOCs	Metals	Dioxin
99070618	MW-35s	8/9/99	VPH	EPH				SVOCs	Metals	Dioxin
99070622	B-L30	8/9/99	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070627	B-R28	8/10/99	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070650	SP01	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070651	SP02	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070652	SP03	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070653	SP04	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070654	SP05	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070655	SP06	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070656	SP07	8/6/99	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070657	B-B16	8/12/99	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070634	B-U19	8/11/99	VPH	EPH				SVOCs	Metals	Dioxin
99070666	B-07	8/13/99	VPH	EPH				SVOCs	Metals	Dioxin
99070671	MW-28s	8/13/99							Metals	Dioxin
99080022	MW-29s	8/20/99	VPH	EPH		SPLP	GS	SVOCs	Metals	Dioxin
99080023	MW-36s	8/20/99							Metals	Dioxin
99080028	MW-33s	8/20/99	VPH	EPH		SPLP	GS	SVOCs	Metals	Dioxin

Key:

EPH = Extractable petroleum hydrocarbons.
GS = Grain size.
ID = Identification.
SPLP = Synthetic precipitate leaching procedure.
SVOCs = Semivolatile organic compounds.
TOC = Total organic carbon.
VPH = Volatile petroleum hydrocarbons.

Table 2-7

SUBSURFACE SOIL SAMPLING SUMMARY (8/2/99 TO 8/20/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Depth (feet bgs)	Analysis							
99070538	LSMW-04	8/2/99	10-12	VPH	EPH				SVOCs		
99070539	LSMW-04	8/2/99	30-32	VPH	EPH				SVOCs		
99070540	LSMW-01	8/6/99	10-12	VPH	EPH				SVOCs		
99070541	LSMW-01	8/6/99	18-20	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070542	LSWM-01	8/6/99	34-36	VPH	EPH				SVOCs		
99070543	LSMW-03	8/7/99	28-30	VPH	EPH				SVOCs		
99070544	LSMW-03	8/7/99	32-34	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070545	LSMW-02	8/7/99	10-12	VPH	EPH				SVOCs		
99070546	LSMW-02	8/7/99	22-24	VPH	EPH				SVOCs		
99070547	LSMW-02	8/7/99	30-32	VPH	EPH				SVOCs		
99070550	B-N3	8/3/99	4-6	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070551	B-N3	8/3/99	14-16	VPH	EPH				SVOCs		
99070553	B-J2	8/3/99	2-4	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070554	B-J2	8/3/99	6-8	VPH	EPH				SVOCs		
99070555	B-J2	8/3/99	14-16	VPH	EPH	TOC			SVOCs	Metals	Dioxin
99070557	B-F3	8/3/99	4-6	VPH	EPH				SVOCs	Metals	Dioxin
99070558	B-F3	8/3/99	10-12	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070559	B-F3	8/3/99	12-14	VPH	EPH				SVOCs		
99070561	B-D7	8/3/99	2-4	VPH	EPH				SVOCs		
99070562	B-D7	8/3/99	6-8	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070563	B-D7	8/3/99	14-16	VPH	EPH				SVOCs		
99070564	B-B13	8/4/99	4-6	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070565	B-B13	8/4/99	8-10	VPH	EPH				SVOCs		
99070566	B-B13	8/4/99	14-16	VPH	EPH				SVOCs		
99070568	B-F16	8/4/99	2-4	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070569	B-F16	8/4/99	8-10	VPH	EPH				SVOCs		
99070570	B-F16	8/4/99	14-16	VPH	EPH				SVOCs		
99070571	B-J20	8/4/99	2-4	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070572	B-J20	8/4/99	8-10	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070574	B-J20	8/4/99	14-16	VPH	EPH				SVOCs		
99070575	B-L25	8/4/99	4-6	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070576	B-L25	8/4/99	6-8	VPH	EPH				SVOCs		
99070577	B-L25	8/4/99	14-16	VPH	EPH				SVOCs		
99070580	B-Q26	8/4/99	2-4	VPH	EPH				SVOCs		
99070581	B-Q26	8/4/99	8-10	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070582	B-Q26	8/4/99	14-16	VPH	EPH				SVOCs		
99070584	B-R18	8/4/99	2-4	VPH	EPH				SVOCs		
99070585	B-R18	8/4/99	10-12	VPH	EPH				SVOCs		
99070586	B-R18	8/4/99	14-16	VPH	EPH				SVOCs		
99070587	B-AA2	8/5/99	6-8	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070588	B-AA4	8/5/99	36-38	VPH	EPH			GS	SVOCs	Metals	Dioxin
99070589	B-AA4	8/5/99	6-8	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070590	B-AA4	8/5/99	18-20	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070591	B-AA6	8/5/99	6-8	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070592	B-AA6	8/5/99	18-20	VPH	EPH				SVOCs		
99070593	B-BB5	8/6/99	4-6	VPH	EPH			GS	SVOCs	Metals	Dioxin
99070594	B-BB5	8/6/99	16-18	VPH	EPH					Metals	Dioxin
99070595	B-BB5	8/6/99	18-20	VPH	EPH			GS	SVOCs	Metals	Dioxin
99070596	B-BB3	8/6/99	2-4	VPH	EPH				SVOCs		
99070597	B-BB5	8/6/99	18-20	VPH	EPH				SVOCs		
99070599	B-L17	8/8/99	8-10	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin

Table 2-7

SUBSURFACE SOIL SAMPLING SUMMARY (8/2/99 TO 8/20/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Depth (feet bgs)	Analysis							
99070600	B-L17	8/8/99	10-12	VPH	EPH				SVOCs		Dioxin
99070601	B-L17	8/8/99	14-16	VPH	EPH				SVOCs		
99070602	B-Q20	8/8/99	2-4	VPH	EPH				SVOCs		
99070603	B-Q20	8/8/99	8-10	VPH	EPH				SVOCs		
99070606	B-Q27	8/8/99	8-10	VPH	EPH			GS	SVOCs	Metals	Dioxin
99070607	B-Q27	8/8/99	12-14	VPH	EPH				SVOCs		
99070608	MW-32s	8/8/99	8-10	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070609	MW-32s	8/8/99	10-12	VPH	EPH				SVOCs		
99070610	MW-32s	8/8/99	14-16	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070612	MW-29s	8/9/99	4-6	VPH	EPH		SPLP	GS	SVOCs	Metals	Dioxin
99070613	MW-29s	8/9/99	12-14	VPH	EPH				SVOCs		
99070614	B-013	8/9/99	24-26	VPH	EPH				SVOCs	Metals	
99070616	MW-35s	8/9/99	8-10	VPH	EPH				SVOCs	Metals	Dioxin
99070617	MW-35s	8/9/99	10-12	VPH	EPH		SPLP		SVOCs		
99070623	B-L30	8/9/99	6-8	VPH	EPH				SVOCs		
99070624	B-L30	8/10/99	15-17	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070625	B-L30	8/10/99	12-19	VPH	EPH				SVOCs		
99070626	B-L30	8/10/99	35-37	VPH	EPH				SVOCs		
99070628	B-R28	8/10/99	2-4	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070629	B-R28	8/10/99	6-8	VPH	EPH				SVOCs		
99070630	B-R28	8/10/99	10-12	VPH	EPH				SVOCs		
99070631	B-R28	8/10/99	20-22	VPH	EPH				SVOCs		
99070632	B-R28	8/11/99	34-36	VPH	EPH				SVOCs		
99070633	B-R28	8/11/99	38-40	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070635	B-U19	8/11/99	>0-2	VPH	EPH				SVOCs		
99070636	B-U19	8/11/99	2-4	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070637	B-U19	8/11/99	10-12	VPH	EPH				SVOCs		
99070638	B-U19	8/11/99	20-22	VPH	EPH				SVOCs		
99070639	B-U19	8/11/99	26-28	VPH	EPH				SVOCs		
99070640	B-U19	8/11/99	38-40	VPH	EPH				SVOCs		
99070641	B-B16	8/12/99	4-6	VPH	EPH				SVOCs		
99070642	B-B16	8/12/99	8-10	VPH	EPH	TOC			SVOCs	Metals	Dioxin
99070643	B-B16	8/12/99	16-18	VPH	EPH				SVOCs		
99070644	B-B16	8/12/99	22-24	VPH	EPH				SVOCs		
99070645	B-B16	8/12/99	30-32	VPH	EPH				SVOCs		
99070646	B-B16	8/12/99	38-40	VPH	EPH				SVOCs		
99070647	TT01-B	8/5/99	6						SVOCs		
99070648	TT01-SW	8/5/99	4						SVOCs		
99070649	TT01-BW	8/5/99	2.5	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070658	B-07	8/13/99	2-4	VPH	EPH				SVOCs		
99070659	B-07	8/13/99	6-8	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070660	B-07	8/13/99	14-16	VPH	EPH				SVOCs		
99070661	B-07	8/13/99	16.5-18.5	VPH	EPH				SVOCs		
99070662	B-07	8/13/99	28-30	VPH	EPH				SVOCs		
99070663	B-07	8/13/99	34-36	VPH	EPH				SVOCs		
99070664	B-07	8/13/99	39.5-41.5	VPH	EPH				SVOCs		
99070667	MW29s	8/13/99	2-4	VPH	EPH				SVOCs		
99070668	MW29s	8/13/99	4-6						SVOCs		
99070669	MW29s	8/13/99	10-12	VPH	EPH	TOC	SPLP		SVOCs	Metals	Dioxin
99070670	MW29s	8/13/99	16-18	VPH	EPH				SVOCs		
99070672	MW-28s	8/13/99	2-4	VPH	EPH				SVOCs		

Table 2-7

SUBSURFACE SOIL SAMPLING SUMMARY (8/2/99 TO 8/20/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Depth (feet bgs)	Analysis							
99070673	MW-28s	8/13/99	6-8	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070674	MW-28s	8/13/99	12-14	VPH	EPH				SVOCs		
99070675	MW-40d	8/13/99	2-4	VPH	EPH				SVOCs		
99070676	MW-40d	8/13/99	7-9	VPH	EPH		SPLP	GS	SVOCs	Metals	Dioxin
99070677	MW-40d	8/14/99	11-13	VPH	EPH				SVOCs		
99070678	MW-40d	8/14/99	20-22	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99070679	MW-40d	8/14/99	30-32						SVOCs		
99070680	MW-35d	8/15/99	2-4	VPH	EPH				SVOCs		
99070681	MW-35d	8/15/99	6-8	VPH	EPH				SVOCs		
99070682	MW-35d	8/15/99	8-10	VPH	EPH				SVOCs		
99070683	MW-35d	8/15/99	12-14	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070684	MW-35d	8/15/99	18-20	VPH	EPH				SVOCs		
99070685	MW-35d	8/15/99	46-48	VPH	EPH		SPLP	GS	SVOCs	Metals	Dioxin
99070686	MW-34d	8/16/99	16-18	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070687	MW-34d	8/16/99	24-26	VPH	EPH				SVOCs		
99070688	MW-34d	8/16/99	30-32	VPH	EPH				SVOCs		
99070689	MW-34d	8/16/99	32-34	VPH	EPH				SVOCs		
99070690	MW-34d	8/16/99	38-40	VPH	EPH				SVOCs		
99070691	MW-34d	8/16/99	46-48	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070692	MW-33d	8/17/99	6-8	VPH	EPH				SVOCs		
99070693	MW-33d	8/17/99	10-12	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070694	MW-33d	8/17/99	16-18	VPH	EPH				SVOCs		
99070695	MW-33d	8/17/99	28-30	VPH	EPH				SVOCs		
99070696	MW-33d	8/17/99	38-40	VPH	EPH				SVOCs		
99070697	MW-33d	8/17/99	44-46	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99070698	MW30d	8/18/99	3-5	VPH	EPH				SVOCs		
99080010	MW-30d	8/18/99	7-9	VPH	EPH				SVOCs		
99080011	MW-30d	8/18/99	16-18	VPH	EPH	TOC		GS	SVOCs	Metals	Dioxin
99080012	MW-30d	8/18/99	32-34	VPH	EPH				SVOCs		
99080013	MW-33s	8/19/99	2-4	VPH	EPH				SVOCs		
99080014	MW-33s	8/19/99	10-12	VPH	EPH				SVOCs		
99080015	MW-33s	8/19/99	20-22	VPH	EPH	TOC	SPLP	GS	SVOCs	Metals	Dioxin
99080016	MW-31s	8/19/99	>0-2	VPH	EPH				SVOCs		
99080017	MW-31s	8/19/99	4-6	VPH	EPH				SVOCs		
99080018	MW-31s	8/19/99	8-10	VPH	EPH				SVOCs	Metals	Dioxin
99080019	MW-31s	8/19/99	12-14	VPH	EPH			GS	SVOCs		
99080020	MW-36s	8/19/99	3-5	VPH	EPH				SVOCs		
99080021	MW-36s	8/19/99	10-12	VPH	EPH				SVOCs		
99080029	MW-37s	8/20/99	1-3	VPH	EPH				SVOCs		
99080030	MW-37s	8/20/99	5-7	VPH	EPH				SVOCs		
99080031	MW-37s	8/20/99	17-19	VPH	EPH		SPLP	GS	SVOCs	Metals	Dioxin

Key:

ID = Identification.
bgs = Below ground surface.
EPH = Extractable petroleum hydrocarbons.
GS = Grain size.
SPLP = Synthetic precipitate leaching procedure.
SVOCs = Semivolatile organic compounds.
TOC = Total organic carbon.
VPH = Volatile petroleum hydrocarbons.

Table 2-8

MONITORING WELL CONSTRUCTION DETAILS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Monitoring Well	Washington, North Zone NAD 1927 (feet)		NAD 1927		NAVD 1988 Elevation		Date Installed	Total Depth (feet bgs)	Screen			
	Northing	Easting	Latitude	Longitude	Rim	Inner casing			Slot Size (inches)	Diameter (inches)	Total Length (feet)	Depth Interval (feet bgs)
MW01-D	649751.55	1594994.22	48°46'08.67"	122°30'45.80"	73.79	73.51	9/11/95	66	0.01	2	10	36.2-46.2
MW02-D	649574.36	1594708.36	48°46'06.86"	122°30'50.01"	73.19	72.70	9/12/95	66	0.01	2	10	38-48
MW03-D	649506.76	1594400.55	48°46'06.13"	122°30'54.58"	73.65	73.15	9/13/95	71	0.01	2	10	45-55
MW05-D	649838.74	1594711.33	48°46'09.47"	122°30'50.05"	76.87	76.52	9/13/95	66	0.01	2	10	43-53
MW06-D	650624.64	1595684.59	48°46'17.43"	122°30'35.78"	75.90	75.40	9/13/95	66	0.01	2	10	34.5-44.5
MW07-S	649819.72	1594941.82	48°46'09.33"	122°30'46.61"	75.68	74.97	4/18/96	15	0.01	2	5	10-15
MW08-S	649725.29	1594797.25	48°46'08.37"	122°30'48.73"	74.13	73.69	4/18/96	14	0.01	2	5	7-12
MW09-S	649722.21	1594925.46	48°46'08.37"	122°30'46.82"	74.07	73.57	4/18/96	21	0.01	2	5	7-12
MW10-S	649797.77	1594636.74	48°46'09.05"	122°30'51.15"	76.99	76.03	4/19/96	15	0.01	2	5	9.25-14.25
MW13-S	649838.96	1594972.91	48°46'09.53"	122°30'46.15"	75.39	74.61	2/11/97	17	0.01	2	5	10-15
MW14-S	649930.01	1594755.17	48°46'10.38"	122°30'49.43"	76.52	75.72	2/12/97	20	0.01	2	5	6-11
MW15-S	650121.64	1594881.05	48°46'12.30"	122°30'47.61"	74.98	74.69	2/12/97	17	0.01	2	5	6-11
MW16-S	650043.83	1594898.81	48°46'11.54"	122°30'47.32"	75.10	74.45	2/12/97	15	0.01	2	5	10-15
MW17-D	649720.21	1594907.98	48°46'08.34"	122°30'47.08"	73.65	73.37	4/15/97	50	0.01	2	10	39.5-49.5
MW18-D	649754.84	1594639.09	48°46'08.63"	122°30'51.10"	76.63	75.81	4/16/97	55	0.01	2	10	43-53
MW19-S	649839.88	1594737.71	48°46'09.49"	122°30'49.66"	76.89	76.58	4/17/97	17	0.01	2	5	8.5-13.5
MW20-D	649959.78	1595084.15	48°46'10.75"	122°30'44.53"	75.03	74.69	4/18/97	47	0.01	2	10	35-45
MW21-S	649974.55	1594761.95	48°46'10.82"	122°30'49.34"	76.02	75.13	4/19/97	23	0.01	2	5	14-19
MW22-S	649853.34	1594697.01	48°46'09.61"	122°30'50.27"	77.15	76.85	4/19/97	17	0.01	2	5	10.25-15.25
MW23-D	649963.91	1594730.81	48°46'10.71"	122°30'49.80"	76.26	76.03	4/19/97	50	0.01	2	10	37-47
MW24-D	649725.27	1594816.47	48°46'08.38"	122°30'48.45"	73.99	73.81	4/20/97	48	0.01	2	10	36-46
MW25-D	649820.84	1594917.33	48°46'09.34"	122°30'46.97"	75.81	75.49	4/21/97	49	0.01	2	10	37-47
MW26-S	649961.38	1594798.13	48°46'10.70"	122°30'48.80"	75.90	75.59	4/24/97	15	0.01	2	5	9.2-14.2
MW28-S	650007.64	1594633.75	48°46'11.12"	122°30'51.26"	75.80	75.54	8/13/99	7.77	0.01	2	4.4	3.5-7.9
MW29-S	649903.80	1594481.24	48°46'10.06"	122°30'53.51"	77.43	76.90	8/13/99	14.61	0.01	2	4.4	10.5-14.9
MW30-D	650304.66	1594670.42	48°46'14.06"	122°30'50.81"	76.58	76.28	8/18/99	44.55	0.02	2	4.5	40-44.5
MW31-S	649960.40	1595430.84	48°46'10.83"	122°30'39.35"	73.99	73.59	8/19/99	36.19	0.01	2	4	9.5-13.5
MW32-S	649903.04	1595190.74	48°46'10.21"	122°30'42.92"	74.81	74.58	8/8/99	15.05	0.01	2	4.65	9.1-13.75
MW33-D	649563.81	1594980.36	48°46'06.82"	122°30'45.95"	71.48	71.08	8/17/99	45.07	0.01	2	4.5	41-45.5
MW33-S	649563.81	1594985.12	48°46'06.82"	122°30'45.88"	71.43	70.92	8/19/99	14.24	0.01	2	4.5	10.5-15
MW34-D	649808.74	1595127.04	48°46'09.27"	122°30'43.84"	74.54	74.21	8/16/99	47.98	0.01	2	4.4	42.7-47.1
MW35-D	649669.10	1594591.02	48°46'07.77"	122°30'51.79"	74.81	74.46	8/15/99	45.87	0.01	2	4.5	42.5-47
MW35-S	649668.31	1594580.64	48°46'07.76"	122°30'51.95"	75.09	74.69	8/9/99	11.32	0.01	2	5	7-12
MW36-S	649996.56	1594811.00	48°46'11.05"	122°30'48.62"	75.54	75.14	8/19/99	12.43	0.01	2	2.5	10-12.5
LSCMW-1	648957.66	1594416.57	48°46'00.72"	122°30'54.16"	41.50	41.24	8/6/99	25.81	0.01	2	9.55	21.25-30.8
LSCMW-2	649059.91	1594575.32	48°46'01.76"	122°30'51.83"	46.68	46.37	8/7/99	27.45	0.02	2	9.55	19.25-28.8

Table 2-8

MONITORING WELL CONSTRUCTION DETAILS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Monitoring Well	Washington, North Zone NAD 1927 (feet)		NAD 1927		NAVD 1988 Elevation		Date Installed	Total Depth (feet bgs)	Screen			
	Northing	Easting	Latitude	Longitude	Rim	Inner casing			Slot Size (inches)	Diameter (inches)	Total Length (feet)	Depth Interval (feet bgs)
LSCMW-3	649179.19	1594815.74	48°46'02.99"	122°30'48.28"	50.47	50.17	8/7/99	33.06	0.01	2	9.55	24.25-33.8
LSCMW-4	649183.54	1594818.16	48°46'03.03"	122°30'48.24"	50.81	50.17	8/2/99	23.09	0.02	2	9.55	13.75-23.3
Ershigs's												
ERSHIGS MW-1S	649966.96	1593903.44	48°46'10.56"	122°31'02.15"	78.07	77.51	4/13/93	15	0.01	2	10	5-15
ERSHIGS MW-1D	649963.73	1593906.51	48°46'10.53"	122°31'02.10"	78.10	77.81	4/20/93	60	0.01	2	10	50-60
ERSHIGS MW-3S	649647.90	1593679.86	48°46'07.37"	122°31'05.38"	79.39	78.83	4/13/93	15	0.01	2	10	5-15
ERSHIGS MW-4S	649756.91	1594352.22	48°46'08.59"	122°30'55.38"	76.90	76.72	4/16/93	15	0.01	2	10	5-15
ERSHIGS MW-4D	649756.09	1594357.25	48°46'08.58"	122°30'55.31"	75.98	76.80	4/21/93	58	0.01	2	10	48-58
Tilbury Cement												
TC-5	649318.32	1592881.81	48°46'03.94"	122°31'17.18"	79.46	77.11	*Log not available-construction similar to TC-6*					
TC-6	649372.90	1593077.13	48°46'04.52"	122°31'14.29"	80.95	75.95	3/28/79	75	0.15	12	10	65-75
Well Points												
WP1	649083.9	1594800.8	48°46'02.04"	122°30'48.47"	25.5	—	8/11/99	2.8	0.01	2	3	0.7-2.8
WP2	649036.9	1594724.4	48°46'01.56"	122°30'49.59"	24.4	—	8/11/99	2.75	0.01	2	3	1.9-2.75

Key:

— = No data.
bgs = Below ground surface.
NAD = North American Datum.
NAVD = North American Vertical Datum.

Table 2-9

GROUNDWATER MONITORING SUMMARY (6/7/99 TO 6/15/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99244000	MW-24d	6/7/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244001	MW-24d	6/7/99						Dissolved Metals		
99244002	MW-10s	6/8/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244003	MW-10s	6/8/99						Dissolved Metals		
99244004	MW-14s	6/8/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244005	MW-14s	6/8/99						Dissolved Metals		
99244007	MW-22s	6/8/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244008	MW-22s	6/8/99						Dissolved Metals		
99244009	MW-19s	6/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244010	MW-19s	6/9/99						Dissolved Metals		
99244011	MW-18d	6/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244012	MW-18d	6/9/99						Dissolved Metals		
99244014	MW-15s	6/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244015	MW-15s	6/9/99						Dissolved Metals		
99244016	MW-6d	6/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244017	MW-6d	6/9/99						Dissolved Metals		
99244018	MW-8s	6/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244019	MW-8s	6/9/99						Dissolved Metals		
99244020	MW-25d	6/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244021	MW-25d	6/9/99						Dissolved Metals		
99244022	MW-9s	6/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244023	MW-9s	6/10/99						Dissolved Metals		
99244024	MW-2d	6/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99244025	MW-2d	6/10/99						Dissolved Metals		
99244027	SEEP-1	6/10/99		EPH	SVOC					
99254000	MW-23d	6/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254001	MW-23d	6/14/99						Dissolved Metals		
99254003	MW-17d	6/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254004	MW-17d	6/14/99						Dissolved Metals		
99254005	MW-3d	6/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254006	MW-3d	6/14/99						Dissolved Metals		
99254007	MW-5d	6/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254008	MW-5d	6/14/99						Dissolved Metals		
99254009	MW-20d	6/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254010	MW-20d	6/14/99						Dissolved Metals		
99254011	Ershigs-4d	6/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254012	Ershigs-4d	6/15/99						Dissolved Metals		
99254013	Ershigs-4s	6/15/99	VPH	EPHX	SVOC	Dioxin	Total Metals		VOC	WQ
99254014	Ershigs-4s	6/15/99						Dissolved Metals		
99254016	Ershigs-1s	6/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254017	Ershigs-1s	6/15/99						Dissolved Metals		
99254018	Ershigs-1d	6/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254019	Ershigs-1d	6/15/99						Dissolved Metals		
99254020	Ershigs-3s	6/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99254021	Ershigs-3s	6/15/99						Dissolved Metals		

Key:

EPH = Extractable petroleum hydrocarbons.
ID = Identification.
SVOC = Semivolatile organic compounds.
VOC = Volatile organic compounds.
VPH = Volatile petroleum hydrocarbons.
WQ = Water quality.

Table 2-10

GROUNDWATER MONITORING SUMMARY (10/12/99 TO 10/21/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99384000	MW-25d	9/12/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384001	MW-25d	9/12/99						Dissolved Metals		
99384002	MW-20d	9/12/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384003	MW-20d	9/12/99						Dissolved Metals		
99384004	MW-34d	9/12/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384005	MW-34d	9/12/99						Dissolved Metals		
99384007	MW-18d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384008	MW-18d	9/13/99						Dissolved Metals		
99384009	MW-24d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384010	MW-24d	9/13/99						Dissolved Metals		
99384011	MW-30d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384012	MW-30d	9/13/99						Dissolved Metals		
99384013	MW-17d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384014	MW-17d	9/13/99						Dissolved Metals		
99384015	MW-6d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384016	MW-6d	9/13/99						Dissolved Metals		
99384017	MW-33d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384018	MW-33d	9/13/99						Dissolved Metals		
99384019	MW-35d	9/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384020	MW-35d	9/13/99						Dissolved Metals		
99384021	MW-2d	9/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384022	MW-2d	9/14/99						Dissolved Metals		
99384023	Tillbury 6	9/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384024	Tillbury 6	9/14/99						Dissolved Metals		
99384036	MW-3d	9/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384037	MW-3d	9/14/99						Dissolved Metals		
99384038	MW-1d	9/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384039	MW-1d	9/14/99						Dissolved Metals		
99384040	Ershigs-1s	9/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384041	Ershigs-1s	9/15/99						Dissolved Metals		
99384042	Ershigs-4d	9/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384043	Ershigs-4d	9/15/99						Dissolved Metals		
99384047	MW-5d	9/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384048	MW-5d	9/15/99						Dissolved Metals		
99384350	LSCMW-02	9/16/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384351	LSCMW-02	9/16/99						Dissolved Metals		
99384352	MW-23d	9/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384353	MW-23d	9/15/99						Dissolved Metals		
99384354	Ershigs-1d	9/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384355	Ershigs-1d	9/15/99						Dissolved Metals		
99384356	Ershigs-3s	9/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384357	Ershigs-3s	9/15/99						Dissolved Metals		
99384358	LSCMW-01	9/16/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384359	LSCMW-01	9/16/99						Dissolved Metals		
99384360	MW-31s	9/16/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ

Table 2-10

GROUNDWATER MONITORING SUMMARY (10/12/99 TO 10/21/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99384361	MW-31s	9/16/99						Dissolved Metals		
99384363	LSCMW-03	9/16/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99384364	LSCMW-03	9/16/99						Dissolved Metals		
99394000	MW-35s	9/19/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394001	MW-35s	9/19/99						Dissolved Metals		
99394002	MW-36s	9/19/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394003	MW-36s	9/19/99				Dioxin		Dissolved Metals		
99394004	MW-15s	9/19/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394005	MW-15s	9/19/99						Dissolved Metals		
99394006	MW-22s	9/19/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394007	MW-22s	9/19/99						Dissolved Metals		
99394008	MW-9s	9/20/99	VPH			Dioxin	Total Metals		VOC	WQ
99394009	MW-9s	9/20/99						Dissolved Metals		
99394011	MW-8s	9/20/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394012	MW-8s	9/20/99						Dissolved Metals		
99394013	MW-32s	9/20/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394014	MW-32s	9/20/99						Dissolved Metals		
99394018	MW-10s	9/21/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394019	MW-10s	9/21/99						Dissolved Metals		
99394020	Tillbury-2	9/21/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99394021	Tillbury-2	9/21/99						Dissolved Metals		
99394027	MW-19s	9/21/99						Dissolved Metals		
99394028	MW-19s	9/21/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ

Key:

EPH = Extractable petroleum hydrocarbons.
ID = Identification.
SVOC = Semivolatile organic compounds.
VOC = Volatile organic compounds.
VPH = Volatile petroleum hydrocarbons.
WQ = Water quality.

Table 2-11

GROUNDWATER MONITORING SUMMARY (12/6/99 TO 12/16/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99504010	MW-9s	12/7/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504011	MW-9s	12/7/99						Dissolved Metals		
99504012	MW-17d	12/7/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504013	MW-17d	12/7/99						Dissolved Metals		
99504014	MW-10s	12/7/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504015	MW-10s	12/7/99						Dissolved Metals		
99504016	MW-18d	12/7/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504017	MW-18d	12/7/99						Dissolved Metals		
99504018	MW-35d	12/7/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504019	MW-35d	12/7/99						Dissolved Metals		
99504022	LSCMW-3	12/8/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504023	LSCMW-3	12/8/99						Dissolved Metals		
99504024	MW-3d	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504025	MW-3d	12/9/99						Dissolved Metals		
99504026	MW-24d	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504027	MW-24d	12/9/99						Dissolved Metals		
99504028	MW-2d	12/8/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504029	MW-2d	12/8/99						Dissolved Metals		
99504030	MW-33d	12/8/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504031	MW-33d	12/8/99						Dissolved Metals		
99504032	Ershigs-1s	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504033	Ershigs-1s	12/9/99						Dissolved Metals		
99504036	Ershigs-1d	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504037	Ershigs-1d	12/9/99						Dissolved Metals		
99504038	LSCMW-1	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504039	LSCMW-1	12/9/99						Dissolved Metals		
99504040	LSCMW-2	12/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504041	LSCMW-2	12/10/99						Dissolved Metals		
99504042	Ershigs-4s	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504043	Ershigs-4s	12/9/99						Dissolved Metals		
99504044	Ershigs-3s	12/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504045	Ershigs-3s	12/10/99						Dissolved Metals		
99504046	Ershigs-4d	12/9/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504047	Ershigs-4d	12/9/99						Dissolved Metals		
99504048	MW-6d	12/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504049	MW-6d	12/10/99						Dissolved Metals		
99504850	MW-25d	12/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504851	MW-25d	12/10/99						Dissolved Metals		
99504852	MW-20d	12/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504853	MW-20d	12/10/99						Dissolved Metals		
99504854	MW-35s	12/10/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504855	MW-35s	12/10/99						Dissolved Metals		
99514000	MW-28s	12/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514001	MW-28s	12/13/99						Dissolved Metals		
99514002	MW-1d	12/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ

Table 2-11

GROUNDWATER MONITORING SUMMARY (12/6/99 TO 12/16/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99514003	MW-1d	12/13/99						Dissolved Metals		
99514004	MW-34d	12/13/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514005	MW-34d	12/13/99						Dissolved Metals		
99514006	MW-5d	12/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514007	MW-5d	12/14/99						Dissolved Metals		
99514008	MW-6d	12/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514009	MW-6d	12/14/99						Dissolved Metals		
99514010	MW-32s	12/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514011	MW-32s	12/14/99						Dissolved Metals		
99514012	MW-15s	12/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514013	MW-15s	12/15/99						Dissolved Metals		
99514014	MW-8s	12/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514015	MW-8s	12/14/99						Dissolved Metals		
99514016	MW-36s	12/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514017	MW-36s	12/14/99						Dissolved Metals		
99514018	MW-31s	12/14/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514019	MW-31s	12/14/99						Dissolved Metals		
99514020	MW-23d	12/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514021	MW-23d	12/15/99						Dissolved Metals		
99514022	MW-30d	12/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514023	MW-30d	12/15/99						Dissolved Metals		
99514024	MW-22s	12/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514025	MW-22s	12/15/99						Dissolved Metals		
99514026	MW-29s	12/15/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514027	MW-29s	12/15/99						Dissolved Metals		
99514028	MW-19s	12/16/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99514029	MW-19s	12/16/99						Dissolved Metals		

Key:

EPH = Extractable petroleum hydrocarbons.
ID = Identification.
SVOC = Semivolatile organic compounds.
VOC = Volatile organic compounds.
VPH = Volatile petroleum hydrocarbons.
WQ = Water quality.

Table 2-12

GROUNDWATER MONITORING SUMMARY (2/27/00 TO 3/2/00)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
00094053	MW-9s	2/27/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094053	MW-9s	2/27/00						Dissolved Metals		
00094052	MW-17d	2/27/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094052	MW-17d	2/27/00						Dissolved Metals		
00094054	MW-10s	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094054	MW-10s	2/28/00						Dissolved Metals		
00094056	MW-18d	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094056	MW-18d	2/28/00						Dissolved Metals		
00094055	MW-35d	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094055	MW-35d	2/28/00						Dissolved Metals		
00094075	LSCMW-3	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094075	LSCMW-3	3/1/00						Dissolved Metals		
00094074	MW-3d	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094074	MW-3d	3/1/00						Dissolved Metals		
00094050	MW-24d	2/27/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094050	MW-24d	2/27/00						Dissolved Metals		
00094087	MW-2d	3/2/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094087	MW-2d	3/2/00						Dissolved Metals		
00094058	MW-33d	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094058	MW-33d	2/28/00						Dissolved Metals		
00094084	Ershigs-1s	3/2/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094084	Ershigs-1s	3/2/00						Dissolved Metals		
00094083	Ershigs-1d	3/2/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094083	Ershigs-1d	3/2/00						Dissolved Metals		
00094081	LSCMW-1	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094081	LSCMW-1	3/1/00						Dissolved Metals		
00094080	LSCMW-2	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094080	LSCMW-2	3/1/00						Dissolved Metals		
00094085	Ershigs-4s	3/2/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094085	Ershigs-4s	3/2/00						Dissolved Metals		
00094088	Ershigs-3s	3/2/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094088	Ershigs-3s	3/2/00						Dissolved Metals		
00094078	Ershigs-4d	3/2/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094078	Ershigs-4d	3/2/00						Dissolved Metals		
00094082	MW-6d	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094082	MW-6d	3/1/00						Dissolved Metals		
00094073	MW-25d	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094073	MW-25d	3/1/00						Dissolved Metals		
00094070	MW-20d	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094070	MW-20d	2/29/00						Dissolved Metals		
00094062	MW-35s	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094062	MW-35s	2/28/00						Dissolved Metals		
00094064	MW-28s	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094064	MW-28s	2/29/00						Dissolved Metals		
00094072	MW-1d	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ

Table 2-12

GROUNDWATER MONITORING SUMMARY (2/27/00 TO 3/2/00)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
00094072	MW-1d	2/29/00						Dissolved Metals		
00094066	MW-34d	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094066	MW-34d	2/29/00						Dissolved Metals		
00094065	MW-5d	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094065	MW-5d	2/28/00						Dissolved Metals		
00094082	MW-6d	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094082	MW-6d	3/1/00						Dissolved Metals		
00094060	MW-32s	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094060	MW-32s	2/29/00						Dissolved Metals		
00094079	MW-15s	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094079	MW-15s	3/1/00						Dissolved Metals		
00094051	MW-8s	2/27/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094051	MW-8s	2/27/00						Dissolved Metals		
00094077	MW-36s	3/1/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094077	MW-36s	3/1/00						Dissolved Metals		
00094069	MW-31s	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094069	MW-31s	2/29/00						Dissolved Metals		
00094067	MW-23d	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094067	MW-23d	2/29/00						Dissolved Metals		
00094071	MW-30d	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094071	MW-30d	2/29/00						Dissolved Metals		
00094059	MW-22s	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094059	MW-22s	2/28/00						Dissolved Metals		
00094068	MW-29s	2/29/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094068	MW-29s	2/29/00						Dissolved Metals		
00094061	MW-19s	2/28/00	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
00094061	MW-19s	2/28/00						Dissolved Metals		

Key:

EPH = Extractable petroleum hydrocarbons.
ID = Identification.
SVOC = Semivolatile organic compounds.
VOC = Volatile organic compounds.
VPH = Volatile petroleum hydrocarbons.
WQ = Water quality.

Table 2-13

AIR SAMPLING SUMMARY (7/8/99 TO 7/13/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Sample Date	Analysis
99070200	21	7/8/99	Metals
99070201	22	7/8/99	Metals
99070202	23	7/8/99	Metals
99070203	24	7/8/99	Metals
99070204	25	7/8/99	Metals
99070205	26	7/8/99	Metals
99070206	27	7/8/99	Metals
99070207	28	7/8/99	Metals
99070208	29	7/8/99	Metals
99070209	30	7/8/99	Metals
99070268	21	7/10/99	Metals
99070269	22	7/10/99	Metals
99070270	23	7/10/99	Metals
99070271	24	7/10/99	Metals
99070272	25	7/10/99	Metals
99070273	26	7/10/99	Metals
99070274	27	7/10/99	Metals
99070275	28	7/10/99	Metals
99070276	29	7/10/99	Metals
99070277	30	7/10/99	Metals
99070278	21	7/11/99	Metals
99070279	22	7/11/99	Metals
99070280	23	7/11/99	Metals
99070281	24	7/11/99	Metals
99070282	25	7/11/99	Metals
99070283	26	7/11/99	Metals
99070284	27	7/11/99	Metals
99070285	28	7/11/99	Metals
99070286	29	7/11/99	Metals
99070287	30	7/11/99	Metals
99070288	21	7/13/99	Metals
99070289	22	7/13/99	Metals
99070290	23	7/13/99	Metals
99070291	24	7/13/99	Metals
99070292	25	7/13/99	Metals
99070293	26	7/13/99	Metals
99070294	27	7/13/99	Metals
99070295	28	7/13/99	Metals
99070296	29	7/13/99	Metals
99070297	30	7/13/99	Metals
99070213	21	7/8/99	Dioxins/SVOCs
99070214	22	7/8/99	Dioxins/SVOCs
99070215	23	7/8/99	Dioxins/SVOCs
99070216	24	7/8/99	Dioxins/SVOCs
99070217	25	7/8/99	Dioxins/SVOCs
99070218	26	7/8/99	Dioxins/SVOCs
99070219	27	7/8/99	Dioxins/SVOCs
99070220	28	7/8/99	Dioxins/SVOCs

Table 2-13

AIR SAMPLING SUMMARY (7/8/99 TO 7/13/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Sample Date	Analysis
99070221	29	7/8/99	Dioxins/SVOCs
99070223	21	7/8/99	Dioxins/SVOCs
99070245	21	7/10/99	Dioxins/SVOCs
99070246	22	7/10/99	Dioxins/SVOCs
99070247	23	7/10/99	Dioxins/SVOCs
99070248	24	7/10/99	Dioxins/SVOCs
99070249	25	7/10/99	Dioxins/SVOCs
99070250	26	7/10/99	Dioxins/SVOCs
99070251	27	7/10/99	Dioxins/SVOCs
99070252	28	7/10/99	Dioxins/SVOCs
99070253	29	7/10/99	Dioxins/SVOCs
99070254	30	7/10/99	Dioxins/SVOCs
99070298	21	7/13/99	Dioxins/SVOCs
99070299	22	7/13/99	Dioxins/SVOCs
99070300	23	7/13/99	Dioxins/SVOCs
99070301	24	7/13/99	Dioxins/SVOCs
99070302	25	7/13/99	Dioxins/SVOCs
99070303	26	7/13/99	Dioxins/SVOCs
99070304	27	7/13/99	Dioxins/SVOCs
99070305	28	7/13/99	Dioxins/SVOCs
99070306	29	7/13/99	Dioxins/SVOCs
99070307	30	7/13/99	Dioxins/SVOCs
99070210	23	7/8/99	VOCs
99070211	22	7/8/99	VOCs
99070212	30	7/8/99	VOCs
99070226	29	7/8/99	VOCs
99070227	26	7/8/99	VOCs
99070228	24	7/8/99	VOCs
99070229	24	7/8/99	VOCs
99070230	28	7/8/99	VOCs
99070231	28	7/8/99	VOCs
99070232	21	7/8/99	VOCs
99070233	22	7/9/99	VOCs
99070234	30	7/9/99	VOCs
99070242	25	7/8/99	VOCs
99070243	29	7/9/99	VOCs
99070244	27	7/9/99	VOCs
99070259	23	7/10/99	VOCs
99070260	24	7/10/99	VOCs
99070261	24	7/10/99	VOCs
99070262	28	7/10/99	VOCs
99070263	28	7/10/99	VOCs
99070264	30	7/10/99	VOCs
99070311	22	7/13/99	VOCs
99070312	23	7/13/99	VOCs
99070313	24	7/13/99	VOCs
99070314	24	7/13/99	VOCs
99070315	25	7/13/99	VOCs

Table 2-13

AIR SAMPLING SUMMARY (7/8/99 TO 7/13/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Sample Date	Analysis
99070316	26	7/13/99	VOCs
99070317	27	7/13/99	VOCs
99070318	28	7/13/99	VOCs
99070319	28	7/13/99	VOCs
99070320	29	7/13/99	VOCs
99070321	30	7/13/99	VOCs

Key:

ID = Identification.
SVOCs = Semivolatile organic compounds.
VOCs = Volatile organic compounds.

Table 2-14

AIR SAMPLING SUMMARY (9/28/99 TO 10/5/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis
99090100	AS21	9/28/99	Metals
99090101	AS22	9/28/99	Metals
99090102	AS32	9/28/99	Metals
99090103	AS24	9/28/99	Metals
99090104	AS25	9/28/99	Metals
99090105	AS33	9/28/99	Metals
99090106	AS27	9/28/99	Metals
99090107	AS28	9/28/99	Metals
99090108	AS29	9/28/99	Metals
99090109	AS30	9/28/99	Metals
99090138	AS21	9/29/99	Metals
99090139	AS22	9/29/99	Metals
99090140	AS32	9/29/99	Metals
99090141	AS24	9/29/99	Metals
99090142	AS25	9/29/99	Metals
99090143	AS33	9/29/99	Metals
99090144	AS27	9/29/99	Metals
99090145	AS28	9/29/99	Metals
99090146	AS29	9/29/99	Metals
99090147	AS30	9/29/99	Metals
99090173	AS21	9/30/99	Metals
99090174	AS22	9/30/99	Metals
99090175	AS32	9/30/99	Metals
99090176	AS24	9/30/99	Metals
99090177	AS25	9/30/99	Metals
99090178	AS33	9/30/99	Metals
99090179	AS27	9/30/99	Metals
99090180	AS28	9/30/99	Metals
99090181	AS29	9/30/99	Metals
99090182	AS30	9/30/99	Metals
99090186	AS21	10/1/99	Metals
99090187	AS22	10/1/99	Metals
99090188	AS32	10/1/99	Metals
99090189	AS24	10/1/99	Metals
99090190	AS25	10/1/99	Metals
99090191	AS33	10/1/99	Metals
99090192	AS27	10/1/99	Metals
99090193	AS28	10/1/99	Metals
99090194	AS29	10/1/99	Metals
99090195	AS30	10/1/99	Metals
99090217	AS21	10/2/99	Metals
99090218	AS22	10/2/99	Metals
99090219	AS32	10/2/99	Metals
99090220	AS24	10/2/99	Metals
99090221	AS25	10/2/99	Metals
99090222	AS33	10/2/99	Metals
99090223	AS27	10/2/99	Metals
99090224	AS28	10/2/99	Metals

Table 2-14

AIR SAMPLING SUMMARY (9/28/99 TO 10/5/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis
99090225	AS29	10/2/99	Metals
99090226	AS30	10/2/99	Metals
99090230	AS21	10/3/99	Metals
99090231	AS22	10/3/99	Metals
99090232	AS32	10/3/99	Metals
99090233	AS24	10/3/99	Metals
99090234	AS25	10/3/99	Metals
99090235	AS33	10/3/99	Metals
99090236	AS27	10/3/99	Metals
99090237	AS28	10/3/99	Metals
99090238	AS29	10/3/99	Metals
99090239	AS30	10/3/99	Metals
99090113	AS21	9/28/99	Dioxins/SVOCs
99090114	AS22	9/28/99	Dioxins/SVOCs
99090115	AS32	9/28/99	Dioxins/SVOCs
99090116	AS24	9/28/99	Dioxins/SVOCs
99090117	AS25	9/28/99	Dioxins/SVOCs
99090118	AS33	9/28/99	Dioxins/SVOCs
99090119	AS27	9/28/99	Dioxins/SVOCs
99090120	AS28	9/28/99	Dioxins/SVOCs
99090121	AS29	9/28/99	Dioxins/SVOCs
99090122	AS30	9/28/99	Dioxins/SVOCs
99090148	AS21	9/30/99	Dioxins/SVOCs
99090149	AS22	9/30/99	Dioxins/SVOCs
99090150	AS32	9/30/99	Dioxins/SVOCs
99090151	AS24	9/30/99	Dioxins/SVOCs
99090152	AS25	9/30/99	Dioxins/SVOCs
99090153	AS33	9/30/99	Dioxins/SVOCs
99090154	AS27	9/30/99	Dioxins/SVOCs
99090155	AS28	9/30/99	Dioxins/SVOCs
99090156	AS29	9/30/99	Dioxins/SVOCs
99090157	AS30	9/30/99	Dioxins/SVOCs
99090240	AS21	10/2/99	Dioxins/SVOCs
99090241	AS22	10/2/99	Dioxins/SVOCs
99090242	AS32	10/2/99	Dioxins/SVOCs
99090243	AS24	10/2/99	Dioxins/SVOCs
99090244	AS25	10/2/99	Dioxins/SVOCs
99090245	AS33	10/2/99	Dioxins/SVOCs
99090246	AS27	10/2/99	Dioxins/SVOCs
99090247	AS28	10/2/99	Dioxins/SVOCs
99090248	AS29	10/2/99	Dioxins/SVOCs
99090249	AS30	10/2/99	Dioxins/SVOCs
99090126	AS21	9/27/99	VOCs
99090127	AS22	9/28/99	VOCs
99090128	AS32	9/28/99	VOCs
99090129	AS24	9/28/99	VOCs
99090130	AS24	9/28/99	VOCs
99090131	AS25	9/28/99	VOCs

Table 2-14

AIR SAMPLING SUMMARY (9/28/99 TO 10/5/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis
99090132	AS27	9/28/99	VOCs
99090133	AS28	9/28/99	VOCs
99090134	AS28	9/28/99	VOCs
99090135	AS29	9/28/99	VOCs
99090136	AS30	9/28/99	VOCs
99090137	AS21	9/28/99	VOCs
99090159	AS30	9/30/99	VOCs
99090160	AS22	9/29/99	VOCs
99090161	AS21	9/29/99	VOCs
99090162	AS21	9/30/99	VOCs
99090163	AS22	9/30/99	VOCs
99090164	AS32	9/30/99	VOCs
99090165	AS24	9/30/99	VOCs
99090166	AS24	9/30/99	VOCs
99090167	AS25	9/30/99	VOCs
99090168	AS27	9/30/99	VOCs
99090169	AS28	9/30/99	VOCs
99090170	AS28	9/30/99	VOCs
99090171	AS29	9/30/99	VOCs
99090172	AS30	9/30/99	VOCs
99090196	AS21	10/1/99	VOCs
99090197	AS22	10/1/99	VOCs
99090198	AS30	10/1/99	VOCs
99090199	AS21	10/2/99	VOCs
99090200	AS22	10/2/99	VOCs
99090201	AS32	10/2/99	VOCs
99090202	AS24	10/2/99	VOCs
99090203	AS24	10/2/99	VOCs
99090204	AS25	10/2/99	VOCs
99090206	AS28	10/2/99	VOCs
99090207	AS28	10/2/99	VOCs
99090208	AS29	10/2/99	VOCs
99090209	AS30	10/2/99	VOCs
99090210	AS27	10/2/99	VOCs
99090211	AS21	10/3/99	VOCs
99090212	AS22	10/3/99	VOCs
99090213	AS30	10/3/99	VOCs

Key:

ID = Identification.
SVOCs = Semivolatile organic compounds.
VOCs = Volatile organic compounds.

Table 2-15

AIR SAMPLING METEOROLOGICAL CONDITIONS (JULY 1999)
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Period	Prevailing Wind Direction (originating from)	Average Wind Speed (meters/second)	Maximum Wind Direction (originating from)	Maximum Wind Speed (meters/second)
7/7/99 (1100) to 7/8/99 (2200)	South-Southeast	2.1	South-Southwest	2.4
7/9/99 (0600) to 7/10/00 (2200)	South-Southwest	1.1	South-Southwest	2.5
7/12/00 (0700) to 7/13/00 (2000)	South-Southwest	1.7	South	3.3

Table 2-16

AIR SAMPLING METEOROLOGICAL CONDITIONS (SEPTEMBER/OCTOBER 1999)
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Period	Prevailing Wind Direction (originating from)	Average Wind Speed (meters/second)	Maximum Wind Direction (originating from)	Maximum Wind Speed (meters/second)
9/27/99 (0700) to 9/28/99 (2100)	Northeast	1.1	West	3.1
9/29/99 (0700) to 9/30/99 (2100)	Southwest	1.1	Southwest	2.3
10/1/99 (0700) to 10/2/99 (2100)	Northwest	2.2	Southeast	3.3

Table 2-17

AIR SAMPLE LOCATIONS AND TYPES
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Sample Identification	Location Description
July 8, 1999	AS21	Source
July 8, 1999	AS22	Source
July 8, 1999	AS23	Source
July 8, 1999	AS29	Downwind Perimeter
July 8, 1999	AS25	Downwind Perimeter
July 8, 1999	AS27	Downwind Residence
July 8, 1999	AS26	Downwind Residence
July 8, 1999	AS28	Upwind Perimeter
July 8, 1999	AS24	Upwind Perimeter
July 8, 1999	AS30	Background
July 11, 1999	AS21	Source
July 11, 1999	AS22	Source
July 11, 1999	AS23	Source
July 11, 1999	AS29	Downwind Perimeter
July 11, 1999	AS25	Downwind Perimeter
July 11, 1999	AS27	Downwind Residence
July 11, 1999	AS26	Downwind Residence
July 11, 1999	AS28	Upwind Perimeter
July 11, 1999	AS24	Upwind Perimeter
July 11, 1999	AS30	Background
July 13, 1999	AS21	Source
July 13, 1999	AS22	Source
July 13, 1999	AS23	Source
July 13, 1999	AS29	Downwind Perimeter
July 13, 1999	AS25	Downwind Perimeter
July 13, 1999	AS27	Downwind Residence
July 13, 1999	AS26	Downwind Residence
July 13, 1999	AS28	Upwind Perimeter
July 13, 1999	AS24	Upwind Perimeter
July 13, 1999	AS30	Background
September 28, 1999	AS21	Source

Table 2-17

AIR SAMPLE LOCATIONS AND TYPES
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Sample Identification	Location Description
September 28, 1999	AS22	Source
September 28, 1999	AS29	Downwind Perimeter
September 28, 1999	AS25	Downwind Perimeter
September 28, 1999	AS27	Downwind Residence
September 28, 1999	AS32	Downwind Residence
September 28, 1999	AS33	Downwind Residence
September 28, 1999	AS28	Upwind Perimeter
September 28, 1999	AS24	Upwind Perimeter
September 28, 1999	AS30	Background
September 30, 1999	AS21	Source
September 30, 1999	AS22	Source
September 30, 1999	AS29	Downwind Perimeter
September 30, 1999	AS25	Downwind Perimeter
September 30, 1999	AS27	Downwind Residence
September 30, 1999	AS32	Downwind Residence
September 30, 1999	AS33	Downwind Residence
September 30, 1999	AS28	Upwind Perimeter
September 30, 1999	AS24	Upwind Perimeter
September 30, 1999	AS30	Background
October 2, 1999	AS21	Source
October 2, 1999	AS22	Source
October 2, 1999	AS28	Downwind Perimeter
October 2, 1999	AS24	Downwind Perimeter
October 2, 1999	AS29	Upwind Perimeter
October 2, 1999	AS25	Upwind Perimeter
October 2, 1999	AS32	Upwind Residence
October 2, 1999	AS33	Upwind Residence
October 2, 1999	AS27	Upwind Residence
October 2, 1999	AS30	Background

Table 2-18

DESCRIPTION OF SURFACE WATER SAMPLING STATIONS FOR LITTLE SQUALICUM CREEK THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Station	Description
SW-1	Terminal pool of Little Squalicum Creek at Bellingham Bay Beach.
SW-2	In Little Squalicum Creek just downstream from Marine Drive Outfall.
SW-3	Tapped spring on hillside upstream from Marine Drive Outfall.
SW-4	In Little Squalicum Creek just upstream from Marine Drive Outfall.
SW-5	In Little Squalicum Creek 40 feet downstream from confluence of Oeser Outfall Tributary and the creek.
SW-6	In Little Squalicum Creek at Birchwood Outfall (Background No. 1).
SW-7	Pond closest to Bellingham Technical College (Background No. 2).
SW-8	Groundwater seep on north bank of Little Squalicum Creek.
SW-9	Tapped spring on hillside downstream from Marine Drive Bridge.

Table 2-19

SURFACE WATER SAMPLING SUMMARY (7/26/99 TO 7/27/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis						
99314150	SW-1	7/26/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314151	SW-2	7/26/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314152	SW-3	7/26/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314153	SW-4	7/26/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314154	SW-5	7/27/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314155	SW-6	7/27/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314157	SW-7	7/27/99	VPH	EPH	SVOC	Dioxin	Metals	VOC	WQ
99314158	SW-8	7/27/99			SVOC	Dioxin			

Key:

EPH = Extractable petroleum hydrocarbons.
ID = Identification.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.
VPH = Volatile petroleum hydrocarbons.
WQ = Water quality.

Table 2-20

SURFACE WATER SAMPLING SUMMARY (12/6/99 TO 12/11/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis							
99504000	SW-1	12/6/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504001	SW-1	12/6/99						Dissolved Metals		
99504002	SW-9	12/6/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504003	SW-9	12/6/99						Dissolved Metals		
99504004	SW-2	12/6/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504005	SW-2	12/6/99						Dissolved Metals		
99504006	SW-4	12/6/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504007	SW-4	12/6/99						Dissolved Metals		
99504008	SW-3	12/6/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504009	SW-3	12/6/99						Dissolved Metals		
99504856	SW-8	12/11/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504857	SW-8	12/11/99						Dissolved Metals		
99504858	SW-5	12/11/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504859	SW-5	12/11/99						Dissolved Metals		
99504860	SW-6	12/11/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504861	SW-6	12/11/99						Dissolved Metals		
99504862	SW-7	12/11/99	VPH	EPH	SVOC	Dioxin	Total Metals		VOC	WQ
99504863	SW-7	12/11/99						Dissolved Metals		

Key:

EPH = Extractable petroleum hydrocarbons.
ID = Identification.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.
VPH = Volatile petroleum hydrocarbons.
WQ = Water quality.

Table 2-21

DESCRIPTION OF SEDIMENT SAMPLING STATIONS FOR LITTLE SQUALICUM CREEK THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Station	Description
SD-1	Terminal pool of Little Squalicum Creek at Bellingham Bay Beach.
SD-2 to SD-4	Between terminal pool and Marine Drive Bridge.
SD-5 to SD-8	Upstream from Marine Drive Bridge and downstream from Birchwood Outfall.
SD-9	Birchwood Outfall (Background No. 1).
SD-10	Oeser Outfall tributary channel.
SD-11	Pond closest to Bellingham Technical College (Background No. 2).

Table 2-22

SEDIMENT SAMPLING SUMMARY (7/28/99 TO 7/29/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Analysis								
99070520	SD-01	7/28/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070521	SD-02	7/28/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	BIO-ACC
99070522	SD-03	7/28/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070523	SD-04	7/28/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070524	SD-05	7/28/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	BIO-ACC
99070525	SD-06	7/29/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	BIO-ACC
99070526	SD-07	7/29/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070527	SD-08	7/29/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070528	SD-09	7/29/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070529	SD-10	7/29/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	SED-TOX	NA
99070530	SD-11	7/29/99	EPH	TOC	GS	SVOC	Metals	Dioxin	AVS/SEM	NA	NA

Key:

AVS/SEM = Acid volatile sulfide/simultaneously extracted metals.
BIO-ACC = Bioaccumulation.
EPH = Extractable petroleum hydrocarbons.
GS = Grain size.
ID = Identification.
NA = Not analyzed.
SED-TOX = Sediment toxicity.
SVOC = Semivolatile organic compound.
TOC = Total organic carbon.

Table 2-23

BERRY SAMPLING SUMMARY (8/20/99 TO 8/21/99)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Location	Date	Matrix	Analysis		
99080024	BERRY-4 washed	8/20/99	Berry	VOC	SVOC	Dioxin
99080025	BERRY-4 unwashed	8/20/99	Berry	VOC	SVOC	Dioxin
99080026	BERRY-3 unwashed	8/21/99	Berry	VOC	SVOC	Dioxin
99080027	BERRY-3 washed	8/21/99	Berry	VOC	SVOC	Dioxin
99080032	BERRY-2 washed	8/21/99	Berry	VOC	SVOC	Dioxin
99080033	BERRY-2 unwashed	8/21/99	Berry	VOC	SVOC	Dioxin
99080034	BERRY-1 washed	8/21/99	Berry	VOC	SVOC	Dioxin
99080035	BERRY-1 unwashed	8/21/99	Berry	VOC	SVOC	Dioxin

Key:

ID = Identification.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Table 2-24

TRIP BLANK SUMMARY
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Frequency of Detection	Maximum Concentration Detected (µg/L)	EPA Risk-Based Screening Level for Tap Water (µg/L)
1,2-Dichloroethane	Found only in the blank, not detected in any samples.		
Benzene	1/22	0.0078	0.41
Ethyl Benzene	1/22	0.056	150
m&p-Xylene	1/22	0.22	140
Naphthalene	1/22	1.0	6.2
o-Xylene	1/22	0.057	140
Tetrachloroethene	3/22	0.013 J	1.1

Key:

EPA = United States Environmental Protection Agency.
J = Estimated concentration.
µg/L = Micrograms per liter.

Table 2-25

FIELD BLANK SUMMARY
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Frequency of Detection	Maximum Concentration Detected (µg/cubic meter)	EPA Risk-Based Screening Level for Ambient Air (µg/cubic meter)
2-Methylnaphthalene	5/6	0.000002	NA
Acenaphthene	5/6	0.0000001	22
Acenaphthylene	3/6	0.00000006	NA
Anthracene	3/6	0.00000008	110
Benzo(a)anthracene	2/6	0.00000002	0.022
Benzo(b)fluoranthene	1/6	0.00000002	0.022
Chrysene	2/6	0.00000002	2.2
Fluoranthene	5/6	0.00000004	15
Fluorene	5/6	0.0000002	15
Naphthalene	6/6	0.000004	0.31
2,3,7,8-TCDD TEQ	4/6	0.00000000004	0.000000045
Phenanthrene	4/6	0.0000002	NA
Pyrene	3/6	0.00000003	11
Toluene	1/6	0.077 J	40

Key:

EPA = United States Environmental Protection Agency.
J = Estimated concentration.
µg = Microgram.
NA = Not available.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.

Table 2-26

RINSATE BLANK SUMMARY
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Frequency of Detection	Maximum Concentration Detected (µg/L)	EPA Risk-Based Screening Level for Residential Soil (µg/kg)
2,4-Dinitrotoluene	1/4	0.012 J	12,000
2-Methylnaphthalene	4/4	0.016	NA
4-Chloro-3-methylphenol	2/4	0.011 J	NA
Acenaphthene	2/4	0.0068	370,000
Acenphthylene	1/4	0.0067	NA
Benzoic acid	1/4	0.037 J	100,000,000
Naphthalene	4/4	0.17	5,600
Pentachlorophenol	2/4	0.016 J	3,000
Phenanthrene	4/4	0.009	NA
Phenol	2/4	0.025	3,700,000
Pyrene	4/4	0.0068	230,000

Key:

EPA = United States Environmental Protection Agency.
J = Estimated concentration.
µg/kg = Micrograms per kilogram.
µg/L = Micrograms per liter.
NA = Not available.

Figure 2-1

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Cone Penetrometer
Laser-Induced Fluorescence
Rapid Optical Screening Tool
(CPT-LIF-ROST)
Sample Locations

CEDARWO

Legend

- The Oeser Company Facility
- CPT/LIF/ROST Sample Location
- 50-Foot Grid Lines

N
W E
S

0 100 200 300
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

ecology and environment, inc.
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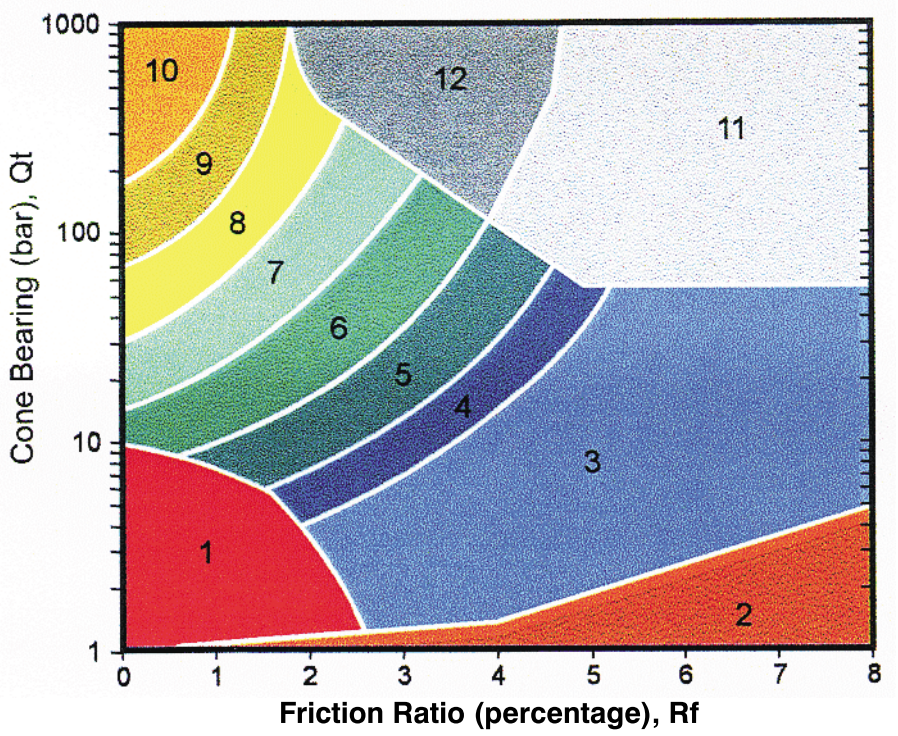
Seattle, Washington

/data1/oeser/rifs/fig2-1.aml

CPT Classification Chart

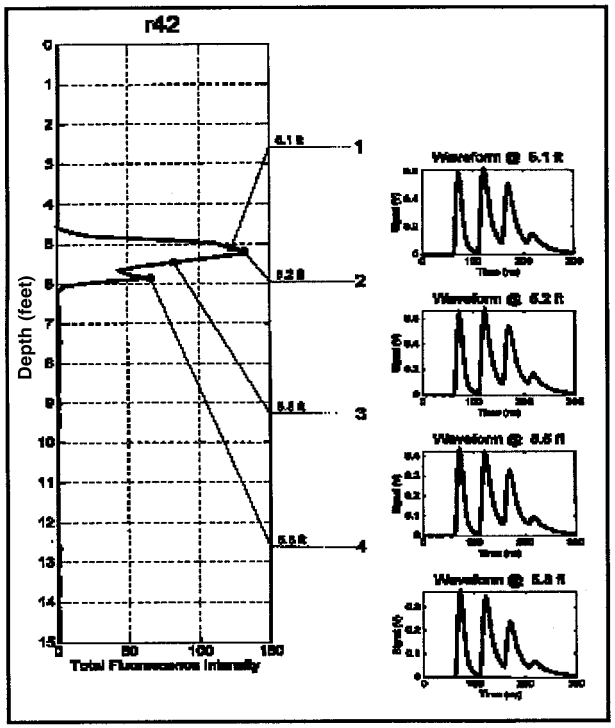
(Robertson and Campanella 1988)



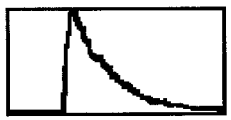
Zone	Q_t / N	Soil Behaviour Type
1	2	sensitive fine grained
2	1	organic material
3	1	clay
4	1.5	silty clay to clay
5	2	clayey silt to silty clay
6	2.5	sandy silt to clayey silt
7	3	silty sand to sandy silt
8	4	sand to silty sand
9	5	sand
10	6	gravelly sand to sand
11	1	very stiff fine grained *
12	2	sand to clayey sand *

* overconsolidated or cemented

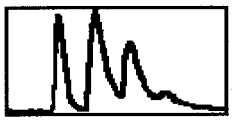
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	THE OESER COMPANY SUPERFUND SITE REMEDIAL INVESTIGATION Bellingham, Washington	Figure 2-2 CONE PENETROMETER (CPT) SOIL CLASSIFICATION CHART				
	Source: Gregg In Situ, Inc.	DATE: 11-20-00	TDD NO. 09-00-09-0001	PAN NO. 0566OCSTT0	Dwg. No. 0566 2-2	Pubs No. S567



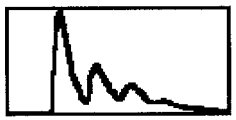
Example Product Waveforms



Jet Fuel



Diesel



Gasoline

Creosote

CPT-LIF-ROST Waveform Log

ROST™ Waveform Log

Waveforms are spectral signatures of the encountered contaminant and can be viewed at any depth on the Fluorescence Versus Depth log.

Four peaks are presented on each waveform and represent, from left to right, fluorescence intensity measured at each of the four monitored wavelengths: 340, 390, 440, and 490 nanometers.

The shape of the waveform can be compared with those from common petroleum products to identify and differentiate encountered contaminants.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	THE OESER COMPANY SUPERFUND SITE REMEDIAL INVESTIGATION Bellingham, Washington	Figure 2-3 (CPT-LIF-ROST) WAVEFORM LOG EXAMPLES				
	Source: Fugro, Inc.	Date 11/17/00	TDD No. 09-00-09-0001	Pan No. 0566OCSTT0	Dwg. No. 0566 2-3	Pubs. No. S567

Figure 2-4

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

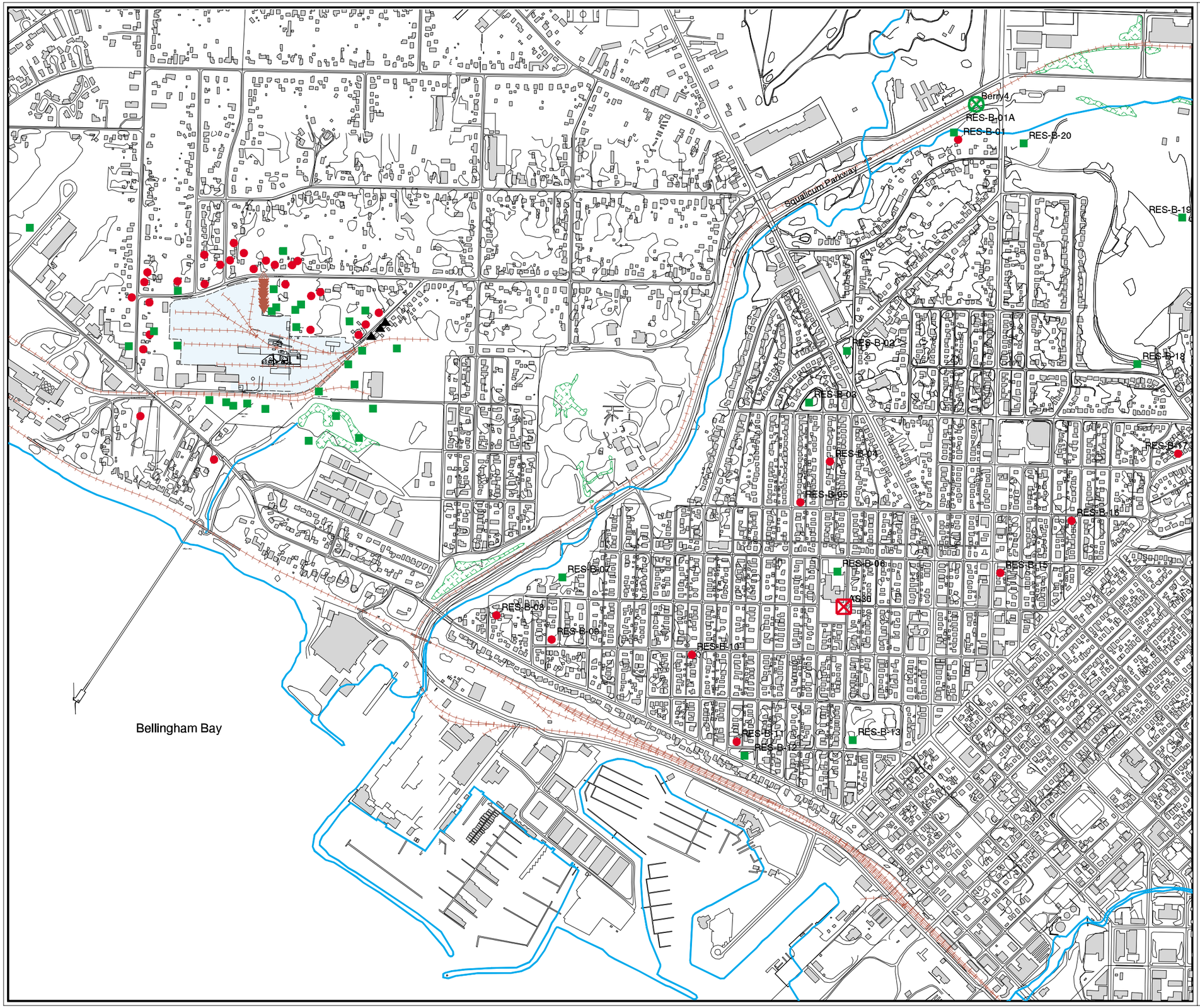
Remedial Investigation

Off-Facility Residential

and Background Surface

Soil Sampling Locations

May 24 - June 3, 1999



Legend

- The Oeser Company Facility
- Wetlands
- Composite Residential Home Sample Location
- Discrete Open Area Sample Location
- Composite Road Border Sample Location
- Composite (A+B+C) Old Drainage Path Sample Location
- Background Blackberry Sample Collection Location
- Background Air Sample Collection Location

N
W E
S

0 500 1000 1500

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/off-fac-res-bkg-surf.aml

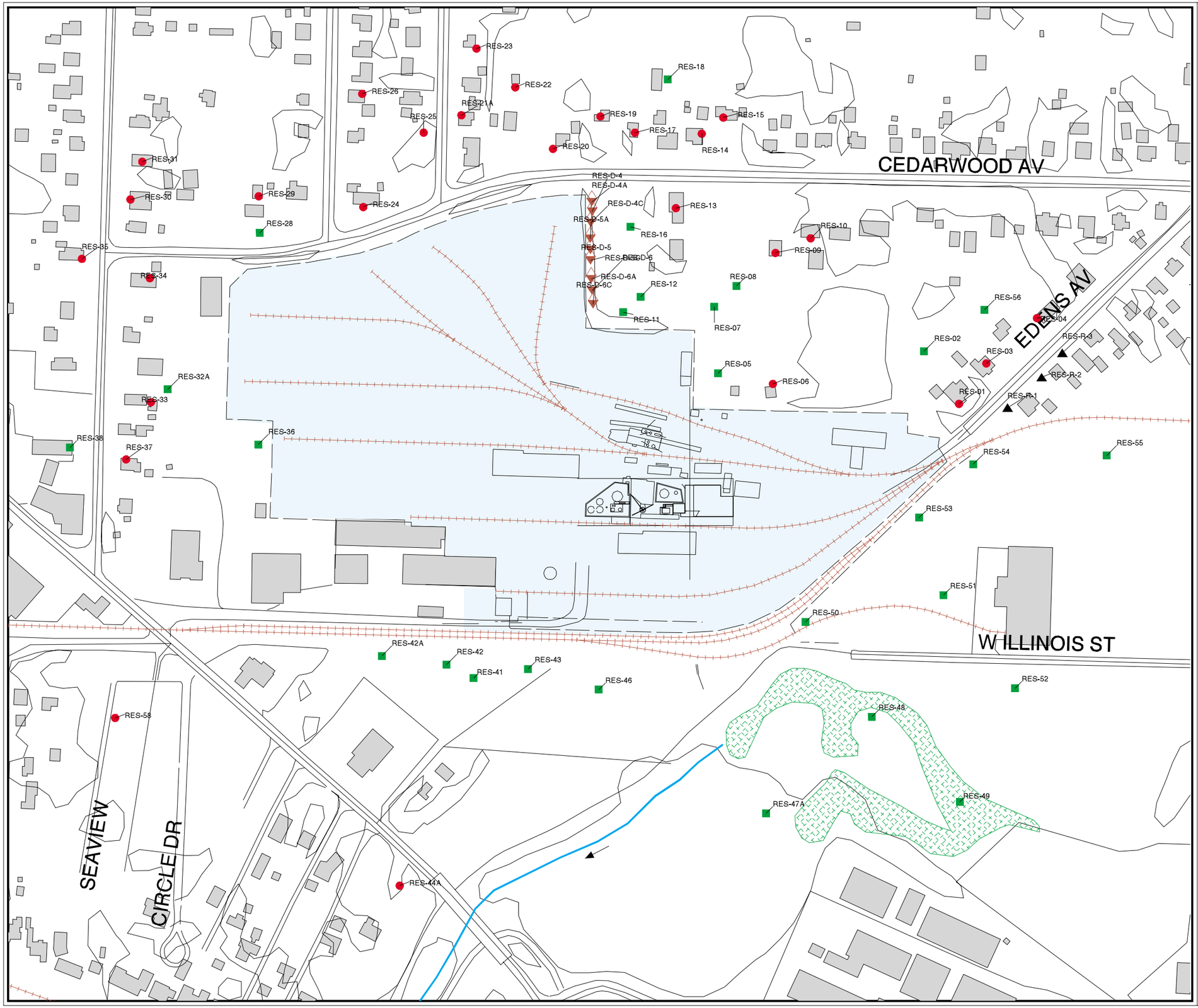
Figure 2-5

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Off-Facility Residential Surface Soil Sampling Locations
May 24 - June 3, 1999



Legend

- The Oeser Company Facility
- Wetlands
- Composite Residential Home Sample Location
- Discrete Open Area Sample Location
- Composite Road Border Sample Location
- Composite (A+B+C) Old Drainage Path Sample Location
- Flow Direction

N
W E
S

0 150 300 450 600
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/fig2-5.aml

Figure 2-6

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Borings and Wells
(Including Borings Converted to Wells)

CEDARWOOD AV

EDENS AV

W ILLINOIS ST

SEAVIEW CIRCLE DR

B-B13 B-B16 B-D7 B-F3 B-F16 MW30-D B-J2 B-J20 B-L17 MW28-S B-M20 B-L19 MW36-S B-L25 B-L30 MW31-S B-N3 B-O7 B-O13 MW29-S MW32-S B-Q20 B-Q27 B-Q26 MW34-D B-R18 B-R28 MW36-D MW35-S B-U19 MW33-D MW33-S B-AA2 B-AA4 B-AA6 B-BB3 B-BB6 MWLSC03 MWLSC04 MWLSC02 MWLSC01

Legend

- The Oeser Company Facility
- Wetlands
- Soil Boring Location
- Shallow Monitoring Well Location
- Deep Monitoring Well Location
- Flow Direction

N W E S

0 150 300 450 600

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/fig2-6.aml

Figure 2-7

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Little Squalicum Creek and South Slope
Surface Soil
Sample Location Map

Legend

- The Oeser Company Facility
- Wetlands
- Surface Soil Field Screening Location
- Suspected Spoils Field Screening Location
- Suspected Spoils Laboratory Sample Location
- Surface Soil Laboratory Sample Location
- Trench Sample Location
- Outfall Location
- Seep Location
- Tapped Spring Location

N
W E
S

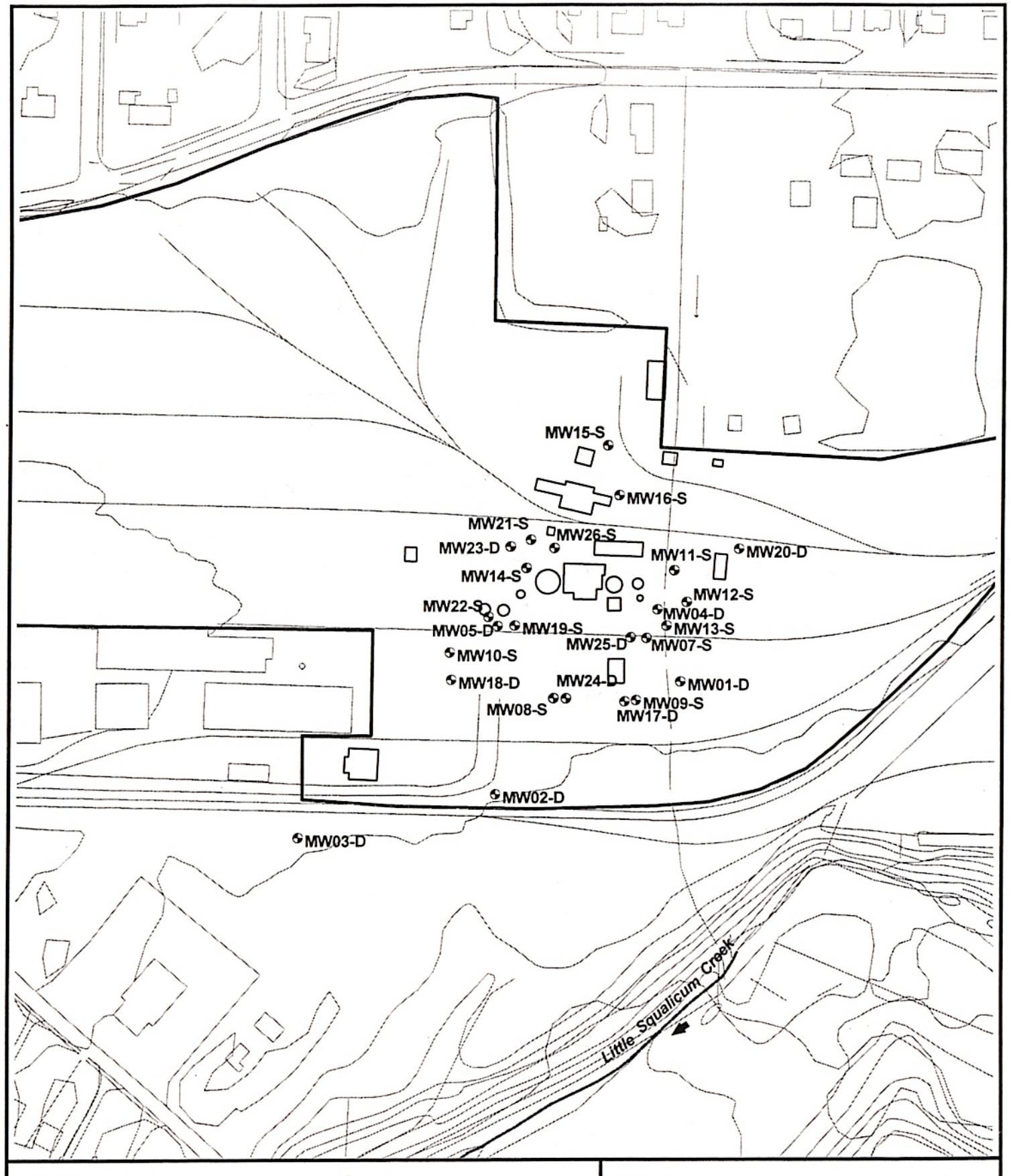
0 100 200 300 400 500
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/fig2-7.aml



KEY:

MW03-D Pre-Existing Monitoring Well

Flow Direction

RI = Remedial Investigation

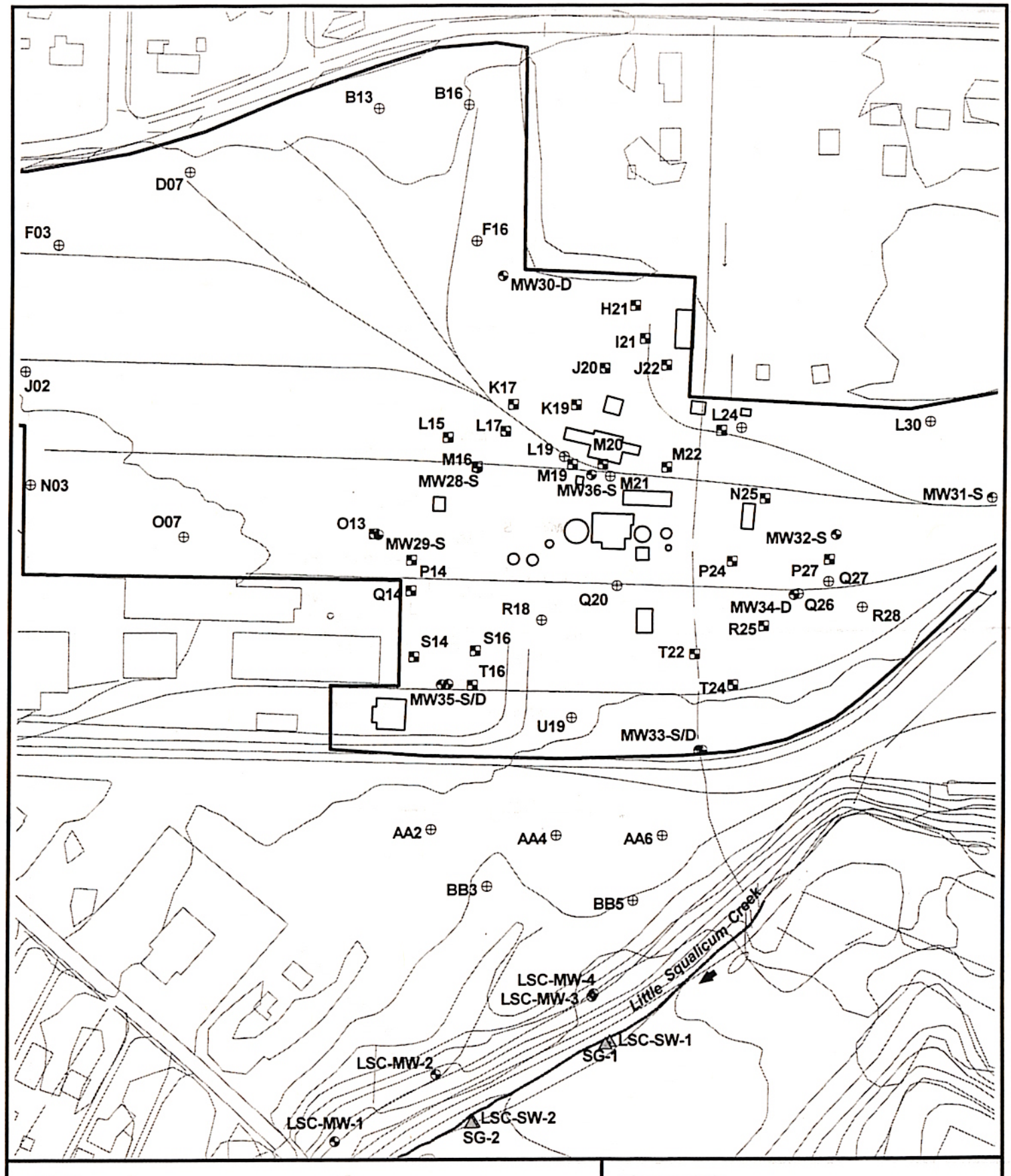
N

100 0 100 Feet

Figure 2-8
Pre-RI Monitoring Wells

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

- RI Well
- RI Boring
- RI Piezometer
- Stage Gage - Stilling Well
- Flow Direction

RI = Remedial Investigation

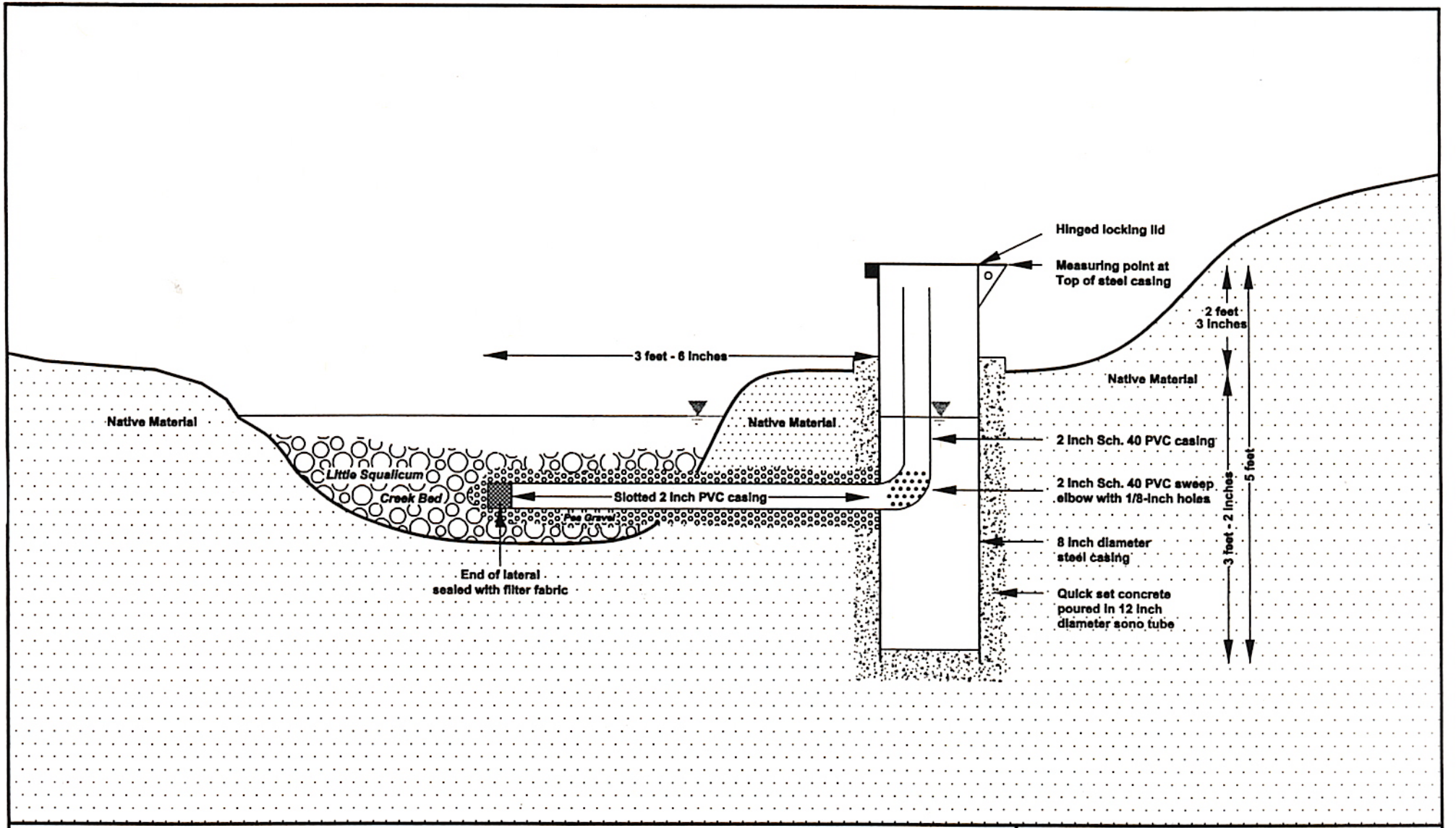
N

100 0 100 Feet

Figure 2-9
RI Monitoring Wells, Piezometers, Borings, and Stage Gages

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY

PVC = Polyvinyl Chloride

Not to Scale

Figure 2-10
Stilling Well Schematic

The Oeser Company
Remedial Investigation

JE9803, LSC-SW-schem.DWG, 6/2000

Pacific Groundwater Group

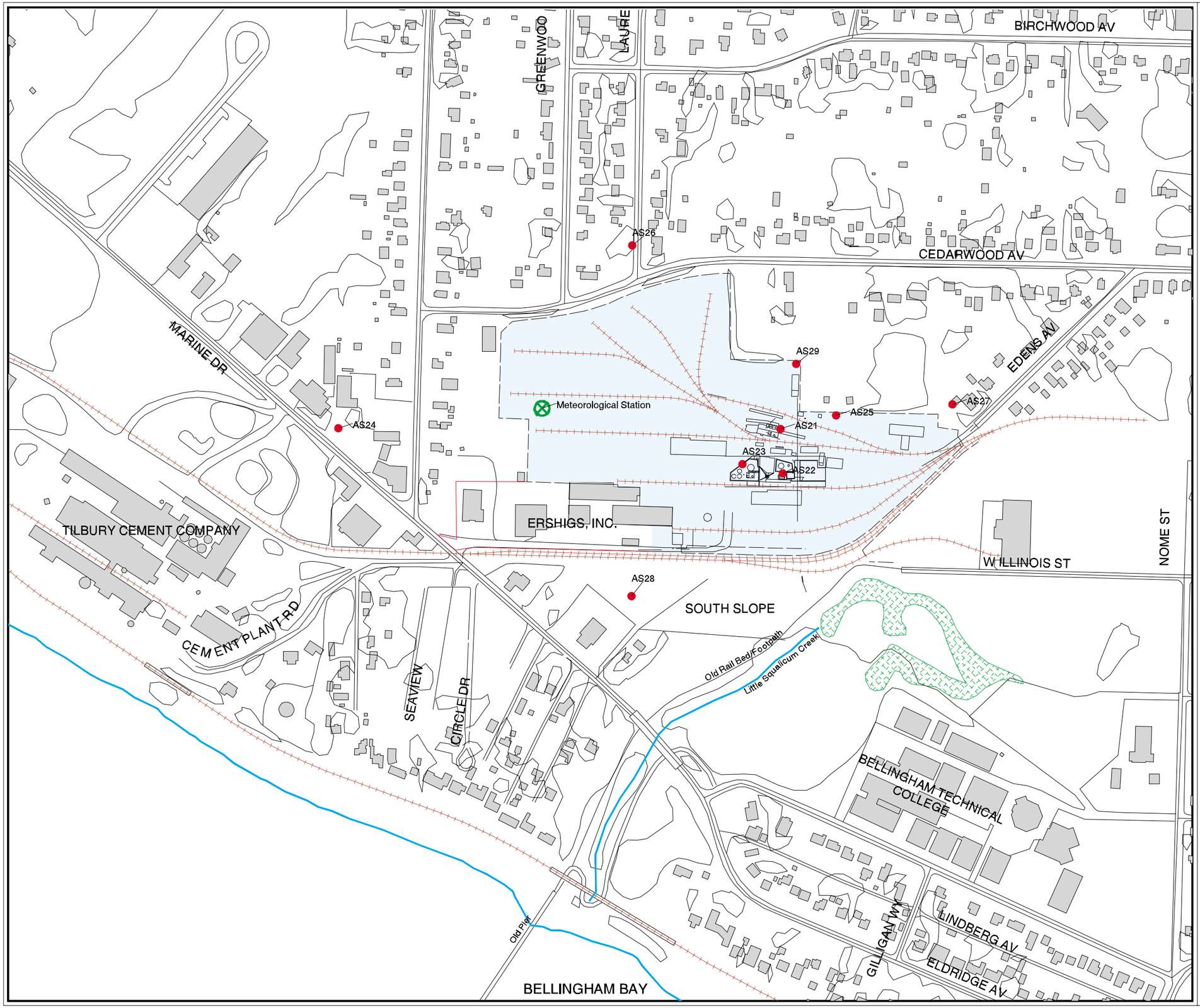


Figure 2-11

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Air Sampling Location Map
7/7/99 to 7/13/99

Legend

- The Oeser Company Facility
- Wetlands
- Air Sample Location
- Shoreline and Waterways

N
W E
S

0 250 500 750 1000
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/fig2-11.aml

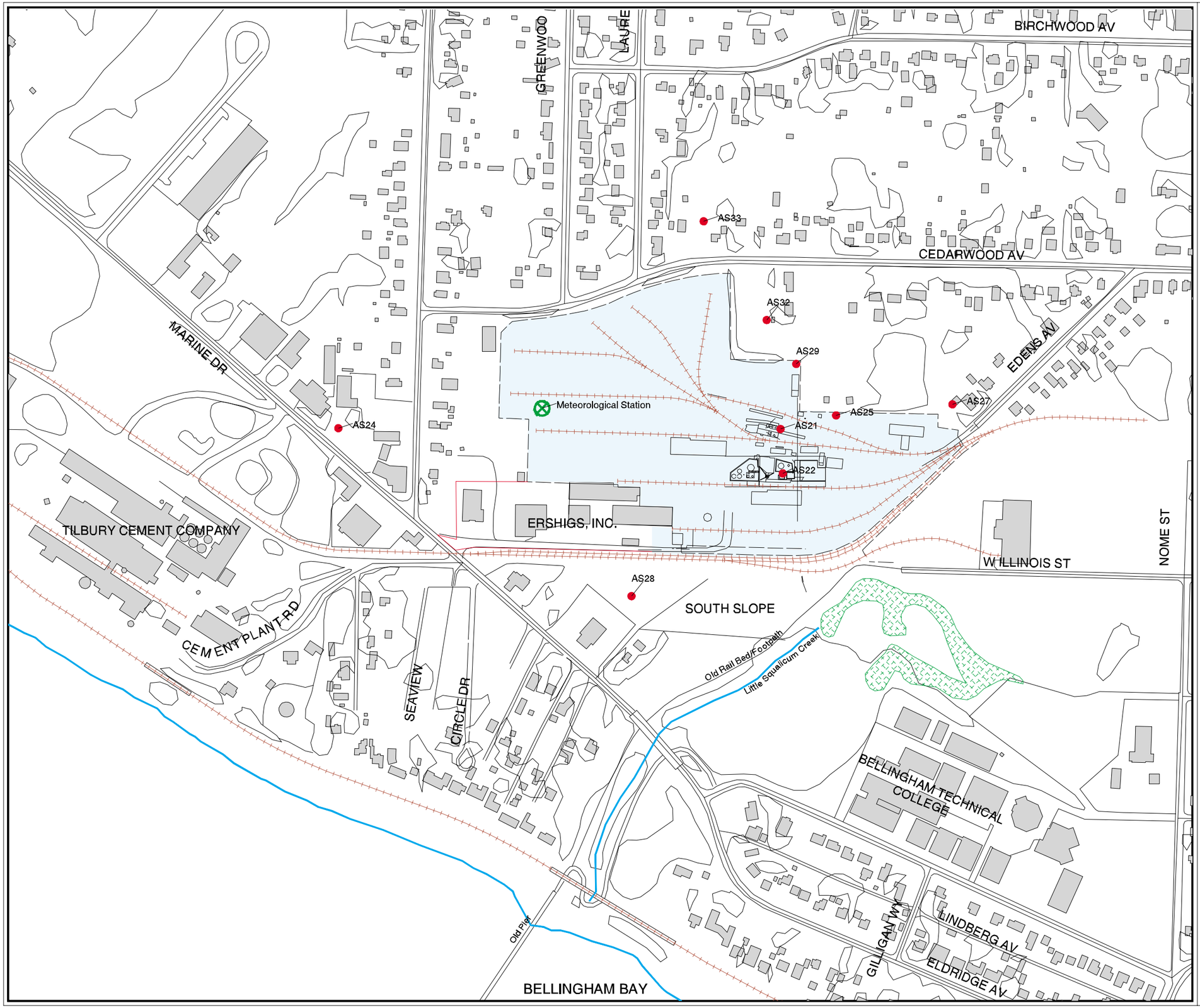


Figure 2-12

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Air Sampling Location Map
9/23/99 to 10/2/99

Legend

- The Oeser Company Facility
- Wetlands
- Air Sample Location
- Shoreline and Waterways

N
W E
S

0 250 500 750 1000
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

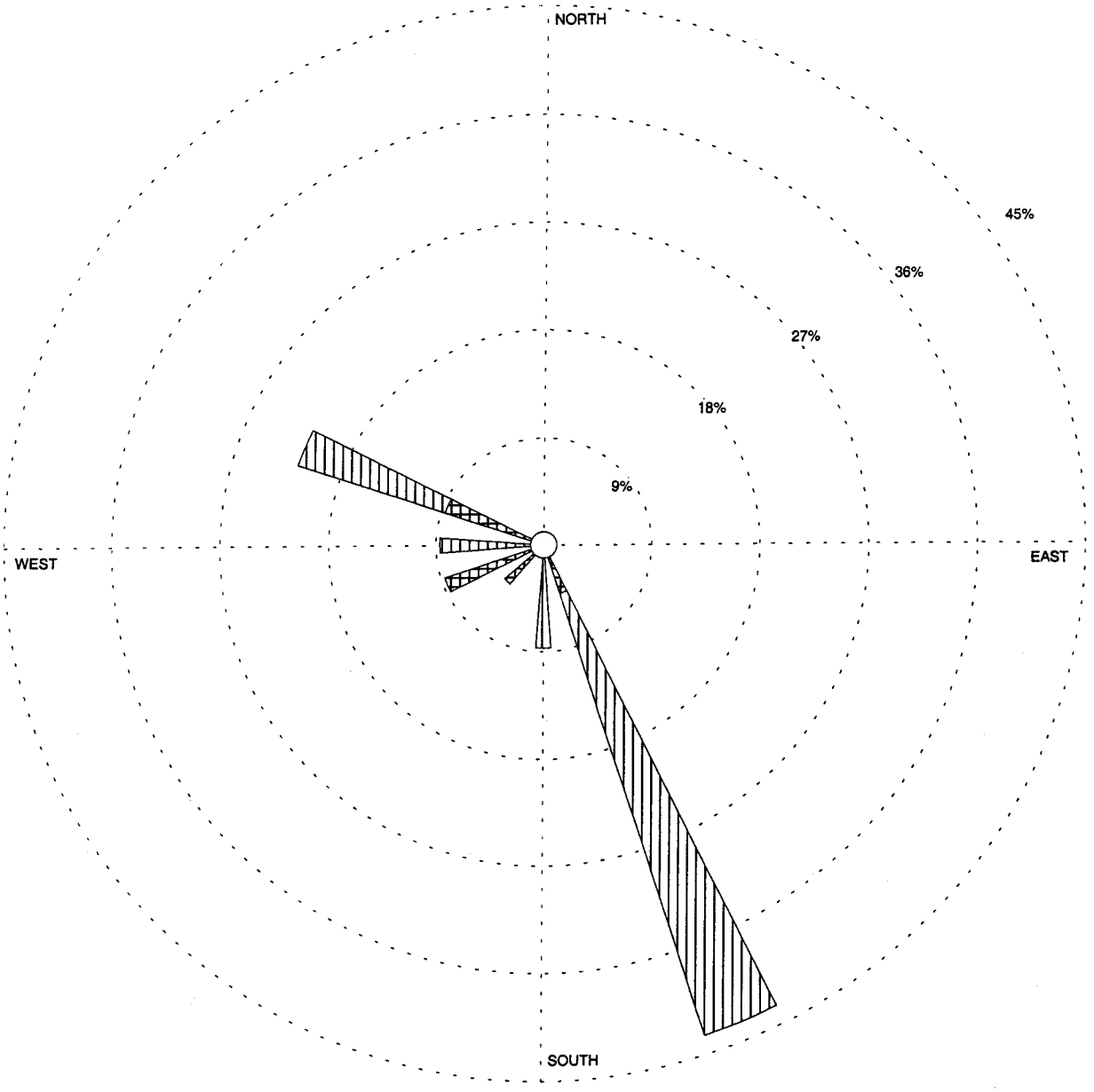
Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/fig2-12.aml

WIND ROSE PLOT

Oeser Site, Bellingham, WA

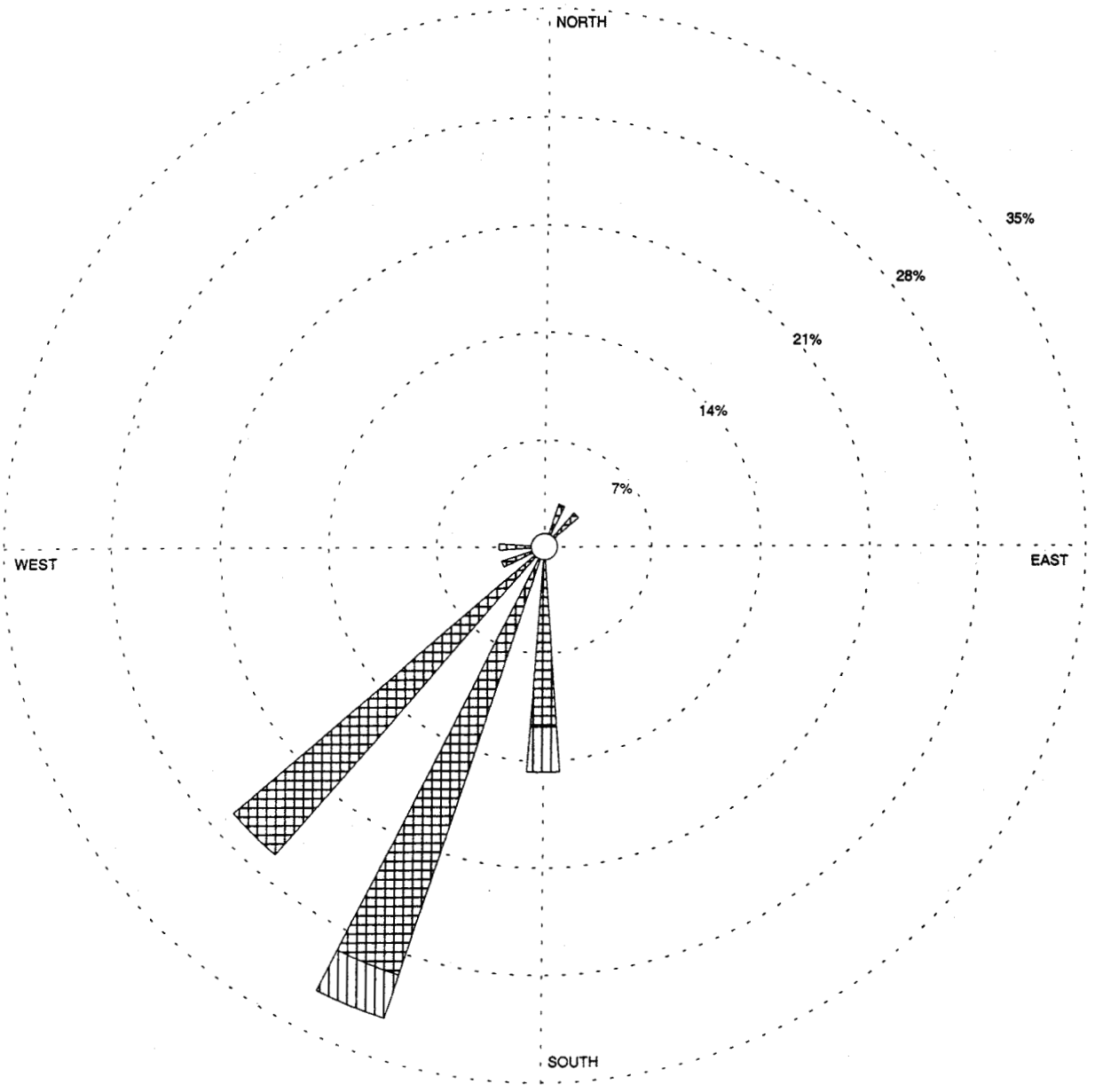


Wind Speed (m/s) > 10.8 8.8-10.8 5.7- 8.8 3.6- 5.7 2.1- 3.6 0.5- 2.1	MODELER **HJB**	DATE **4/15/00**	COMPANY NAME ecology and environment, inc. International Specialists in the Environment
	DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS **m/s = meters/second** **m/s = 2.237 miles/hour** **Maximum wind speed =2.4 m/s at 199 degrees.**
	AVG. WIND SPEED **2.10 m/s**	CALM WINDS **4.35%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **99** **July 7 - July 8** **11 AM - 10 PM**	**Figure 2-13** **Wind Rose Plot (7/7/99 to 7/8/99)**

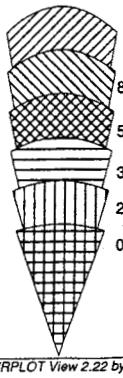
WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Oeser Site, Bellingham, WA



Wind Speed (m/s)

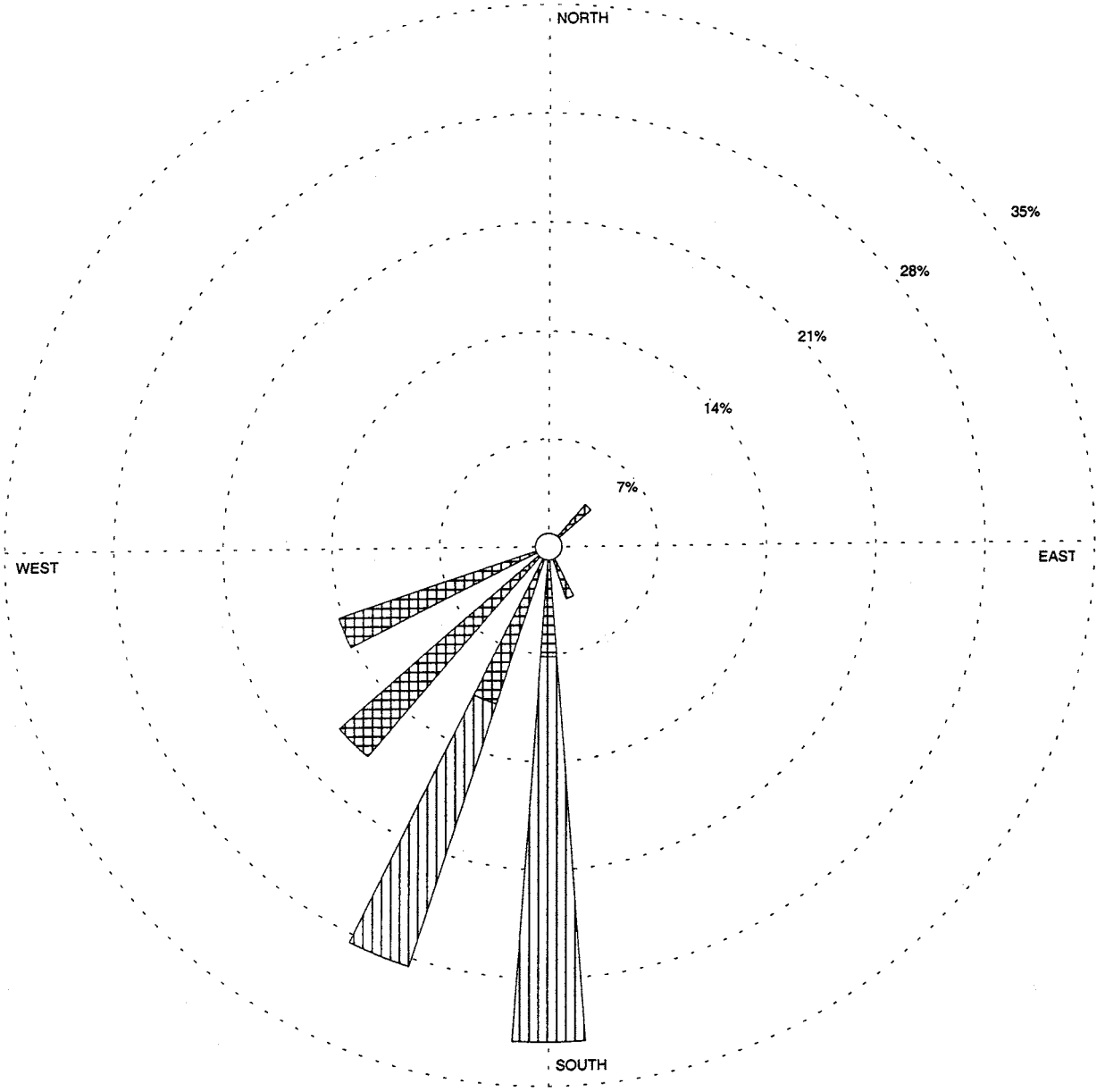


MODELER **HJB**	DATE **4/15/00**	COMPANY NAME ecology and environment, inc. International Specialists in the Environment	
DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS **m/s = meters/second** **m/s = 2.237 miles/hour** **Maximum wind speed =2.5 m/s at 198 degrees.**	
AVG. WIND SPEED **1.14 m/s**	CALM WINDS **14.71%**		
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **99** **July 9 - July 10** **6 AM - 10 PM**	**Figure 2-14** **Wind Rose Plot (7/9/99 to 7/10/99)**	

WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Oeser Site, Bellingham, WA

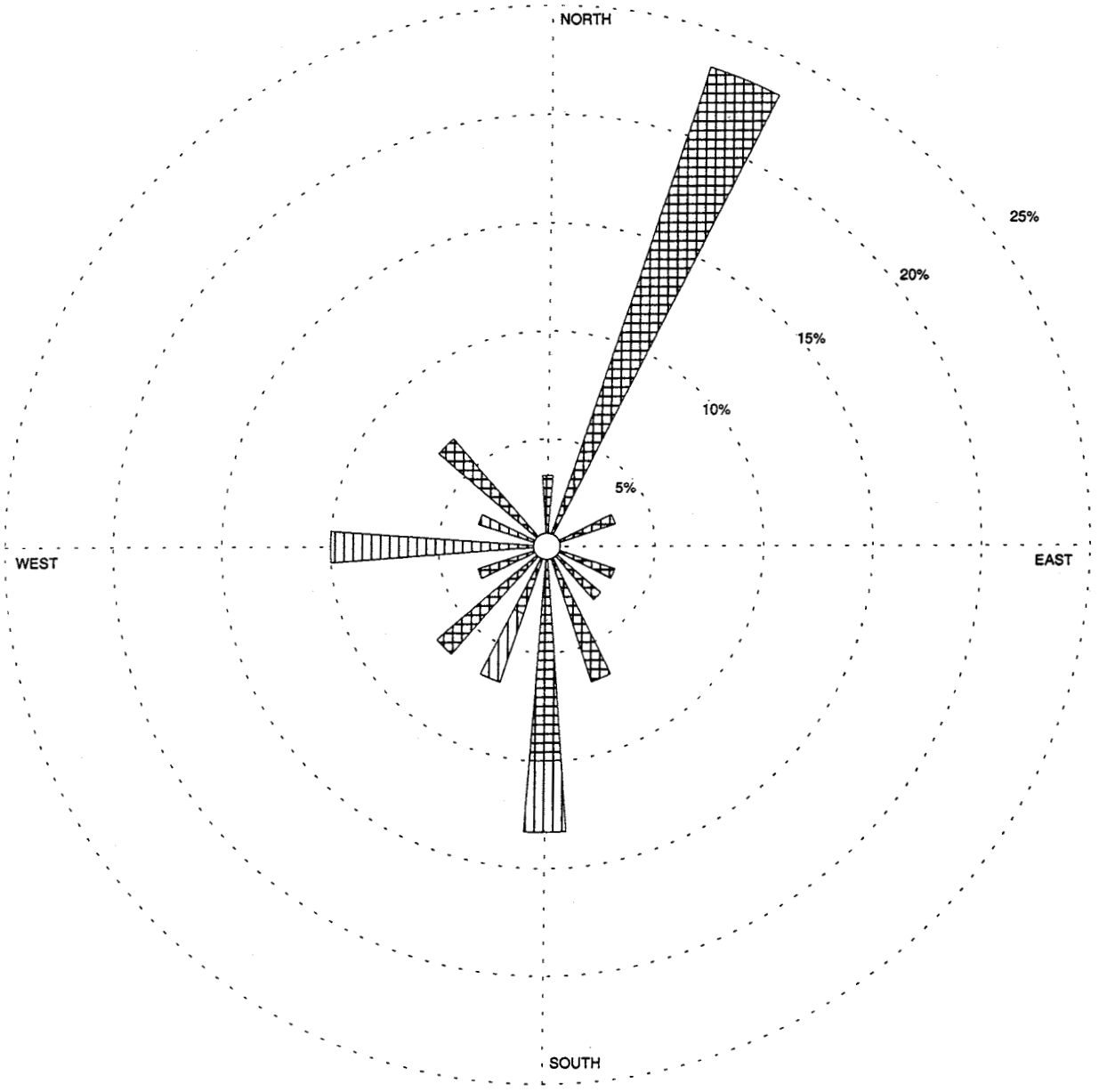


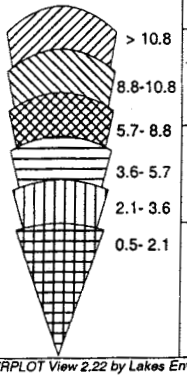
Wind Speed (m/s) > 10.8 8.8-10.8 5.7- 8.8 3.6- 5.7 2.1- 3.6 0.5- 2.1	MODELER **HJB**	DATE **4/15/00**	COMPANY NAME ecology and environment, inc. International Specialists in the Environment
	DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS **m/s = meters/second** **m/s = 2.237 miles/hour** **Maximum wind speed = 3.3 m/s at 180 degrees.**
	AVG. WIND SPEED **1.67 m/s**	CALM WINDS **0.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **99** **July 12 - July 13** **7 AM - 8 PM**	**Figure 2-15** **Wind Rose Plot (7/12/99 to 7/13/99)**

WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Oeser Site, Bellingham, WA



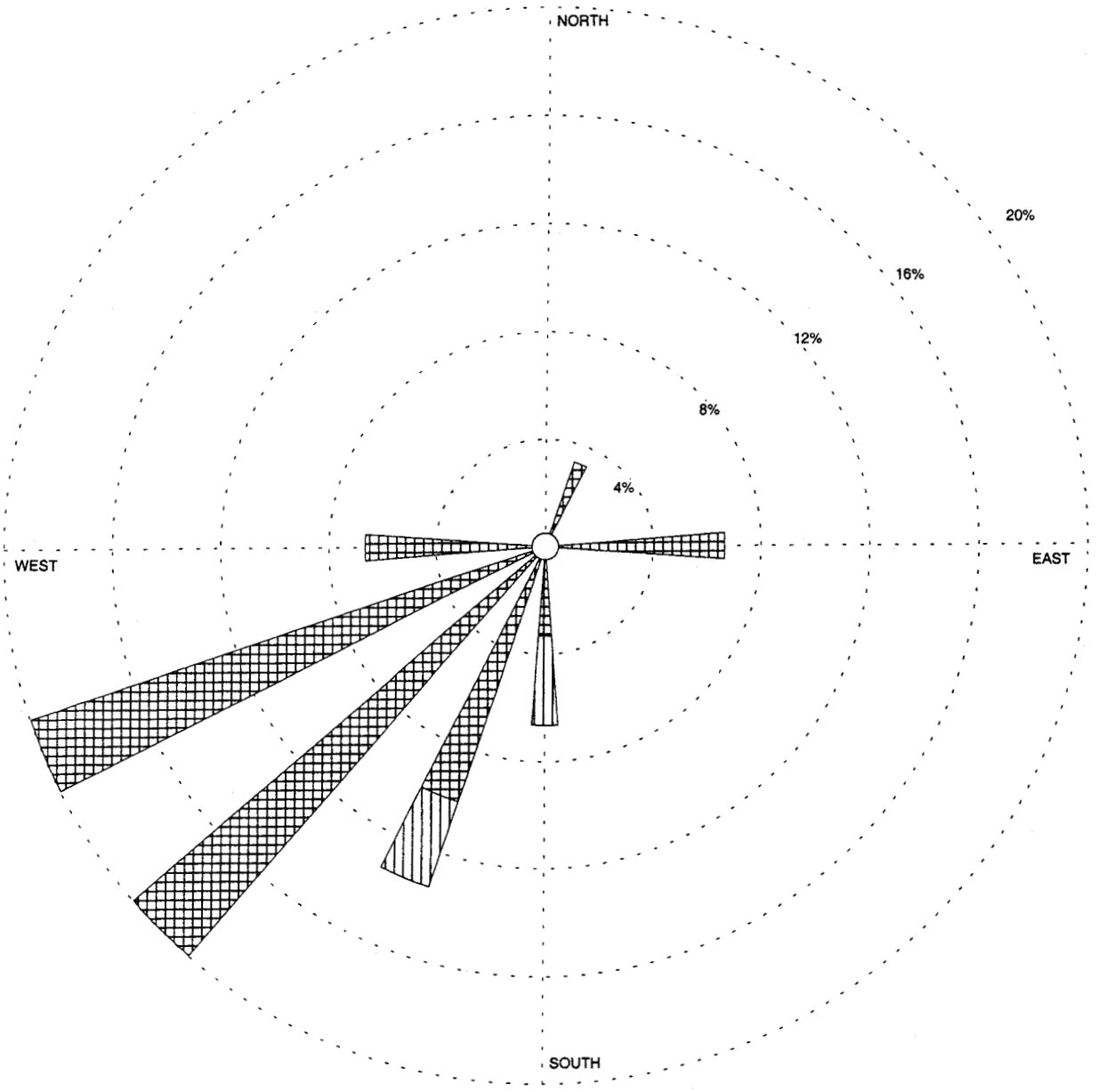


MODELER **HJB**	DATE **4/15/00**	COMPANY NAME ecology and environment, inc. International Specialists in the Environment	
DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS **m/s = meters/second** **m/s = 2.237 miles/hour** **Maximum wind speed =3.1 m/s at 292 degrees.**	
AVG. WIND SPEED **1.08 m/s**	CALM WINDS **6.67%**		
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **99** **September 27 - September 28** **7 AM - 9 PM**	**Figure 2-16** **Wind Rose Plot (9/27/99 to 9/28/99)**	

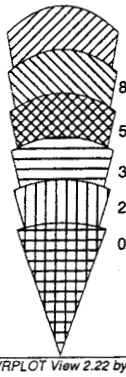
WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Oeser Site, Bellingham, WA



Wind Speed (m/s)

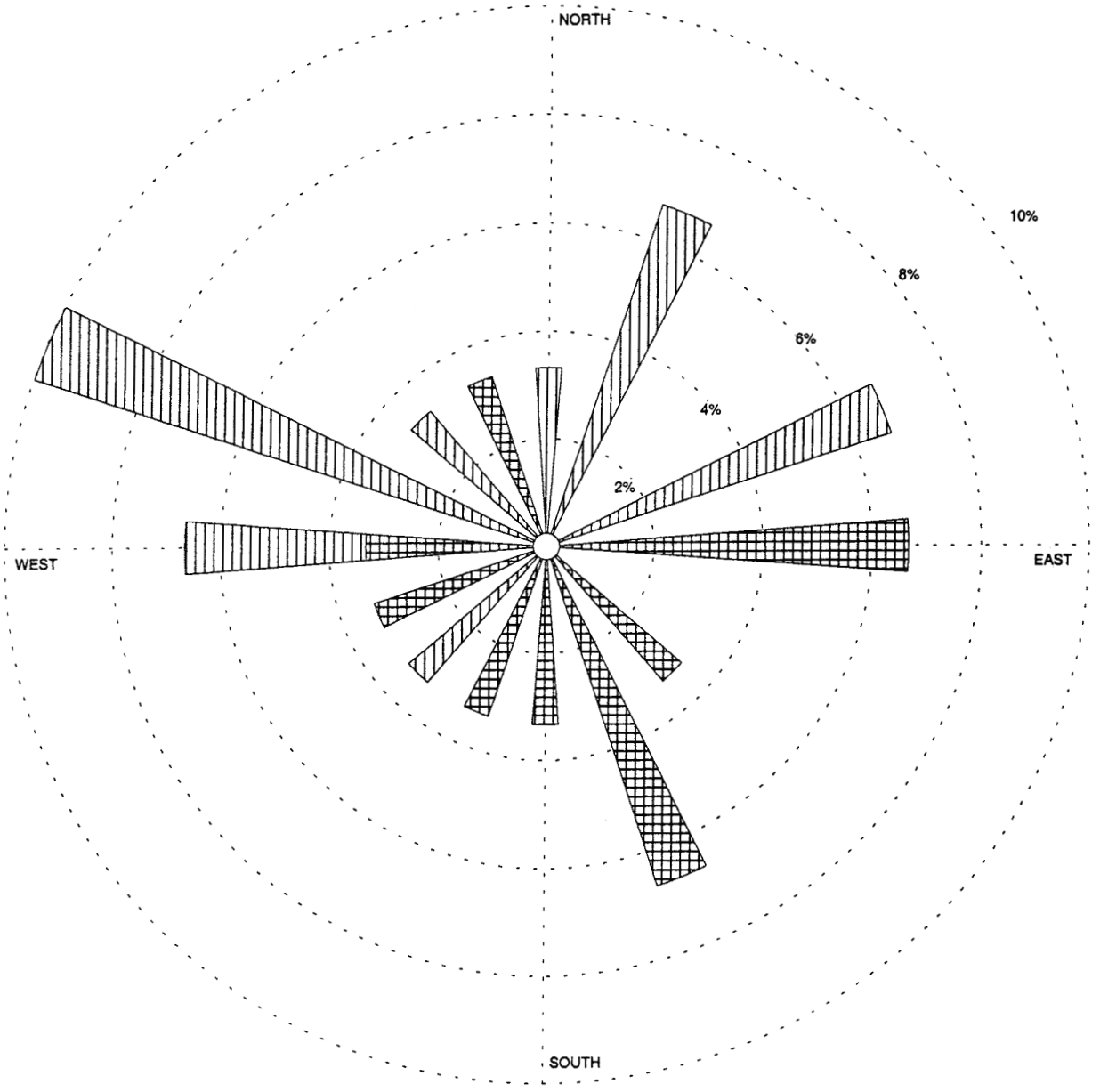


MODELER **HJB**	DATE **4/15/00**	COMPANY NAME ecology and environment, inc. International Specialists in the Environment	
DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS **m/s = meters/second** **m/s = 2.237 miles/hour** **Maximum wind speed =2.3 m/s at 194 degrees.**	
AVG. WIND SPEED **1.05 m/s**	CALM WINDS **23.33%**		
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **99** **September 29 - September 30** **7 AM - 9 PM**	**Figure 2-17** **Wind Rose Plot (9/29/99 to 9/30/99)**	

WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

WIND ROSE PLOT

Oeser Site, Bellingham, WA



Wind Speed (m/s) > 10.8 8.8-10.8 5.7- 8.8 3.6- 5.7 2.1- 3.6 0.5- 2.1	MODELER **HJB**	DATE **4/15/00**	COMPANY NAME ecology and environment, inc. International Specialists in the Environment
	DISPLAY **Wind Speed**	UNIT **m/s**	COMMENTS **m/s = meters/second** **m/s = 2.237 miles/hour** **Maximum wind speed =3.5 m/s at 14.2 degrees.**
	AVG. WIND SPEED **1.71 m/s**	CALM WINDS **30.00%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **99** **October 1 - October 2** **7 AM - 9 PM**	**Figure 2-18** **Wind Rose Plot (10/1/99 to 10/2/99)**

WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

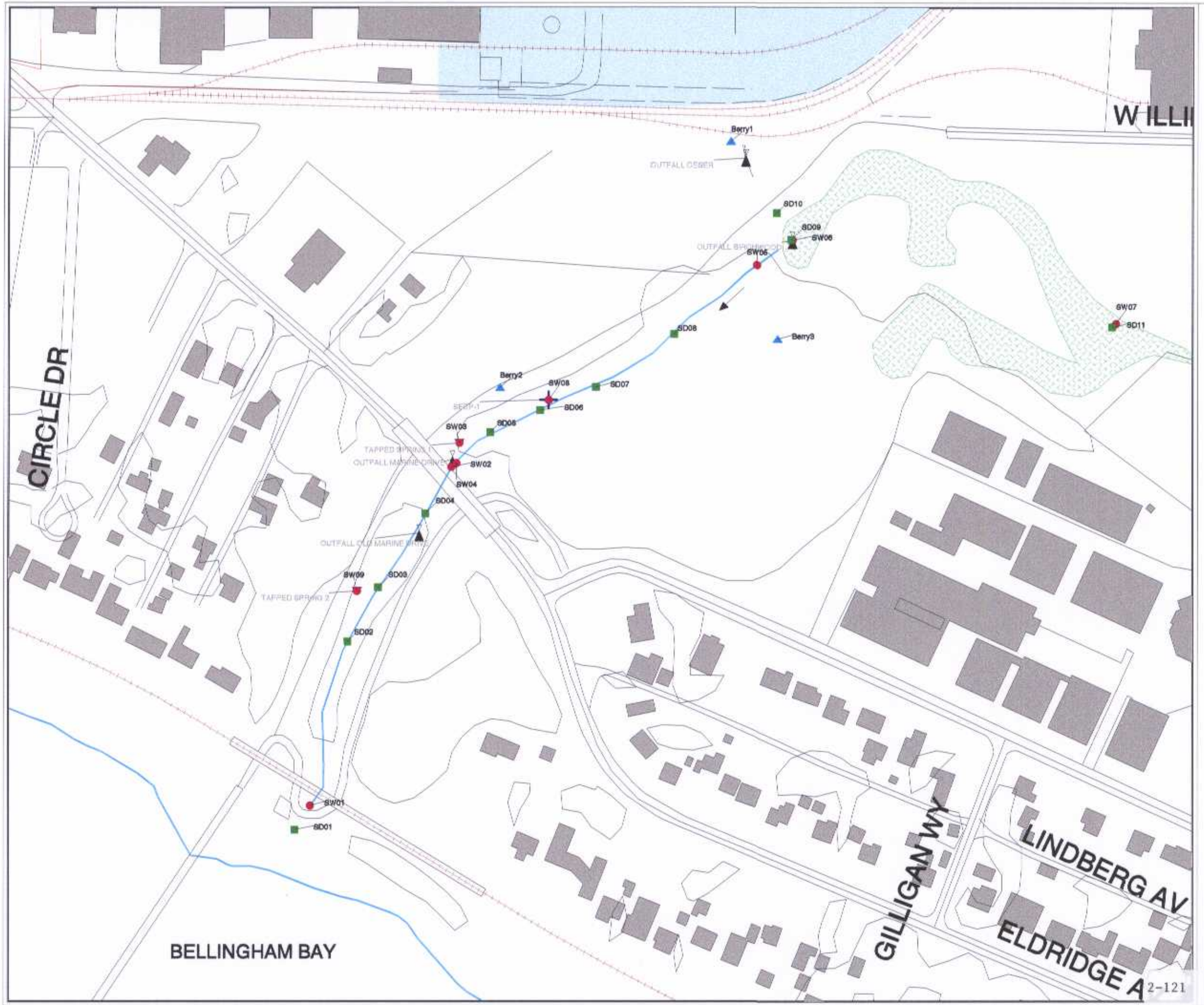


Figure 2-19

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Little Squalicum Creek
Sample Location Map

Legend

- The Oeser Company Facility
- Wetlands
- Surface Water, Seep, Tapped Spring Sample Location
- Sediment Sample Location
- Blackberry Sample Location
- Outfall Location
- Seep Location
- Tapped Spring Location
- Flow Direction

N
W
E
S

0 100 200 300 400 500
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

/data1/oeser/rifs/fig2-19.aml

3. PHYSICAL CHARACTERISTICS OF THE STUDY AREA

This section summarizes information collected during the RI pertaining to geology, hydrogeology, surface water, hydrology, and ecology. Detailed information regarding surface and subsurface features at the site were presented in Section 1. Demography and land use were also discussed in detail in Section 1. Historic meteorology was discussed in Section 1, as well as discussions of the weather conditions impacting the RI presented in Section 2.

3.1 GEOLOGY AND HYDROGEOLOGY

This section presents geologic and hydrogeologic interpretations of data collected in July through September 1999 as part of The Oeser Company facility RI. Data collected included cone penetrometer, soil borings, groundwater level measurements, and aquifer test data.

3.1.1 Geology

3.1.1.1 Regional Geology

The sediments underlying The Oeser Company site are glacial outwash deposits resulting from a series of glaciations that occurred in Pleistocene time, which began about 2 million years ago and ended about 10,000 years ago. During this epoch, the Puget lobe of the Cordilleran glacier occupied the Puget Sound Lowland at least six times. These glacial episodes have been referred to as the Orting, the Stuck, the Salmon Springs, the Double Bluff, the Possession, and the Fraser glaciations (Easterbrook 1994). According to Easterbrook, they span more than 1.7 million years. The glacial episodes were separated by long interglacial periods (Woodward et al. 1995). The youngest and best understood of these glacial episodes, the Vashon Stage of the Fraser Glaciation, ended 13,650 (plus or minus 550) years ago in Seattle, Washington (Booth and Goldstein 1994).

Each glacial episode is characterized by a "drift sequence." If complete, this sequence, from bottom to top, would typically consist of advance outwash, till, and recessional outwash. Melt-water streams issue from the front and margins of advancing and retreating glaciers. These streams or stream systems leave behind outwash deposits which contain mostly sand and/or gravel. Because the glaciers

are constantly moving in response to climatic and other changes, the outwash deposits cover extensive areas.

Advance outwash is deposited from streams and rivers issuing from the glacier as it advances. Recessional outwash, on the other hand, is deposited by streams and rivers issuing from the glacier as it retreats. Recessional outwash is similar to advance outwash in its composition and method of deposition, with one major difference: it has not been overridden by advancing ice. Therefore, it is less compact and dense than advance outwash, which has been overridden by several thousand feet of ice. The outwash deposits underlying The Oeser Company site are likely recessional since they are not well compacted.

3.1.1.2 Site Geology

Cone penetrometer and conventional soil borings were used to explore the subsurface geology. Figure 3-1 shows the explored locations, and Figure 3-2 shows cross-section locations. Figures 3-3 and 3-4 present hydrogeologic data in cross sections. The maximum depth of exploration for this project is 66 feet. Within this explored depth three primary hydrogeologic units have been identified:

- An "upper sandy zone" occurs typically from land surface to 20 or 25 feet deep. It is predominantly fine to medium sand with lenses of silt and clay. The clay and silt lenses range in thickness from less than 1 foot to 8 feet. The sands, silts, and clays are predominantly brown, with occasional gray and mottled areas. Individual silt/clay lenses have been correlated between boreholes suggesting that, in some cases, they may be laterally extensive. Sands between and above the clay/silt lenses may be saturated with groundwater although such saturation also appears in the absence of silt/clay lenses. Cross section A-A' indicates that the silt fraction of this zone is greatest in the southern portion of the site near MW24-D;
- 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 where it has been penetrated locally. The silt and clay lenses are brown and generally less than 1 foot thick. Unsaturated groundwater conditions prevail in the upper portion of the gravelly zone based on moisture conditions interpreted during advancement of the deeper borings on site. The water table of the "deep aquifer" occurs from 35 to 50 feet bgs; in some locations, this water table is within the lower portion of the gravelly zone; and
- A "lower sandy zone" has been identified below the gravelly zone. The top of this zone is encountered at depths of 40 to 50 feet bgs. It is composed of poorly graded, fine-to-medium sand with silt and clay. Gray plastic clay lenses are often noted in conjunction with this zone. The clay/silt lenses in this unit are thicker and probably more continuous than those of the upper sandy zone. These silt and clay lenses may comprise a logical lower extent of the lower sandy zone. The entire lower sandy zone is saturated with groundwater below the site.

3.1.1.3 Cone Penetrometer Versus Boring Log Geological Interpretations

Geologic logs from the cone penetrometer study were compared to geologic logs recorded during the drilling of monitoring wells and soil borings. Only logs that were less than 10 feet apart were selected to reduce the error introduced by site heterogeneity. The comparison logs are presented in Figures 3-5 through 3-9. In general, geological descriptions correlate well between the two methods.

3.1.1.4 Cone Penetrometer Data Reduction

Geologic data from the cone penetrometer borings were used to assess the relative fines content and assess potential for vertical infiltration of recharge. The cone penetrometer geological data were supplied by Gregg Drilling in the form of text descriptions such as “silty clay” or “sand.” Values were reported approximately every 0.1 foot. The text descriptions were assigned numeric values for gridding purposes.

The numeric textural values were gridded three-dimensionally using the octant inverse-distance method with a weighting exponent of 3.5 and a minimum distance of 20. The minimum distance of 20 was used to minimize the effects of neighboring values in the same boring and increase the effects of values in adjacent borings at the same depth. The grid dimensions were 50 by 50 by 25 in the x, y, and z dimensions. The inverse-distance interpolation method calculates a weighted average where the weight is a function of the distance between each source data point to the destination data point. The closer a source data point is to the destination data point, the greater its value is weighted. The octant method means that the eight nearest surrounding points were used in the calculation.

Figures 3-10, 3-11, and 3-12 depict the contoured geologic textures in plan view, cross-sectional view, and oblique view. These figures are not averages or slices but simply a view of the collapsed contoured data. Shaded areas on the figures indicate finer grained materials indicated by Gregg Drilling as silt, silty clay, clayey silt, sensitive fines, organic soil, or clay. Unshaded areas include coarser-grained materials including gravelly sand, sand, stiff sand, silty sand/sand, cemented sand, and sandy silt. Therefore, the shaded areas are less susceptible to vertical infiltration, whereas vertical infiltration would be more likely at areas without shading.

Blanking points were required at the site boundary to prevent contours from extending into areas where data were not collected. Blanking point locations are indicated by the green dots shown in Figure 3-10. Blanking points are simulated CPT borings with zero values at 0.1-foot vertical intervals. Contours also extended below the maximum depth of the borings. Adding blanking points below the

borings did not remove the contours because of the 20-foot minimum distance gridding criteria. Therefore, all values below the bottom of the borings are not shown.

3.1.1.5 CPT Results

A map view of the distribution of fine geologic materials is presented in Figure 3-10. CPT borings are indicated by blue dots, and blanking points are indicated by green dots. In general, there are two areas of coarser material, one to the south and east of the treatment area and one to the north and west of the retort. A portion of the area north and west of the retort is paved and is therefore unlikely to contribute as much infiltration as the unpaved sections south of the treatment area.

A cross-sectional view of the CPT data is presented in Figure 3-11. As with the map view, all data are superimposed so that the figure is not a particular slice of data. In general, fines content decreases with depth. This agrees with information collected during the boring program. Figure 3-12 is an oblique view of all CPT data. In Figures 3-11 and 3-12, blue lines indicate CPT borings.

3.1.2 Hydrogeology

Groundwater occurs in two zones beneath the site. The shallow zone is characterized by discontinuous saturation that is perched on fine-grained material and discharges downward to the deep aquifer. The deep aquifer is coarser, continuous, and discharges to Little Squalicum Creek and Bellingham Bay.

3.1.2.1 Shallow Groundwater

Shallow groundwater occurs at a depth of 4 to 15 feet bgs in the upper sandy zone described in Section 3.1.1.2. The shallow groundwater is perched, often on discernable silt/clay lenses that occur within the upper sandy zone. Shallow groundwater occurrence is discontinuous because the silt/clay lenses on which the groundwater is perched are discontinuous. In one instance, perched groundwater was noted in one boring but an adjacent boring less than 5 feet away had no measurable groundwater. In some instances, groundwater occurs where no silt clay lens is evident. In this case, groundwater is likely perched on a zone of higher silt/clay content that does not occur as a distinct layer but is gradational.

3.1.2.1.1 Hydraulic Conductivity Tests

Short-term, constant-rate aquifer tests were conducted in several shallow wells to evaluate aquifer transmissivity. Transmissivity is a measure of the ability of the aquifer to transmit water. A

peristaltic pump was used for all shallow wells. The wells were pumped at a constant rate and the resulting changes in water level (drawdown) were recorded. After approximately 30 minutes of pumping, the pump was turned off and the recovery of water levels was recorded. Recovery data were recorded for approximately 20 minutes. The discharge line was sealed during recovery to prevent water from draining back down into the well. Aquifer test procedures are described in detail in the field operations memorandum (PGG 2000).

The Cooper-Jacob (1946) modified nonequilibrium method described by Driscoll (1986) was used to calculate aquifer parameters from the aquifer test data. Changes in water levels in response to pumping were plotted versus time to assess aquifer transmissivity. Figures 3-13 through 3-17 show the graphs of logarithmic time versus drawdown response and recovery in shallow wells during the tests. These graphs were used to compute the aquifer transmissivity using the following equation:

$$T = 264Q/\Delta s$$

where:

T = transmissivity, in gpd/foot
Q = pumping rate, in gpm
s = drawdown, in feet
Δs = drawdown over one log cycle on the straight-line part of the drawdown

Changes in water level in response to pumping decreases aquifer saturated thickness and consequently decreases the transmissivity of the aquifer during pumping. If the saturated thickness varied by more than 10% during the test, the drawdown data were corrected for the variation. The following equation, derived by Jacob (1944) and described by Walton (1962), was used to adjust drawdown for the decrease in transmissivity:

$$s' = s - (s^2/2m)$$

where:

s’ = drawdown that would occur in an equivalent aquifer, in feet

s = observed drawdown, in feet

m = initial saturated thickness of the aquifer, in feet

Transmissivity values calculated from the test data are summarized below:

Well	T (gpd/foot)	
	Pumping	*Recovery*
MW-9S	150	150
MW-15S	19	7
MW-22S	460	500
MW-35S	150	150
MW-36S	20	17

The shallow wells are completed in the “upper sandy zone,” which is characterized by lenticular deposits of sand, silt, and clay. Transmissivity values calculated for the shallow zone range from about 7 to 500 gpd/foot and have a geometric mean of about 75 gpd/foot. The range of calculated transmissivity values reflects the heterogeneity of this zone. Areas with higher transmissivity are expected to be areas with potentially higher rates of horizontal flow.

3.1.2.1.2 Water Levels and Groundwater Flow

Shallow perched groundwater elevations showed an annual variation between 1 and 7 feet during the period monitored. Groundwater elevations measured during the four groundwater sampling events are presented in Figures 3-18 through 3-21. The groundwater elevations have not been contoured because of the discontinuous nature of shallow groundwater occurrence beneath the site. Horizontal groundwater flow likely occurs over short distances on the perched lenses but the dominant flow direction is likely downward toward the deep aquifer. Vertical flow paths are likely tortuous, with perched water flowing horizontally on perched lenses before reaching an area with limited fines or where fine grained materials are absent. The perched would then flow downward through coarser material until a finer material is encountered and the process begins again.

3.1.2.2 Deep Groundwater

Deep groundwater generally occurs at a depth of 30 to 45 feet bgs in the gravelly zone described in Section 3.1.1.2. The deep aquifer is composed of coarser material and is generally more permeable than the upper sandy zone. Unlike the shallow perched groundwater in the upper sandy zone, deep groundwater occurs in a continuous aquifer.

The lower extent of the aquifer is not clearly defined. In some locations, a gray clay layer 2 to 5 feet in thickness defines the bottom of the aquifer but it is not present in all borings.

3.1.2.2.1 Hydraulic Conductivity Tests

Short-term, constant-rate, aquifer tests were conducted in several deep wells to evaluate aquifer transmissivity. Deep well tests were conducted with a submersible pump. Water was pumped from the well at a constant rate for approximately 30 minutes and resulting changes in water level over time ("drawdown") were recorded. Recovery data were not useful because the pumps were not equipped to prevent backflow down the well when the pump was turned off. Changes in water levels in response to pumping were plotted versus time. The slope of the resulting line is proportional to the ability of the surrounding aquifer materials to transmit water (transmissivity). Pumping test procedures and analysis methods were described in previous sections of the RI. Figures 3-22 through 3-25 show the drawdown response and recovery in deep wells during short term pumping tests. Transmissivity values calculated from the test data are summarized in Table 3-1.

The deep wells are completed in the "gravelly zone," which is characterized by relatively clean sandy gravel with minor sand and silt lenses. Transmissivity values calculated for the deep aquifer from the test data range from about 800 gpd/foot to greater than 5,000 gpd/foot and have a geometric mean around 2,900 gpd/foot. The range of values shows less heterogeneity in the deep aquifer than was observed in the shallow perched zone. Transmissivities calculated for the deep aquifer are higher than those for the shallow perched zones, which is consistent with the coarser deep aquifer material. In general, larger transmissivity values in the deep aquifer indicate potentially higher rates of horizontal flow than in the shallow perched zone. Assuming consistent gradients, areas with higher transmissivity indicate relatively higher rates of horizontal flow.

Effective aquifer thickness at each well was estimated by adding the available drawdown within the screen at the end of the test and an additional 5 feet to account for partial penetration effects. If a confining unit was present within 5 feet of the bottom of the screen, the additional aquifer thickness was

not added. The geometric mean of the hydraulic conductivity values presented above is approximately 300 gpd/square foot.

3.1.2.2.2 Water Levels and Groundwater Flow

Groundwater flow is generally to the southwest beneath The Oeser Company facility. Groundwater levels measured during each of the four quarters are shown in Figures 3-26 through 3-29. Flow directions were consistent over the four quarters monitored. Groundwater elevations in the deep aquifer varied between 1 and 3 feet during the period measured. The gradient between MW06-D and MW03-D is approximately 0.009 during all four quarters. Using the average hydraulic conductivity value above and an effective porosity of 0.2, this gradient results in an average linear flow velocity of about 2 feet per day.

There appears to be a groundwater mound near MW35-D, which is located adjacent to The Oeser Company office and the Ershigs facility (Figures 3-27, 3-28, and 3-29). Groundwater elevations at MW-35D are consistently 1 to 2 feet higher than the next highest adjacent well. The elevated heads are likely indicative of a local recharge source such as a dry well, storm drain, or leaking water main. The water line running from the office to the facility runs approximately 15 feet south of MW-35D. Site personnel report that the line is not leaking although no rigorous testing has been completed on the line. The mound appears in the same location where two 4,000-gallon diesel USTs were excavated in approximately 1994. Information about the type of materials used as fill was unavailable. The area may serve as an enhanced drainage zone for both vertical infiltration of precipitation and vertical and horizontal movement of shallow groundwater into the deeper groundwater zone.

Groundwater elevations in the Little Squalicum Creek wells (LSC-MW-1 through LSC-MW-4) appear anomalous in that groundwater elevations are significantly higher in the middle well (LSC-MW-2). The high water level elevations may be associated with the creek and culvert 30 feet east of LSC-MW-2. LSC-MW-2 is located at the present terminus of the natural overland flow path toward the creek, formerly known as Sugar Waste Gulch when it was used by U & I to channel sugar-processing wastes from the former plant to Little Squalicum Creek. This area may represent a preferential groundwater flow path, such as a former stream bed.

3.1.2.3 Infiltration and Vertical Flow Velocity

3.1.2.3.1 Infiltration

Infiltration rate calculations were made to estimate the quantity and timing of recharge to the deep aquifer. This analysis is applicable to the unpaved areas in the northwest and south east parts of the sites. Approximately 80 percent of the site is unpaved; however, much of the contamination on site underlies paved area. Precipitation falling on the paved areas of the site is captured and discharged through the storm drain system. Recharge to bare ground would be underestimated by this model since little evapotranspiration would occur in areas without plant cover.

A spreadsheet model based on algorithms used in the United States Geological Survey Deep Percolation Model (Bauer and Vaccaro 1987) was used to estimate recharge at The Oeser Company. The model employs a daily water budget to track soil moisture, runoff, snow-pack storage, and interception loss. The model estimates daily potential evapotranspiration using the Blaney-Criddle (Dunne and Leopold 1978) method, and calculates actual evapotranspiration as a function of soil texture and available moisture in the root zone. Infiltration was assumed to equal precipitation minus evapotranspiration and change in soil moisture in the upper 5 feet of soil. The Blaney-Criddle formula calculates evapotranspiration using temperature, day length (based on latitude), and crop factor as variables. For this analysis, precipitation is the only source of water and a crop factor for grass was assumed to represent the natural shrub vegetation at the site. Average monthly temperature and precipitation for Bellingham, Washington, were used. Soil physical properties are given below in Section 3.1.2.3.1. Infiltration to the water table beneath the site was calculated to be about 16 inches per year.

3.1.2.3.2 Vertical Flow Velocity

Travel time is calculated as the travel distance, or length, divided by velocity. The travel distance at the site is equal to the depth to water in the deep aquifer, or approximately 40 feet. Velocity is the speed at which water infiltrates to displace the existing soil moisture. It is calculated as the infiltration rate divided by moisture content (I/θ). Moisture content is the volumetric ratio of water to total soil volume (V_W/V_T).

Average moisture content below the site is assumed to range from 0.05 for the gravelly sand to 0.15 for the silty loam (Saxton et al. 1985). The upper half of the vadose zone contains significant sand and clay and therefore has a higher moisture content. The lower half of the vadose zone contains gravel, has much less silt and clay than the upper half, and therefore has a lower moisture content. The average

soil texture beneath the site is considered a sandy loam and therefore the average moisture content is approximately 0.1.

Velocity ranges from 26 feet per year where moisture content is as low as 0.05 to 8 feet per year where moisture content is as high as 0.15. Average velocity is about 13 feet per year for an average water content of 0.1. Travel time to the water table is approximately three years, based on the average velocity and the average water content. Travel time through silty layers is longer than travel time through sand layers of the same thickness. If preferential flow paths existed through mostly coarse material, travel time for these preferential flow paths could be as small as 1.5 years.

3.1.2.4 Surface Water/Groundwater Connection

Little Squalicum Creek is the dominant surface water feature near the site and likely acts as a discharge point for the deep aquifer in its downstream reaches. At the stilling well LSC-SW-1, the stream stage varied between 1.5 and 4 feet above the aquifer elevation at nearby monitoring well LSC-MW-3 as shown in Figure 3-30. This suggests that Little Squalicum Creek is perched above the deep aquifer and loses water to the aquifer at that location. At stilling well LSC-SW-2, the stream stage is typically 5 feet below groundwater levels in monitoring well LSC-MW-2 suggesting that the creek has become a gaining stream at that location. The elevation of the seep located just north of LSC-SW-2 is in between the groundwater elevation at monitoring well LSC-MW-2 and surface water elevation at LSC-SW-2. Therefore, it is likely that the seep discharges from the deep aquifer.

3.2 SURFACE WATER HYDROLOGY

Two stage gauges, SG-1 and SG-2, were installed to monitor stream stage in Little Squalicum Creek in August 1988. Stream stage elevations were measured manually between August 1998 and July 1999. During that time, measured elevations ranged between 25.15 and 25.95 feet in SG-1 (upstream) and between 20.22 and 21.57 feet in SG-2 (downstream).

Stilling wells were installed in August 1999 to replace the stage gauges. Electronic stream stage measurements were collected at LSC-SW-1 (upstream) and LSC-SW-2 (downstream) between November 1999 and March 2000. Stage elevations ranged between 26.48 and 27.35 feet in LSC-SW-1 (upstream) and between 21.12 and 23.14 feet in LSC-SW-2 (downstream). The greater stage variation in LSC-SW-2 is likely a result of surface water contributions from the culvert between the two gauges.

As discussed in Section 2.5.9, a mass balance of surface and storm drain water flowing into and out of Little Squalicum Creek was conducted. Table 3-2 presents the measurements made of all major

sources to the creek and the outflow onto the beach at Bellingham Bay. Measurement locations are shown in Figure 2-19. The headwaters of the creek originate with the storm drain outflow from the Birchwood outfall. The creek terminates with the culvert that empties onto the beach at Bellingham Bay. During the dry season, tapped spring flows account for about one third of the flow from the creek. During the rainy season, virtually all flow from the creek can be traced back to stormwater runoff entering the creek through the three storm drain systems which service the surrounding area.

3.3 ECOLOGY OF THE SOUTH SLOPE AND LITTLE SQUALICUM CREEK

Information about the ecology of Little Squalicum Creek and the South Slope was obtained through site visits, a review of existing reports and data, and correspondence with state and federal agencies. This section identifies site ecosystems and species of concern based on information from these sources.

3.3.1 South Slope

The South Slope terrestrial area, which refers to the area south of The Oeser Company's facility and north of Little Squalicum Creek, may have been impacted by waste disposal and/or deposition of airborne contamination from the facility. The area is undeveloped and vegetated with various grasses, various wildflowers, horsetails (*Equisetum spp.*), blackberry (*Rubus spp.*), dogwood (*Cornus spp.*), hawthorne (*Cartaegus spp.*), alder (*Alnus spp.*) trees and saplings, and cherry (*Prunus spp.*) trees and saplings. The area provides cover, shelter, and food for wildlife. During field work conducted in July 1999, several species of birds and mammals were observed in this area including the American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), swallows, rabbits, squirrels, and deer. Because the South Slope has ecological value, the area has been evaluated in the ERA.

3.3.2 Little Squalicum Creek

The creek is located in a forested ravine several hundred feet to the southeast of The Oeser Company facility. The creek currently begins at the Birchwood outfall and ends approximately 1500 feet downstream at Bellingham Bay (Figures 1-3 and 2-19). The creek channel ranges in width from approximately 3 to 6 feet. Water in the creek is generally less than 1 foot deep. The creek is fed by three stormwater outfalls (the Birchwood, Oeser, and Marine Drive outfalls), two tapped springs, and several small seeps (Figure 2-19). The creek transitions from a losing stream to a gaining stream somewhere between the stream gauge locations LSC-SW-1 and LSC-SW-2 (Figure 3-29). During

wetter seasons, flow is estimated at 1 to 10 cfs (URS 1994). The minimum and maximum flows, estimated from measurements taken during the RI, were less than 0.1 cfs and 4.1 cfs, respectively. During drier seasons, the creek bed may be exposed. When flowing, the creek typically does not reach Bellingham Bay but, instead, infiltrates into the beach. Historically, Little Squalicum Creek was longer and its flow was greater; however, during development in the City of Bellingham, the flow of Little Squalicum Creek was largely diverted to nearby Squalicum Creek (Wahl 1998c), which is located approximately 1 kilometer southeast of The Oeser Company's facility.

Use of Little Squalicum Creek by fish is very limited. On occasion, (Wahl 1998c) observed salmon fingerlings in a small pool that forms where the creek meets the beach at Bellingham Bay. Several salmon fingerlings were observed here in July 1999 during collection of water and sediment from the creek. The fish apparently enter the creek from the bay during unusually high tides and/or storm surges and remain there for a short time before returning to the bay (Wahl 1998c). The creek does not support fish upstream from this terminal pool. WDFW has shock-fished Little Squalicum Creek on several occasions and has not recovered fish (McGowan 1998). The absence of fish upstream from the terminal pool most likely is due to the creek's shallow depth and limited flow.

Benthic invertebrates were observed in Little Squalicum Creek during collection of water and sediment samples from the creek. Amphipods, snails, and caddisfly larvae (Order Trichoptera) were observed in areas with noticeable current and gravel substrate. In areas with low flow and a muddy bottom, midge larvae (Family Chironomidae) and aquatic oligochaetes were observed.

The channel of Little Squalicum Creek is shaded by a well-developed overstory of alder (*Alnus spp.*), willow (*Salix spp.*), and black cottonwood (*Populus trichocarpa*) trees. Common plant species in the understory include grasses; horsetail; blackberry; hawthorne; holly (*Ilex spp.*); and saplings of alder, willow, cottonwood, mountain ash (*Sorbus spp.*), fir (*Abies spp.*), and cedar (*Thuja spp.*). The creek and its riparian zone provide cover, shelter, food, and water for wildlife. Because of its potential value to wildlife and status as a wetland (see Section 3.3.4), the creek and its riparian zone are judged to be an ecosystem of concern. Therefore, the area has been evaluated in the ERA.

3.3.3 Threatened, Endangered, Sensitive, or Rare Species

USFWS and WDFW were contacted for information on the presence of Federal and State listed species in the site vicinity. The information was first requested in November 1997 during initial scoping work at the site. In May 2000, both agencies were contacted again for up-to-date information. A copy of the agency correspondence is included as Appendix I.

USFWS indicated that two Federal listed species, the bald eagle (*Haliaeetus leucocephalus*) and the bull trout (*Salvelinus confluentus*), may be present in the site vicinity (Barrera 2000). The bald eagle occupies forested areas with large-diameter trees along major water bodies; it feeds on fish, waterfowl, and carrion. The bald eagle prefers areas with limited human activity; therefore, it seems unlikely that bald eagles would use the site or nearby surrounding area. The bull trout occupies deep pools of large cold rivers in western Canada and the northwest United States. It is most common in high mountainous areas where snowfields and glaciers are present; such habitat is not present at The Oeser Company site.

USFWS also indicated that five "species of concern" may be present in the site vicinity (Barrera 2000). These species are the Pacific lamprey (*Entosphenus tridentata*), river lamprey (*Lampetera ayresi*), long-eared myotis (*Myotis evotis*; a bat), long-legged myotis (*Myotis volans*; a bat), and peregrine falcon (*Falco peregrinus*). The Pacific lamprey and river lamprey enter coastal streams for spawning. Juvenile lamprey (ammocoetes) live in silt, mud, and sand of shallow eddies, as well as backwaters of streams, before migrating to the ocean, where they spend the remainder of their lives. WDFW has shock-fished Little Squalicum Creek on several occasions and has not recovered lamprey or other fish (McGowan 1998). Consequently, it appears that the Pacific lamprey and river lamprey are not present at the site. The long-eared myotis, long-legged myotis, and peregrine falcon were not observed by E & E field personnel during site visits; however, their potential presence in the site vicinity cannot be ruled out at this time.

WDFW reported that Bellingham Bay is a bald eagle winter area (Goldsmith 2000). As mentioned above, given the disturbed nature of The Oeser Company site, it seems unlikely that bald eagles would use the site or nearby surrounding area. According to WDFW, the closest water body to The Oeser Company facility known to support an anadromous fish run is Squalicum Creek, which is located approximately 1 kilometer southeast of Little Squalicum Creek (Goldsmith 2000). Little Squalicum Creek is not connected to Squalicum Creek and facility-related contaminants are not expected in the latter.

3.3.4 Wetland Survey

The ravine in which Little Squalicum Creek is located was investigated for the presence of wetlands by Springwood Associates, Inc. (1992a). Wetlands in the ravine were identified and delineated following the three-parameter approach recommended by the United States Army Corps of Engineers (Environmental Laboratory 1987). In order for an area to be identified as a wetland by this approach, it must have positive indicators of hydric (wetland) soils, hydrology, and hydrophytic (wetland) vegetation.

The investigation by Springwood Associates, Inc. (1992a) identified a portion of the Little Squalicum Creek channel as a saturated alder/cottonwood-forested wetland (type PFO1B). Other wetland types identified in the ravine include: seasonally flooded, alder/cottonwood-forested wetland (type PFO1C); semi-permanently-flooded, alder/cottonwood-forested wetland (type PFO1F); saturated, dogwood/blackberry-scrub/shrub wetland (type PSS1B); persistent, saturated rush/sedge/grass-emergent wetland (type PEM1B); and nonpersistent, permanently-flooded rush/sedge/grass-emergent wetland (type PEM2H). Lastly, Little Squalicum Creek also is identified as a wetland on the National Wetland Inventory (NWI) map for the area (USFWS 1987); the NWI map identifies the creek as a palustrine, scrub-shrub/emergent, seasonally-flooded wetland.

Table 3-1

HYDRAULIC CONDUCTIVITY TEST DATA
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well	Transmissivity (gpd/foot)	Estimated Effective Aquifer Thickness	Hydraulic Conductivity (gpd/square foot)
MW05-D	1,100	15	70
MW17-D	5,000	15	330
MW23-D	2,000	7	290
MW24-D[a]	>33,000	12	>2,800
MW25-D[a]	>1,500	12	>130
MW33-D	1,000	13	80
MW35-D[a]	>2,900	5	>580

[a] The water levels in these wells could not be drawn down at the pump's maximum discharge rate. The minimum T values shown for these wells were calculated using the maximum flow rate measured at the well and assuming 0.04 foot of drawdown over one log cycle.

Key:

gpd = Gallons per day.
T = Transmissivity.

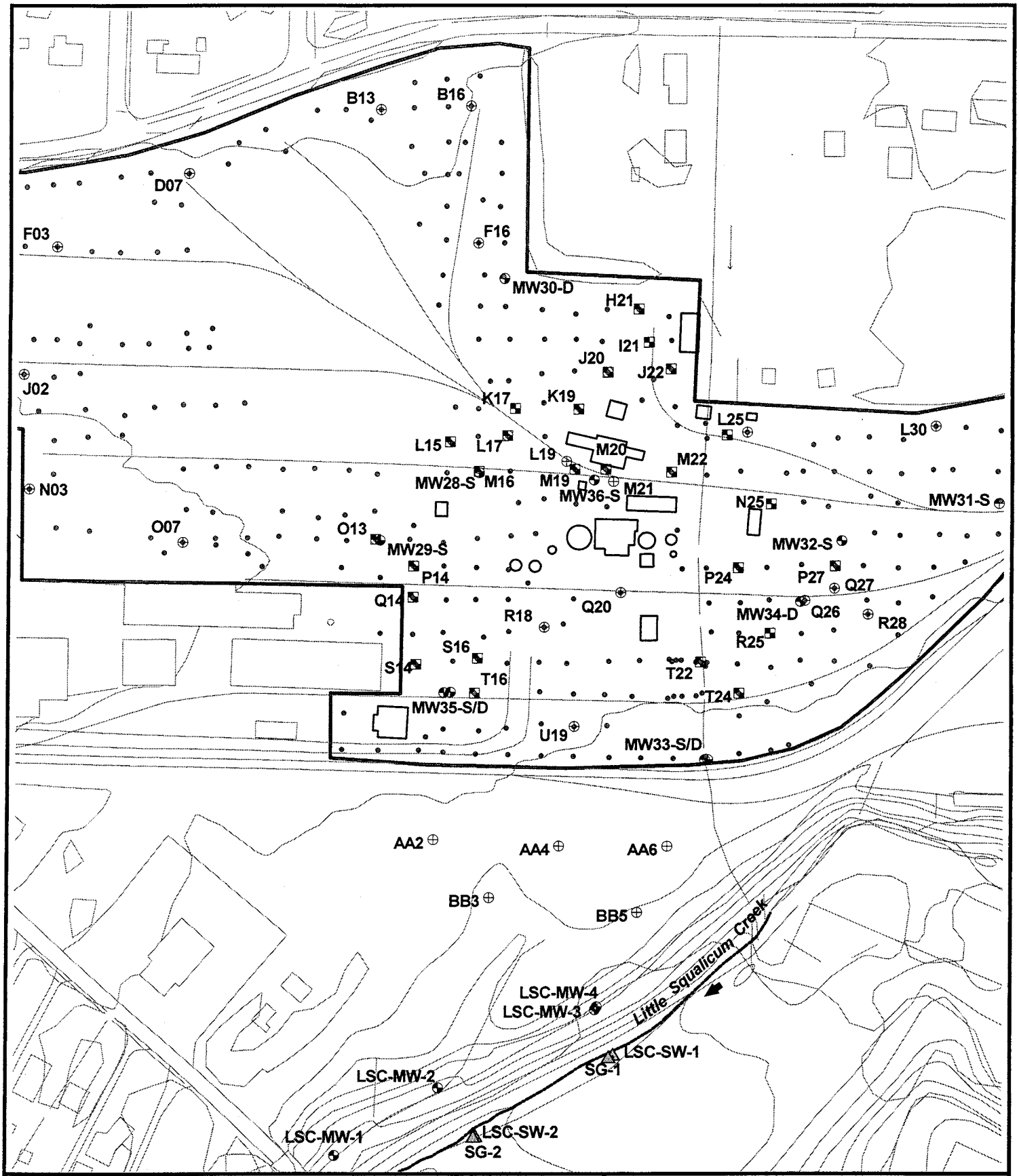
Table 3-2

LITTLE SQUALICUM CREEK WATER BALANCE
THE OESER COMPANY
REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Location	Flow (gpm) estimated on 9/22/99	Flow (gpm) estimated on 12/17/99	Flow (gpm) estimated on 3/2/00
Birchwood Outfall	0.5	1120	750
Oeser Outfall	0	160	400
Seep	0.5	1	1
Tapped Spring 1	3	6	30
Marine Drive Outfall	3	560	400
Tapped Spring 2	8	10	60
Beach Culvert Outfall	43	1600	1800
Inflow/Outflow	15/43 (35%)	1857/1600 (116%)	1641/1800 (91%)

Key:

gpm = Gallons per minute.



KEY:

- CPT
- RI Well
- RI Boring
- RI Piezometer
- Stage Gage - Stilling Well
- Flow Direction

RI = Remedial Investigation

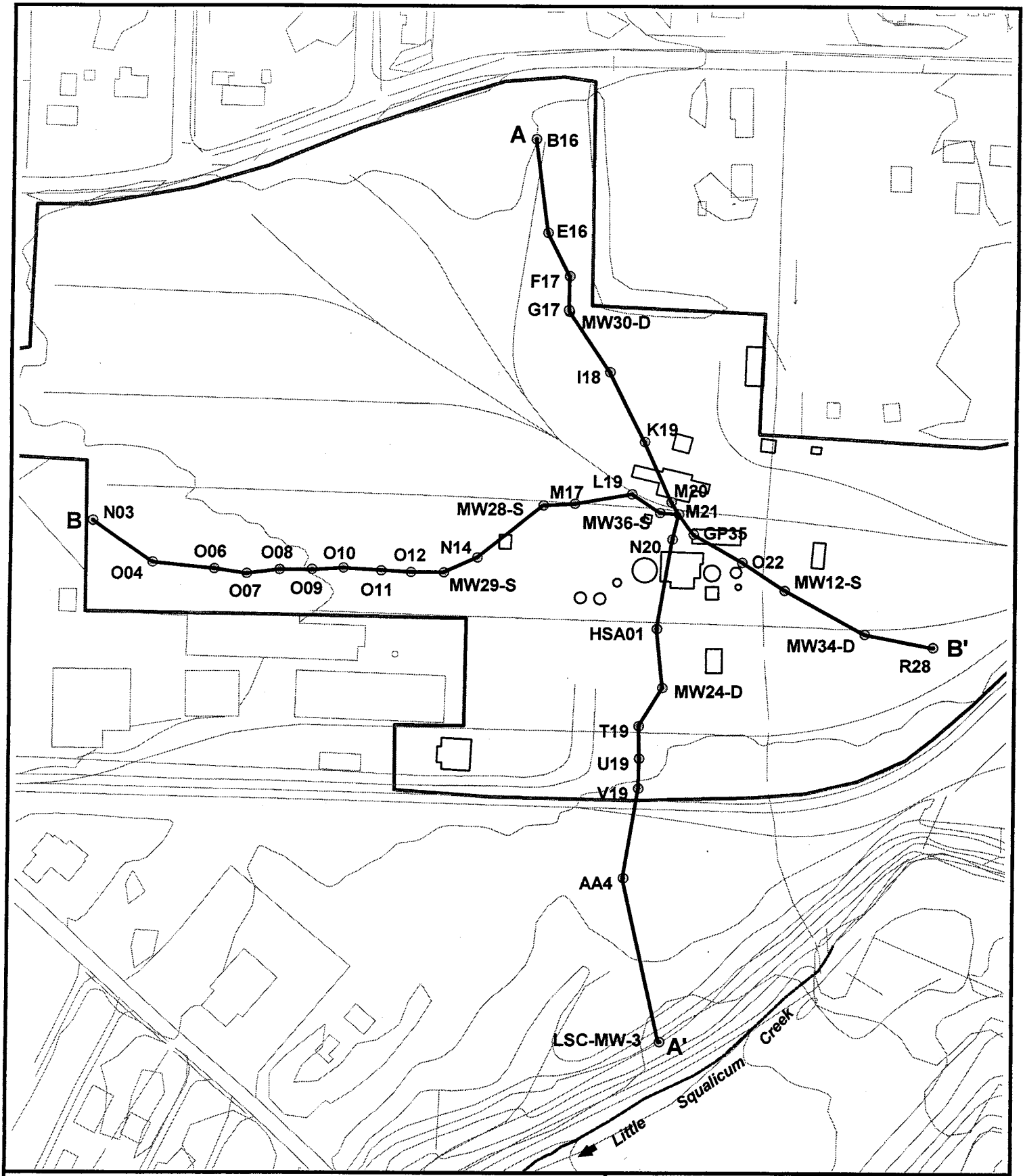
N

100 0 100 Feet

Figure 3-1
Subsurface Exploration Locations

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

➨ Flow Direction

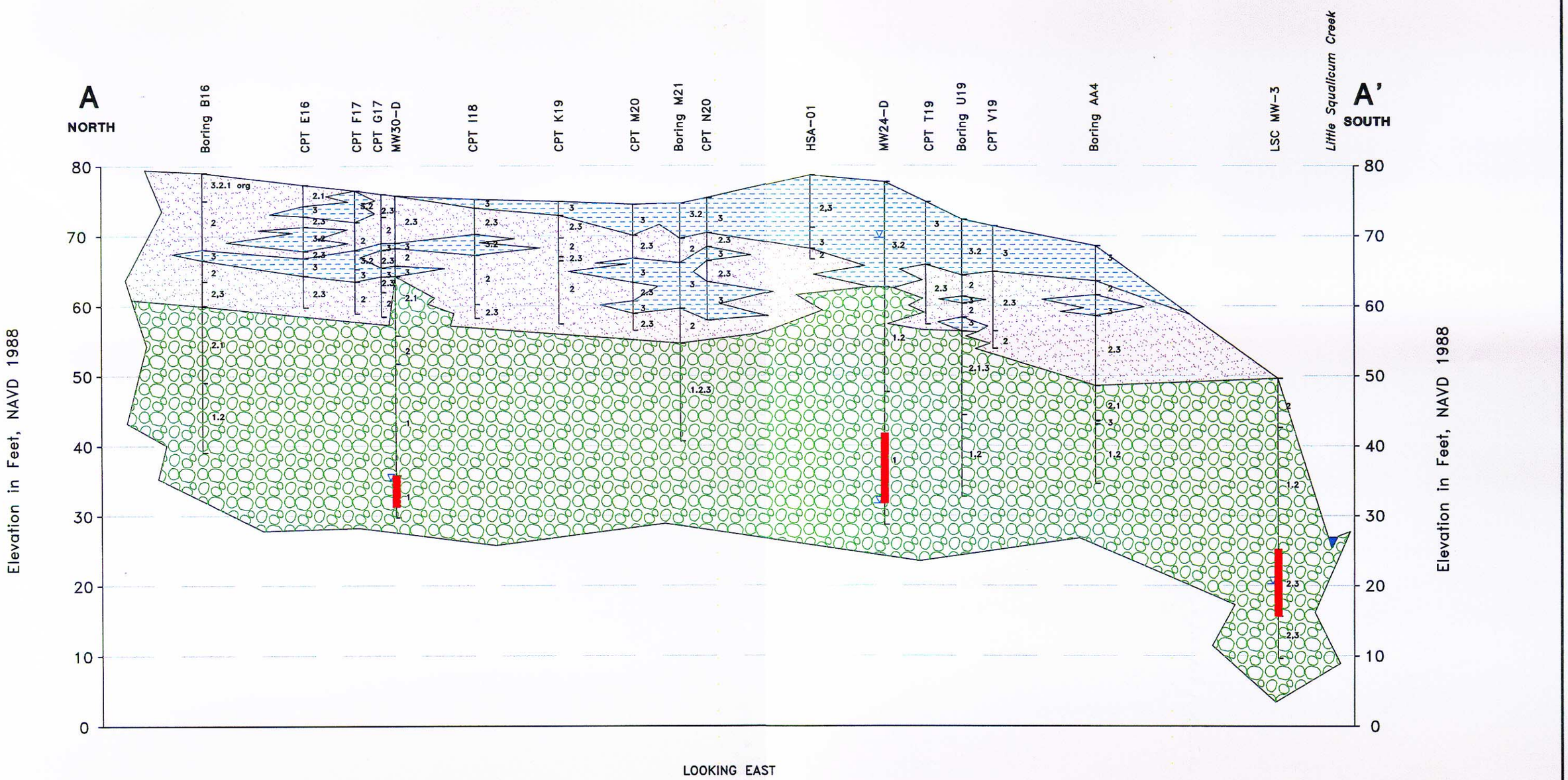
N

100 0 100 Feet

Figure 3-2
Cross-Section Alignments

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY

- Sandy silt and clay
- Silty sand and Sand
- Sandy gravel with minor silt/clay
- 7E01 — Well Identifier
- Water level at time of drilling
- Geologic contacts
- Screened Interval

1 = GRAVEL
2 = SAND
3 = SILT/CLAY
4 = TILL
"," = and
"." = modifier

Vertical Scale in Feet
0 7.5 15
0 75 150
Horizontal Scale in Feet

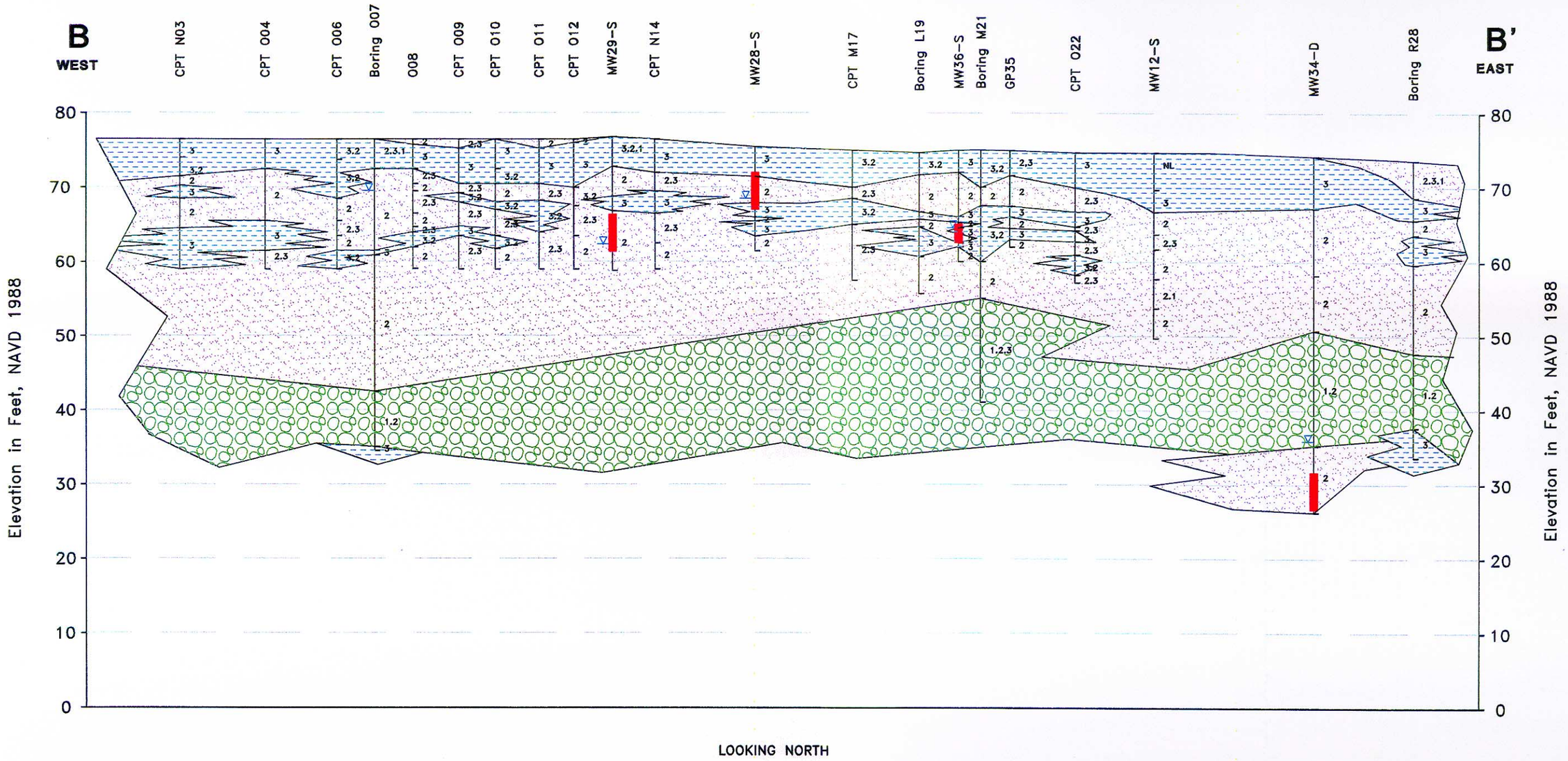
NAVD = North American Vertical Datum
CPT = Cone Penetrometer
LSC = Little Squalicum Creek

FIGURE 3-3
Geologic Cross-Section A-A'

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

dwg, 7/00



KEY

- Sandy silt and clay
- Silty sand and sand
- Sandy gravel with minor silt/clay
- 7E01 — Well Identifier
- Water level at time of drilling
- Geologic contacts
- Screened Interval

1 = GRAVEL
2 = SAND
3 = SILT/CLAY
4 = TILL
"," = and
"." = modifier
NL = Not Logged

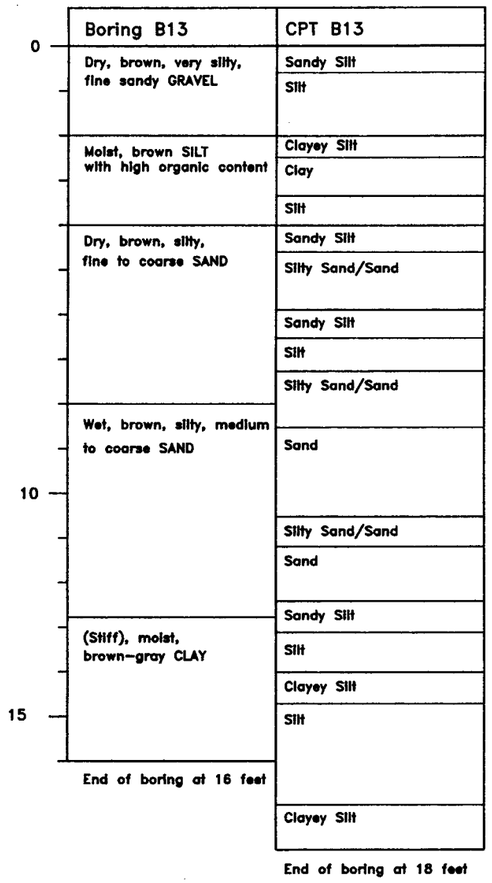
Vertical Scale in Feet
0 7.5 15
0 75 150
Horizontal Scale in Feet

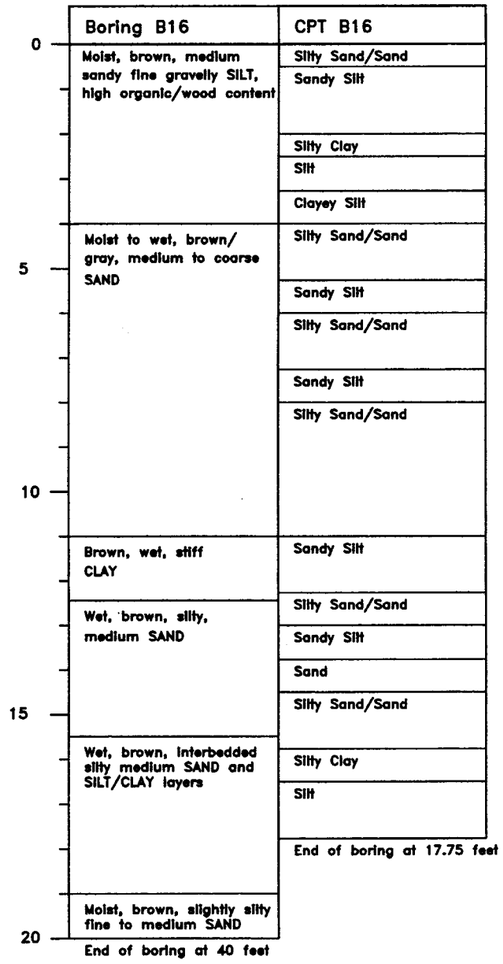
NAVD = North American Vertical Datum
CPT = Cone Penetrometer
LSC = Little Squalicum Creek

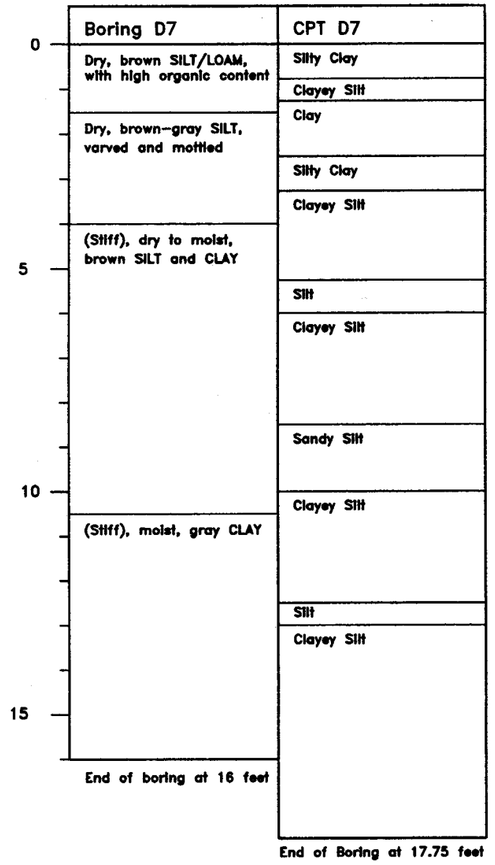
FIGURE 3-4
Geologic Cross-Section B-B'

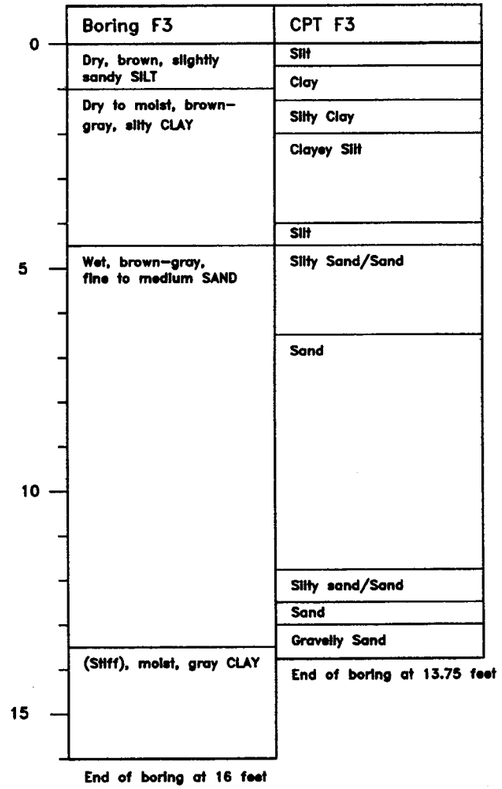
The Oeser Company
Remedial Investigation
JE rg, 7/00

Pacific Groundwater Group









KEY

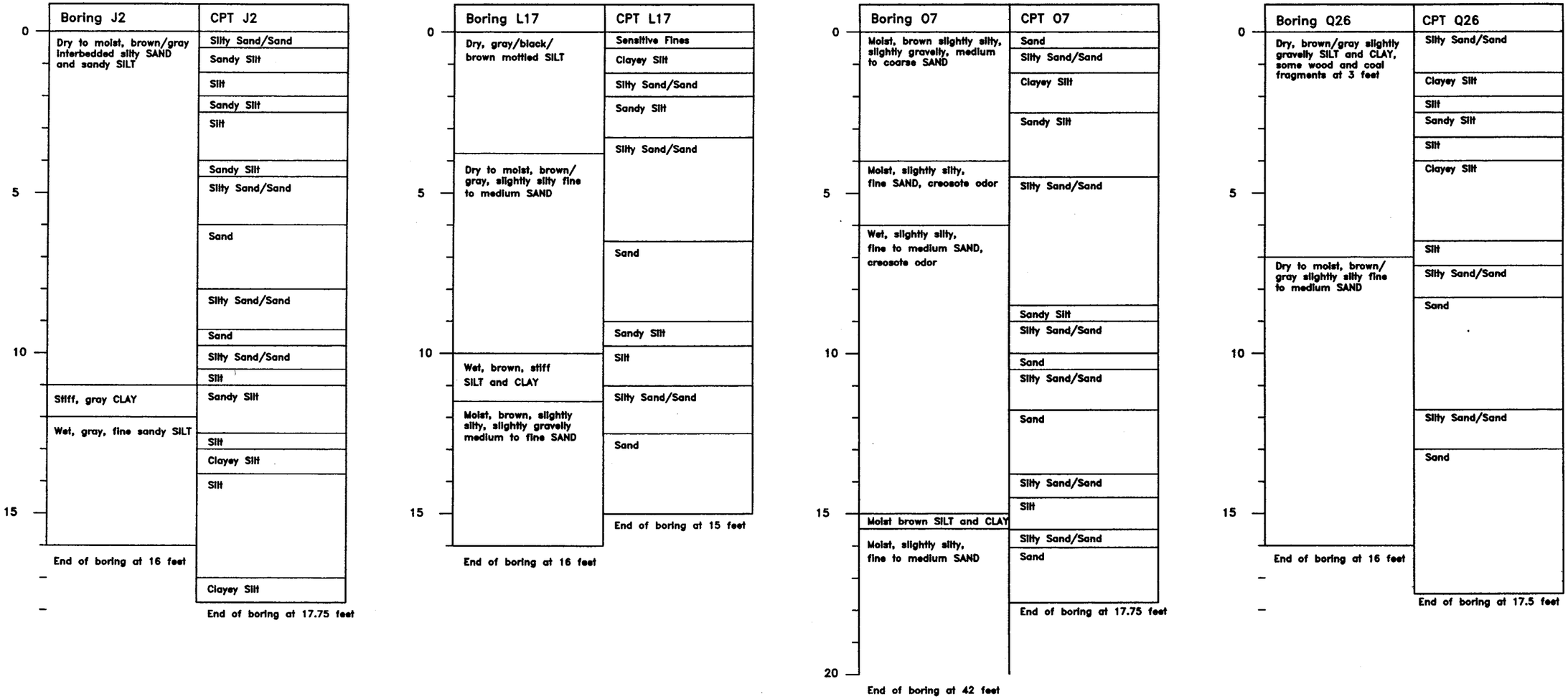
CPT = Cone Penetrometer Test

FIGURE 3-5
Boring/Cone Penetrometer Test Comparison A

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

JE\ g.DWG, 6/2000



KEY

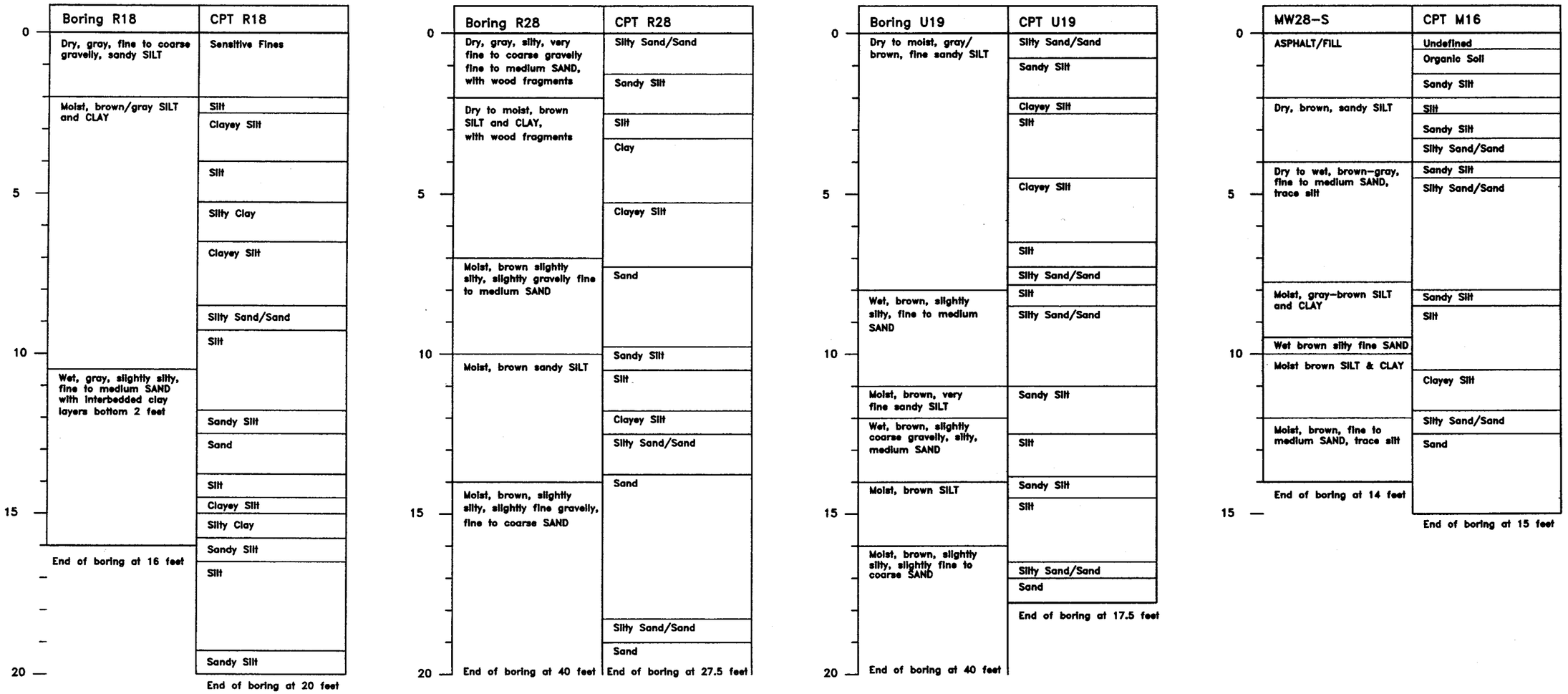
CPT = Cone Penetrometer Test

FIGURE 3-6
Boring/Cone Penetrometer Test Comparison B

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

CPT-Boring.DWG, 6/2000



KEY

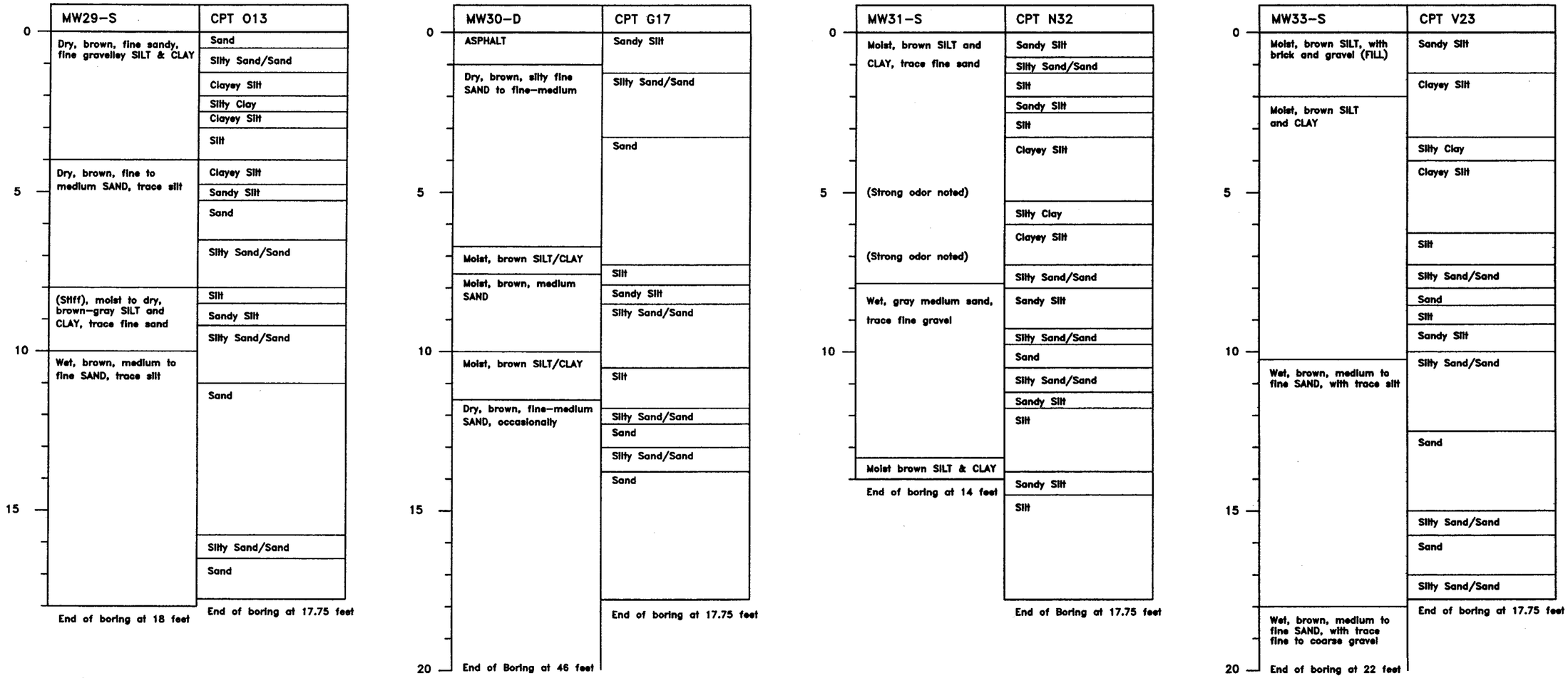
CPT = Cone Penetrometer Test

FIGURE 3-7
Boring/Cone Penetrometer Test Comparison C

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

7T-Boring.DWG, 6/2000



KEY

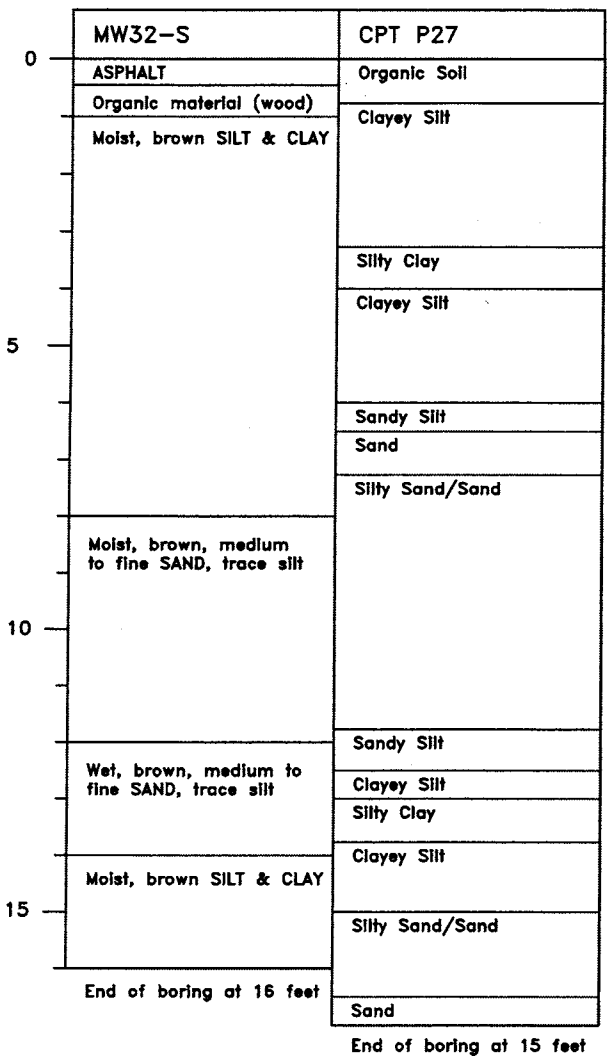
CPT = Cone Penetrometer Test

FIGURE 3-8
Boring/Cone Penetrometer Test Comparison D

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

T-Boring.DWG, 6/2000



KEY

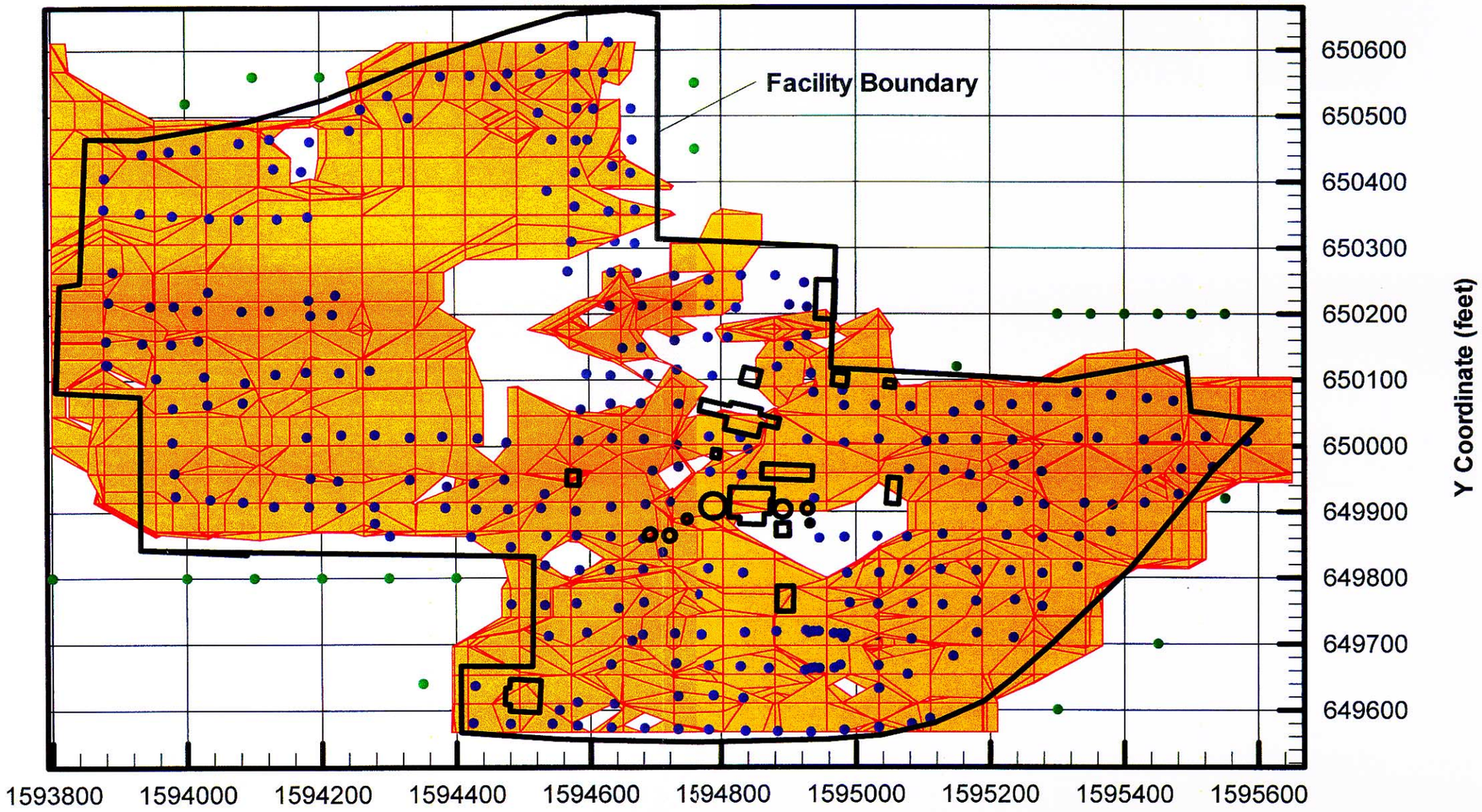
CPT = Cone Penetrometer Test

FIGURE 3-9
Boring/Cone Penetrometer Test
Comparison E

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

JE9803, CPT-Boring.DWG, 6/2000



KEY

Contoured areas represent silt, silty clay, clayey silt, sensitive fines, organic soil, or clay as defined by Gregg Drilling Cone Penetrometer Testing results.

X and Y coordinates are in Washington State Plane North North American Datum 1927

- Cone Penetrometer Test Boring Location
- Blanking Point
- Facility Boundary

N

0 100 200
Scale in Feet

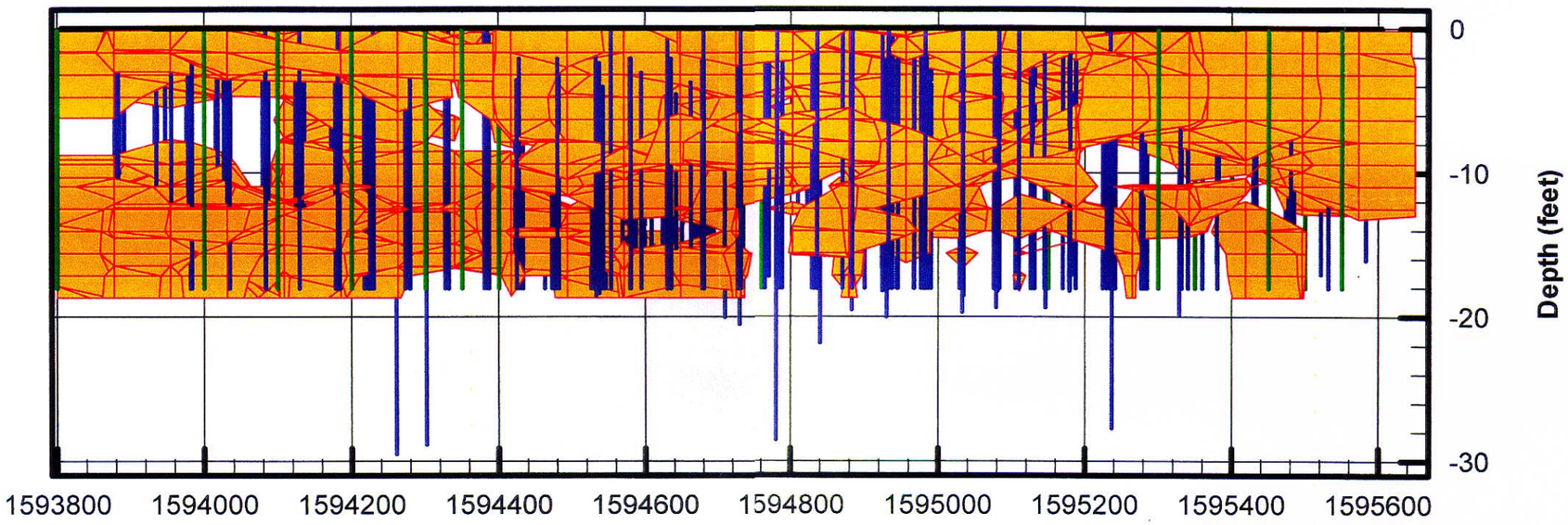
FIGURE 3-10
Geologic Texture Contours
Map View

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

J Map Border.DWG, 5/00

Looking North



X Coordinate (feet)

KEY

Contoured areas represent silt, silty clay, clayey silt, sensitive fines, organic soil, or clay as defined by Gregg Drilling Cone Penetrometer Testing results.

X and Y coordinates are in Washington State Plane North North American Datum 1927

| Cone Penetrometer Test Boring Location
| Blanking Point

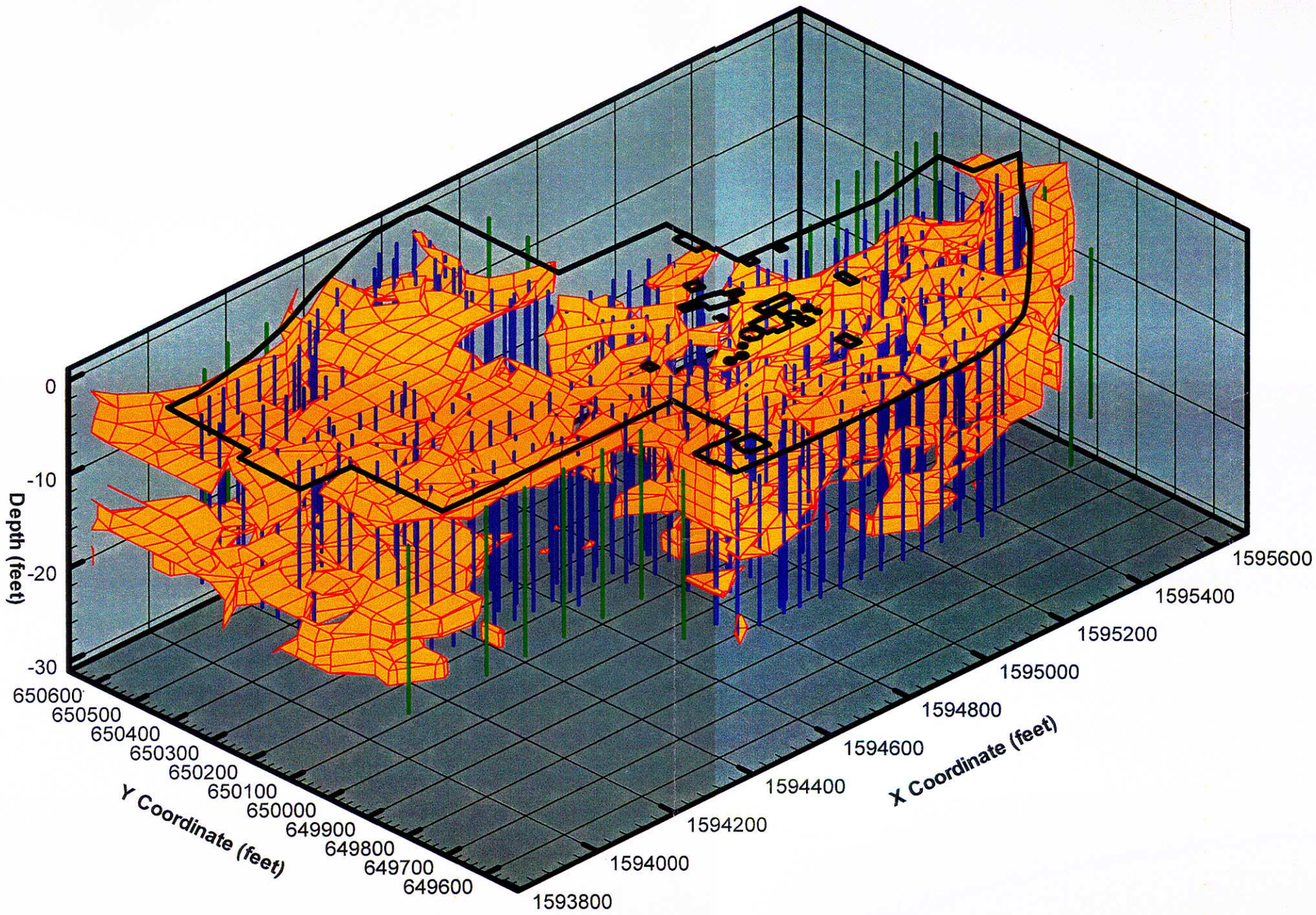
0 100 200
Scale In Feet

FIGURE 3-11
Geologic Texture Contours: Cross-Section View

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

2 XSect Border.DWG, 5/00



KEY

Contoured areas represent silt, silty clay, clayey silt, sensitive fines, organic soil, or clay as defined by Gregg Drilling Cone Penetrometer Testing results.

X and Y coordinates are in Washington State Plane North North American Datum 1927

- Cone Penetrometer Test Boring Location
- Blanking Point
- Facility Boundary

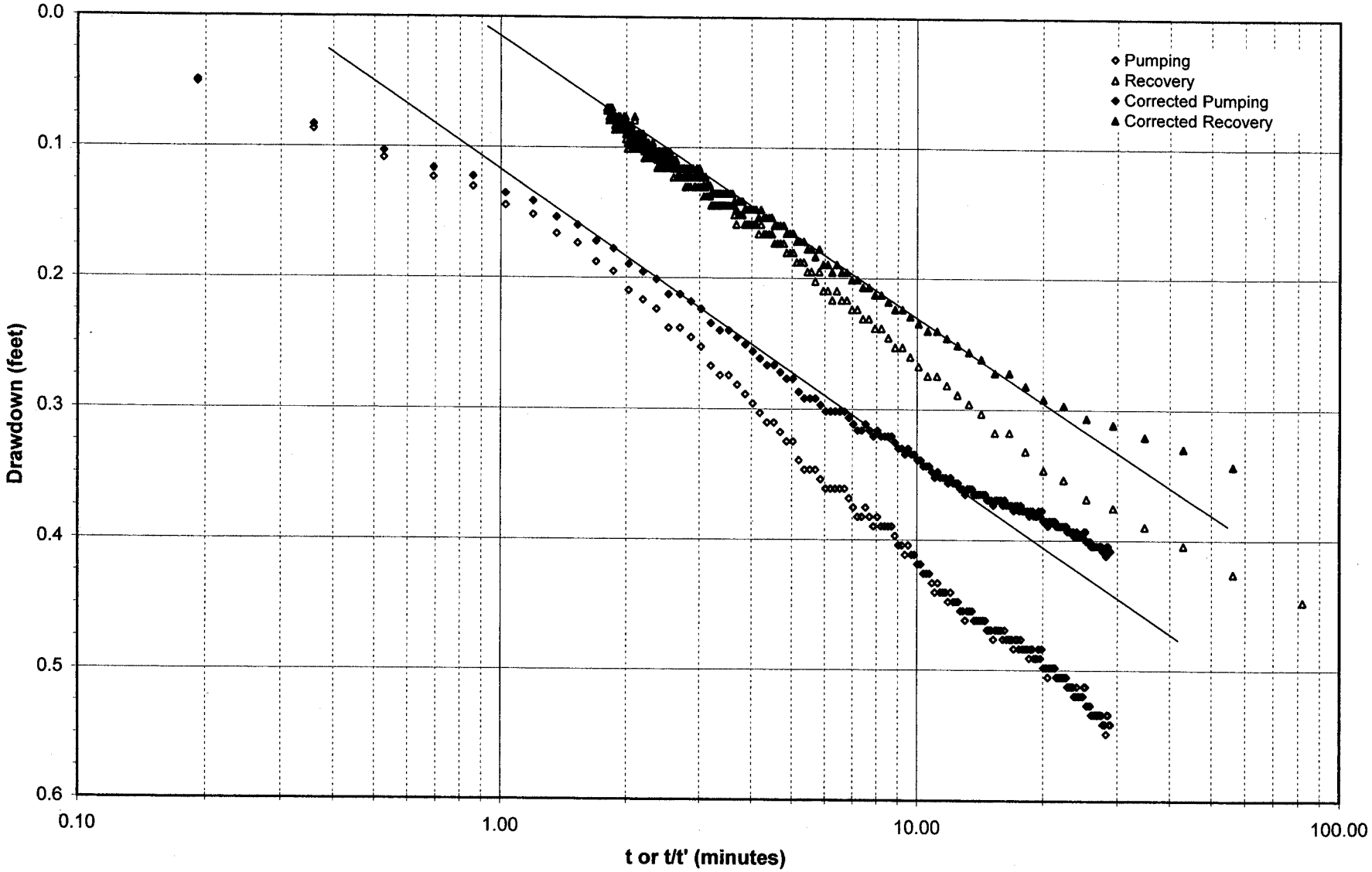
0 150 300
Scale In Feet

FIGURE 3-12
Geologic Texture Contours: Oblique View

The Oeser Company
Remedial Investigation

Pacific Groundwater Group

1 Oblique Border.DWG, 5/00



TEST CONDITIONS:
MW-09S Pump on at 14:31, 09/22/99
Average Pumping Rate: 0.125 gpm
MW-09S Pump off at 15:00, 09/22/99

RESULTS:
$T = \frac{264\ Q}{\Delta s}$

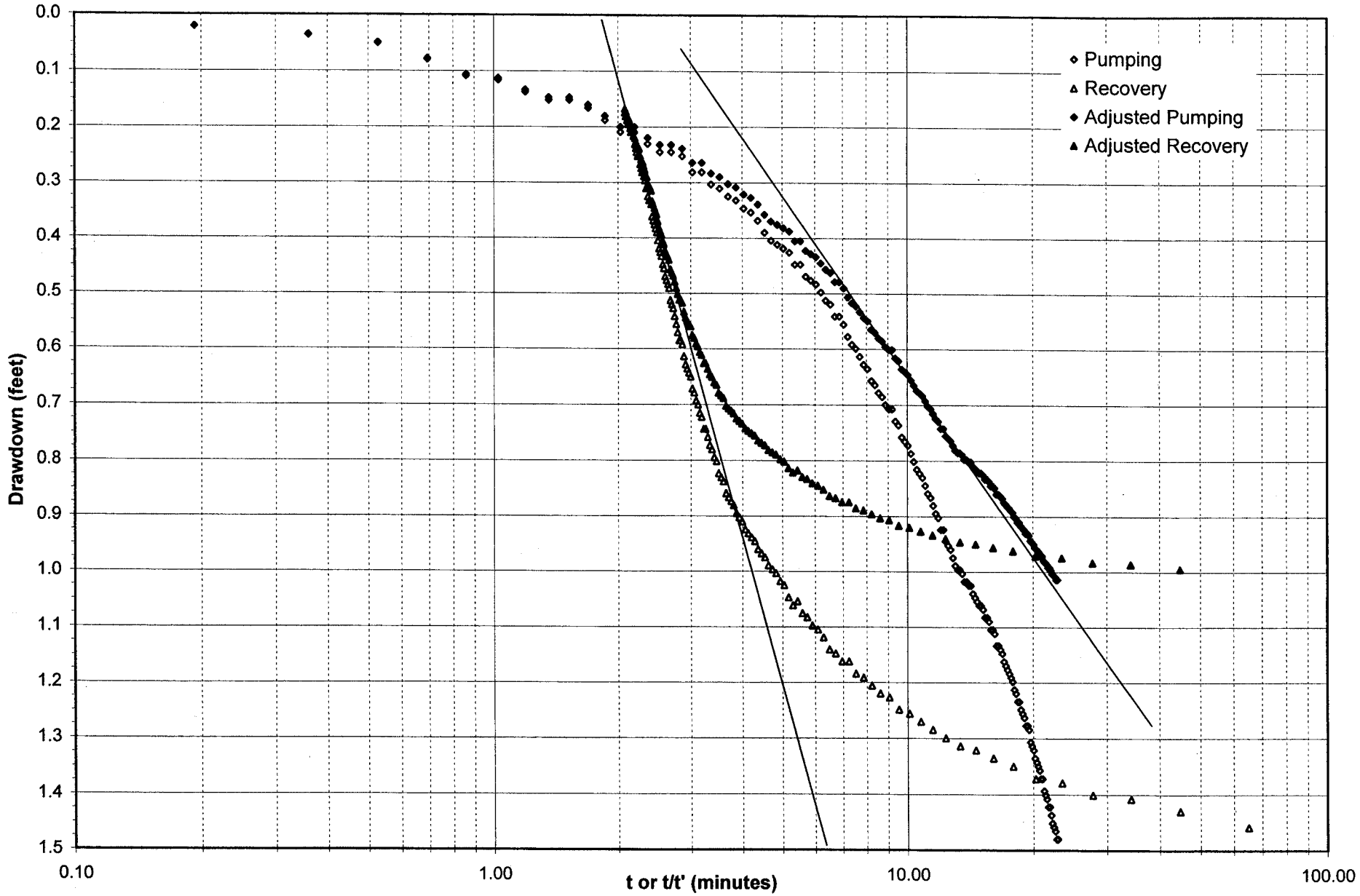
RESULTS:
Pumping
$T = \frac{264\ (0.125)}{0.22} = 150$ gpd/ft
Recovery
$T = \frac{264\ (0.125)}{0.22} = 150$ gpd/ft

KEY:
T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-13
Semilogarithmic Drawdown and Recovery in MW09-S

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



TEST CONDITIONS:
MW-15S Pump on at 13:35, 09/23/99
Average Pumping Rate: 0.075 gpm
MW-15S Pump off at 13:58, 09/23/99

RESULTS

$$T = \frac{264\ Q}{\Delta s}$$

RESULTS:
Pumping

$$T = \frac{264\ (0.075)}{2.03} = 19\ gpd/ft$$

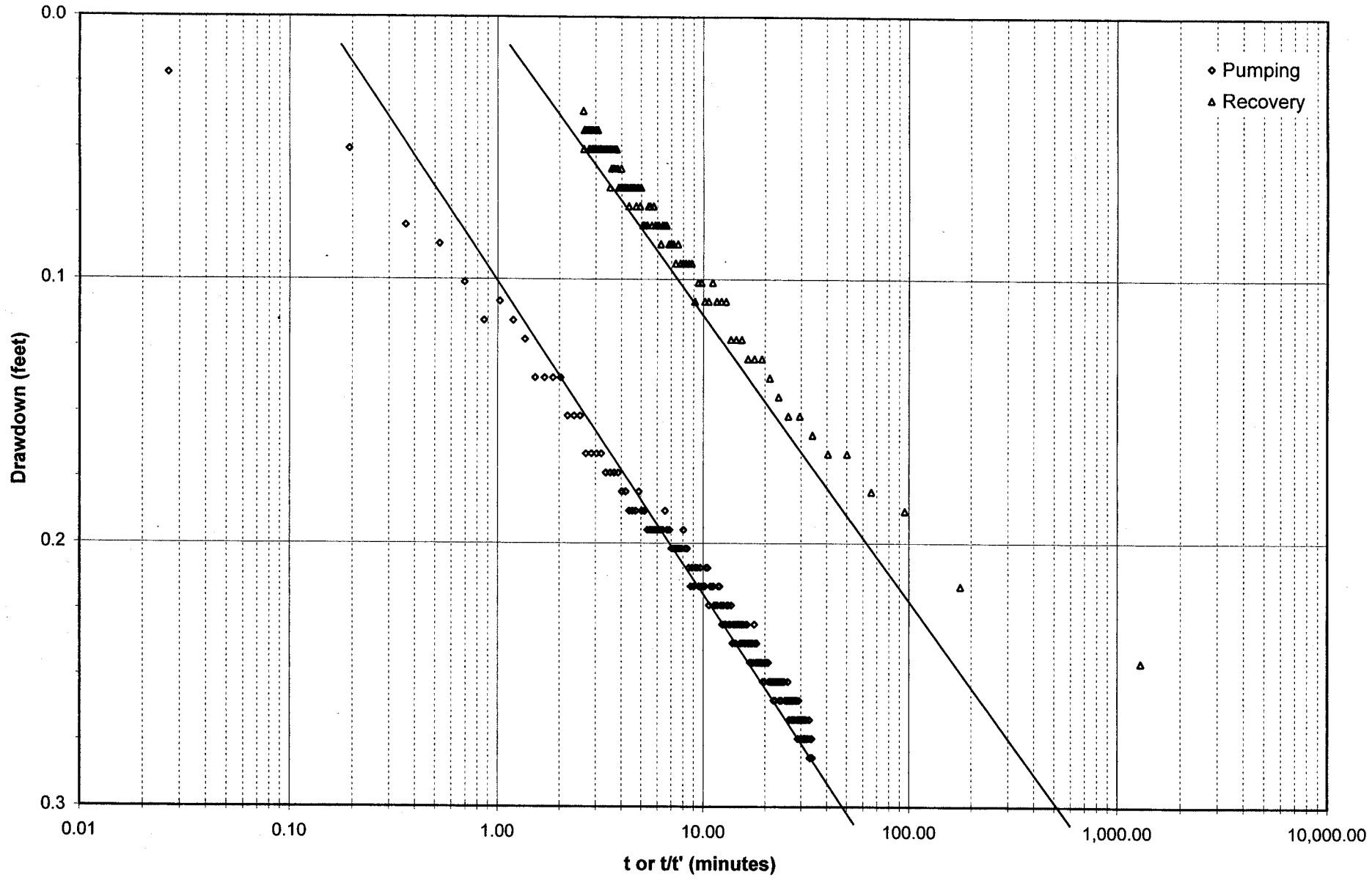
Recovery

$$T = \frac{264\ (0.075)}{2.7} = 7.0\ gpd/ft$$

KEY:
T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Ds = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-14
Semilogarithmic Drawdown and Recovery in MW15-S
The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



TEST CONDITIONS:
MW-22S Pump on at 10:47, 09/23/99
Average Pumping Rate: 0.211 gpm
MW-22S Pump off at 11:21 09/23/99

RESULTS:
$T = \frac{264\ Q}{\Delta s}$

RESULTS:
Pumping
$T = \frac{264\ (0.211)}{0.12} = 460$ gpd/ft
Recovery
$T = \frac{264\ (0.211)}{0.11} = 500$ gpd/ft

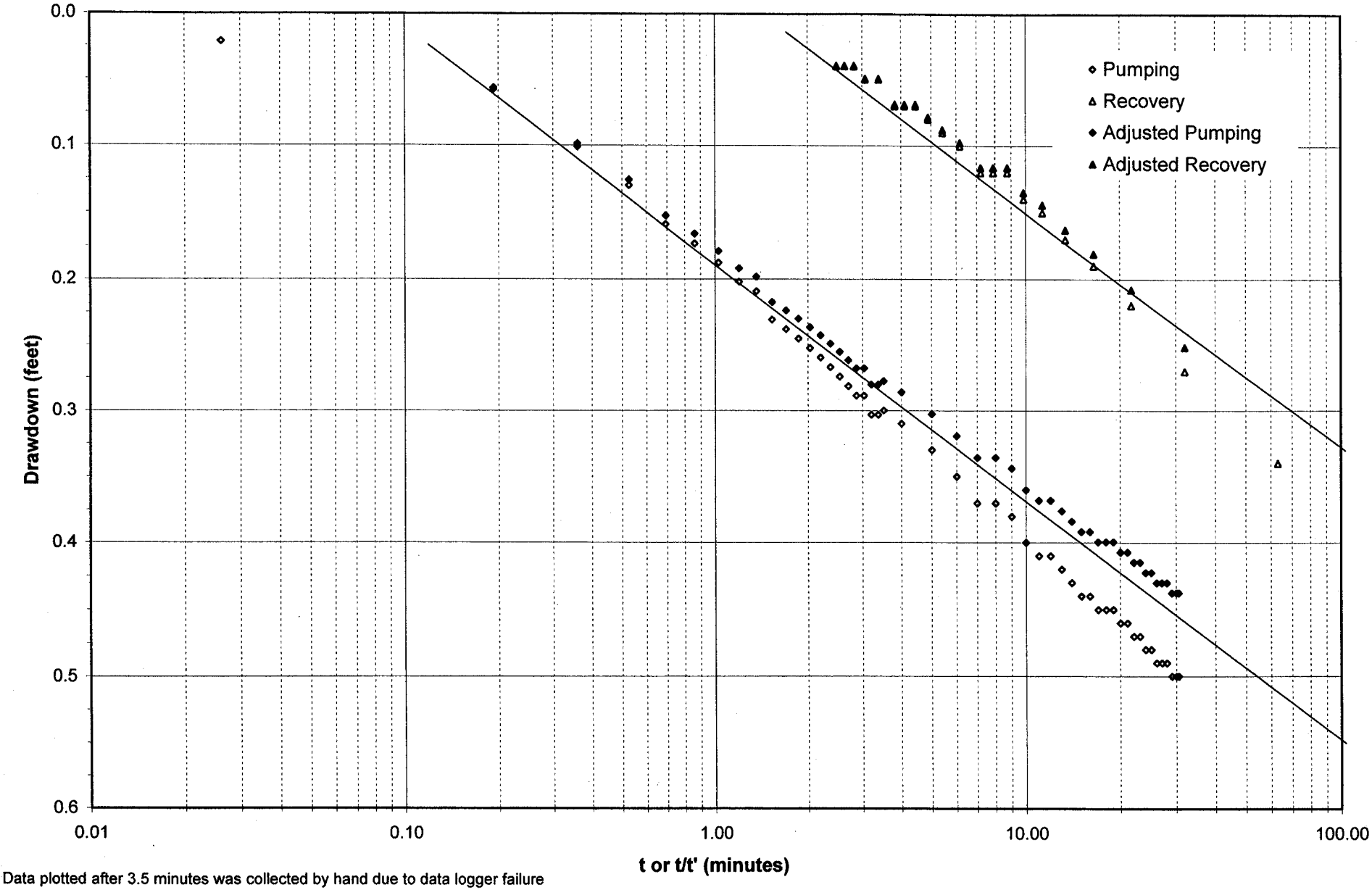
KEY:
T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-15
Semilogarithmic Drawdown and Recovery in MW22-S

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group

3-41



Data plotted after 3.5 minutes was collected by hand due to data logger failure

TEST CONDITIONS:

MW-35S Pump on at 9:02, 09/23/99
Average Pumping Rate: 0.101 gpm
MW-35S Pump off at 9:33 09/23/99

RESULTS

$T = \frac{264\ Q}{\Delta s}$

RESULTS:

Pumping

$T = \frac{264\ (0.101)}{0.18} = 150$ gpd/ft

Recovery

$T = \frac{264\ (0.101)}{0.175} = 150$ gpd/ft

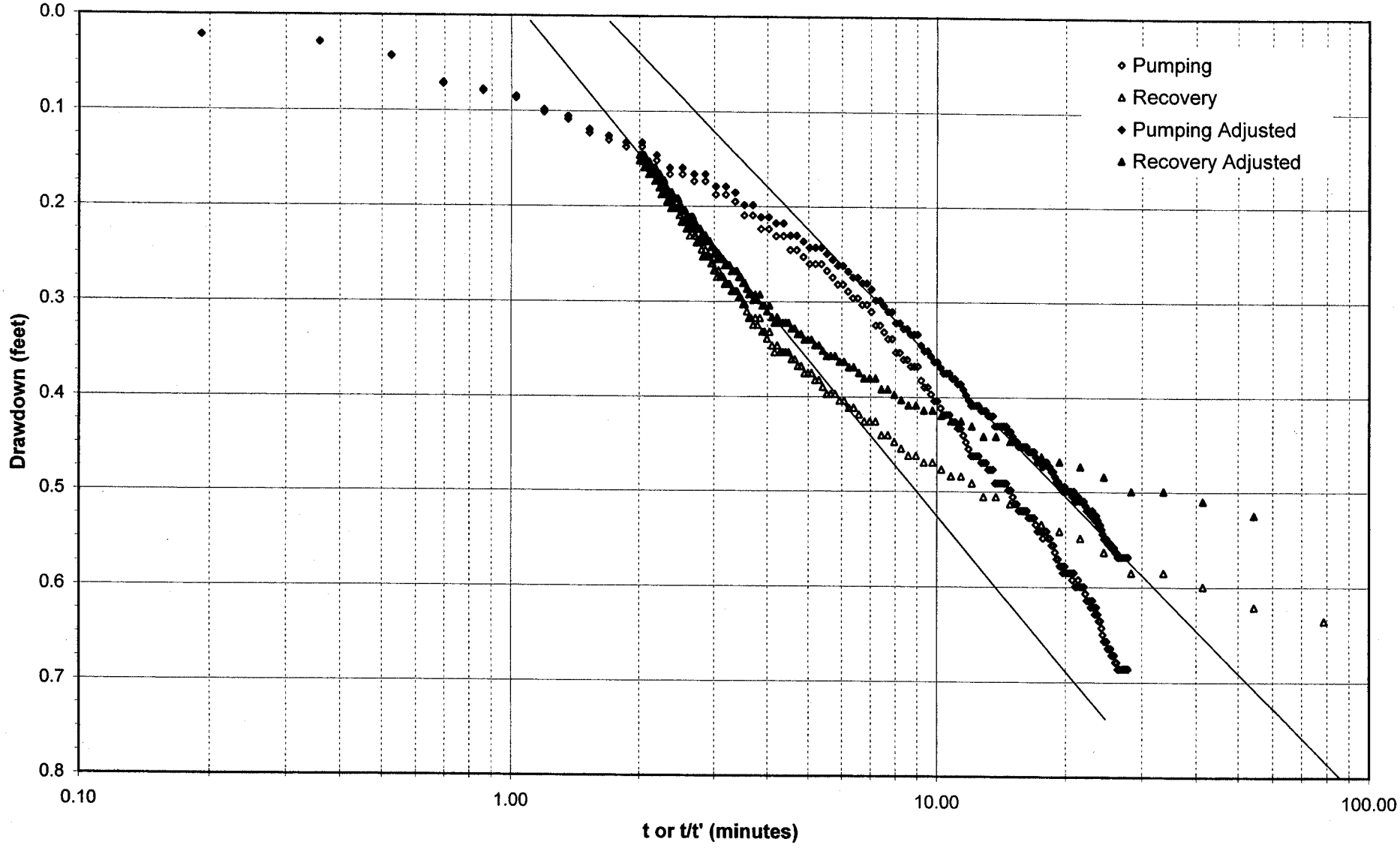
KEY:

T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-16
Semilogarithmic Drawdown and Recovery in MW35-S

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



TEST CONDITIONS:

MW-36S Pump on at 16:37, 09/22/99
Average Pumping Rate: 0.037 gpm
MW-36S Pump off at 17:05 09/22/99

RESULTS:

$T = \frac{264\ Q}{\Delta s}$

RESULTS

Pumping

$T = \frac{264\ (0.037)}{0.48} = 20$ gpd/ft

Recovery

$T = \frac{264\ (0.037)}{0.58} = 17$ gpd/ft

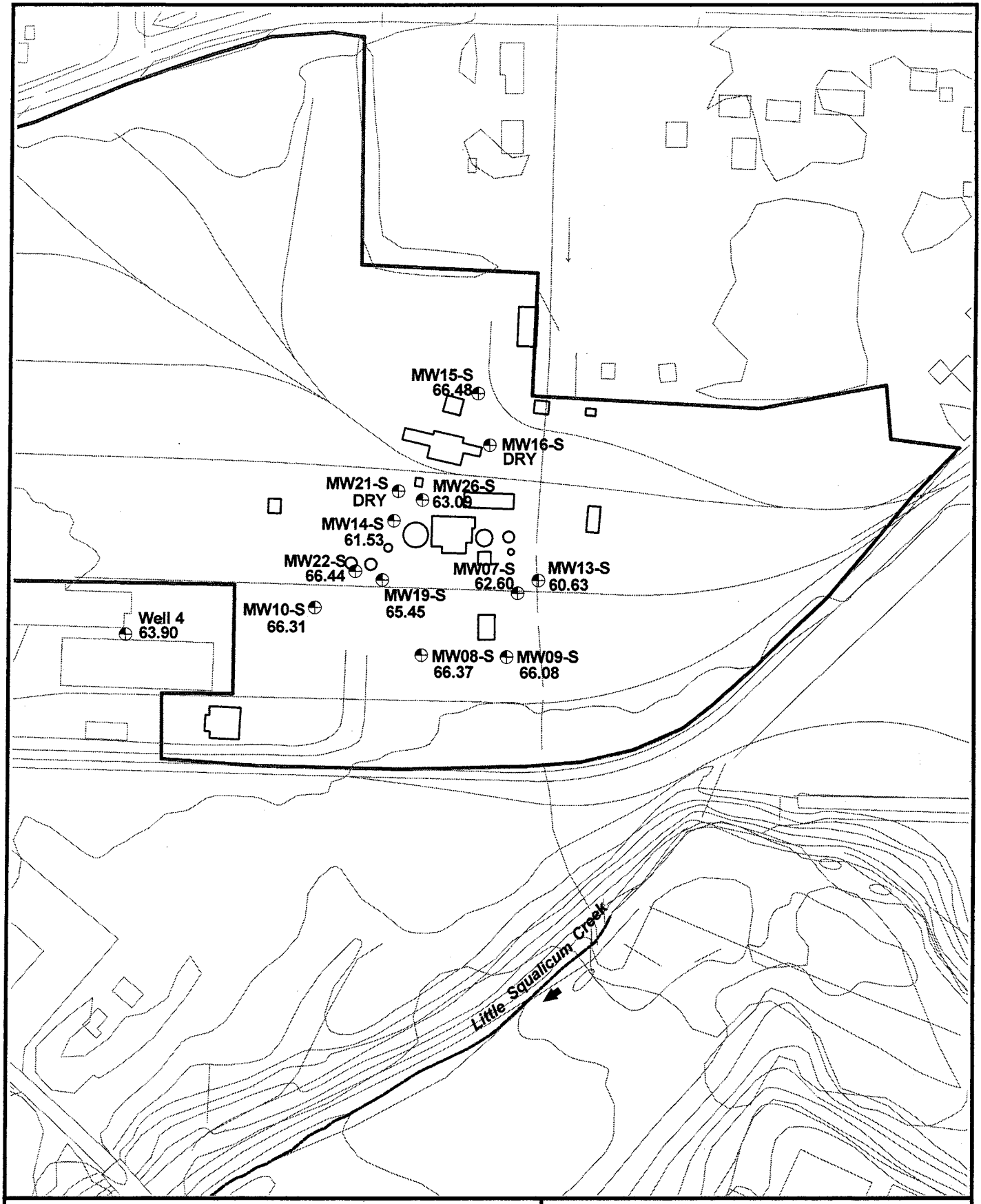
KEY:

T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-17
Semilogarithmic Drawdown and Recovery in MW36-S

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



KEY:

⊕ 64.55 **Monitoring Well Location and Groundwater Elevation (Elevations in feet above the North American Vertical Datum of 1988)**

➡ **Flow Direction**

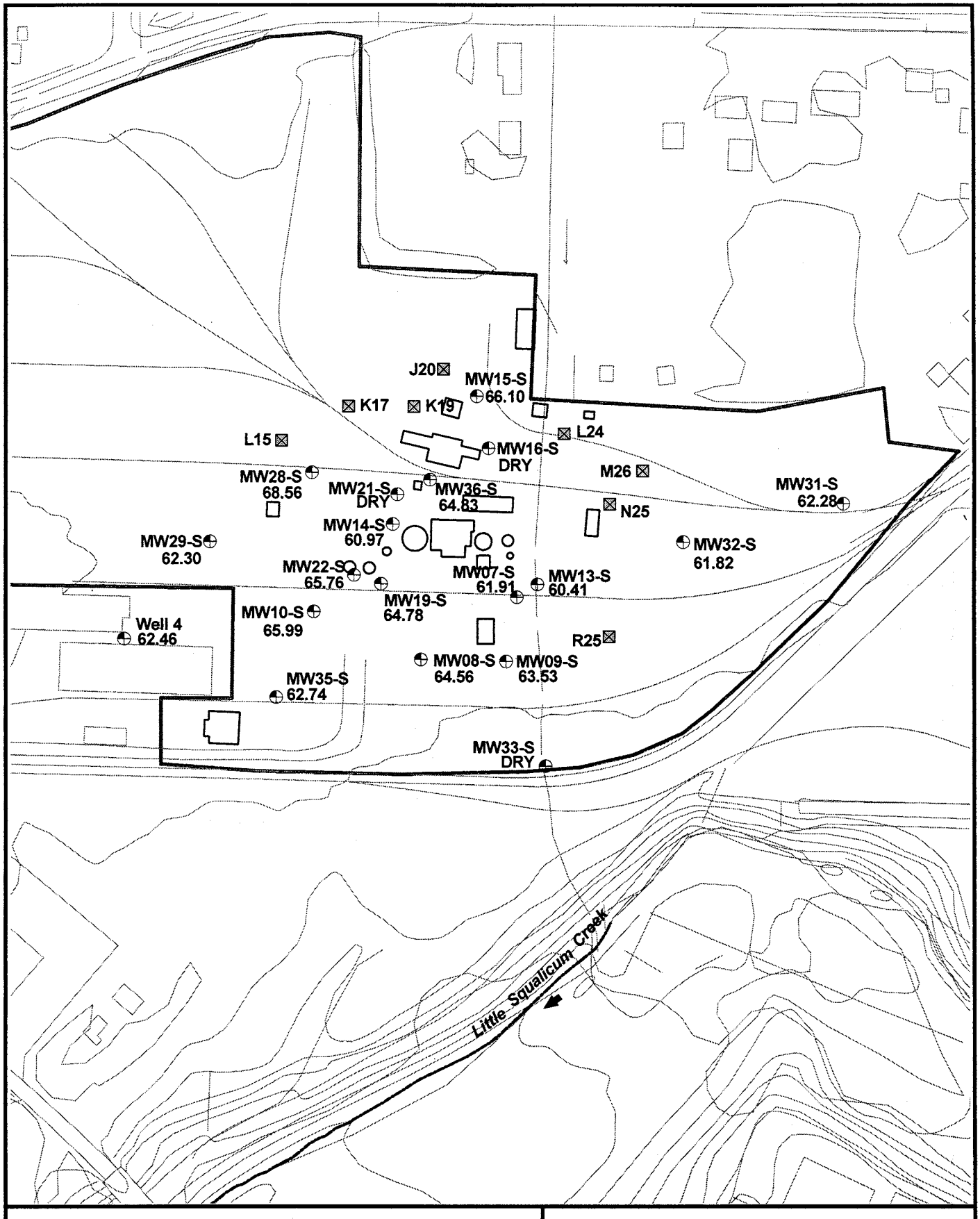
N

100 0 100 Feet

Figure 3-18
Shallow Groundwater Elevation
June 1999

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

- ⊕ Monitoring Well Location
- 64.55 and Groundwater Elevation (Elevations in feet above the North American Vertical Datum of 1988)
- ⊠ Dry Piezometer (from 8/99)
- ➡ Flow Direction

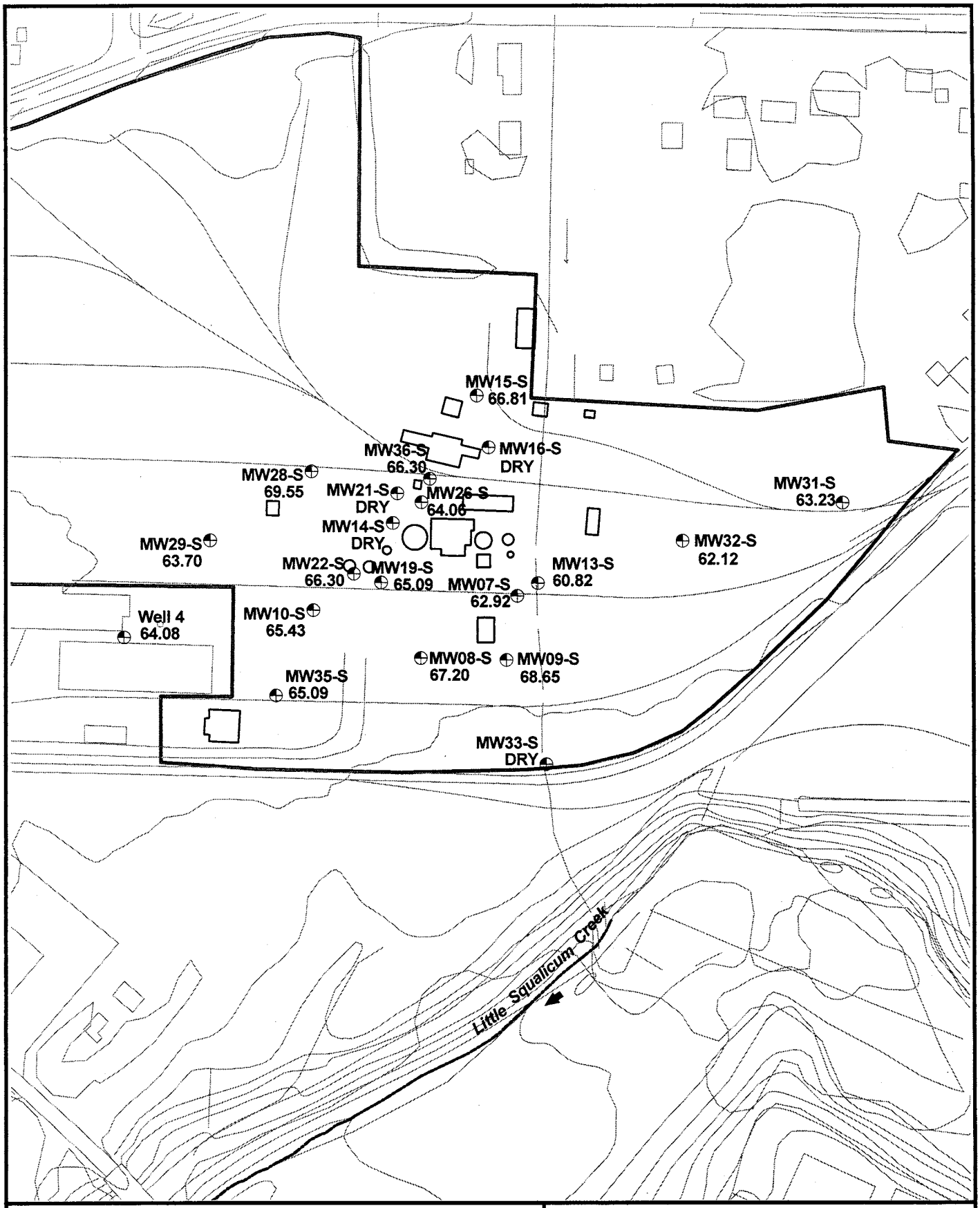
N

100 0 100 Feet

Figure 3-19
Shallow Groundwater Elevation
September 1999

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

64.55 ⊕ **Monitoring Well Location and Groundwater Elevation (Elevations in feet above the North American Vertical Datum of 1988)**

➡ **Flow Direction**

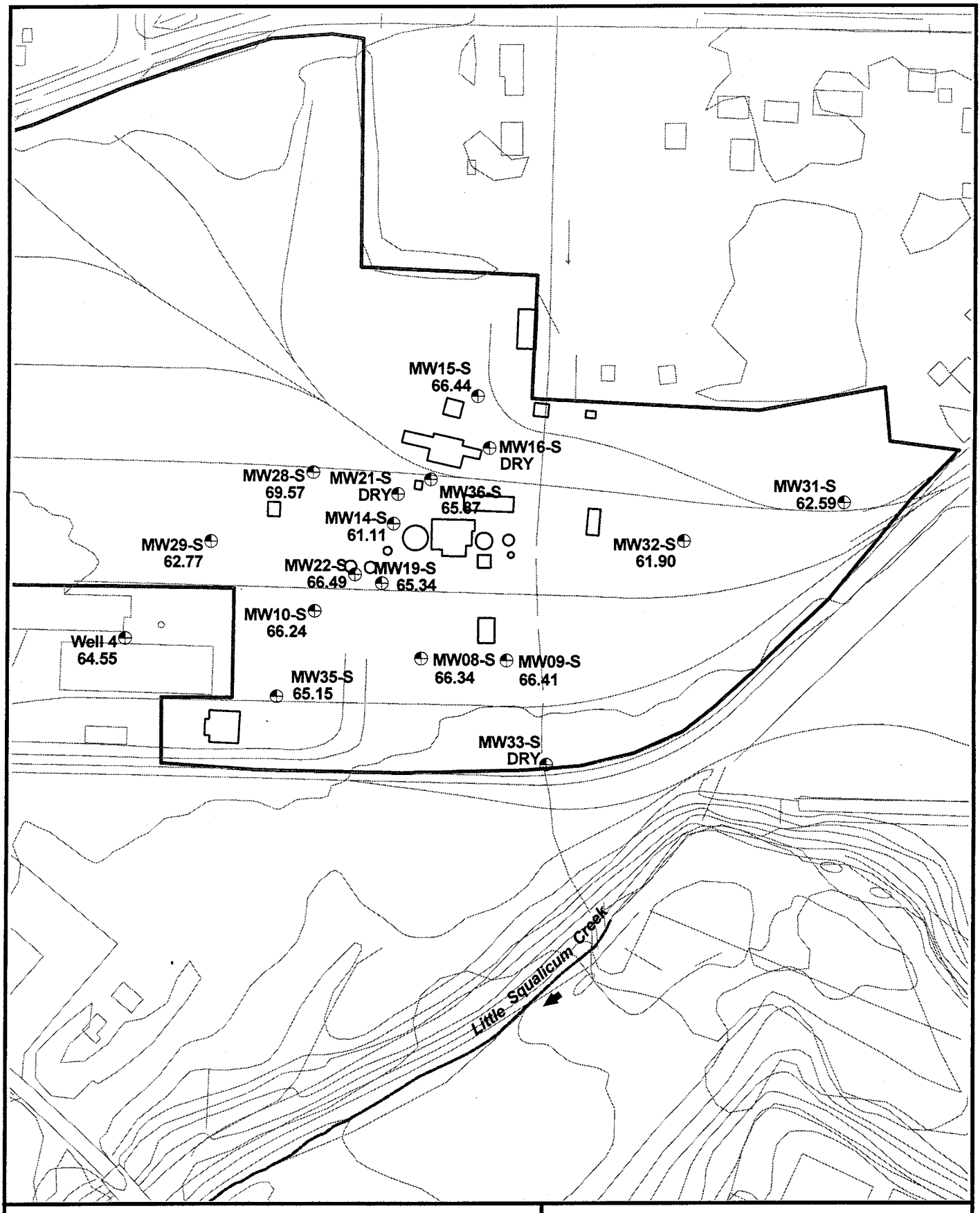
N

100 0 100 Feet

Figure 3-20
Shallow Groundwater Elevation
December 1999

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

⊕ 64.55 **Monitoring Well Location and Groundwater Elevation (Elevations in feet above the North American Vertical Datum of 1988)**

➡ **Flow Direction**

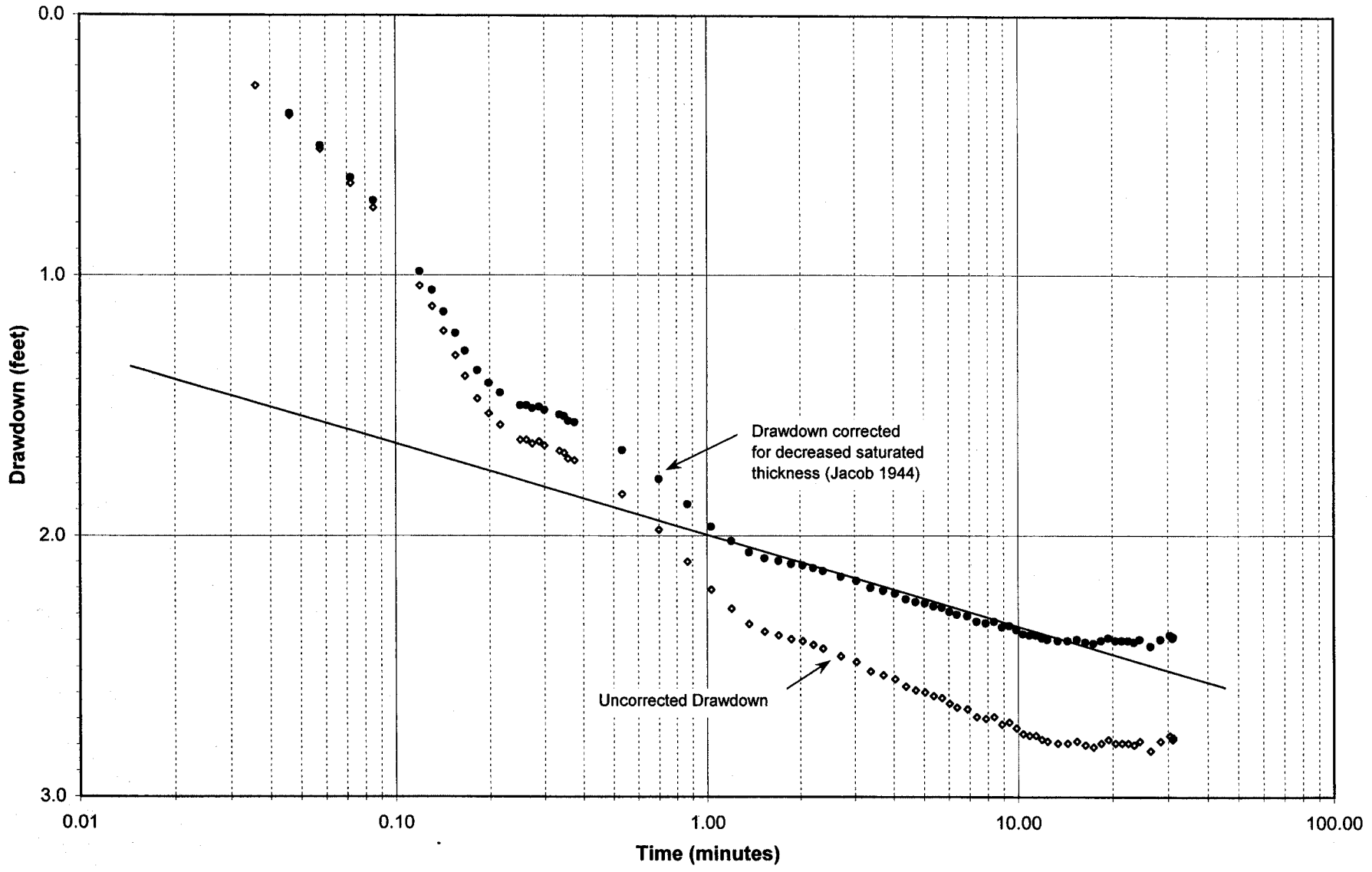
N

100 0 100 Feet

Figure 3-21
Shallow Groundwater Elevation
February 2000

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



TEST CONDITIONS:

MW05-D Pump on at 16:21, 09/02/99
Average Pumping Rate: 1.4 gpm
MW05-D Pump off at 16:52 09/03/99

RESULTS:

$T = \frac{264\ Q}{\Delta s}$

$T = \frac{264\ (1.4)}{0.35} = 1100$ gpd/ft

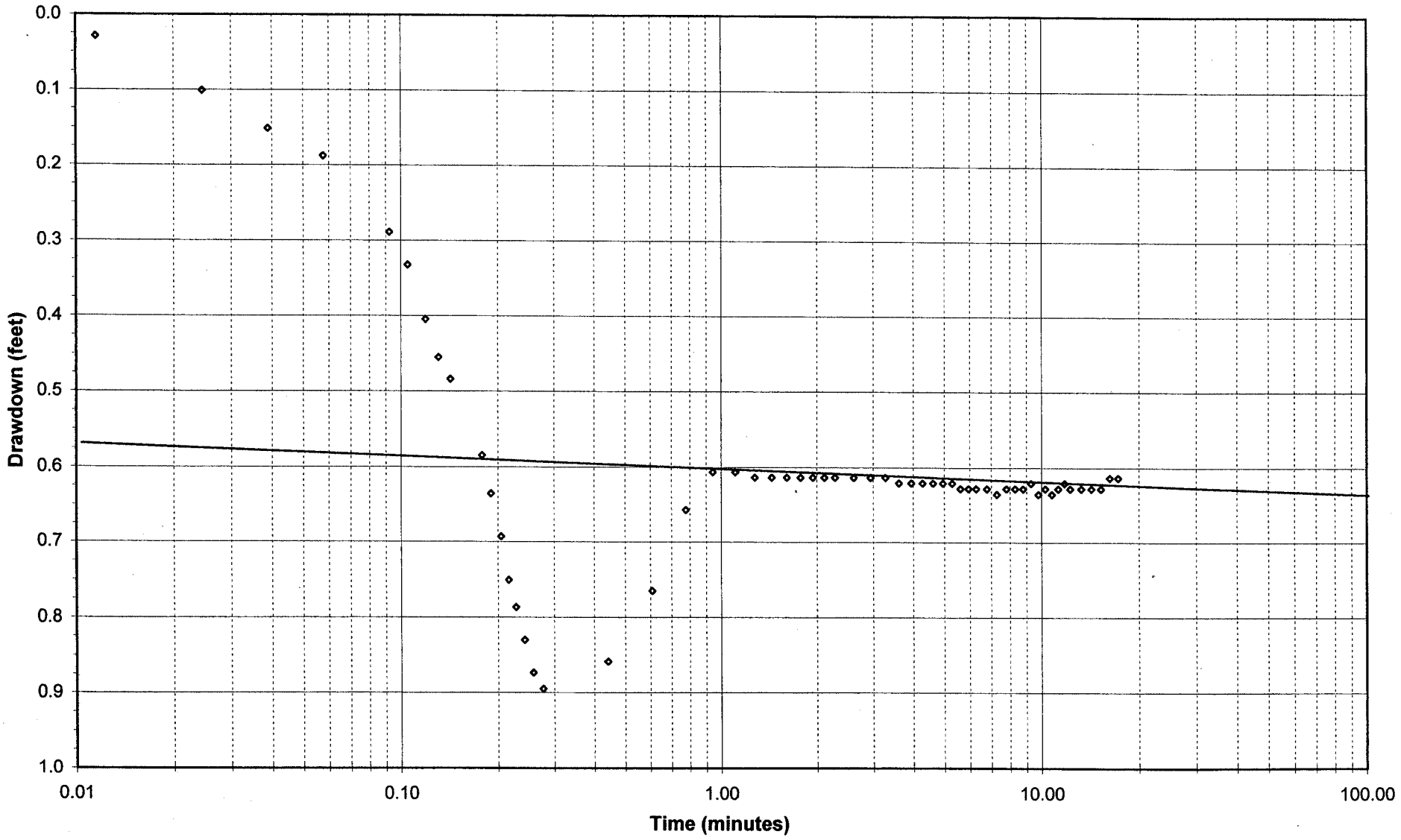
KEY:

T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-22
Semilogarithmic Drawdown in MW05-D

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



TEST CONDITIONS:

MW-17D Pump on at 08:11, 09/03/99
Average Pumping Rate: 3.3 gpm
MW-17D Pump off at 08:28, 09/03/99

RESULTS:

$T = \frac{264\ Q}{\Delta s}$

$T = \frac{264\ (3.3)}{0.175} = 5{,}000$ gpd/ft

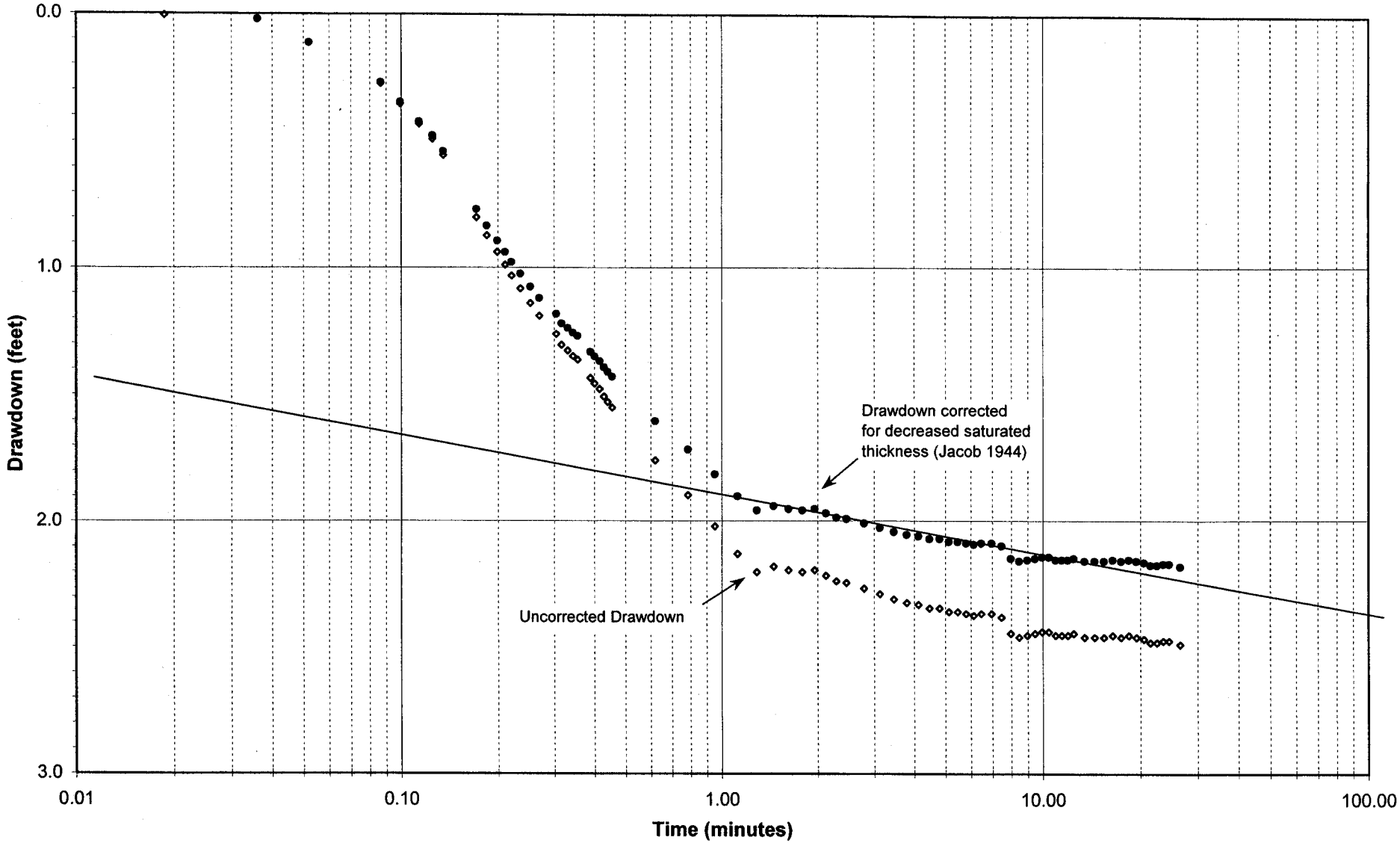
KEY:

T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-23
Semilogarithmic Drawdown in MW17-D

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



TEST CONDITIONS:
MW23-D Pump on at 11:17, 09/03/99
Average Pumping Rate: 1.9 gpm
MW23-D Pump off at 11:44 09/03/99

RESULTS:

$$T = \frac{264\,Q}{\Delta s}$$

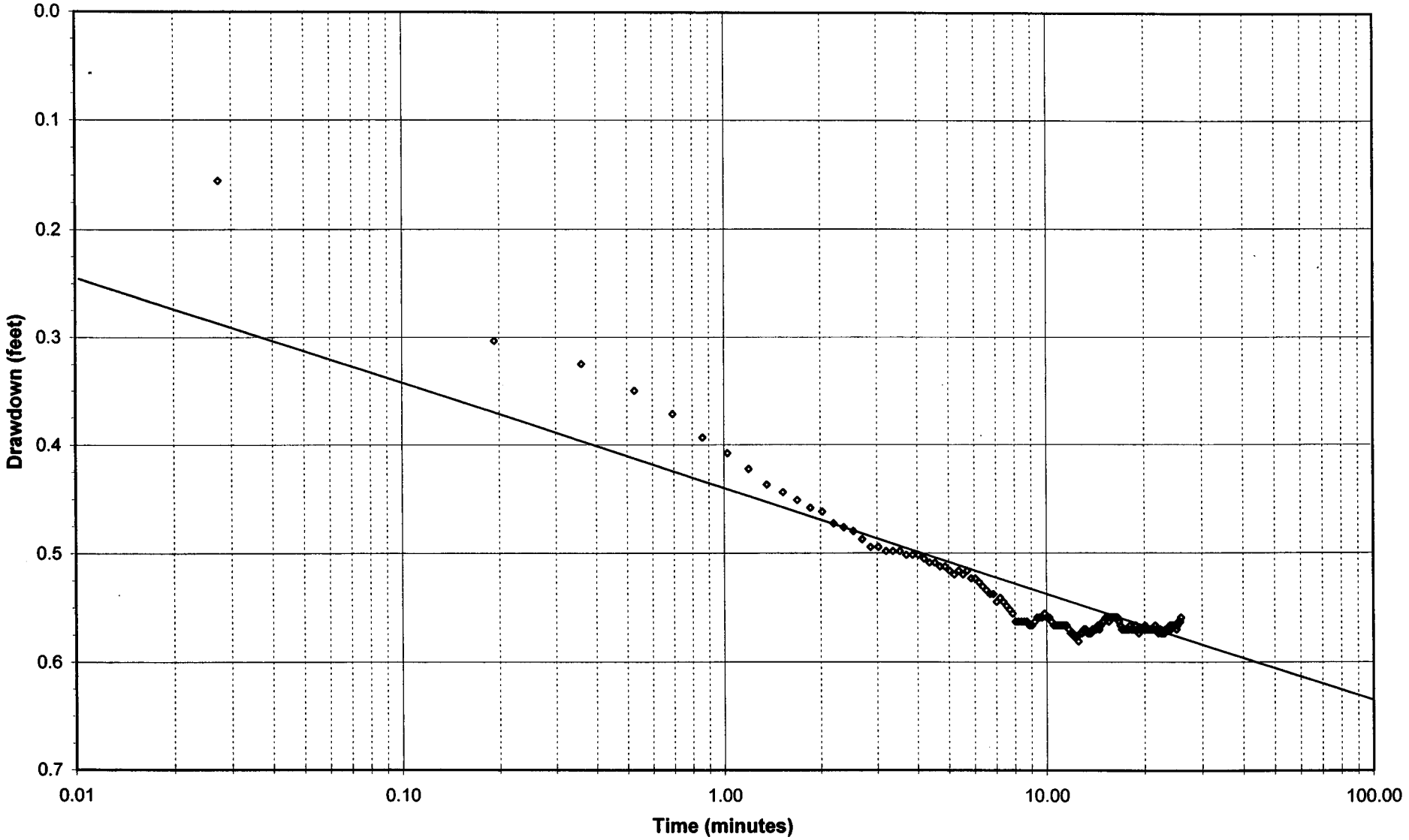
$$T = \frac{264\,(1.9)}{0.25} = 2{,}000 \text{ gpd/ft}$$

KEY:
T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = Gallons per minute
gpd/ft = Gallons per day per foot

Figure 3-24
Semilogarithmic Drawdown in MW23-D
The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group

3-50



TEST CONDITIONS:

MW-33D Pump on at 17:33, 10/13/99
Average Pumping Rate: 0.38 gpm
MW-33D Pump off at 17:59, 10/13/99

RESULTS:

$T = \frac{264\,Q}{\Delta s}$

$T = \frac{264\,(0.38)}{0.10} = 1000$ gpd/ft

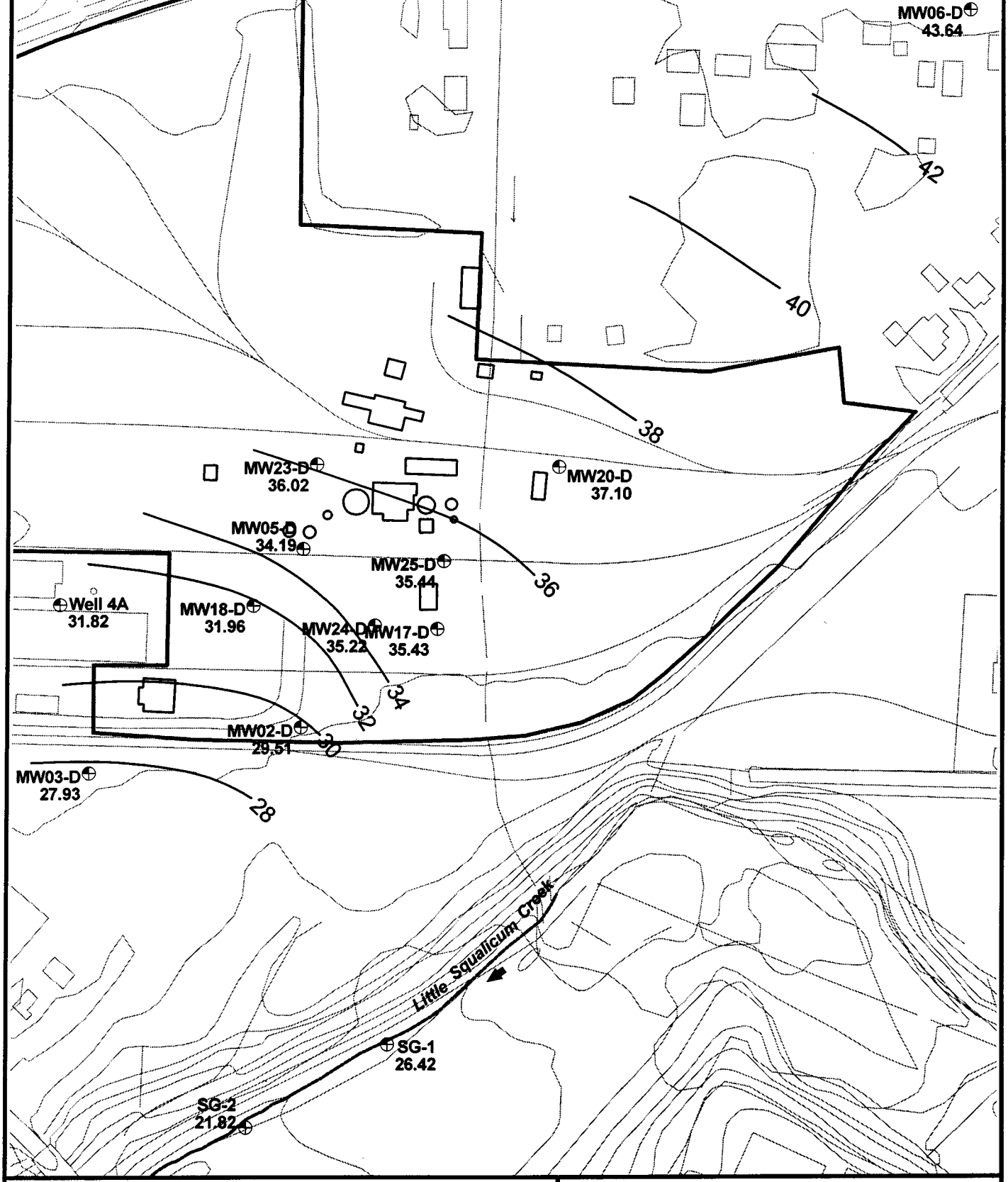
KEY:

T = Transmissivity (gpd/ft)
Q = Discharge rate (gpm)
Δs = Change in drawdown over one log cycle (feet)
gpm = gallons per minute
gpd/ft = gallons per day per foot

Figure 3-25
Semilogarithmic Drawdown in MW33-D

The Oeser Company
Remedial Investigation
JE9803

Pacific Groundwater Group



KEY:

⊕ **Monitoring Well Location and Groundwater Elevation**
27.93 **(Elevations in feet above the North American Vertical Datum of 1988)**

➡ **Flow Direction**

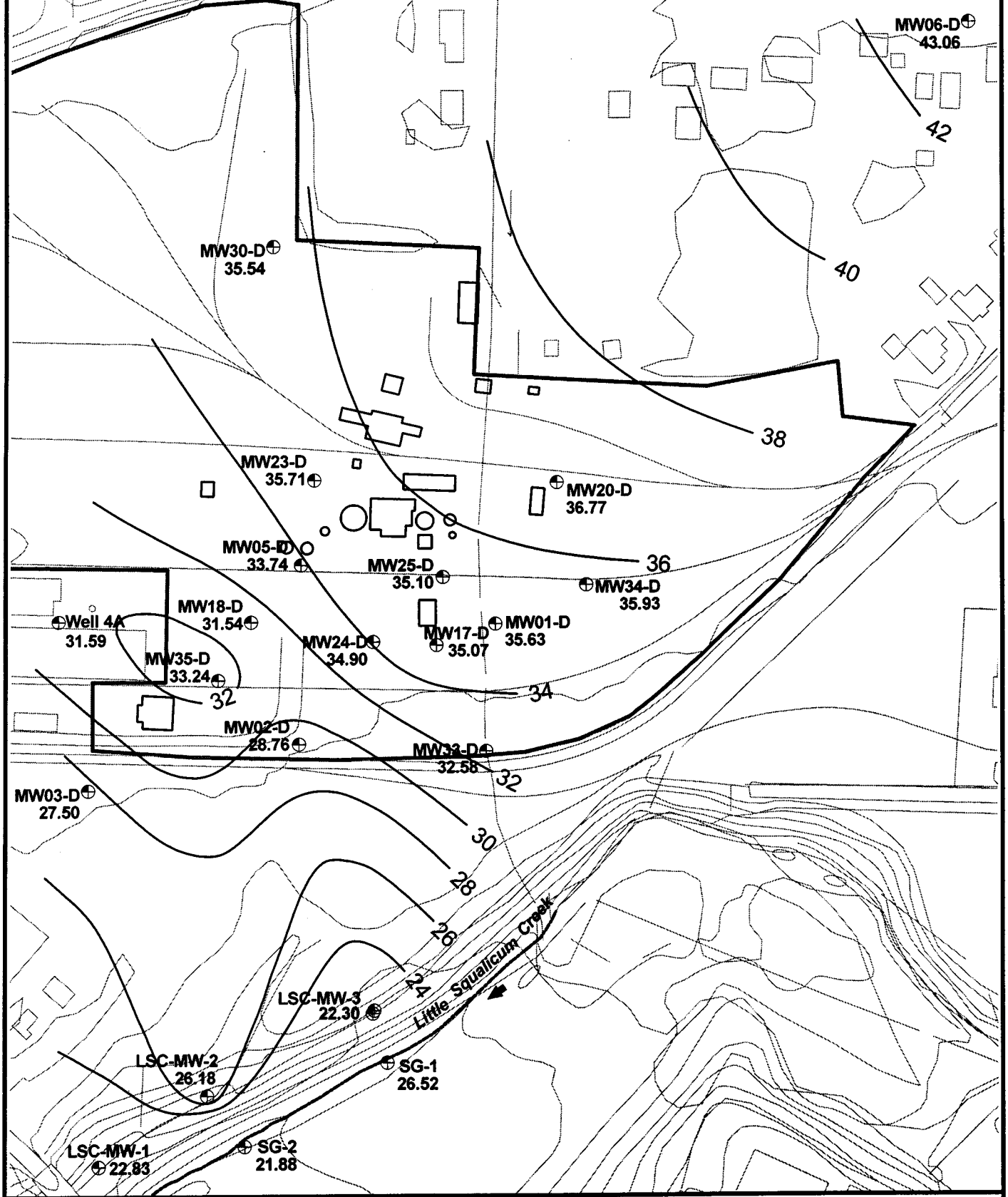
N

100 0 100 Feet

Figure 3-26
Deep Groundwater Elevation
June 1999

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

⊕ Monitoring Well Location
27.93 and Groundwater Elevation
(Elevations in feet above the North American Vertical Datum of 1988)

➨ Flow Direction

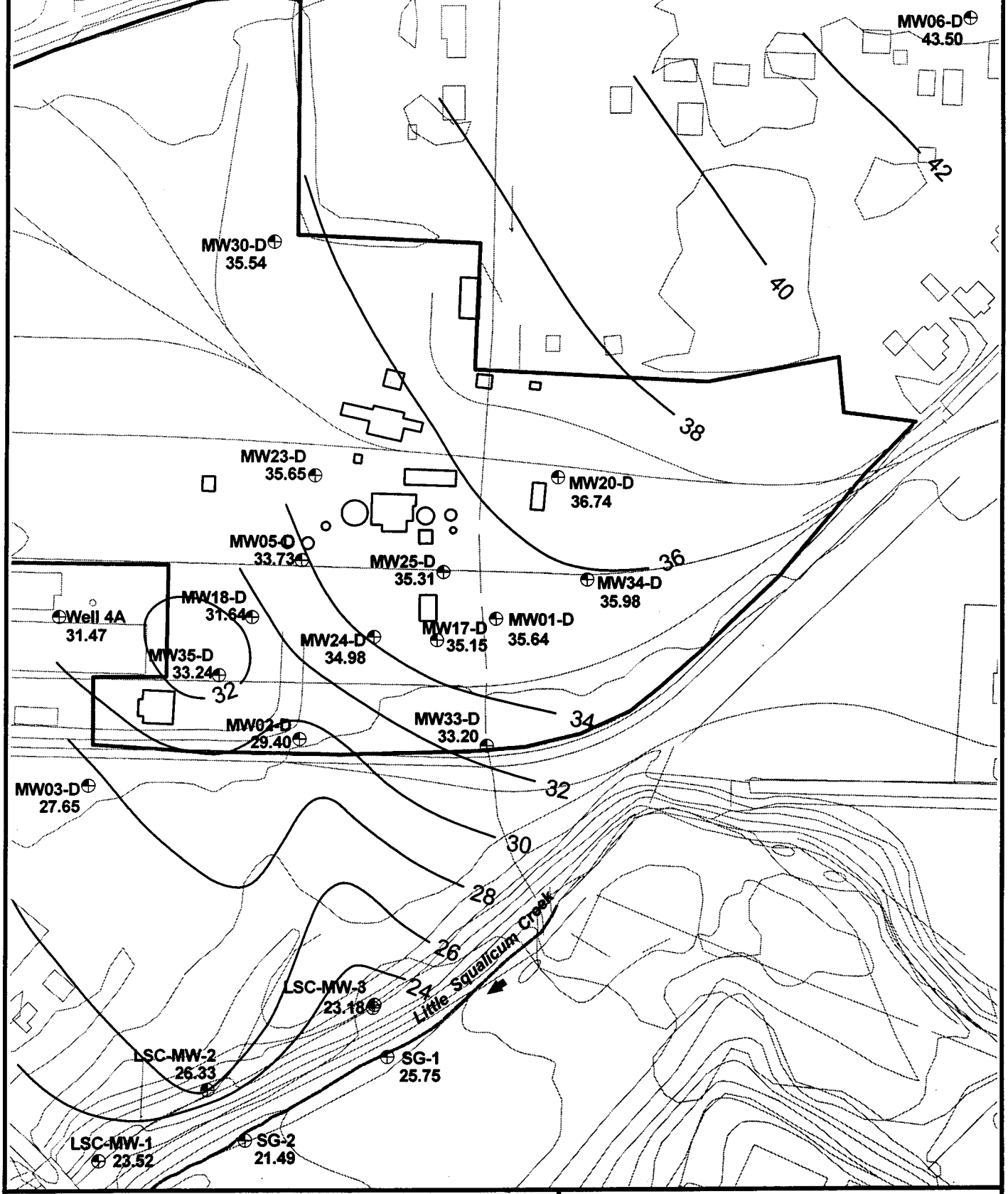
N

100 0 100 Feet

Figure 3-27
Deep Groundwater Elevation
September 1999

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

⊕ Monitoring Well Location
27.93 and Groundwater Elevation
(Elevations in feet above the North American Vertical Datum of 1988)

➨ Flow Direction

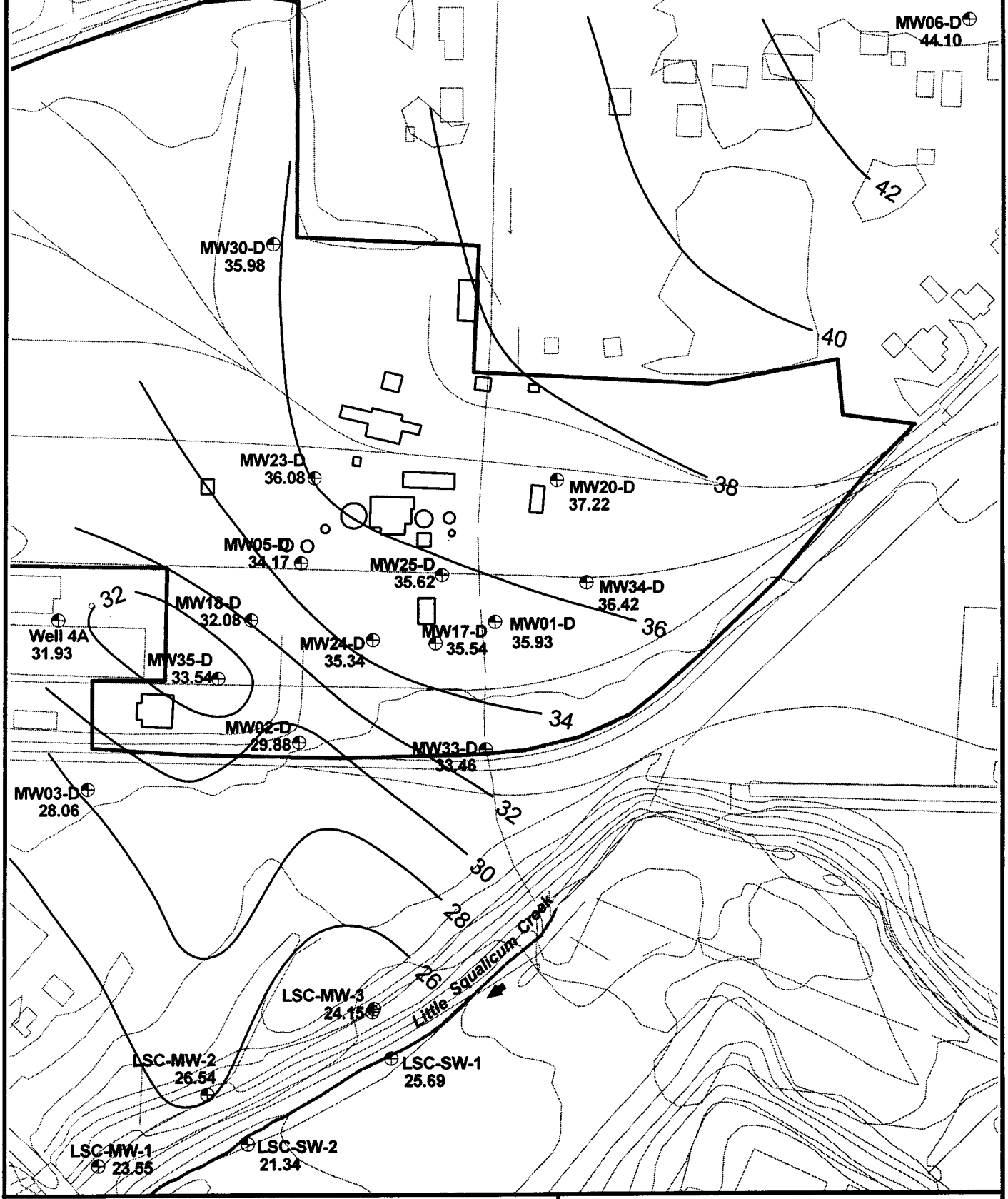
N

100 0 100 Feet

Figure 3-28
Deep Groundwater Elevation
December 1999

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



KEY:

- ⊕ 27.93 — Monitoring Well Location and Groundwater Elevation (Elevations in feet above the North American Vertical Datum of 1988)
- ➡ Flow Direction

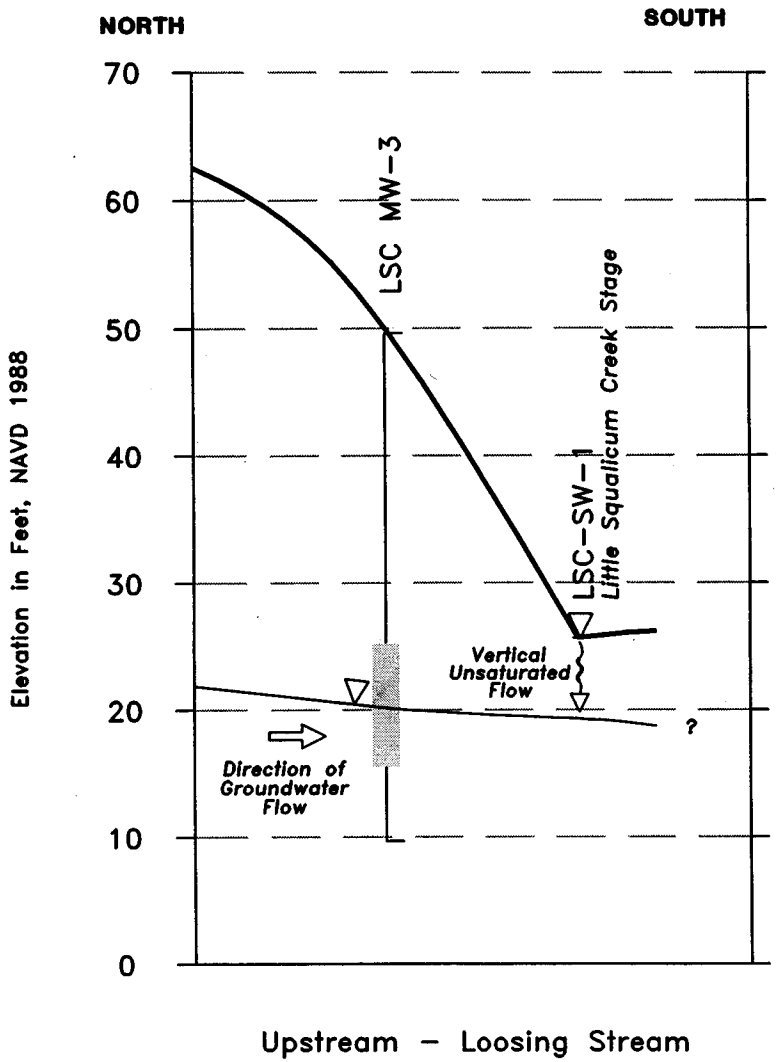
N

100 0 100 Feet

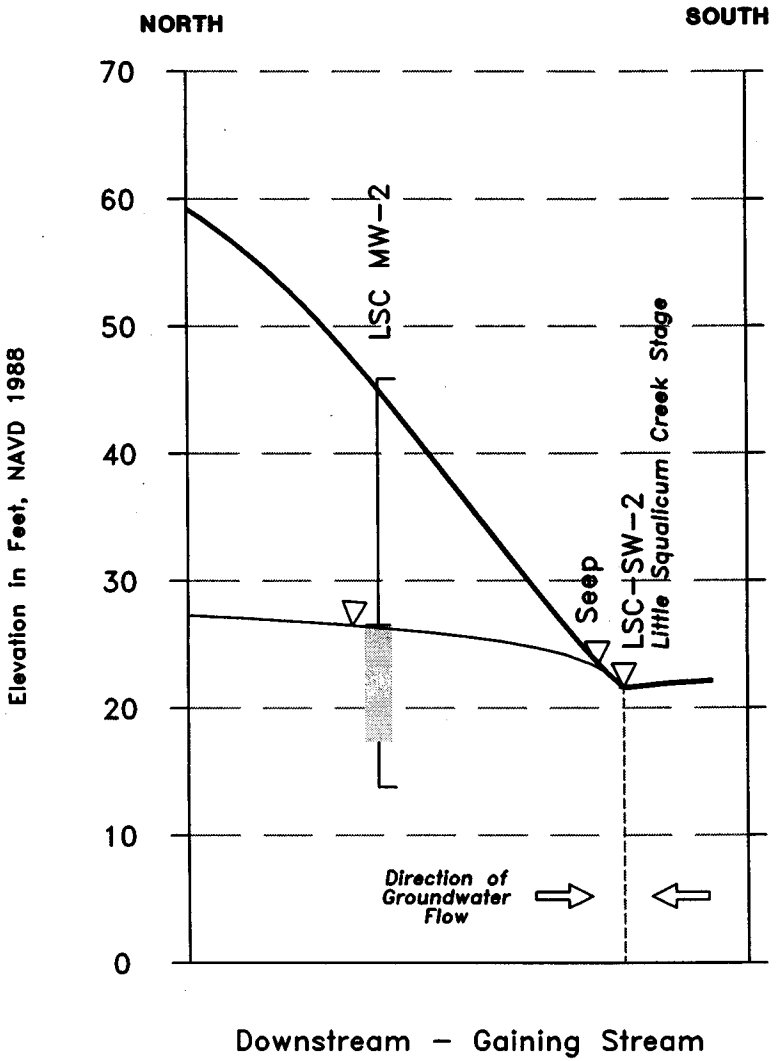
Figure 3-29
Deep Groundwater Elevation
February 2000

The Oeser Company
Remedial Investigation

Pacific Groundwater Group



Upstream – Loosing Stream



Downstream – Gaining Stream

KEY

Deep Groundwater Table

Water level on 2/27/00

Screened Interval

Vertical Scale in Feet

0 15 30

0 75 150

Figure 3-30
Groundwater-Surface Water Interaction

The Oeser Company
Remedial Investigation

Pacific Groundwater

4. NATURE AND DISTRIBUTION OF CONTAMINANTS

This section presents analytical results from multi-media sampling conducted during The Oeser Company RI. This section is divided into six subsections:

- Section 4.1 identifies analytes detected at the site but not included as COPCs and the reasons why they were removed as COPCs; it also summarizes potential COPCs by analyte groups;
- Section 4.2 presents the results of surface soil sampling and analyses at various locations, including the background residential area, the off-facility residential area, areas within The Oeser Company facility, the South Slope, and Little Squalicum Creek;
- Section 4.3 presents the results of subsurface soil sampling and analyses at various locations, including areas within The Oeser Company facility, the South Slope and Little Squalicum Creek;
- Section 4.4 presents the results of groundwater sampling and analyses in both shallow and deep groundwater beneath and around the facility;
- Section 4.5 presents the results of ambient air sampling and analyses at various locations within and around The Oeser Company facility; and
- Section 4.6 presents the results of ecological sampling and analyses in various media and locations, including surface water, sediment, berries, and biota.

A general summary of the nature (which analytes were detected) and distribution (where analytes were detected) of analytes is included in each subsection. Data is summarized in Section 4 using text, tables, and figures to present and correlate results. Section 4 generally discusses sample locations (e.g., residence RES-23) rather than specific sample numbers (e.g., 99070543).

Organic and inorganic analytes detected in samples were evaluated based on source, frequency of occurrence, frequency of detection above background concentrations, and frequency of exceedence over PSLs. This information will be combined with the baseline HHRA and ERA that are part of the RI for The Oeser Company site and will be utilized by the EPA for remedial decision making to reduce and manage potential risks associated with the site.

The data tables in Section 4 include comparisons of detected analyte concentrations to ARAR values.

4.1 Identification of COPCs

All analytes detected during multi-media studies of The Oeser Company site were reviewed to determine if they should be kept for consideration as COPCs. The following subsections identify analytes removed as potential COPCs and the reasons for doing so; they also summarize the types of compounds determined to be COPCs for the RI.

4.1.1 Analytes Not Considered COPCs

A number of analytes detected during multi-media studies of The Oeser Company site were deleted from further discussion since they are not considered COPCs.

4.1.1.1 Common Laboratory and/or Field Blank Contaminants

As previously stated in Section 2.8, the following common laboratory and/or field blank contaminants are not discussed in the RI: acetone (2-propanone), methylene chloride, 2-butanone, carbon disulfide, bis(2-ethylhexyl)phthalate, diethylphthalate, dimethylphthalate, butylbenzylphthalate, di-n-butylphthalate, and di-n-octylphthalate. None of these compounds are known to be or have been associated with operations at The Oeser Company facility. All are listed in the EPA's National Functional Guidelines for Organic Data Review (1994a) as common laboratory contaminants. All data for these compounds were evaluated, and, based on best professional judgement, it was determined that the concentrations measured were indicative of laboratory contamination rather than actual contamination in the media tested. Dichlorodifluoromethane (Freon 12) and fluorotrichloromethane (Freon 11) were detected in 3 of 239 and 13 of 251 samples, respectively. None of the measured concentrations exceeded the EPA PRGs for the media in which they were found. Both analytes are common laboratory contaminants associated with refrigeration and air conditioning units, and neither is known to be associated with facility operations. Therefore, neither has been further addressed in this report.

4.1.1.2 Infrequently Detected Analytes

A number of analytes were detected at a frequency of less than 2%, based on a minimum of at least 200 samples, for the entire data set of all sampling at the site. These analytes do not appear to be

related to site operations based on the limited number of detections and no known or anticipated link to previous or current facility operations. Table 4-1 identifies these analytes and presents the number of detections by medium. Table 4-2 compares these results to EPA PRGs if PRGs were exceeded. 1,3,5-Tribromophenol and vinyl acetate were not detected during any RI sampling events.

The purpose of identifying infrequently detected analytes was not to "a priori" eliminate potential contaminants from further consideration, but to cost-effectively evaluate the data while protecting human health and the environment. Analytes detected at very low frequencies present only limited opportunities for exposure. Risk, which requires both toxicity and exposure to complete a risk pathway, is expected to be low for these rarely detected analytes. Based upon past experience and best professional judgement, it is possible that at least some of these analytes are not facility or site related, but may be artifacts of laboratory-derived interferences. Therefore, these analytes are not further evaluated in this report.

4.1.1.3 Evaluation of Metals

Although all available information regarding the history of wood treatment practices at the site indicates that inorganic-based wood preservatives were never used, analysis for metals was conducted during the RI field work and some earlier sampling events to verify that elevated concentrations of metals are not present at the facility. The primary metals of concern were arsenic and chromium, which are frequently components of inorganic-based wood preservatives and are relatively toxic.

Results of the sampling and analyses confirm that no facility-related metal contamination exists; however, elevated concentrations of several metals, discussed below, were found at the site. Since the purpose of this report is to document the nature and extent of contamination related to The Oeser Company, a complete discussion of nonfacility-related metals contamination is not included. The purpose of this section is to present an overview of the metals data to document the lack of facility-related contamination and to briefly highlight areas of potential contamination from other sources.

4.1.1.3.1 Metals - Soil Data

Of approximately 200 surface and subsurface soil samples analyzed for arsenic during RI field work and earlier sampling events, five samples contained arsenic concentrations exceeding the MTCA Method A benchmark of 20 milligrams per kilogram (mg/kg), based on an estimate of background arsenic concentrations in Washington state. The highest arsenic concentration, 150 mg/kg, was found in a

surface soil sample taken from the location of monitoring well MWLSC1, the southern-most monitoring well installed on the footpath along Little Squalicum Creek, over 500 feet south of the office at the southwest corner of the facility. This surface soil sample also exhibited the highest concentrations of barium (510 mg/kg), lead (170 mg/kg), and zinc (610 mg/kg) of any soil samples collected during site investigations, as well as concentrations of antimony, cadmium, and copper elevated above typical background levels.

The other four samples containing concentrations of arsenic above 20 mg/kg included surface soil samples from locations RES-50 (52 mg/kg), RES-53 (50.3 mg/kg), RES-54 (48.4 mg/kg), and MW03-D (24.1 mg/kg). All of these are off-facility locations to the south of the facility, along the railroad tracks. Arsenic concentrations were well within normal background ranges in all surface and subsurface soil samples collected on the facility, including all samples from the treatment areas exhibiting high concentrations of organic contaminants.

Chromium concentrations at the facility also do not appear different from background concentrations. Although a few slightly elevated concentrations are found on the facility, the 90th percentile concentration of chromium in on-facility samples of 51 mg/kg is essentially identical to the 90th percentile reported in Ecology (1994) for background chromium concentrations in the Puget Sound area (48 mg/kg), as well as the 90th percentile in the background samples collected during RI field work (also 48 mg/kg). Furthermore, no relationship is apparent between the few elevated concentrations of chromium and organic contamination; the high concentrations of chromium are widely scattered, and samples collected from the treatment areas exhibiting high concentrations of organic contamination do not have elevated chromium concentrations.

Other metals also are found only at typical background concentrations on the facility; however, samples collected from the South Slope Area and along Little Squalicum Creek frequently exhibited concentrations of metals in excess of typical background levels. As noted above, the surface soil sample collected from well MWLSC1 contained high concentrations of many metals. Other South Slope and creek-area soil samples contained concentrations of metals, including aluminum, barium, cadmium, iron, lead, manganese, vanadium, and zinc, that generally exceeded levels found on the facility.

Based on these results, no facility-related metals contamination exists in soil. This is consistent with information that inorganic wood treating chemicals have not been used at the facility. Consequently, no further discussion of the nature and extent of metals contamination is necessary. Further evaluation of the extent and source of contamination in soils to the south of the facility by the owners of this property or other potentially responsible parties may be necessary.

4.1.1.3.2 Metals - Groundwater Data

As with the soil data, although some elevated metals concentrations are seen in groundwater samples, these results do not appear to indicate facility-related contamination. Concentrations of nearly all metals are higher in samples collected from the shallow perched groundwater than in samples collected from the deep aquifer. While higher concentrations of facility-related organic contamination also are found in the shallow groundwater, the high metals concentrations appear to be naturally occurring rather than a result of site activities.

For example, concentrations of arsenic are consistently high in all shallow groundwater samples regardless of proximity to the treatment areas and facility contamination. Samples collected from the shallow monitoring well Ershigs-1s, on the Ershigs property to the west of The Oeser Company facility, exhibited arsenic concentrations among the highest found during RI groundwater monitoring. Chromium was not detected in any groundwater samples collected during RI field work. (Chromium was found in earlier monitoring events but primarily in unfiltered samples; the highest filtered result of 6.1 µg/L was found in upgradient background well MW06-D.)

Other metals were also found only at low concentrations in groundwater and do not appear to exhibit contamination, facility-related or otherwise. The only results of note are that concentrations of lead and zinc are elevated in Tilbury Cement Wells TC-5 and TC-6 relative to other monitoring wells at or near the facility, but the concentrations are not high enough to be a health concern to the workers using these wells as sources of drinking water.

4.1.1.3.3 Metals - Air Data

Air samples collected during RI field work were analyzed for arsenic and chromium. Although concentrations of these metals exceeded risk-based screening levels in nearly all samples, the downwind air samples did not have higher concentrations of these metals than the upwind or background samples. In addition, the source samples collected on the facility near the retort, evaporator, and treated log storage areas did not exhibit elevated concentrations of arsenic or chromium. Consequently, concentrations of these metals in air do not appear to be site-related.

4.1.1.3.4 Metals - Sediment and Surface Water Data

Given the comparatively high concentrations of some metals in soils near Little Squalicum Creek, the presence of these metals in creek sediment and surface water would be expected. Concentrations of metals in sediment throughout the creek were generally high but comparable to, and in some cases less

than, the upstream reference sample. Consequently, the contamination does not appear to be related to The Oeser Company. Concentrations of metals in surface water are generally low.

One odd detail in the sediment data is that concentrations of several metals are significantly higher in samples collected during the ESI than in samples collected during the RI field work. For example, six of the seven cobalt results from ESI samples are significantly higher than any of the RI results, with the highest result observed in the upstream (reference) sample. Chromium results were also higher in nearly all ESI results than in RI results. No reason for this discrepancy is apparent. Possible explanations may include problems with data quality in one (or both) sets of results; that concentrations of these metals in sediment have changed significantly in the four years between the sampling events; or that the ESI sampling intentionally targeted locations with apparent sediment contamination, whereas the RI sediment samples were collected at roughly evenly spaced intervals without targeting visual contamination. Whatever the reason, no apparent relationship can be seen that would indicate any facility-related metals contamination.

4.1.1.3.5 Metals as COPCs - Summary and Conclusions

Based on the evaluation of sample analyses from all media, it appears that no metals contamination has resulted from The Oeser Company facility activities. Consequently, no further discussion of metals is included in the discussion of the nature and extent of site contamination, and metals are not considered in the site baseline risk assessment; however, some metals contamination from other, as yet unidentified, sources does exist in the South Slope and Little Squalicum Creek areas. Identification of these sources and the nature and extent of contamination is outside the scope of this RI.

4.1.2 Water Quality

Water quality data were collected during the purging of monitoring wells to establish that conditions required for sample collection had been achieved. These data include:

- pH;
- temperature;
- dissolved oxygen;
- conductivity;
- turbidity; and
- oxidation reduction potential.

Additional water quality parameters were measured for use, not in identifying the nature and extent of contamination, but in evaluating potential groundwater and/or surface water remediation options, if remediation was to be identified as necessary. These parameters include:

- iron II;
- TDS;
- TSS;
- alkalinity;
- TOC;
- biological oxygen demand;
- chemical oxygen demand; and
- anions (chloride, fluoride, bromide, phosphate, sulfate, sulfide, and nitrate/nitrite).

These analytes are not COPCs; they are included in The Oeser Company investigation database, but are not discussed in this report.

4.1.3 Potential COPCs

The following is a summary of chemicals, by category, identified as potential COPCs for The Oeser Company RI:

- Chlorinated VOCs - six potential COPCs (e.g., tetrachloroethene);
- Aromatic VOCs - 21 potential COPCs (e.g., benzene);
- Phenols - 15 potential COPCs (e.g., PCP);
- PAHs - 36 potential COPCs (e.g., benzo[a]pyrene);
- Dioxin;
- Petroleum; and
- Other compounds - five potential COPCs (e.g., MTBE).

Potential COPCs are listed individually in the summary of results tables and statistical analysis tables included in Section 4.

Appendix J is a compact disc with location and analytical data collected during the RI and previous studies at The Oeser Company site in Bellingham, Washington. The laboratory analytical data and associated data on sample locations, depths, media, and other information are provided in a Microsoft Access 1997 database. The analytical results include the RI data as well as all earlier sampling events for which electronic data are available. All results have been converted into standard units to facilitate database queries, and analyte names also have been made consistent where reported differently by multiple laboratories or in various reports. Also included on the compact disc are four additional files, containing x and y coordinates for all sample locations (projected in state plane coordinates), the results of grain size analyses, the results of Little Squalicum Creek toxicity testing, and the results of the RI field screening for TPH.

4.2 SURFACE SOIL SAMPLE RESULTS

This section presents analytical results from the extensive soil sampling program conducted at The Oeser Company site during both the RI and previous investigations summarized in Section 1.6. Surface soil samples were collected from seven areas within The Oeser Company facility, residences surrounding the facility, the South Slope, the Little Squalicum Creek area, and background locations. This section is organized into eight sections:

- Section 4.2.1 provides the criteria and guidelines used to interpret surface soil data;
- Section 4.2.2 provides an overview of the sampling results;
- Section 4.2.3 presents results for surface soil samples collected at open land background locations and background residential locations;
- Section 4.2.4 presents results for surface soil samples collected from off-facility residential sampling locations;
- Section 4.2.5 compares off-facility and background results;
- Section 4.2.6 presents results for surface soil samples collected from the seven subareas within the facility;
- Section 4.2.7 presents results for surface soil samples collected from South Slope sampling locations; and
- Section 4.2.8 presents results for surface soil samples collected adjacent to Little Squalicum Creek.

4.2.1 Interpretation of Results

Surface soil contaminant concentrations are compared to risk-based screening levels given in the EPA, Region 9, PRGs and MTCA Methods A and B standards for direct contact with soil. Results are also compared to MTCA Method B standards for groundwater protection and MTCA terrestrial ecological standards for unrestricted land use. PRG screening values for residential soil exposure represent an excess human health risk of one in one million (1 in 1,000,000) for carcinogens or an HQ of 1 for noncarcinogens. For several compounds without PRG screening values, EPA, Region 10, recommends the use of surrogate values based on compounds with similar molecular structure and toxicological properties. The PRG for naphthalene was used for 1-methylnaphthalene and 2-methylnaphthalene. The PRG for acenaphthene was used for acenaphthylene; pyrene for benzo(g,h,i,)perylene; and anthracene for phenanthrene. Risk-based screening levels are described in detail in Section 2.1.4. Risk-based screening levels do not represent cleanup levels for The Oeser Company site; they are presented as a reference against which detected concentrations can be compared and evaluated. Site-specific COCs will be derived from ARARs, risk-based screening levels, and the human health and ecological risk assessments conducted for the site during the RI.

All analytical data are presented with data validation qualifiers to reflect their reliability. Unless specifically discussed, data usability was not impacted by qualification of results. Summary tables describing the evaluation of data usability are presented as Appendix C. A complete copy of all analytical laboratory data, as provided by the laboratories and validated by the EPA (i.e., data with qualifiers) is provided as Appendix G.

Consistent with EPA guidance, dioxin results are presented both as individual PCDD and PCDF congener/homolog concentrations and as the sum of individual PCDD and PCDF congeners/homologs after conversion to equivalent concentrations of 2,3,7,8-TCDD, the most toxic dioxin isomer, using toxicity equivalency factors (TEFs; Van den Berg et al. 1998).

Concentrations of cPAHs reported both as individual concentrations and as total benzo(a)pyrene (B[a]P) equivalents are presented. The purpose of providing B(a)P equivalent concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site. To assess risks associated with exposure to cPAHs, individual cPAH concentrations have been used to calculate their total B(a)P equivalents utilizing the relative (compared to B[a]P) potency factors of the individual cPAHs following the methodology described in EPA guidance (1993). Relative potency factors (RPFs) for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene are provided (EPA 1993). Additional RPFs are available from the

California Environmental Protection Agency for benzo(j)fluoranthene, dibenzo(a,j)acridine, dibenzo(a,h)acridine, 7H-dibenzo(c,g)carbazole, dibenzo(a,e)pyrene, dibenzo(a,h)pyrene, dibenzo(a,i)pyrene, dibenzo(a,l)pyrene, 7,12-dimethylbenzo(a)anthracene, 1,6-dinitropyrene, 1,8-dinitropyrene, 3-methylcholanthrene, 5-methylchrysene, 5-nitroacenaphthene, 6-nitrochrysene, 2-nitrofluorene, 1-nitropyrene, and 4-nitropyrene (CalEPA 1996).

Concentrations of noncarcinogenic PAHs (ncPAHs) are presented; ncPAHs include the following thirteen compounds: acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, 2-chloronaphthalene, fluoranthene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and retene. Again, the purpose of providing a sum of individual concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site.

Depending on the analyses conducted, concentrations of petroleum hydrocarbons are presented as TPH-D (diesel range), TPH-G (gasoline range), individual carbon chain range fractions of EPH, individual carbon chain range fractions of VPH, total EPH (used in this report to represent the diesel range), or total VPH (used in this report to represent the gasoline range). Total EPH was determined by summing the concentrations for all aromatic and aliphatic carbon chain ranges within the analytical method for each sample. Total VPH was determined by summing the concentrations for all aromatic and aliphatic carbon chain ranges within the analytical method for each sample.

For the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalent quotient (TEQ), total cPAHs (as BaP equivalents), ncPAHs, EPHs, and VPH analytes reported as not detected (nondetects) were assigned a concentration of zero.

The data for the tentatively identified compounds (TICs) are included as Appendix G. Since the identification of these analytes relies on a reduced level of quality assurance and the concentrations are estimated, these analytes are not further addressed in this report.

Surface soil results are presented in Tables 4-3 through 4-31 and Figures 4-1 through 4-5. Statistical tables and results summary tables are presented for each sample group. Statistical tables provide analyte-specific information for the sample group as a whole, including range of detected concentrations, location of maximum concentration, detection frequency, range of DLs, frequency exceeding the PRG, the PRG, frequency exceeding MTCA values, and the MTCA values for each analyte detected. Results summary tables provide sample-by-sample results for each analyte detected. Concentrations exceeding PRGs are indicated by shading. Tables are presented for each subarea (Background, Off-Facility Residential, North Pole Yard, South Pole Yard, Wood Storage Area, Treated

Pole Yard, North Treatment Area, West Treatment Area, East Treatment Area, South Slope, and Little Squalicum Creek).

Distributions of selected descriptive contaminants in surface soil across the facility are illustrated in Figures 4-1 through 4-5. Color-coded sample points that correspond to risk-based or other representative ranges of analyte concentrations are presented for total cPAHs as B(a)P equivalents, total ncPAHs, PCP, and dioxin as 2,3,7,8-TCDD TEQs.

Dioxin toxic equivalency (TEQ) is not a single compound, but a measure of a complex mixture of chemicals known as polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and certain coplanar polychlorinated biphenyls (PCBs). These persistent environmental chemicals have similar chemical structures and properties, and exposure may cause similar toxic responses. In order to address risks associated with exposure to these "dioxin-like" compounds, toxic equivalency factors (TEFs) have been developed. TEFs compare potential toxicity of each dioxin-like compound to that of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), the most toxic member of this group of compounds. Dioxin-like PCBs are not COPCs at The Oeser Company site. The table below identifies the dioxin and furan congeners and their TEFs used in this report to calculate 2,3,7,8-TCDD TEQs.

PCDD Congener	TEF	PCDF Congener	TEF
2,3,7,8-TCDD	1.0	2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDD	1.0	1,2,3,7,8-PeCDF	0.05
1,2,3,4,7,8-HxCDD	0.1	2,3,4,7,8-PeCDF	0.5
1,2,3,6,7,8-HxCDD	0.1	1,2,3,4,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDD	0.1	1,2,3,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDD	0.01	1,2,3,7,8,9-HxCDF	0.1
1,2,3,4,6,7,8,9-OCDD	0.0001	2,3,4,6,7,8-HxCDF	0.1
		1,2,3,4,6,7,8-HpCDF	0.01
		1,2,3,6,7,8,9-HpCDF	0.01
		1,2,3,4,6,7,8,9-OCDF	0.0001

4.2.2 Overview of Surface Soil Sample Results

Surface soil samples were collected from subareas within the facility, as well as nearby off-facility areas, including nearby residences, the South Slope, Little Squalicum Creek, and a background area located between 0.6 and 1.6 miles east of the facility. PAHs and dioxin were detected throughout the study area. cPAH concentrations exceeded PSLs on the facility and at several off-facility locations, including the background sample locations. Dioxin concentrations exceeded PSLs on the facility and at several off-facility locations, but not at any background locations. PCP was not found in the background locations, and while present at concentrations above the PSL in virtually all on-facility samples, it was almost completely absent from the nearby residential area. The concentration of dioxin (2,3,7,8-TCDD TEQ) in surface soil in nearby off-facility areas statistically is not significantly different from background concentrations.

4.2.3 Background Surface Soil Samples

MTCA defines *area background* as "the concentration of hazardous substances that are consistently present in the environment in the vicinity of a site which are the result of human activities unrelated to releases from the site" and *natural background* as "the concentration of hazardous substance consistently present in the environment that has not been influenced by localized human activities." Since there is no place near The Oeser Company facility that has not been affected by human activities, the background samples discussed in this report represent area background, impacted by residential and industrial point sources within the urban environment of Bellingham, Washington near The Oeser Company but unaffected by the facility's operations.

Many of the potential COPCs are known to be ubiquitous in urban areas as the result of activities such as incineration/burning, automotive engine operation, paper manufacturing, etc. For comparison, Ecology collected soil samples from urban, open, and forested land in Washington. The dioxin TEQ concentrations ranged from 0.033 to 19.5 parts per trillion (ng/kg) (Ecology 1999). The EPA provided an estimate of the mean dioxin TEQ in North American soils of 7.96 (with a standard deviation of 5.70) parts per trillion (EPA 1994d). ASTDR estimates of background soil concentrations of PAHs in soil (ASTDR 1993) include:

Compound	Rural Soil (mg/kg)	Agricultural Soil (mg/kg)	Urban Soil (mg/kg)
Acenaphthene	0.0017	0.006	
Acenaphthylene		0.005	
Anthracene		0.011-0.013	
Benzo(a)anthracene	0.005-0.020	0.056-0.110	0.169-59
Benzo(a)pyrene	0.002-1.3	0.0046-0.900	0.165-0.220
Benzo(b)fluoranthene	0.020-0.030	0.058-0.200	15-62
Benzo(e)pyrene		0.053-0.130	0.060-14
Benzo(g,h,i)perylene	0.010-0.070	0.066	0.900-47
Benzo(k)fluoranthene	0.010-0.110	0.058-0.250	0.300-26
Chrysene	0.0383	0.078-0.120	0.251-0.640
Fluoranthene	0.0003-0.040	0.120-0.210	0.200-166
Fluorene		0.0097	
Indeno(1,2,3-c,d)pyrene	0.010-0.015	0.063-0.100	8-61
Phenanthrene	0.030	0.048-0.140	
Pyrene	0.001-0.0197	0.099-0.150	0.145-147

Twenty background surface soil samples were collected from a residential area in Bellingham, Washington, not expected to be impacted by The Oeser Company. Ten were composites collected from depositional and high traffic areas at residences, and 10 were discrete open field samples collected as described in Section 2.4.1.

4.2.3.1 Open Field Background Surface Soil Samples

Analytical results for the open field background surface soil samples are summarized in Table 4-3. The statistical analysis of these data is presented in Table 4-4. Because these samples were chosen to represent the area, as defined by MTCA, the distribution of background concentrations of ubiquitous anthropogenic contaminants for The Oeser Company Superfund Site is not integral to the RI; therefore, no figures displaying background contaminant distributions are included. The distributions of

contaminants were evaluated, and no trends were identified. Petroleum hydrocarbons were not analyzed for in background samples.

Carcinogenic PAHs

Total cPAHs were detected in four of the 10 open field background samples with total cPAH concentrations ranging from 0.0000596 to 0.228 mg/kg. cPAHs were detected in two samples above the EPA, Region 9, residential PRG for B(a)P equivalents (0.062 mg/kg) with the maximum concentration occurring at RES-B-06. The concentration of B(a)P equivalents in this sample also exceeded the MTCA Method B direct contact value of 0.137 mg/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Noncarcinogenic PAHs

Total ncPAHs were detected in nine of the open field background samples at concentrations ranging from 0.0491 to 1.84 mg/kg. No individual ncPAHs exceeded any EPA or MTCA risk-based benchmarks.

Dioxin

Dioxin was detected in all open field background samples, but no samples contained dioxin (reported as 2,3,7,8-TCDD TEQ) above the EPA, Region 9, residential PRG (3.9 ng/kg) or the MTCA Method B direct contact value of 6.7 ng/kg. Detected concentrations ranged from 0.12 to 2.8 ng/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Pentachlorophenol

PCP was not detected in any open field background samples.

4.2.3.2 Residential Background

Analytical results for residential background surface soil samples are summarized in Table 4-5. The statistical analysis of these data is presented in Table 4-6. Contaminant distributions are not illustrated for residential background samples for the same reason noted for the open field background samples. Fuels were not analyzed for in background samples.

Carcinogenic PAHs

In nine of the 10 residential background samples, cPAHs were detected with total concentrations ranging from 0.000115 to 0.936 mg/kg. cPAHs were detected in three of 10 samples above the EPA, Region 9, residential PRG for B(a)P equivalents (0.062 mg/kg) with the maximum concentration occurring at RES-B-10. The concentration of B(a)P equivalents in two samples exceeded the MTCA Method B direct contact value of 0.137 mg/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Noncarcinogenic PAHs

Total ncPAHs were detected in all residential background samples at concentrations ranging from 0.154 to 2.80 mg/kg. No individual ncPAHs exceeded risk-based benchmarks.

Dioxin

All residential background samples contained detectable concentrations of dioxin with concentrations ranging from 0.78 to 18.83 ng/kg. Six samples contained dioxin (reported as 2,3,7,8-TCDD TEQ) above the EPA, Region 9, residential PRG (3.9 ng/kg). Four of these six samples exceeded the MTCA Method B direct contact value of 6.7 ng/kg. Five of these samples exceeded the MTCA terrestrial ecological standard of 5 ng/kg. None of the samples exceeded the MTCA Method B groundwater protection standard.

Pentachlorophenol

PCP was not detected in any residential background samples.

Nature and Distribution of Contaminants

PCP was not detected in any background samples. PAHs and dioxin were detected, but the levels of ncPAHs did not exceed the PRGs. Both cPAHs and dioxin were detected in background samples above the PRGs; however, the spatial distribution of cPAHs and dioxin in either open field or residential results does not appear to have a pattern.

4.2.4 Off-Facility Surface Soil Samples

Sixty-one surface soil samples were collected from the residential areas adjacent to The Oeser Company facility. These samples were collected from locations based on modeled dispersion of

potentially contaminated soil from the facility to nearby areas as described in Section 5.2 of the Oeser RI work plan (E & E 1999b). Twenty-seven were composites collected at residences; 28 were discrete open field samples; and six were composites, three each from along Edens Road and the former drainage swale north of the facility. All of these samples were collected as described in Section 2.4.1.

4.2.4.1 Off-Facility Open Field Surface Soil Samples

Analytical results for the off-facility open field surface soil samples are summarized in Table 4-7. The statistical analysis of these data is presented in Table 4-8. Distributions of selected descriptive contaminants detected in surface soil above the EPA, Region 9, residential PRGs are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP. Petroleum hydrocarbons were not analyzed for in the off-facility samples.

Carcinogenic PAHs

In 10 of the 28 open field off-facility samples, cPAHs were identified with total detected concentrations ranging from 0.000055 to 0.896 mg/kg. cPAHs were detected in five of 28 samples above the EPA, Region 9, residential PRG for B(a)P equivalents (0.062 mg/kg) with the maximum concentration occurring at RES-50. The concentration of B(a)P equivalents in four samples also exceeded the MTCA Method B direct contact value of 0.137 mg/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Noncarcinogenic PAHs

Total ncPAHs were detected in 21 of the 28 open field off-facility samples at concentrations ranging from 0.64 to 5.91 mg/kg. No individual ncPAHs exceeded EPA or MTCA risk-based benchmarks.

Dioxin

All open field off-facility samples contained dioxin with concentrations ranging from 0.28 to 434.90 ng/kg. Seventeen samples contained dioxin (reported as 2,3,7,8-TCDD TEQ) above the EPA, Region 9, residential PRG (3.9 ng/kg). Fourteen of these 17 samples exceeded the MTCA Method B direct contact value of 6.7 ng/kg. One of the 17 samples exceeded the MTCA Method B groundwater

protection standard of 314 ng/kg. Sixteen of these samples exceeded the MTCA terrestrial ecological standard of 5 ng/kg.

Pentachlorophenol

PCP was detected in only one of the off-facility open field samples, at a concentration of 1.53 mg/kg. This concentration does not exceed the PCP EPA PRG, MTCA Method B direct contact value, or MTCA terrestrial ecological standard. The concentration does exceed the MTCA Method B groundwater protection standard of 0.077 mg/kg.

4.2.4.2 Off-Facility Residential Surface Soil Samples

Analytical results for the off-facility residential surface soil samples are summarized in Table 4-9. The statistical analysis of these data is presented in Table 4-10. Distributions of selected descriptive contaminants detected in surface soil above the EPA, Region 9, residential PRGs are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP. Petroleum hydrocarbons were not analyzed for in the off-facility samples.

Carcinogenic PAHs

Sixteen of the 27 off-facility residential samples contained cPAHs with total concentrations ranging from 0.000103 to 2.211 mg/kg. cPAHs were detected in 6 samples above the EPA, Region 9, residential PRG for B(a)P equivalents (0.062 mg/kg) with the maximum concentration occurring at RES-26. The concentration of B(a)P equivalents in three samples also exceeded the MTCA Method B direct contact value of 0.137 mg/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Noncarcinogenic PAHs

Total ncPAHs were detected in 26 of the 27 off-facility residential samples at concentrations ranging from 0.0509 to 9.534 mg/kg. No individual ncPAHs exceeded risk-based benchmarks.

Dioxin

All off-facility residential samples contained dioxin with detected concentrations ranging from 0.57 to 47.36 ng/kg. Seventeen samples contained dioxin (reported as 2,3,7,8-TCDD TEQ) above the

EPA, Region 9, residential PRG (3.9 ng/kg). Thirteen of the 17 samples exceeded the MTCA Method B direct contact value of 6.7 ng/kg. Fourteen of 27 samples exceeded the MTCA terrestrial ecological standard of 5 ng/kg. None of the samples exceeded the MTCA Method B groundwater protection standard of 314 ng/kg.

Pentachlorophenol

PCP was not detected in any off-facility residential samples.

4.2.4.3 Biased Samples

"Biased" refers to the selection of locations expected to show elevated levels of contaminants based on potential dispersion of contaminated soil by vehicle traffic from the facility to Edens Road and the release of contaminants from the facility by overland flow of surface water through the former drainage swale north of the facility.

Analytical results for the off-facility biased surface soil samples (collected along Edens Road and the former drainage swale north of the facility) are summarized in Table 4-11. The statistical analysis of these data is presented in Table 4-12. Distributions of selected descriptive contaminants detected in surface soil above the EPA, Region 9, residential PRGs are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP. Petroleum hydrocarbons were not analyzed for in the off-facility samples.

Carcinogenic PAHs

In one of the six biased off-facility samples (Road 3), cPAHs were identified at a total estimated concentration of 0.0535 mg/kg, below the EPA, Region 9, residential PRG for B(a)P equivalents (0.062 mg/kg) and the MTCA Method B direct contact value of 0.137 mg/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Noncarcinogenic PAHs

Total ncPAHs were detected in four of the six biased off-facility samples (two along Edens Road and two in the old drainage swale) at concentrations ranging from 0.222 to 0.543 mg/kg. No individual ncPAHs exceeded risk-based benchmarks.

Dioxin

All the biased off-facility samples contained dioxin with concentrations ranging from 9.61 to 192 ng/kg. Dioxin (reported as 2,3,7,8-TCDD TEQ) is above the EPA, Region 9, residential PRG (3.9 ng/kg), the MTCA terrestrial ecological standard of 5 ng/kg, and the MTCA Method B direct contact value of 6.7 ng/kg in all six samples. None of the samples exceeded the MTCA Method B groundwater protection value of 314 ng/kg.

Pentachlorophenol

PCP was not detected in any biased off-facility soil samples.

4.2.4.4 Nature and Distribution of Contaminants in Off-Facility Surface Soil

The off-facility residential and biased surface soil samples were collected from areas surrounding The Oeser Company facility. PCP was detected in only one of 61 samples, at RES-53 (an open field sample) to the east of the facility. The concentration of PCP at this location did not exceed the PRG. The presence of PCP at only this one location indicates that if PCP has migrated off site, the rate of decomposition/biodegradation may be equal to or greater than the rate of release. The area on the southeast edge of the facility adjacent to the Wood Storage Area has some of the highest concentrations of PAHs and dioxin in the off-facility samples. The highest concentration of cPAHs (0.90 mg/kg) was found at RES-50, and the highest concentration of dioxin (434 ng/kg) was found at RES-53. Because drainage at The Oeser Company facility is to the south and the prevailing wind condition is to the southwest, it is not likely that the contamination found at this location originated from wind or surface runoff migration. In addition, these samples were collected on the east side of the railroad tracks. The railroad has a raised bed which makes runoff an unlikely contaminant migration mechanism. Rather, it is more likely that this contamination may have originated from the treated railroad ties or materials in passing rail cars.

The other location with high levels of dioxin (2,3,7,8-TCDD TEQ [195.1 ng/kg]) is RES-42A, which is located south of the Ershigs facility. Dioxin concentrations of other samples collected in this vicinity (RES-41, RES-42, RES-43, and RES-46) ranged from 3.8 to 57.9 ng/kg. Therefore, based solely on dioxin concentrations measured in off-facility soil, the concentration of dioxin found at RES-42A appears anomalous for the area and may reflect contamination from other sources. Concentrations of cPAHs in this area exceed the B(a)P equivalent PRG at RES-42A and RES-43, but were not detected at

the other three sampling locations where dioxin was found. The higher concentrations of cPAHS and dioxin are co-located in this area.

Dioxin was detected in every off-facility sample. Aside from the areas discussed above, there does not appear to be a spatial pattern to its distribution. Sample locations with concentrations that exceed the 2,3,7,8-TCDD TEQ PRG and MTCA B direct contact value surround the facility. The same is true for cPAHs. Sample locations with cPAH levels that exceed the PRG and MTCA B direct contact value surround the facility with no apparent pattern to their distribution. These trends suggest that there may be sources other than or in addition to The Oeser Company facility for these contaminants.

The biased samples chosen to identify, if present, areas of elevated contaminant levels based on previous land use and past site history did not present a distribution of contaminants that would suggest unique problems exist in these areas.

While concentration data do not appear to identify The Oeser Company as the source of dioxin in off-faciltity surface soil samples, dioxin data present a special case. The data is reduced to 2,3,7,8-TCDD TEQ values in order to provide useful information based on toxicity rather than presenting results for over 200 separate compounds that make up dioxin. The following section presents data which indicate that The Oeser Company may not be the source of dioxin in the surface soil surrounding the facility based upon the specific dioxin congeners (compounds) detected.

4.2.4.5 Dioxin Congener Profiles

The relative concentrations of dioxin congeners associated with PCP wood treatment frequently exhibit a unique and distinct profile (EPA 1997b). A significant majority of the total concentration of dioxins and furans is usually present as OCDD, since two PCP molecules can be “attached” to form an OCDD molecule. The remainder of the dioxins and furans are present mostly as HpCDD and octachlorodibenzofuran (OCDF); the lesser-chlorinated congeners make up a much smaller fraction of the total concentration. Table 4-13 includes examples of several on-facility surface soil samples that exhibit this relationship. Also included in this table are congener profiles for rural and urban background soil and for dioxin in PCP.

Overall, OCDD generally comprises about 80-85% of the total 2,3,7,8-chlorine substituted dioxin concentrations, with 1,2,3,4,6,7,8-HpCDD and OCDF totaling about an additional 12% (although the exact ratios vary somewhat in individual samples). A similar ratio can be seen in air samples collected near on-facility sources, such as the samples collected from AS22 (near the evaporator; Table 4-14). Table 4-14 also includes rural and urban background air congener profiles. Again, OCDD comprises

approximately 80-85% of the total concentration, with 1,2,3,4,6,7,8-HpCDD and OCDF making up much of the remainder.

Use of congener profile analysis can assist with determination of whether or not off-facility areas have been impacted by PCP wood-treating activities, or if dioxins are present from other sources. If the profile of the dioxin congeners is unlike that seen on the facility, the facility would not likely be a source. The dioxin concentrations seen in three off-facility samples near the facility are provided in Table 4-15.

4.2.4.6 Multivariate Analysis of Variance of Dioxin Data from Soils

4.2.4.6.1 Statistical Preliminaries

There are numerous anthropogenic sources of dioxins/furans (e.g. municipal incinerators, diesel fuel combustion in trucks, etc.; EPA 2001). These sources produce different mixtures of dioxins and furans. These mixtures result in "congener profiles" that represent the distribution of the individual congeners within a mixture. These profiles may be used as signatures of the dioxins/furans from different sources. The distributions of the seventeen congeners utilized to compute dioxin 2, 3, 7, 8-TCDD TEQ have been analyzed for the soil samples from 9 different areas of The Oeser Company site. The 9 areas are designated as OS (on facility), BGOFS (background open field samples), OFS (open field samples), BGRES (background residential), RES (residential), BIAS (bias residential), SOUTH (south slope), LCS (Little Squalicum Creek), and LCSSED (Little Squalicum Creek sediment). A multivariate analysis of variance (MANOVA) of the concentration data of the congeners from these 9 areas was conducted. The purpose of this statistical analysis was to test the hypothesis (1) the samples from each of the areas belong to different populations and (2) the distribution characteristics in each of the population are distinct.

The purpose of analysis of variance (ANOVA) is to test differences in means (for groups or variables) for statistical significance. This is accomplished by analyzing the variance, that is by partitioning the total variance into the component that is due to true random error (this is called within-group sum of squares or *SS*) and the components that are due to differences between means. These latter variance components are then tested for statistical significance, and if significant, one rejects the null hypothesis of no difference between means, and accepts the alternative hypothesis that the means (in the population) are different from each other.

If the number of independent variables (e.g. concentration of one contaminant species) under consideration is one then a univariate statistical method can be employed. In this case, the statistical significance test is performed via *F*-test or computing the *F*-statistic. If the number of grouping variables

is two then *F*-test would give the same results as students *t*-test or *t*-statistic. However, in the case under consideration the grouping variables (areas of concern) are nine in number. In this case, a simple *t*-test would not provide the necessary answer and ANOVA is necessary. Furthermore, the number of dependent variables (congeners) is seventeen. So a multivariate analysis of variance (MANOVA) is necessary. In this case the multivariate *F* value is called Wilk's λ. Even though the computation in the multivariate case is more complex than the univariate case, the logic and the nature of the computations do not change. Due to the complexities in multivariate statistics, there are several other multivariate test criteria such as Rao's *R*, Pillai-Bartlett trace, and *V*.

The within-group variability (*SS*) is usually referred to as 'error variance' or SS_{error}. This term denotes the fact that one cannot readily explain or account for it (in the case of spatial data however, this implies that spatial variation is completely ignored; this is the case in the present investigation). The between-group variance is usually referred to as 'factor variance' or variance due to the effect of grouping or SS_{effect}. The SS_{effect} can be explained as due to the difference in means between groups. The *F*-test is based on a comparison of the variance due to the between groups variability (called Mean Square Effect, or MS_{effect}) with the within-group variability (called Mean Square Error, of MS_{error}), i.e. $F = Ms_{effect} / MS_{error}$. Thus, greater is the departure from 1 the value of *F*, greater the difference between the groups. The reliability of a computed *F*-value is quantified by using a standard measure called *p*-level or statistical significance level. Specifically, the *p*-level represents the probability of error that is involved in accepting the result as valid. For example, a *p*-level of 0.05 (i.e. 1/20 or 5/100) indicates that there is a 5% probability that the result is invalid. Generally, a result with a *p*-level of < 0.05 is considered statistically significant.

If the overall multivariate test is significant, one may conclude that the respective effect (in this case the area from where samples were taken) is significant. After obtaining a significant multivariate test for a particular main effect, it is often necessary to examine the univariate *F* test for each of the variables to interpret the respective effect. In this way the specific dependent variables that contributed to the significant overall effect can be identified.

4.2.4.6.2 Results

The seventeen congeners were divided into nine groups representing the 9 areas within the site. MANOVA and ANOVA were applied to the concentrations of each of the congeners (dependent variables) to test the variation due to their groupings. The following table summarizes the main results of the MANOVA.

Multivariate test statistic for MANOVA of congeners

Test	Value	*p*-level
Wilk's λ	0.233353	
Rao's *R*	1.324127	0.012390
Pillai-Bartless trace	1.155122	
V	1.161446	0.113852

The different multivariate test criteria do not agree. While Wilk's λ and Rao's *R* indicate significant effect of the grouping at $p < 0.05$, Pillai-Bartless trace and *V* indicate that the groupings are not statistically significant. The reason for this discrepancy is explored by conducting ANOVA on the individual congeners.

The following table shows the *F*-statistic for the univariate ANOVA by taking the individual congeners. These values indicate that as far as congeners Dioxin-5, 7, 9, 12, and 14 are concerned, there is no significant difference between the groups ($p > 0.05$). However for the rest of the twelve congeners, the grouping is a significant factor in the observed variation of the congener concentrations. In other words, these twelve congeners appear to be samples of different populations. Stated in another way, each of the nine areas noted above represent different congener populations as long as only Dioxin 1, 2, 3, 4, 6,8, 10, 11, 13, 15, 16, and 17 are concerned.

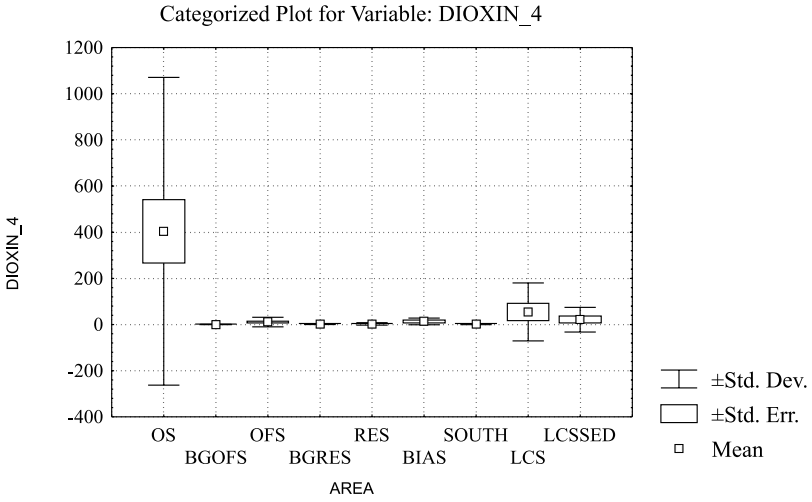
Results of ANOVA. One factor (area), nine dependent variables (congeners)

Congener	MS_{effect}	MS_{error}	*F*-statistic	*p*-level
Dioxin-1 (1,2,3,4,6,7,8-HpCDD)	667200E+4	126515E+4	5.273667	0.000010
Dioxin-2 (1,2,3,4,6,7,8-HpCDF)	289759E+3	733988E+2	3.947740	0.000339
Dioxin-3 (1,2,3,4,7,8,9-HpCDF)	445245	103576	4.298729	0.000134
Dioxin-4 (1,2,3,4,7,8-HxCDD)	381475	82771	4.608803	0.000059
Dioxin-5 (1,2,3,4,7,8-HxCDF)	107891	129929	0.830383	0.577430
Dioxin-6 (1,2,3,6,7,8-HxCDD)	8314225	1400472	5.936731	0.000002
Dioxin-7 (1,2,3,6,7,8-HxCDF)	10875	5494	1.979584	0.054156
Dioxin-8 (1,2,3,7,8,9-HxCDD)	2046858	395471	5.175748	0.000013
Dioxin-9 (1,2,3,7,8,9-HxCDF)	4874	5851	0.833076	0.575120
Dioxin-10 (1,2,3,7,8-PeCDD)	52180	9263	5.633493	0.000004
Dioxin-11 (1,2,3,7,8-PeCDF)	22983	8336	2.757178	0.007697
Dioxin-12 (2,3,4,6,7,8-HxCDF)	43107	27472	1.569117	0.140514
Dioxin-13 (2,3,4,7,8-PeCDF)	24210	5746	4.213264	0.000168
Dioxin-14 (2,3,7,8-TCDD)	36	18	1.961825	0.056520
Dioxin-15 (2,3,7,8-TCDF)	1738	357	4.868120	0.000030
Dioxin-16 (OCDD)	438793E+6	103728E+6	4.230253	0.000161
Dioxin-17 (OCDF)	235463E+4	851205E+3	2.766234	0.007519

The first seventeen figures at the end of this section show the mean and standard deviation for each of the congeners in each of the areas in the form of box-whisker plots. From these plots it is clear that the on facility samples come from a population which appears different from the populations of the other samples. In terms of certain congeners, the samples from Little Squalicum Creek and Little Squalicum Creek sediment appear to come from a population that is distinct from the others. However, such distinctions cannot be made if congeners Dioxin-5, 7, 9, 12, and 14 are taken into account. Nonetheless, on the facility samples have distinct mean and variance. If the mean concentration and the associated standard deviation are taken as an indication of the nature of the source of the congeners then the dioxins/furans measured in 8 different off-facility areas were derived from a source different from that of the on the facility samples. Note that in case of Dioxins 5, 7, 9, 12, and 14 the F statistic does not significantly depart from unity (the F value lies between 0.8304 and 1.9784). In all other cases the F value ranges between 2.7572 and 5.2737. Considering the number of samples (degree of freedom) and variables, this is a rather restricted range indicating a somewhat similar variation of the congener concentrations within the groups of 8 off-site areas.

The reason why the various groups appear to come from different populations (sources) is the nature of the statistical distribution of a particular congener within an area. For example, the last figure (at the end of this section) shows the histogram of Dioxin-16 (OCDD) distribution in the nine areas. The distribution pattern is distinct in OS compared to the other areas. Such differences in the distribution patterns may further indicate that the source of the dioxins in the on the facility samples is different from the source of the off-facility samples.

The value of the ANOVA lies in the fact such differences that may or may not be obvious from visual inspections of histograms or probability distribution functions can be quantified in terms of statistically significant (or insignificant) differences.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LCSSED
AREA
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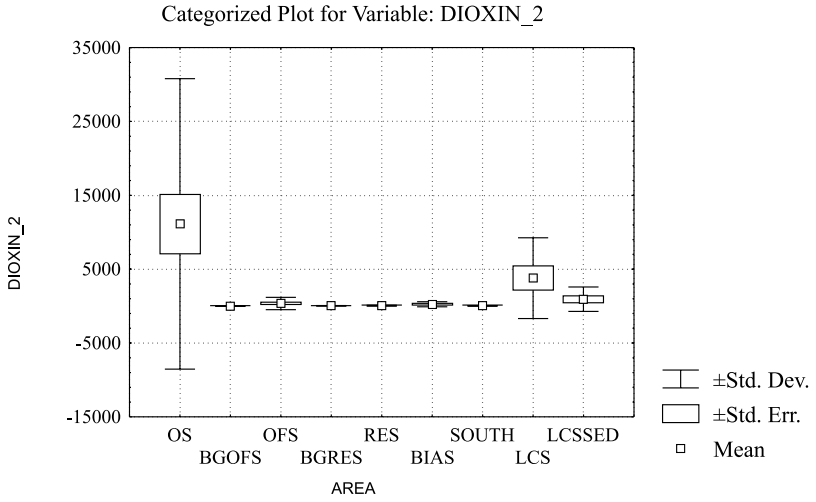
±Std. Err.
Mean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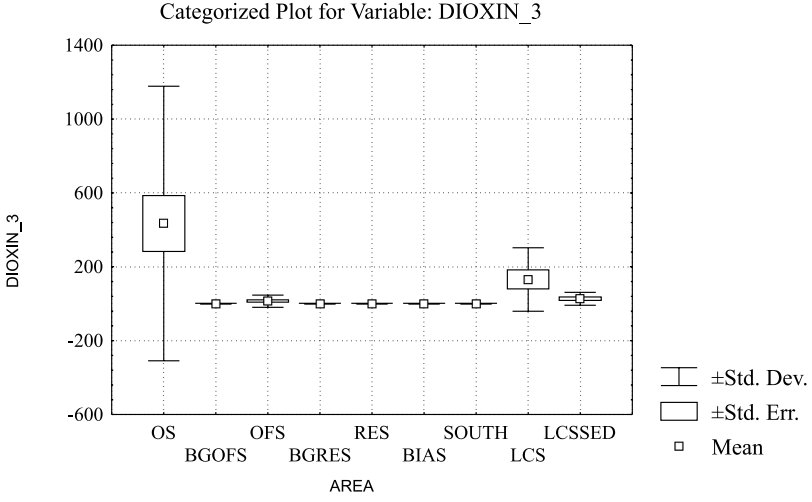
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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RES
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SOUTH
LCS
LCSSED
AREA
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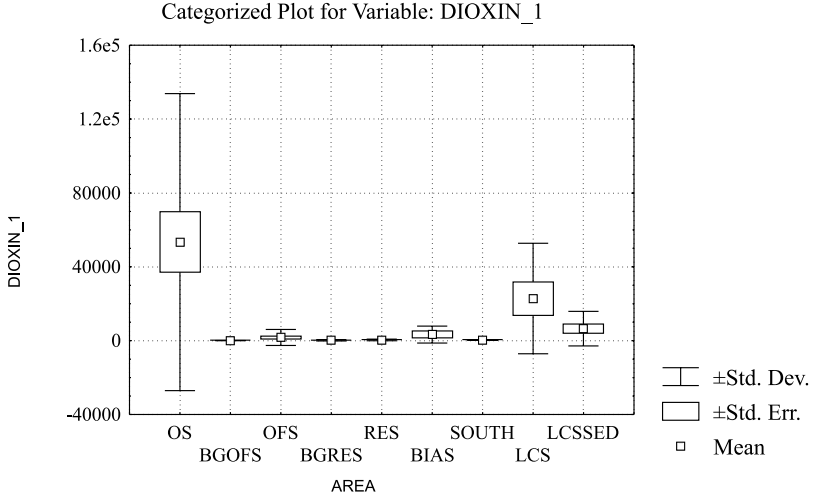
±Std. Err.
Mean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AREA
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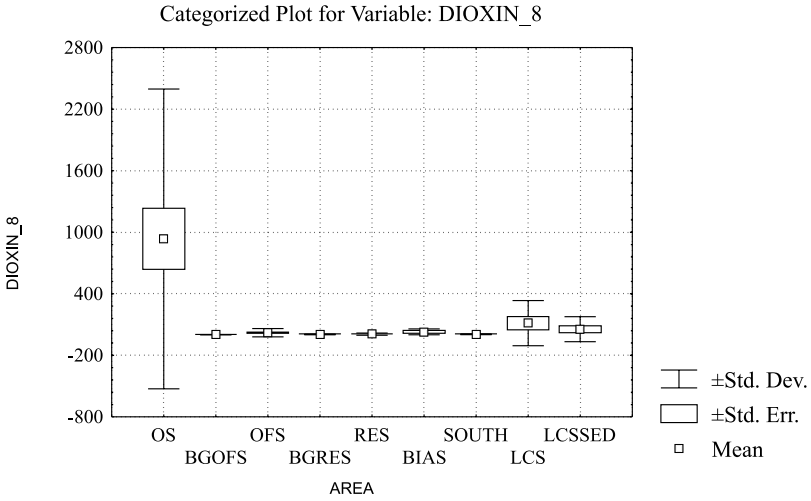
±Std. Err.
Mean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BGRES
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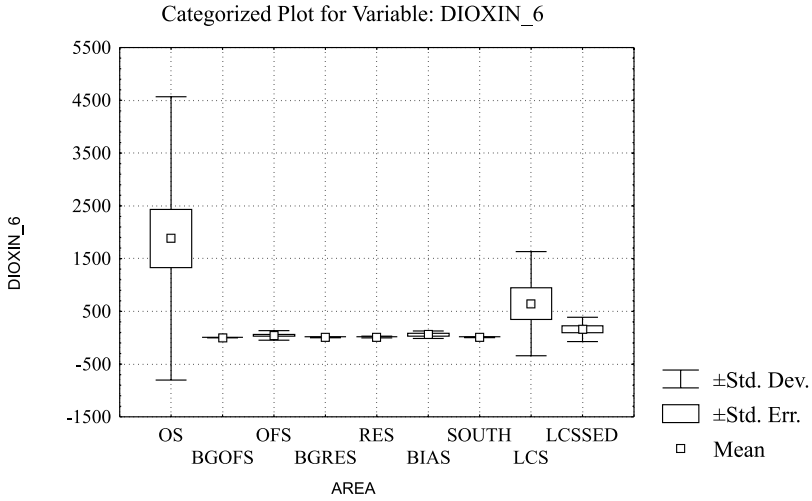
SOUTH
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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2500
1500
500
-500
-1500
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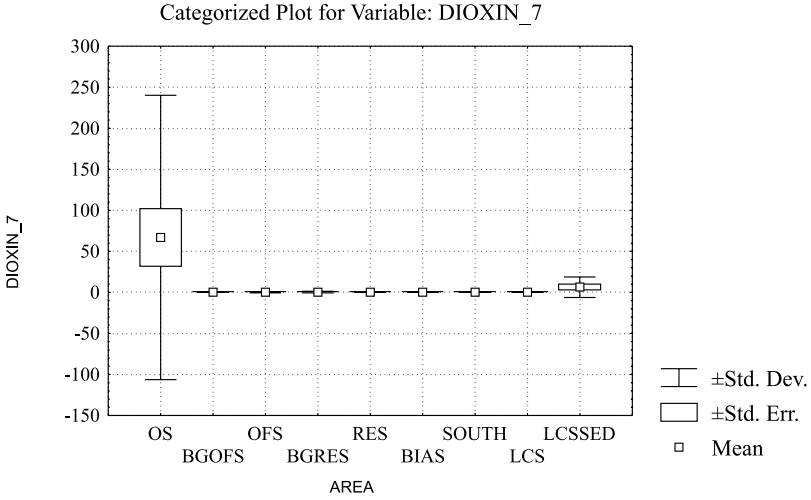
OFS
BGRES
RES
BIAS
SOUTH
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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100
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-100
-150
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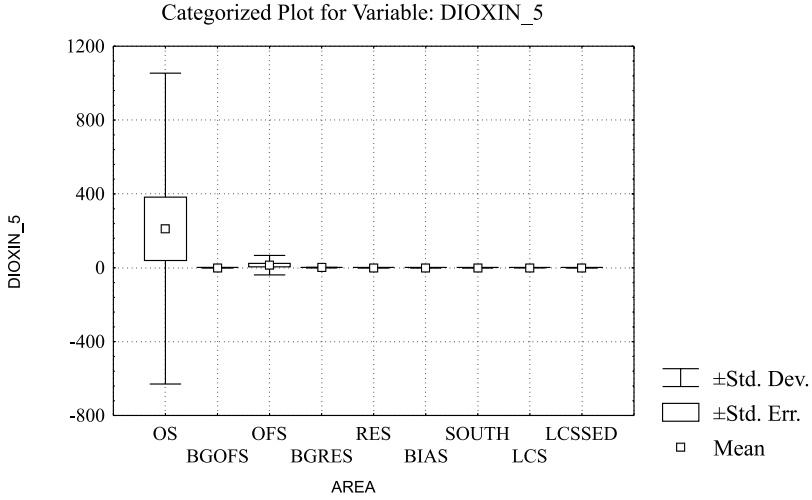
BGOFS
OFS
BGRES
RES
BIAS
SOUTH
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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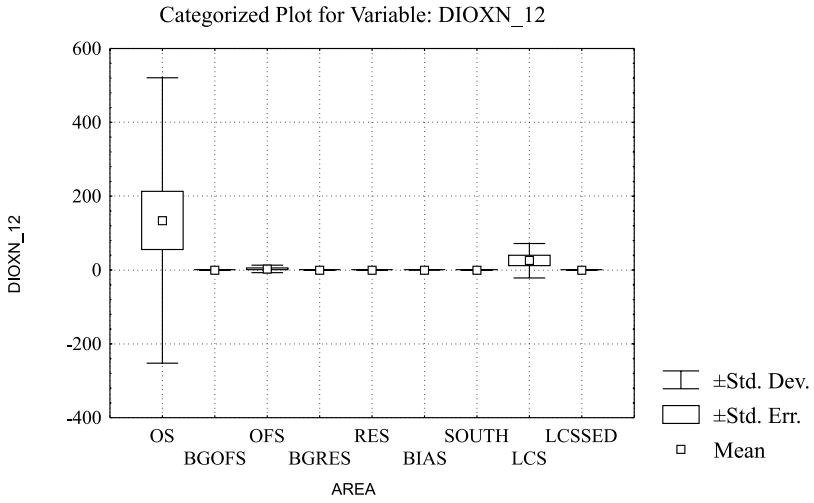
800
400
0
-400
-800
OS
BGOFS
OFS
BGRES
RES
BIAS
SOUTH
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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BIAS
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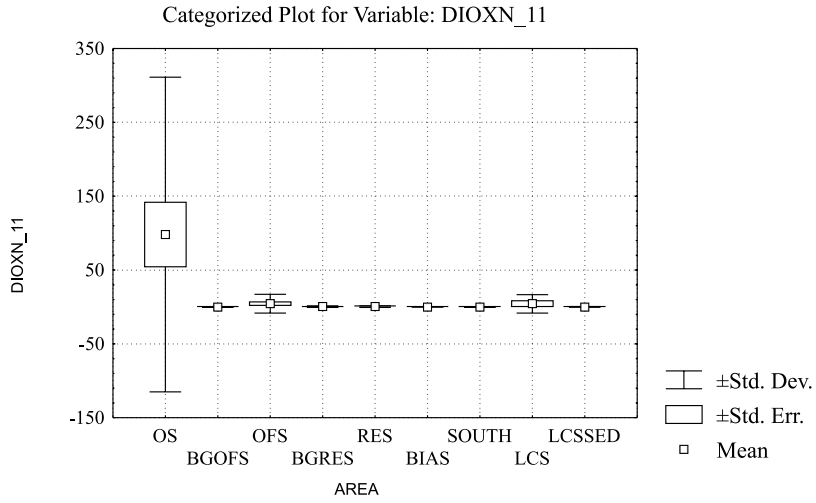
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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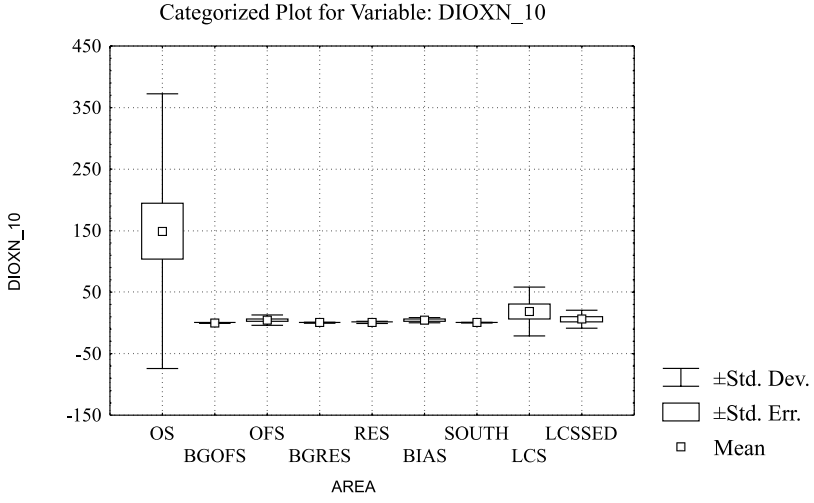
RES
BIAS
SOUTH
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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RES
BIAS
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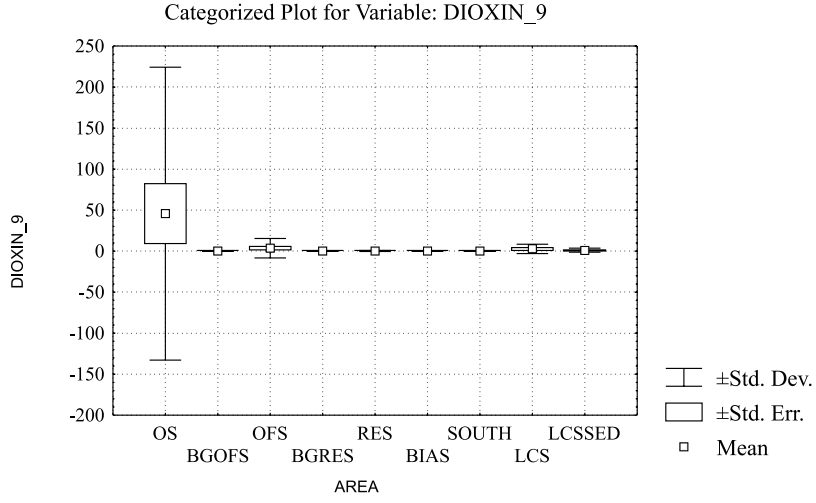
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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AREA
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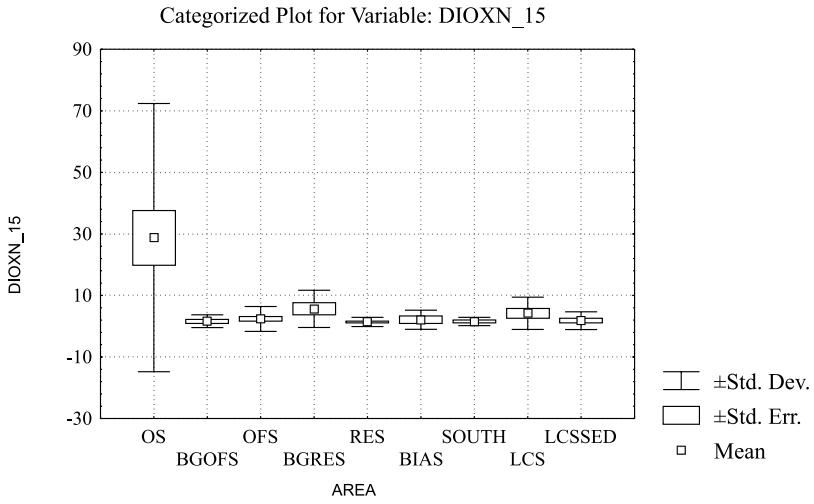
±Std. Err.
Mean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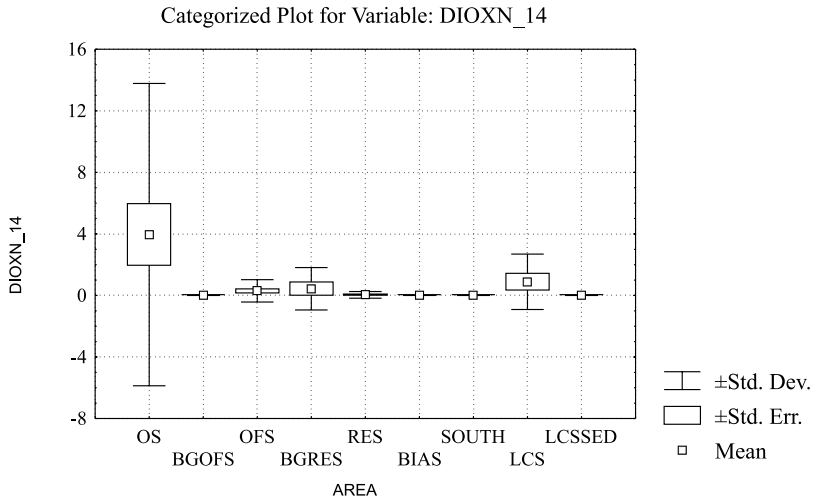
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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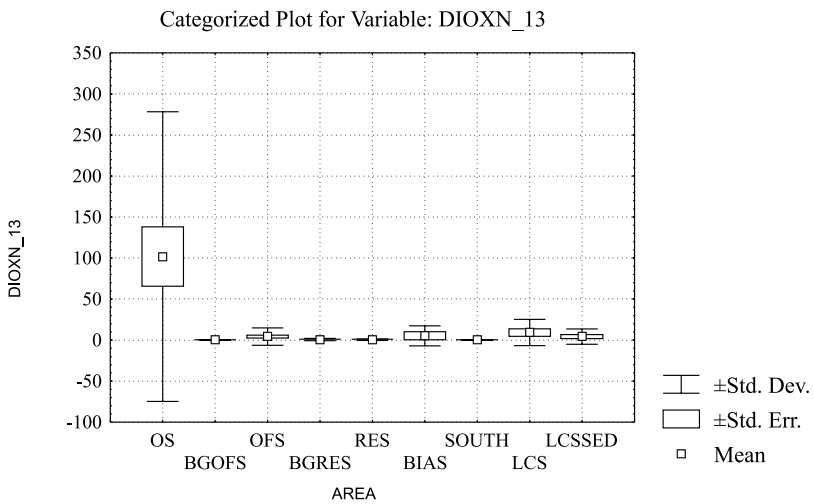
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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OFS
BGRES
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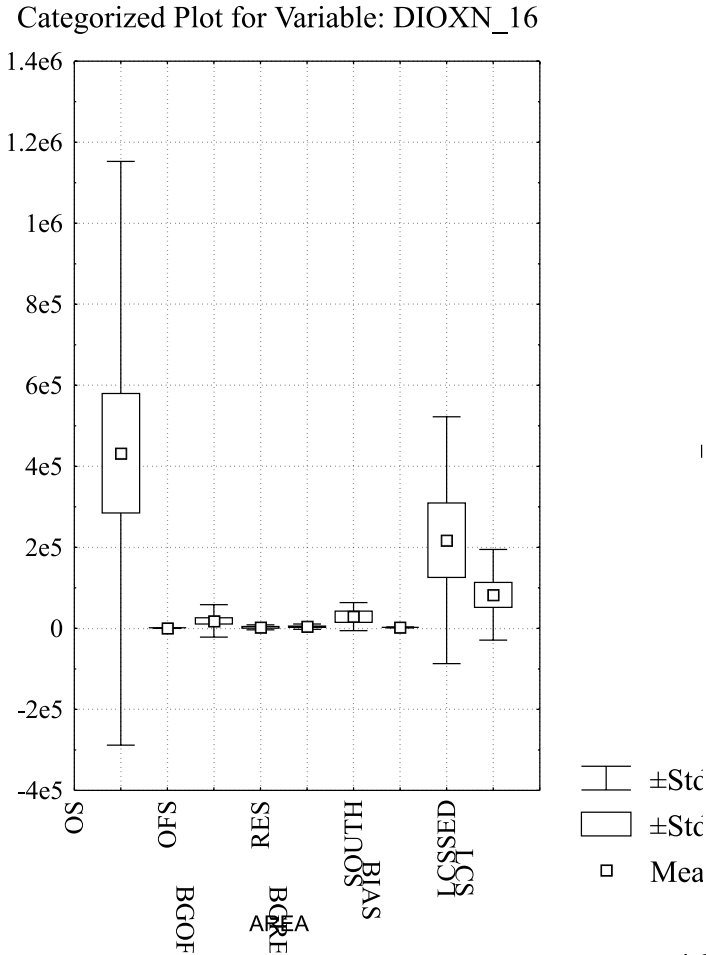
SOUTH
LCS
LCSSED
AREA
±Std. Dev.
±Std. Err.
Mean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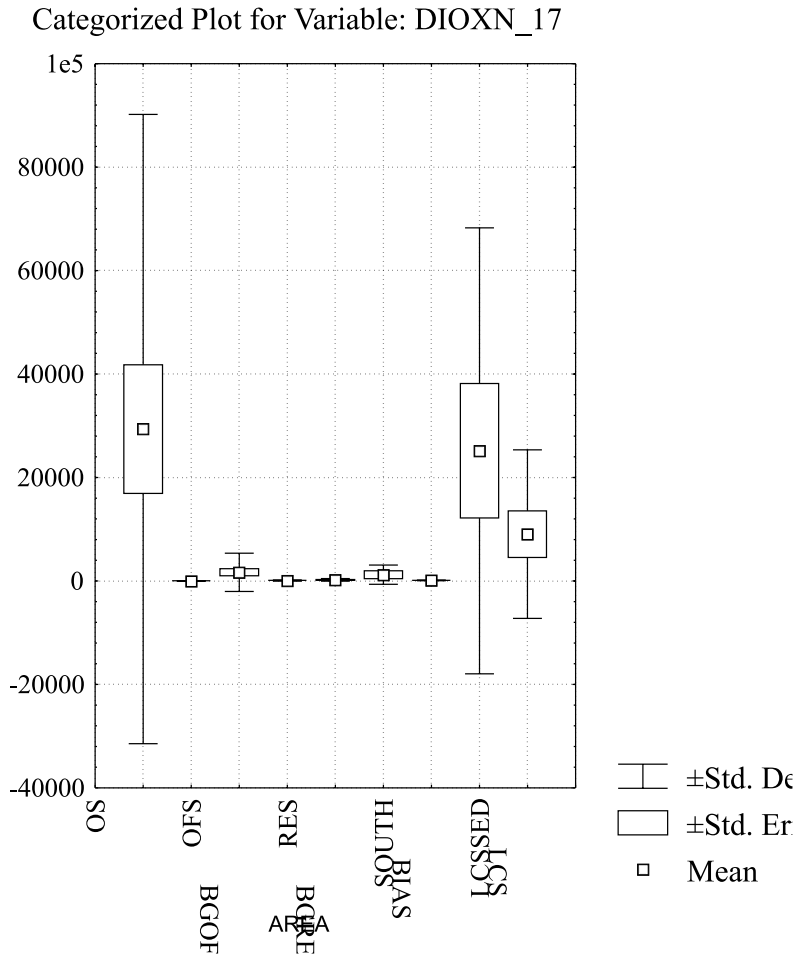
AREA
±Std
±Std
Mea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LCSS
BGOF
AREA
±Std. De
±Std. Er
Mean

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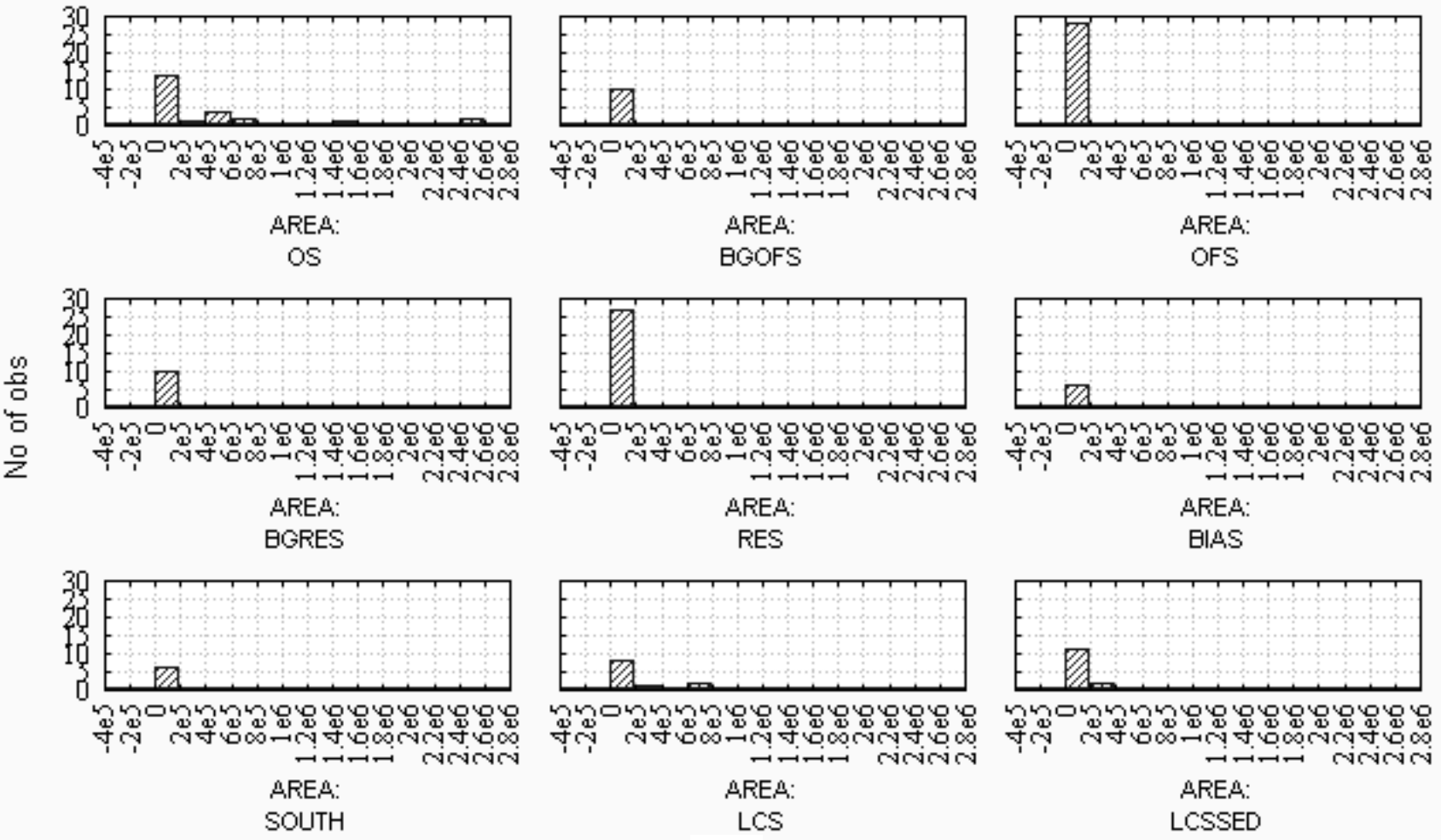

4.2.5 Off-Facility Versus Background Surface Soil Results Comparison

The following section discusses the statistical differences and similarities between the background and off-facility sample analytical results.

Statistical analyses were used to compare analytical results from off-facility samples collected near the facility with those collected in the background area. The purpose of this analysis was to determine if the populations statistically are significantly different overall; if not, the conclusion is that site operations have not produced increased concentrations in nearby off-facility soils. Individual samples may have concentrations exceeding the background results; this would be expected if the populations were the same, simply because there were more samples collected from the near-facility areas than the background areas.

The analyses were performed twice, first comparing the 27 residential samples collected near the facility with the 10 background residential samples and again, comparing the 28 open field samples collected near the facility with the 10 background open field samples. Because they were collected using a different sampling protocol than the residential and open field samples, the biased samples collected from along the roadway and former drainage path were not included in the evaluations.

Analyses were conducted as follows: for each analyte in each of the populations, the Shapiro-Wilk's W test was performed to determine if the data followed a normal distribution. Data were then log transformed and tested again for lognormality. If data for both populations being compared (i.e., residential and background residential, as well as open field and background open field) were determined to be normally distributed, then a t-test was performed to compare the two populations. If data for both populations being compared were determined to be lognormally distributed, then a t-test was performed on the log-transformed data to compare the two populations. In the event that the data for the two populations did not exhibit the same distribution or if one or more data sets were not adequately described by either a normal or lognormal distribution, then the nonparametric Mann-Whitney U test was used. A p-level of 0.05 was used to identify a statistically significant difference.

Comparisons were performed for the following analytes and groups of analytes: dioxin (as 2,3,7,8-TCDD TEQ), arsenic, calcium, chromium, magnesium, and total detected PAHs (the sum of cPAH and ncPAH concentrations). A few other SVOCs were detected that would not be expected to be related to wood treatment operations, such as benzyl alcohol; these compounds were not included in the analysis.

The conclusions of the analyses are as follows: in the comparison between open field and background open field samples, there was a statistically significant difference between the populations for

dioxin and calcium. Calcium may be present near the site due to former sugar beet processing at the facility's current location. The other analytes tested showed no statistically significant difference between the populations.

In the comparison between near facility residential and background residential samples, there was a statistically significant difference between the populations for calcium only. Other analytes, including dioxin (as 2,3,7,8-TCDD TEQ), tested showed no statistically significant difference between the populations.

4.2.6 Facility Surface Soil Sample Results

The following subsections describe the analytical testing results for surface soil samples collected during previous investigations and the RI at on-facility locations at The Oeser Company. Some soil samples collected on the site were collected in a biased manner intended to characterize hot spots as part of the site RI. As a result, estimates of arithmetic mean concentrations for specific operational areas of the site may somewhat overestimate actual average soil concentrations in these areas to which an individual working on the site would be exposed. As with previous reports, the sections are organized based on the type of work performed in the areas.

4.2.6.1 North Pole Yard

The North Pole Yard is located west of the Treated Pole Area and northwest of the Treatment Area. Untreated, and occasionally treated, logs are stored in the pole yard. Surface soils throughout the North Pole Yard have not been capped, but much of this area is vegetated or covered with stacked poles. Surface soil sample analytical results for the North Pole Yard are summarized in Table 4-16. The statistical analysis of these data is presented in Table 4-17. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for surface soil are illustrated in Figure 4-1 for cPAHs (as B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP.

Carcinogenic PAHs

Total cPAHs (0.000041 to 0.124 mg/kg) were detected in six samples. In three of six samples, cPAHs were detected above the PRG for B(a)P equivalents (0.062 mg/kg) ranging from 0.0661 to 0.124 mg/kg. No samples exceeded the MTCA Method B direct contact value of 0.137 mg/kg. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were

exceeded in any samples. The maximum concentration was detected at B-F3 located in the northwest corner of the North Pole Yard.

Noncarcinogenic PAHs

In five of six samples, ncPAHs were detected at concentrations ranging from 0.0431 to 4.29 mg/kg. No individual ncPAHs exceeded EPA or MTCA risk-based benchmarks.

Dioxin

Six samples contained dioxin (reported as 2,3,7,8-TCDD TEQ) above the PRG (3.9 ng/kg) ranging from 38 ng/kg to 19,084 ng/kg. The six samples also exceeded the MTCA Method B direct contact value of 6.7 ng/kg and the MTCA terrestrial ecological standard of 5 ng/kg. Four of the six samples exceeded the MTCA Method B groundwater protection standard of 314 ng/kg.. The maximum concentration was detected at SS-17, located on the east side of the subarea near the railroad tracks.

Pentachlorophenol

PCP was detected in all six samples with concentrations ranging from 0.77 to 110 mg/kg. PCP was detected above the PRG (2.98 mg/kg) in two of six samples collected in the North Pole Yard. Only one sample (SS-17) exceeded the MTCA Method B direct contact value of 8.33 mg/kg. All six samples exceeded the MTCA groundwater protection standard of 0.077 mg/kg. One of the six samples exceeded the MTCA terrestrial ecological standard of 11 mg/kg.

Petroleum

EPHs were not detected above the MTCA Method A value of 2000 mg/kg or the terrestrial ecological standard of 460 mg/kg.

4.2.6.2 South Pole Yard

The South Pole Yard is located south of the North Pole Yard and west of the West Treatment Area. Untreated, and occasionally treated, logs are stored in the South Pole Yard. The central and western portions of this subarea were capped with gravel during EPA's removal action. The northeast corner of this subarea has an asphalt cover. Surface soil sample analytical results for the South Pole Yard are presented in Table 4-18. The statistical analysis of these data is presented in Table 4-19.

Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for surface soil are illustrated in Figure 4-1 for cPAHs (as B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP.

Carcinogenic PAHs

Total cPAHs (0.0029 to 29.5 mg/kg) were detected in five samples. In two of five samples, cPAHs were detected above the PRG for B(a)P equivalents (0.062 mg/kg), the MTCA Method B direct contact value (0.137 mg/kg), and the MTCA groundwater protection standard of 2.32 mg/kg. The MTCA terrestrial ecological standard of 30 mg/kg was not exceeded. The maximum concentration was detected at B-N3, located on the western border of the facility.

Noncarcinogenic PAHs

Individual ncPAHs were not detected at concentrations above EPA or MTCA risk-based screening benchmarks in five samples. Total ncPAHs ranged from 0.0564 to 125 mg/kg.

Dioxin

Dioxin was detected throughout the South Pole Yard. Nine samples were collected and analyzed for dioxin. Eight samples contained dioxin above the PRG (3.9 ng/kg), the MTCA Method B direct contact value (6.7 ng/kg), and the MTCA terrestrial ecological value of 5 ng/kg; ranging in concentration from 9.54 to 7,690 ng/kg. Five samples contained dioxin above the MTCA Method B groundwater protection standard of 314 ng/kg. The maximum concentration was detected at MW35-S located near the railroad tracks on the southern border of the South Pole Yard.

Pentachlorophenol

PCP was detected in five samples with concentrations ranging from 0.035 to 18 mg/kg. The PCP concentration was above the PRG (2.98 mg/kg) in two of five samples collected in the South Pole Yard. Only one sample (B-N3) exceeded the MTCA Method B direct contact value of 8.33 mg/kg. Four of the five samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg. One sample exceeded the MTCA terrestrial ecological standard of 11 mg/kg.

Petroleum

EPHs, identified in one of five samples (444 mg/kg at B-N3), were not detected above the MTCA Method A value for soil of 2000 mg/kg or the MTCA terrestrial ecological standard of 460 mg/kg.

4.2.6.3 Wood Storage Area

The Wood Storage Area is located in the southern portion of the facility. The majority of this subarea has vegetative cover with a small portion of exposed soil near the edge of the East and West Treatment areas. There is also a small portion of asphalt on the western portion of the subarea. Surface soil sample analytical results for the Wood Storage Area are presented in Table 4-20. The statistical analysis of these data is presented in Table 4-21. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for surface soil are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP.

Carcinogenic PAHs

In all seven samples, cPAHs were detected above the PRG for B(a)P equivalents (0.062 mg/kg), ranging from 0.0719 to 5.96 mg/kg. Six samples exceeded the MTCA Method B direct contact value of 0.137 mg/kg. One of seven samples exceeded the MTCA Method B groundwater protection standard of 2.32 mg/kg. The MTCA terrestrial ecological standard was not exceeded in any samples. The maximum concentration detected, in SI-OS04, was located near the borders of the East and West Treatment areas.

Noncarcinogenic PAHs

Relatively low concentrations (0.52 to 21 mg/kg) of ncPAHs were detected throughout the Wood Storage Area. No individual ncPAHs exceeded EPA or MTCA risk-based screening benchmarks.

Dioxin

All five samples contained 2,3,7,8-TCDD TEQ above the PRG (3.9 ng/kg), the MTCA Method B direct contact value of 6.7 ng/kg, and the MTCA terrestrial ecological standard of 5 ng/kg; with concentrations ranging from 52 to 3,770 ng/kg. The MTCA Method B groundwater protection standard of 314 ng/kg was exceeded in four of five samples. The maximum concentration was detected at B-U19, located near the southern boundary of the facility.

Pentachlorophenol

PCP was detected above the PRG (2.98 mg/kg) in three of seven samples collected in the Wood Storage Area, with concentrations ranging from 0.14 to 7.87 mg/kg; however, none of the samples exceeded the MTCA Method B direct contact value of 8.33 mg/kg or the MTCA terrestrial ecological standard of 11 mg/kg. All seven samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg. The maximum concentration was detected in sample SI-OS04.

Petroleum

Total EPHs were not detected above the MTCA Method A value for soil of 2000 mg/kg or the MTCA terrestrial ecological standard of 460 mg/kg in the five samples collected.

4.2.6.4 Treated Pole Area

Except for the area immediately surrounding the railroad tracks, the entire Treated Pole Area is currently covered with either asphalt or a gravel cap. Consequently, exposure to contaminated soils is not currently possible in this area. Surface soil sample analytical results for the Treated Pole Area are presented in Table 4-22. The statistical analysis of these data is presented in Table 4-23. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for surface soil are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP.

Carcinogenic PAHs

Total cPAHs (0.0067 to 12.9 mg/kg) were detected in seven samples. cPAHs were detected above the PRG (0.062 mg/kg) and MTCA Method B direct contact value (0.137 mg/kg) in four of seven samples. The MTCA Method B groundwater protection standard of 2.32 mg/kg was exceeded in two samples. The MTCA terrestrial ecological standard was not exceeded in any samples. The maximum concentration (12.9 mg/kg B[a]P equivalent) was detected at sample location SS19, close to the North Pole Yard.

Noncarcinogenic PAHs

All seven samples had ncPAHs detected in them, but individual ncPAHs were not detected above EPA or MTCA risk-based screening levels. Total ncPAHs ranged from 0.03 to 78 mg/kg.

Dioxin

All four samples had concentrations (299 to 6911 ng/kg) greater than the PRG, MTCA Method B direct contact, and MTCA terrestrial ecological standards. Three of the four samples exceeded the MTCA Method B groundwater protection standard of 314 ng/kg. The maximum concentration was detected at sample location SS22, located near the northern border of the facility within the area covered by the gravel cap.

Pentachlorophenol

PCP was detected above the PRG (2.98 mg/kg) in three of seven samples collected in the Treated Pole Area. Two samples, located at OS08 and SS19, exceeded the MTCA Method B direct contact value of 8.33 mg/kg and the MTCA terrestrial ecological standard of 11 mg/kg. Six of seven samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg. The maximum concentration (34 mg/kg) was detected at SS19.

Petroleum

Petroleum was not analyzed for in the Treated Pole Area surface area samples.

4.2.6.5 North Treatment Area

The North Treatment Area extends from the southern portion of the Treated Pole Area to the southern extent of the retort; it includes the retort, the former dryer, the active peeler unit, and untreated log storage in its eastern portion. The majority of this subarea is paved, but the northeast portion of the subarea is covered with sawdust and the north-central portion has a gravel cap. Surface soil sample analytical results for the North Treatment Area are presented in Table 4-24. The statistical analysis of these data is presented in Table 4-25. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for surface soil are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP.

Carcinogenic PAHs

In all seven samples, cPAHs were detected (0.108 to 4.2 mg/kg) above the PRG (0.062 mg/kg). Six samples exceeded the MTCA Method B direct contact value (0.137 mg/kg). One of the seven samples exceeded the MTCA Method B groundwater protection standard of 2.32 mg/kg. The MTCA

terrestrial ecological standard was not exceeded in any samples. The maximum concentration (4.2 mg/kg B[a]P equivalent) was detected at sample location SI-SD2 located just south of the retort. Other surface soil samples that exceeded the MTCA Method B direct contact value were located east of the retort at sampling locations SS04 and SI-OS05.

Noncarcinogenic PAHs

Individual ncPAHs were not detected above EPA or MTCA risk-based screening levels. Total ncPAHs ranged from 0.418 to 11.5 mg/kg.

Dioxin

All 13 surface soil samples collected from this area contained dioxin concentrations (6.7 to 17,000 ng/kg) greater than the PRG and MTCA Method B direct contact and terrestrial ecological standards. Ten of the 13 samples exceeded the MTCA Method B groundwater protection standard. The maximum concentration was detected at sampling location SS01 on the northeast corner of the retort. In SS24 and SS66, 2,3,7,8-TCDD TEQs of 11,000 and 7,660 ng/kg were detected, respectively. These sampling locations were located in the central portion of the subarea.

Pentachlorophenol

PCP was detected in seven samples (0.76 to 72 mg/kg) and above the PRG (2.98 mg/kg) in four of seven samples collected in the North Treatment Area. PCP was detected in two samples (SI-SD2 and SS04) above the MTCA Method B direct contact value. One of the seven samples exceeded the MTCA terrestrial ecological standard of 11 mg/kg. All seven samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg. The maximum concentration (72 mg/kg) was detected in sample SS04.

Petroleum

Total EPHs were detected in three of four samples (maximum concentration 292 mg/kg), all below the MTCA Method A benchmark for soil of 2000 mg/kg and the MTCA terrestrial ecological standard of 460 mg/kg. VPH, analyzed in four surface soil samples, was detected above the MTCA Method A value of 100 mg/kg in one sample. None of the samples exceeded the MTCA terrestrial ecological standard of 200 mg/kg.

4.2.6.6 West Treatment Area

The PCP enclosure, PCP fill line, butt tanks, and butt-tank drip pad are located in the West Treatment Area. The majority of this subarea is covered with structures or asphalt. The western border of this subarea is covered with gravel. Due to the presence of surface cover in the West Treatment Area, no surface soils have been collected.

4.2.6.7 East Treatment Area

The East Treatment Area extends from the shop to east of the former drywell and gravel infiltration bed. It includes the creosote enclosure, an abandoned oil/water separator, a thermal tank, and the creosote fill line; however, structures cover much of the surface, and paving and excavation areas in the East Treatment Area have eliminated much of the remaining surface soil. Due to the presence of surface cover in the East Treatment Area, no surface soils have been collected.

4.2.6.8 Nature and Extent of Contamination

Dioxin was detected in relatively high concentrations throughout the facility (Figure 4-3). Dioxin concentrations correlated most strongly with PCP concentrations ($R^2 = 0.69$). Ninety-seven percent of the surface soil samples collected from the facility exceeded the EPA PRG for dioxin (based on 2,3,7,8-TCDD TEQ). Seventy percent of the samples exceeded the EPA PRG by at least 100-fold. Twenty-two percent of the surface soil samples exceeded the EPA PRG by at least 1000-fold. Surface soil samples containing greater than 1000-fold dioxin concentrations were collected at locations in all subareas of the facility (the North Pole Area [B-D7 and SS17], the South Pole Area [SS50 and MW35-S], the Treated Pole Area [SS22], and the North Treatment Area [SS66, SS24, and SS01]).

Individual ncPAHs were not detected above their respective EPA PRGs.

Total cPAHs were detected throughout the facility (Figure 4-1). Seventy-two percent of the surface soil samples collected contained cPAHs (based on B[a]P equivalents) above the EPA PRG. Thirty-four percent of the samples contained concentrations greater than 10 times the EPA PRG. Only 6% of the samples contained cPAHs greater than 100 times the EPA PRG. These samples were located in the Treated Pole Area (SS19) and the South Pole Yard (B-N3). The concentrations of the cPAHs did not correlate with other detected chemicals. The strongest correlation was with total EPH ($R^2 = 0.48$).

PCP was detected in surface soil samples throughout the facility (Figure 4-4). Forty-four percent of the surface soil samples contained PCP above the EPA PRG. Twelve percent of the samples exceed the PRG by 10-fold. Those samples were detected in the Treated Pole Area (OS08 and SS19), the North

Treatment Area (SS04), and the North Pole Area (SS17). As stated above, PCP concentrations were most highly correlated with dioxin concentrations.

Petroleum contamination was detected in a few isolated areas; no concentrations exceeded the MTCA Method A screening values. VPHs were detected in only one sample, which reflects the volatile nature of the light petroleum fractions represented and the limited source of this type of contamination at the facility. EPHs were detected in several samples; however, no concentrations exceeded either the MTCA Method A value or MTCA terrestrial ecological standard. The source of EPHs is likely related to the use of diesel fuel as the carrier oil for PCP and some sensitivity in this test to the lower molecular weight fraction of creosote.

4.2.7 South Slope Surface Soil

Surface soil samples were collected from the South Slope for field analysis for TPH and laboratory analysis for SVOCs, dioxin, and EPHs. The field and laboratory results are summarized in Sections 4.2.7.1 and 4.2.7.2, respectively.

4.2.7.1 TPH Field-Screening Results

Twenty-one locations on the South Slope were sampled and analyzed for TPH using a standard EPA field-screening technique (E & E 1999d) to provide a rough indication of the presence or absence of contamination from creosote and/or PCP carrier oils. Sampling locations and field screening data are shown in Figure 4-5. A background location in an overgrown field near BTC also was sampled and analyzed. The vegetative cover at the background area was similar to that on the South Slope. Results are summarized in Table 4-26.

TPH field-screening results for South Slope samples ranged from 50 to 475 mg/kg, with an average of 121 mg/kg. No visible petroleum contamination was noticeable at the sample locations. The TPH result for the background sample was 120 mg/kg, nearly identical to the average for the South Slope. Six of the South Slope samples (SS-FS02 Duplicate, SS-FS05, SS-FS06, SS-FS11, SS-FS15, and SS-FS19) exceeded the background value of 121 mg/kg. At three of these six locations, surface soil also was collected for laboratory analysis of PAHs and EPH fractions, and no indication of petroleum contamination was found (see below). This result suggests that background exceedences observed in field screening may be the result of natural organic matter in the soil samples. The components of natural organic matter are chemically similar to petroleum hydrocarbons and may have been detected by the TPH field analysis method. Overall, the field screening results, in conjunction with the laboratory results

described below, suggest that surface soil on the South Slope is not contaminated with petroleum hydrocarbons.

4.2.7.2 Laboratory Analytical Results

A total of 15 surface soil samples were collected from the South Slope for laboratory analysis for SVOCs, dioxin, and EPHs. Five of the samples (RES-41, RES-42, RES-42A, RES-43, and RES-46) were collected as part of the off-facility residential soil sampling program (See Figure 4-1 for locations.). Six samples (AA2, AA4, AA6, BB3, BB5, and CC4) were collected from selected grid cells on the South Slope in August 1999, and four samples were collected from the groundwater monitoring well locations MWLSC-1 through MWLSC-4. The data for these 15 samples are summarized in Table 4-27 and are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQ), and Figure 4-4 for PCP. PAHs, dioxin, phenols, and other SVOCs were detected in surface soil from the South Slope. The data for these chemicals are compared with background (i.e., the off-site, open-field background, surface soil samples) and with human-health screening benchmarks in Table 4-28 to evaluate the significance of the results.

Carcinogenic PAHs

Concentrations of cPAHs in South Slope samples were generally comparable to cPAH concentrations in the off-site, open-field, background samples (concentration ranges for cPAHs were 0.000055 to 1.09 mg/kg for the South Slope and 0.000060 to 0.224 mg/kg for background). Concentrations of cPAHs on the South Slope exceeded EPA PRGS and MTCA Method B direct contact values for the protection of human health at RES-42A, MWLSC-01, and MWLSC-04. Neither the MTCA Method B groundwater protection nor the MTCA terrestrial ecological standard were exceeded in any samples.

Noncarcinogenic PAHs

Concentrations of ncPAHs in South Slope samples were comparable to ncPAH concentrations in the off-site, open-field background samples (Concentration ranges for ncPAHs were 0.02 to 1.06 mg/kg for the South Slope and 0.05 to 1.8 mg/kg for background.). Also, concentrations of individual ncPAHs on the South Slope did not exceed benchmarks for the protection of human health.

Other SVOCs

Five other SVOCs were detected infrequently at trace levels (typically less than 0.1 mg/kg) in the South Slope samples. These SVOCs also were detected infrequently at similar levels in on-facility soil. Two of these SVOCs, benzoic acid and benzyl alcohol, occur widely in nature and are also derived from anthropogenic sources such as automobile exhaust; these SVOCs may not be directly related to wood preservation activities. Instead, they are likely part of the "anthropogenic background" for the City of Bellingham.

Pentachlorophenol

PCP was detected in seven of 15 samples from the South Slope, but not in the background samples. The detected concentrations for the South Slope ranged from 0.0056 to 0.41 mg/kg and were less than the EPA PRG and MTCA values, except for one sample that exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg.

Petroleum

South slope samples were tested for EPH only. EPHs were only sporadically detected, all below MTCA Method B groundwater protection and terrestrial ecological standards, in the surface soil samples from the South Slope, primarily near the railbed where motorized vehicles are known to be driven. This is also in the area where fuel oil for the cement plant was historically transported. These results do not indicate that wood-preservation wastes were disposed of on the South Slope.

Dioxin

Dioxin concentrations were elevated in surface soil samples from the South Slope compared to background and human health screening benchmarks. The 2,3,7,8 TCDD TEQ concentration ranges were 2.7 to 195 ng/kg for the South Slope and 0.12 to 2.8 ng/kg for background; more than 50% of the South Slope samples exceeded the EPA PRG, MTCA Method B groundwater protection standard, and MTCA terrestrial ecological standard.

4.2.8 Little Squalicum Creek Surface Soil

Surface soil samples were collected from the Little Squalicum Creek ravine for field analysis for TPHs and laboratory analysis for SVOCs, dioxin, and EPHs. The field and laboratory results are summarized in Sections 4.2.8.1 and 4.2.8.2, respectively.

4.2.8.1 TPH Field Screening Results

Approximately 45 locations on the north and south banks of Little Squalicum Creek were sampled and analyzed for TPH using the same field-screening method as with the South Slope soil. The screening method measures a broad range of hydrocarbons including diesel fuel, kerosene, crude oil, motor oil, hydraulic fluid, grease, transformer oil, and #2, #4 and #6 fuel oils. It is not specific for any particular hydrocarbon. The method is generally not applicable for measurement of gasoline range hydrocarbons. It does yield a positive response to naturally occurring hydrocarbons (e.g., from decaying vegetation) in soil. Data cannot be used for formal evaluation of compliance with MTCA cleanup levels for petroleum. Sampling was conducted to look for the presence of petroleum-contaminated "spoils piles" on the banks of the creek. It was noted that contaminated creek sediments may have been dredged from the creek channel and deposited in piles along the banks in years past (Secrist 1998), although no definitive records of such dredging have been found. The dredging may have taken place in order to increase flow in the creek and thus keep the ravine bottom well drained for activities such as gravel mining and/or log storage. The locations and results for the TPH field-screening samples are shown in Figure 4-5.

Three background locations also were sampled and field analyzed for TPH. Two of the background locations were in the Little Squalicum Creek ravine; one was at the Birchwood Outfall and one was at a pond near the BTC (Figure 4-5). The vegetative cover and soil texture at these two background locations were similar to that along the north and south banks of Little Squalicum Creek. A third background sample was collected from the Bellingham Bay Beach. This background sample consisted of sand with little or no organic material and was included in the study to determine the response of the TPH field kit on a purely inorganic matrix.

TPH field-screening results are summarized in Table 4-29. Results for the background locations ranged from "not detected" for the beach sample to 667 mg/kg for the Birchwood Outfall sample. The relatively high result for the Birchwood Outfall sample may be due to natural organic matter in the sample and/or oil and grease from stormwater.

TPH field results for the creek bank samples ranged from 43 to greater than 2000 mg/kg, and approximately half of the samples exceeded the highest background concentration of 667 mg/kg (Figure 4-5). Generally, samples that appeared to be petroleum-contaminated (e.g., SP-FS10, SP-FS25A, and SP-FS52) were characterized by a TPH result greater than 2000 mg/kg. Many samples on the south side of the creek (e.g., samples SP-FS17 to SP-FS20 and the transect samples from the south side) were characterized by TPH concentrations greater than 1000 mg/kg. These samples were collected close to or

on the dirt road that parallels the creek on the ravine bottom. High TPH levels in this area may be due to the use of contaminated creek sediments to build up the road bed and/or from possible historic use of oil on the road for dust control. Overall, TPH field-screening results indicate that petroleum contamination is present along the banks of the creek in several areas.

4.2.8.2 Laboratory Analytical Results

Ten surface soil samples were collected from the Little Squalicum Creek area for laboratory analysis for SVOCs, dioxin, and EPHs. Three of the samples were collected from the ravine bottom as part of the off-site, residential, soil-sampling program (RES-47A, RES-48, and RES-49), and seven were collected from the creek banks in areas of possible spoils contamination (SP01 to SP07). Analytical data are illustrated in Figure 4-1 for cPAHs (B[a]P equivalents), Figure 4-2 for ncPAHs, Figure 4-3 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-4 for PCP. The data for these samples are summarized in Table 4-30. PAHs, dioxin, phenols, and other SVOCs were detected in the samples. In Table 4-31, the results are compared with background (i.e., bank soil collected at the Birchwood Outfall and the off-site, open-field, background samples) and human health screening benchmarks to evaluate their significance.

PAHs, PCP, EPHs, and dioxin were detected in surface soil at the Birchwood Outfall background location. The concentrations were 8.8 mg/kg B(a)P equivalents for cPAHs, 5.4 mg/kg for ncPAHs, 642 mg/kg for EPHs, 2.2 mg/kg for PCP, and 1561 ng/kg for 2,3,7,8-TCDD TEQ. These concentrations are one to two orders of magnitude greater than those in the open-field background samples (0.0006 to 0.225 mg/kg B[a]P equivalents for cPAHs; 0.05 to 1.8 mg/kg for ncPAHs; PCP was not detected; and 0.12 to 2.8 ng/kg for the 2,3,7,8-TCDD TEQ), perhaps because stormwater discharges have affected soil near the Birchwood Outfall. The detection of PCP in soil at the Birchwood Outfall suggests that this location is affected by wood-preservation chemicals. This could indicate that historical activities at The Oeser Company have affected this area (e.g., the storm drain system that leads to the Birchwood Outfall included areas where PCP-treated wood wastes may have been in contact with surface water that subsequently entered this drainage system).

Four samples collected from the creek banks (SP01, SP02, SP03, and SP05) contained levels of cPAHs greater than the Birchwood Outfall background sample and human health screening benchmarks. These four samples correspond with field-screening samples SP-FS11, SP-FS25A, SP-FS01, and SP-FS17. Three of these samples (SP01, SP02, and SP03) also had concentrations of ncPAHs greater than the Birchwood Outfall background sample and one EPH sample concentration greater than the 2000 mg/kg MTCA Method A benchmark. The highest concentrations of cPAHs, ncPAHs, and EPHs

were found in sample SP02. This sample had a strong petroleum odor and an oily/silvery appearance. The sample collected at SP02 had the highest concentration of EPH (5533 mg/kg) and VPH (87 mg/kg), both above their respective MTCA Method A screening values. The EPH concentration also exceeds the MTCA terrestrial ecological value.

The 2,3,7,8-TCDD TEQ concentration range for the surface soil samples from the creek area was 1.86 to 1102 ng/kg, and all samples had concentrations less than the Birchwood Outfall background sample (1561 ng/kg); however, as noted above, the concentration for the Birchwood Outfall background sample is several orders of magnitude greater than the concentration range for the open-field background samples (0.12 to 2.8 ng/kg) collected away from The Oeser Company facility.

4.3 SUBSURFACE SOIL SAMPLE RESULTS

This section presents analytical results from the extensive subsurface soil sampling program conducted at The Oeser Company facility during the RI and previous investigations summarized in Section 1.6. Subsurface soil samples were collected from seven areas within the facility, the South Slope, and Little Squalicum Creek. This section is organized into seven subsections:

- Section 4.3.1 provides criteria and guidelines used to interpret surface soil data;
- Section 4.3.2 provides an overview of the sampling results;
- Section 4.3.3 presents results for subsurface soil samples collected from the seven subareas within the facility;
- Section 4.3.4 presents results for subsurface soil samples collected from the South Slope sampling locations;
- Section 4.3.5 presents results for subsurface soil samples collected adjacent to Little Squalicum Creek;
- Section 4.3.6 presents the results for the CPT-LIF-ROST investigation of facility subsurface soil; and
- Section 4.3.7 presents the results for the SPLP testing conducted on facility soil.

4.3.1 Interpretation of Results

Interpretation of subsurface soil results described in Section 4.3 follows the same guidance outlined in Section 4.2.1. In that section, details of the risk-based screening criteria, data usability, and data presentation (types of tables and figures) are described.

4.3.2 Overview of Subsurface Soil Sample Results

In general, contaminant concentrations decreased with depth and were less than surface soil concentrations except in the main treatment area of the facility. PRGs for several analytes were exceeded at various locations and depths across the facility. There was little strong correlation between contaminant concentrations, except for dioxin and PCP at depths greater than 12 feet bgs. Little contamination was detected in either the South Slope or Little Squalicum Creek subsurface soil, and no concentrations exceeded PRGs. No correlation between soil concentrations and contaminant leachability, based on SPLP results, was identified. CPT-LIF-ROST data provide clear indications of contamination as isolated pockets primarily around the treatment areas, with little contamination found at depths greater than 10 feet bgs.

4.3.3 Facility Subsurface Soil Sample Results

Subsurface soil data are discussed below by subarea.

4.3.3.1 North Pole Yard

Subsurface soil sample analytical results for the North Pole Yard are summarized in Table 4-32. The statistical analysis of these data is presented in Table 4-33 for the 0.5- to <6-foot-bgs depth interval; Table 4-34 for the 6- to <12-foot-bgs depth interval; and Table 4-35 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Total cPAHs (B[a]P equivalents) were detected above the PRG of 0.062 mg/kg, the MTCA Method B direct contact value of 0.137 mg/kg, and the MTCA Method B groundwater protection standard of 2.32 mg/kg in the 2- to 4-foot interval of soil boring B-J2 (25.56 mg/kg) located in the western portion of the subarea.

Depth Interval - 6 to <12 feet. Total cPAHs were detected in two soil borings (B-J2 and B-B13), but concentrations did not exceed the risk-based benchmarks noted above.

Depth Interval - >12 feet. Total cPAHs were detected in one sample (B-J2), but the concentration did not exceed the risk-based benchmarks noted above.

Noncarcinogenic PAHs

Detections of ncPAHs in the subsurface soil of the North Pole Area generally mirror the contaminant profile described for the cPAHs; however, concentrations of individual ncPAHs did not exceed EPA PRGs or MTCA Method B direct contact and ecological risk-based screening benchmarks within the subarea.

Dioxin

Depth Interval - 0.5 to <6 feet. Dioxin was detected above the PRG (3.9 ng/kg 2,3,7,8-TCDD TEQ), the MTCA Method B direct contact value (6.7 ng/kg), the MTCA Method B groundwater protection standard (314 ng/kg), and the MTCA terrestrial ecological standard (5 ng/kg) in B-J2 and B-B13. The maximum 2,3,7,8-TCDD TEQ was detected at 1120 ng/kg in soil boring B-J2 within the 2- to 4-foot interval.

Depth Interval - 6 to <12 feet. Dioxin was detected above the PRG (3.9 ng/kg 2,3,7,8-TCDD TEQ) and the MTCA Method B direct contact value (6.7 ng/kg), but not the MTCA Method B groundwater protection standard (314 ng/kg) in B-D7 (51 ng/kg at 6 to 8 feet bgs) located in the north-central portion of the area.

Depth Interval - >12 feet. Dioxin was detected in one sample (B-J2), but the concentration did not exceed the risk-based screening criteria noted above.

Pentachlorophenol

Depth Interval - 0.5 to< 6 feet. PCP was detected above the PRG (2.98 mg/kg), the MTCA Method B direct contact value (8.33 mg/kg), the MTCA Method B groundwater protection standard (0.077 mg/kg), and the MTCA terrestrial ecological standard (11 mg/kg) in subsurface soil samples B-J2 and B-B13. The maximum concentration detected in the subsurface soil of the North Pole Yard, 490 mg/kg, was found in the 2- to 4-foot interval of soil boring B-J2.

Depth Interval - 6 to <12 feet. PCP was detected in one subsurface sample (0.19 mg/kg at B-J2), but not above the risk-based screening criteria, except for the MTCA Method B groundwater protection standard noted above.

Depth Interval - >12 feet. PCP was detected in one subsurface sample (0.038 mg/kg at B-J2), but not above the risk-based screening criteria noted above.

Petroleum

Depth Interval - 0.5 to <6 feet. EPHs and VPHs were detected above MTCA Method A values (2000 and 30 mg/kg, respectively) within this depth interval. EPHs were detected at 2,260 mg/kg in soil boring B-B13 at the 4- to 6-foot interval. This sample also exceeded the MTCA terrestrial ecological standard of 460 mg/kg. VPHs were detected at 170 and 185 mg/kg in soil borings B-J2 (2- to 4-foot depth) and B-B13 (4- to 6-foot depth), respectively. These samples are below the MTCA terrestrial ecological standard of 200 mg/kg for VPH.

Depth Interval - 6 to <12 feet. EPHs and VPHs also were detected above risk-based screening criteria within this depth interval. Total EPH was detected at 1,890 mg/kg in soil boring B-B13 at the 8- to 10-foot interval, and total VPH was detected at 472 mg/kg in soil boring B-B13 at the 8- to 10-foot interval.

Depth Interval - >12 feet. EPHs and VPHs were not detected in this interval.

4.3.3.2 South Pole Yard

Subsurface soil sample analytical results for the South Pole Yard are summarized in Table 4-36. The statistical analysis of these data is presented in Table 4-37 for the 0.5- to <6-foot-bgs depth interval; Table 4-38 for the 6- to <12-foot-bgs depth interval; and Table 4-39 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Carcinogenic PAHs were detected in four of seven soil borings/monitoring wells above the PRG of 0.062 mg/kg (B[a]P equivalents) and the MTCA Method B value of 0.137 mg/kg. These detections occurred throughout the South Pole Yard in B-O7 (2 to 4 feet bgs), MW28-S (2 to 4 feet bgs), MW35-D (2 to 4 feet bgs), and MW29-S (4 to 6 feet bgs). Neither the MTCA Method B groundwater protection standard nor the MTCA terrestrial ecological standard were exceeded in any samples.

Depth Interval - 6 to <12 feet. Total cPAHs (based on B[a]P equivalents) were detected (71.5 mg/kg) in one of nine soil borings (B-O7 at 6 to 8 feet bgs). This sample exceeds the EPA PRG and all three MTCA values.

Depth Interval - >12 feet. Total cPAHs were detected within this interval, but the concentrations did not exceed risk-based screening criteria.

Noncarcinogenic PAHs

Depth Interval - 0.5 to< 6 feet. Total ncPAHs were detected at relatively low concentrations (up to 1 mg/kg), and no single ncPAH was detected above risk-based screening criteria.

Depth Interval - 6 to <12 feet. Naphthalene (510 mg/kg) and 2-methylnaphthalene (360 mg/kg) were detected above the PRG (56 mg/kg), but not above the MTCA Method B direct contact value (1600 mg/kg) in soil boring B-07 within the 6- to 8-foot interval. The maximum concentration (2,580 mg/kg) of ncPAHs also occurred at this location, but no other ncPAHs exceeded risk-based screening criteria.

Depth Interval - >12 feet. Total ncPAHs were detected at relatively low concentrations (up to 0.9 mg/kg); however, no single ncPAH was detected above risk-based screening criteria.

Dioxin

Depth Interval - 0.5 to 6 feet. Dioxin was detected within this interval; however, the concentrations did not exceed the EPA PRG or the three MTCA risk-based screening criteria.

Depth Interval - 6 to 12 feet. Dioxin was detected above the EPA PRG and three MTCA risk-based screening benchmarks in one of four subsurface samples collected from the South Pole Yard. Soil boring B-O7 (6 to 8 feet bgs) contained 1,160 ng/kg 2,3,7,8-TCDD TEQ.

Depth Interval - >12 feet. Dioxin was detected within this interval; however, the concentrations did not exceed previously stated risk-based screening criteria.

Pentachlorophenol

Depth Interval - 0.5 to <6 feet. PCP was detected above the PRG (2.98 mg/kg), the MTCA Method B direct contact value (8.33 mg/kg), and the MTCA Method B groundwater protection standard (0.077 mg/kg) in soil boring B-O7 (2 to 4 feet bgs) at a concentration of 8.6 mg/kg. The MTCA terrestrial ecological standard (11 mg/kg) was not exceeded

Depth Interval - 6 to <12 feet. PCP also was detected above the previously noted screening values, at 200 mg/kg within the 6- to 8-foot interval and at 8.6 mg/kg in the 2- to 4-foot interval of soil boring B-O7.

Depth Interval - >12 feet. PCP was not detected above risk-based screening criteria within this interval, except for the B-O7 14- to 16- foot interval (0.48 mg/kg) which exceeds the groundwater protection standard.

Petroleum

Depth Interval - 0.5 to< 6 feet. EPHs were detected within this interval; however, the concentration (85.3 mg/kg) was below previously noted risk-based screening criteria.

Depth Interval - 6 to <12 feet. One subsurface soil sample contained EPHs above the MTCA Method A value and the MTCA terrestrial ecological standard. EPHs were detected at 6,530 mg/kg in soil boring B-O7 in the 6- to 8-foot interval. One subsurface soil sample contained VPHs above the MTCA Method A and terrestrial ecological values. VPHs were detected at 1,670 mg/kg in soil boring B-O7 in the 6- to 8-foot interval.

Depth Interval - >12 feet. EPHs and VPHs were not detected within this interval.

4.3.3.3 Wood Storage Area

Subsurface soil sample analytical results for the Wood Storage Area are summarized in Table 4-40. The statistical analysis of these data is presented in Table 4-41 for the 0.5- to <6-foot-bgs depth interval, Table 4-42 for the 6- to <12-foot-bgs depth interval, and Table 4-43 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth

interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Within this interval, cPAHs were detected above the PRG and the MTCA Method B direct contact value in three of eight samples and two of eight samples, respectively. The cPAHs were detected in B-U19 (located in the south-central portion of the area), B-R28 (located in the eastern portion of the area), and SI-OS04 (located near the border of the West Treatment Area). Neither the MTCA Method B groundwater protection standard nor the MTCA terrestrial ecological standard were exceeded in any samples.

Depth Interval - 6 to <12 feet. Within this interval, cPAHs also were detected above the PRGs and the MTCA Method B direct contact value in three samples (MW24-D, OS49, and GP11). The maximum concentration (1.28 mg/kg) was detected at location GP-11 at 11 to 13 feet, located on the north side of the area near the excavation in the East Treatment Area. Neither the MTCA Method B groundwater protection standard nor the MTCA terrestrial ecological standard were exceeded in any samples.

Depth Interval - >12 feet. Within this interval, cPAHs were not detected.

Noncarcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Within this sampling interval, ncPAHs were detected in seven of eight samples collected (up to 21 mg/kg); however, individual ncPAHs did not exceed EPA PRG or the three MTCA risk-based screening criteria.

Depth Interval - 6 to <12 feet. Within this sampling interval, ncPAHs were detected in eight of 15 samples collected (up to 100 mg/kg); however, individual ncPAHs did not exceed the EPA PRG or the three MTCA risk-based screening criteria.

Depth Interval - >12 feet. Within this sampling interval, ncPAHs were detected in six of 26 samples collected (up to 0.085 mg/kg); however, individual ncPAHs did not exceed the EPA PRG or the three MTCA risk-based screening criteria.

Dioxin

Depth Interval - 0.5 to <6 feet. Dioxin was detected in one of two sampling locations above the PRG (3.9 ng/kg), the MTCA Method B direct contact value (6.7 ng/kg), the MTCA Method B

groundwater protection standard (314 ng/kg), and the MTCA terrestrial ecological standard (5 ng/kg). Subsurface soil sample B-U19 (2 to 4 feet bgs) contained the single 2,3,7,8-TCDD TEQ detection (563 ng/kg) above the risk-based screening criteria. B-U19 is located in the south-central portion of the subarea.

Depth Interval - 6 to <12 feet. Dioxin was detected in the only sampling location (MW33-D), but the concentration did not exceed the risk-based screening criteria noted above.

Depth Interval - >12 feet. Dioxin was not detected within this sampling interval.

Pentachlorophenol

Depth Interval - 0.5 to <6 feet. Seven samples were analyzed for PCP. PCP was detected (19 mg/kg) above the EPA, Region 9, residential PRG (2.98 mg/kg), the MTCA Method B direct contact value (8.33 mg/kg), and the MTCA terrestrial ecological standard (11 mg/kg) at B-U19 (2 feet bgs). Three samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg.

Depth Interval - 6 to <12 feet. PCP was detected above the PRG in three of 14 samples, at GP11 (39 mg/kg), OS49 (21.1 mg/kg), and MW25-D (4.3 mg/kg); samples collected from GP11 and OS49 exceeded the MTCA Method B direct contact value and the MTCA terrestrial ecological standard. All borings are located near the southern border of the East Treatment Area. Four samples exceeded the MTCA Method B groundwater protection standard.

Depth Interval - >12 feet. PCP was not detected above risk-based screening criteria within this screening interval.

Petroleum

Depth Interval - 0.5 to <6 feet. EPHs were detected in four of six samples, all below the MTCA Method A value of 2,000 mg/kg. Soil boring B-U19 contained 531 mg/kg EPHs. This is the only sample that exceeds the MTCA terrestrial ecological standard of 460 mg/kg. VPHs were detected at 10 mg/kg in B-U19, but not above the MTCA Method A value (30 mg/kg) or the MTCA terrestrial ecological value (200 mg/kg).

Depth Interval - 6 to <12 feet. EPHs were detected in three of eight samples, all below the MTCA Method A value. VPHs were detected above the MTCA screening values in one of eight samples. Soil boring B-Q20 contained 624 mg/kg EPH and 168 mg/kg total VPH. The EPH concentration exceeds its MTCA terrestrial ecological standard. B-Q20 is located on the border of the East Treatment Area and the Wood Storage Area.

Depth Interval - >12 feet. EPHs and VPHs were detected; however, concentrations did not exceed MTCA screening levels noted above.

4.3.3.4 Treated Pole Area

Subsurface soil sample analytical results for the Treated Pole Area are summarized in Table 4-44. The statistical analysis of these data is presented in Table 4-45 for the 0.5- to <6-foot-bgs depth interval, Table 4-46 for the 6- to <12-foot-bgs depth interval, and Table 4-47 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5 to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. In three of 11 subsurface soil samples, cPAHs were detected above the PRG (0.062 mg/kg) and the MTCA Method B direct contact value (0.137 mg/kg). The maximum concentration (10.3 mg/kg B[a]P equivalents) was detected at 2 to 4 feet bgs at sampling location GP37, in the northeast corner of the facility. Soil borings GP46 and SI-OS02 (located in the northern portion of the area) also contained PAH B(a)P equivalents above these risk-based screening criteria. Two samples exceeded the MTCA Method B groundwater protection standard (2.32 mg/kg). No samples exceeded the MTCA terrestrial ecological standard (30 mg/kg).

Depth Interval - 6 to <12 feet. In two of seven subsurface soil samples, cPAHs were detected above the EPA PRG and the MTCA Method B direct contact risk-based screening criteria. GP54 (6 to 8 feet bgs) and MW15-S (8 to 10 feet bgs) contained 0.575 and 0.75 mg/kg B(a)P equivalents, respectively. These borings are located near the border of the North Treatment Area. Neither the MTCA Method B groundwater protection standard nor the MTCA terrestrial ecological standard were exceeded in any samples.

Depth Interval - >12 feet. In one of nine subsurface soil samples, cPAHs were detected, but the concentration did not exceed risk-based screening benchmarks.

Noncarcinogenic PAHs

Depth Interval - 0.5 to <6 feet. In eight of 11 samples within this sampling interval, ncPAHs were detected (up to 416 mg/kg); however, individual ncPAHs did not exceed risk-based screening criteria.

Depth Interval - 6 to <12 feet. 2-Methylnaphthalene and naphthalene were detected above the PRG, but not above the MTCA Method B direct contact value. 2-Methylnaphthalene was detected (82 mg/kg) in MW15 (8 to 10 feet bgs). Naphthalene was detected in soil boring GP54 (6 to 8 feet bgs) and MW15 (8 to 10 feet bgs) at 140 and 310 mg/kg, respectively. These concentrations also exceed the MTCA Method B groundwater protection standard of 23.5 mg/kg. Total ncPAHs also were highest at these two locations.

Depth Interval - >12 feet. Within this sampling interval, ncPAHs were detected in three samples (up to 0.099 mg/kg); however, individual ncPAHs did not exceed risk-based screening criteria.

Dioxin

Depth Interval - 0.5 to< 6 feet. Dioxin was detected (as 2,3,7,8-TCDD TEQ) in one of two samples slightly above the PRG (3.9 ng/kg 2,3,7,8-TCDD TEQ) and the MTCA terrestrial ecological standard (5 ng/kg); however, the concentration detected (6.5 ng/kg 2,3,7,8-TCDD TEQ) at B-J20 (located near the North Treatment Area) did not exceed the MTCA Method B direct contact value of 6.7 ng/kg or the MTCA Method B groundwater protection standard of 314 ng/kg.

Depth Interval - 6 to <12 feet. Dioxin was detected at two locations, but the concentration did not exceed the risk-based screening criteria noted above.

Depth Interval - >12 feet. Dioxin was detected at one location, but the concentration did not exceed the risk-based screening criteria noted above.

Pentachlorophenol

Depth Interval - 0.5 to <6 feet. PCP was not detected above EPA PRG, MTCA Method B direct contact, or MTCA terrestrial ecological risk-based screening benchmarks. One sample (2.2 mg/kg at GP37) exceeded the MTCA groundwater protection standard of 0.077 mg/kg.

Depth Interval - 6 to <12 feet. PCP was detected above the PRG (2.98 mg/kg) in two subsurface soil samples collected in this interval. The maximum concentration detected (12 mg/kg) was found at location MW15-S (8 to 10 feet bgs), at the south end of the Treated Pole Area. This sample also

exceeded the MTCA Method B direct contact value and the MTCA terrestrial ecological standard. Four samples exceeded the MTCA Method B groundwater protection standard.

Depth Interval - >12 feet. PCP was not detected above risk-based screening benchmarks, noted above, within this interval.

Petroleum

Depth Interval - 0.5 to <6 feet. EPHs were not detected above risk-based screening criteria within this interval.

Depth Interval - 6 to <12 feet. TPH-G was detected at sampling location GP54 (6 to 8 feet bgs) and MW15 (8 to 10 feet bgs) at 6,000 and 7,900 mg/kg, respectively. These concentrations exceed the MTCA Method A and terrestrial ecological standards. EPHs were detected, but not above risk-based screening benchmarks.

Depth Interval - >12 feet. EPHs were not detected above risk-based screening criteria within this interval.

4.3.3.5 North Treatment Area

Subsurface soil sample analytical results for the North Treatment Area are presented in Table 4-48. The statistical analysis of these data is presented in Table 4-49 for the 0.5- to <6-foot-bgs depth interval; Table 4-50 for the 6- to <12-foot-bgs-depth interval; and Table 4-51 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRGs for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to< 6 feet. cPAHs were detected in four of 15 subsurface soil samples above the EPA PRG (0.062 mg/kg) and in three of 15 subsurface soil samples above the MTCA Method B direct contact value (0.137 mg/kg). Three samples exceeded the MTCA Method B groundwater protection standard (2.32 mg/kg), and one sample exceeded the MTCA terrestrial ecological standard of

30 mg/kg. The maximum detection (164 mg/kg B[a]P equivalents) occurred in soil boring B-M20 (2 to 4 feet bgs) located south of the retort.

Depth Interval - 6 to <12 feet. In eight of 29 subsurface soil samples, cPAHs were detected above the PRG and the MTCA Method B direct contact value. Six samples exceeded the MTCA Method B groundwater protection standard. The maximum concentration (18.5 mg/kg) was detected in MW31-S (8 to 10 feet bgs) located on the eastern edge of the facility.

Depth Interval - >12 feet. Fourteen of 47 and 13 of 47 subsurface soil samples had cPAH detections exceeding the PRG and the MTCA Method B direct contact value, respectively. Eight samples exceeded the MTCA Method B groundwater protection standard. MW21-S (15 to 17 feet bgs) was the location (southwest of the retort) with the highest concentration (17.6 mg/kg).

Noncarcinogenic PAHs

Depth Interval - 0.5 to <6 feet. In 12 of 15 samples within this sampling interval, ncPAHs were detected (up to 256 mg/kg); however, individual ncPAHs did not exceed risk-based screening criteria.

Depth Interval - 6 to <12 feet. Naphthalene and 2-methylnaphthalene were detected above the PRG value (55.9 mg/kg) in four of 29 and five of 29 subsurface soil samples, respectively. Five samples exceeded the naphthalene and 2-methylnaphthalene groundwater protection value of 23.5 mg/kg. The maximum concentration for each compound was detected in MW31-S located on the eastern edge of the facility.

Depth Interval - >12 feet. Naphthalene and 2-methylnaphthalene were detected above the PRG and the MTCA Method B groundwater protection value in seven of 47 subsurface soil samples. These compounds were detected throughout the North Treatment Area. The highest concentrations were detected in MW21-S and GP05, located southwest and northeast of the retort, respectively.

Dioxin

Depth Interval - 0.5 to< 6 feet. Dioxin was detected above the EPA and three MTCA risk-based screening benchmarks in one of two subsurface samples collected from the North Treatment Area. The maximum concentration (1,710 ng/kg 2,3,7,8-TCDD TEQ) was detected in soil boring GP61 (7 to 9 feet bgs) located southwest of the retort.

Depth Interval - 6 to <12 feet. Dioxin was detected above the EPA and three MTCA risk-based screening benchmarks in three of six subsurface samples collected from the North Treatment

Area. The maximum concentration (908 ng/kg 2,3,7,8-TCDD TEQ) was detected in soil boring B-M20 (7 to 9 feet bgs) located south of the retort.

Depth Interval - >12 feet. One of six samples exceeded the EPA and three MTCA risk-based screening criteria for dioxin in this depth interval. The soil sample B-M20 (20 to 22 feet bgs) had a concentration of 564 mg/kg.

Pentachlorphenol

Depth Interval - 0.5 to <6 feet. PCP was detected above the PRG (2.98 mg/kg) and the MTCA Method B direct contact value (8.33 mg/kg) in four of 15 subsurface soil samples collected from this interval. Seven samples exceeded the MTCA Method B groundwater protection standard (0.077 mg/kg), and three samples exceeded the MTCA terrestrial ecological standard (11 mg/kg). The highest concentration (520 mg/kg) was detected in MW31-S at 2 feet bgs located near the eastern edge of the area. Soil boring B-M20 contained 200 mg/kg at 2 to 4 feet bgs.

Depth Interval - 6 to <12 feet. PCP was detected above the PRG and the MTCA Method B direct contact value in nine of 28 subsurface soil samples and three of 28 subsurface soil samples, respectively. Fourteen samples exceeded the groundwater protection standard, and three exceeded the terrestrial ecological standard. The highest concentrations were detected at GP06 (60 mg/kg), located next to the northeast corner of the retort, and MW31-S (49 mg/kg).

Depth Interval - >12 feet. PCP was detected above the PRG and the MTCA Method B direct contact value in 12 of 47 and seven of 47 subsurface soil borings, respectively. Twenty-two samples exceeded the groundwater protection standard, and seven exceeded the terrestrial ecological standard. The highest concentrations were detected in GP05 (110 mg/kg), MW21-S (60 mg/kg), GP31 (47 mg/kg), and B-M20 (48 mg/kg).

Petroleum

Subsurface petroleum contamination is widespread in the North Treatment Area. Seven soil borings/monitoring wells contained diesel/gasoline contamination above the residential MTCA Method A benchmarks.

Depth Interval - 0.5 to <6 feet. EPHs were detected above the MTCA Method A value (2000 mg/kg) in two of eight samples collected, at relatively high concentrations. EPHs were detected at 5,220 mg/kg in B-M20 (2 to 4 feet bgs) and 5,130 mg/kg in MW31-S (2 feet bgs). VPHs were detected

in four of eight subsurface soil samples above the MTCA Method A value of 30 mg/kg. A VPH concentration of 284 mg/kg was detected in MW31-S (4 to 6 feet bgs).

Depth Interval - 6 to <12 feet. TPH-D was detected at sampling location GP35 (8 to 10 feet bgs) at 3,730 mg/kg. EPHs were also detected above the MTCA Method A value in one of 13 subsurface soil borings at 4,720 mg/kg. The highest concentration was detected in MW31-S (8 to 10 feet bgs). Three of 12 samples contained VPH above the screening criteria: monitoring well MW31-S (8 to 10 feet bgs) and MW36-S (4 to 6 and 10 to 12 feet bgs). The highest concentration (2,460 mg/kg) was detected at MW31-S.

Depth Interval - >12 feet. The highest concentration of TPH-D (20,000 mg/kg) was detected in MW21-S (15 to 17 feet bgs). EPHs were detected in two subsurface soil samples above MTCA Method A screening criteria. Subsurface soil samples GP60 (12 to 14 feet bgs) and B-M20 (20 to 22 feet bgs) contained 3,024 and 3,500 mg/kg, respectively. VPHs were detected above MTCA Method A screening criteria in B-M20 at 246 mg/kg.

4.3.3.6 West Treatment Area

Subsurface soil samples have been collected from approximately 20 borings and wells in the West Treatment Area. Elevated concentrations of PAHs and PCP were detected throughout the area; however, PCP concentrations were generally lower than those detected in the East Treatment Area. Subsurface soil sample analytical results for the West Treatment Area are presented in Table 4-52. The statistical analysis of these data is presented in Table 4-53 for the 0.5- to <6-foot-bgs depth interval, Table 4-54 for the 6- to <12-foot-bgs depth interval, and Table 4-55 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. PAH concentrations are higher in the West Treatment Area than elsewhere within the facility. In five of eight and four of eight subsurface soil samples collected,

cPAHs were detected above the EPA PRG (0.062 mg/kg) and the MTCA Method B direct contact value (0.137 mg/kg), respectively. Three samples exceeded the MTCA Method B groundwater protection standard (2.32 mg/kg), and one sample exceeded the MTCA terrestrial ecological standard of 30 mg/kg. The highest concentration was found at location HSA08, under the concrete enclosure. The PAH concentration at 3 feet bgs was 156 mg/kg as B(a)P equivalents.

Depth Interval - 6 to <12 feet. In eight of 14 subsurface soil samples collected from this depth interval, cPAHs were detected above the EPA PRG and the MTCA Method B direct contact value. Eight samples exceeded the groundwater protection standard, and two exceeded the terrestrial ecological standard. The maximum cPAH concentrations were detected in soil borings HSA07 (64 mg/kg) and HSA09 (64 mg/kg), located between the stormwater collection tank and the PCP tanks.

Depth Interval - >12 feet. In over half (22 of 42) of the subsurface soil samples collected, cPAHs were detected above the PRG. Sixteen of 42 subsurface soil sample concentrations were above the MTCA Method B direct contact value. The maximum concentration was detected in MW22-S (13 to 15 feet bgs), located in the southwest corner of the subarea. Concentrations as high as 63 mg/kg were detected (HSA06) down to 25 feet bgs. In addition, concentrations slightly above the PRG (0.062 mg/kg) were detected at 56 feet bgs (MW05-D). Twelve of 42 samples exceeded the MTCA Method B groundwater protection standard, and five exceeded the MTCA terrestrial ecological standard.

Noncarcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Naphthalene and 2-methylnaphthalene were detected above the EPA PRG of 55.9 mg/kg and the MTCA Method B groundwater protection standard of 23.5 mg/kg in two of eight subsurface soil samples collected. These analytes were found in HSA08 (3 to 4.5 feet bgs) and HSA09 (3 to 4.5 feet bgs). Naphthalene exceeded the MTCA Method B direct contact value (1,600 mg/kg) in one sample. Acenaphthene (1,400 mg/kg at HSA08) also exceeded the groundwater protection standard. The highest concentrations of total ncPAHs (11,800 and 1,390 mg/kg, respectively) were detected in HSA08 and HSA09.

Depth Interval - 6 to <12 feet. Naphthalene and 2-methylnaphthalene were detected above the PRG in three of 14 and one of 14 subsurface soil samples, respectively. Both analytes also exceeded the groundwater protection standard in the same three samples. Naphthalene concentrations ranged from 83 to 700 mg/kg. The highest concentration was detected in HSA09 (8 to 9.5 feet bgs). The only 2-methylnaphthalene detection (230 mg/kg) above the PRG was also found in HSA09.

Depth Interval - >12 feet. Naphthalene and 2-methylnaphthalene were detected above the PRG in 11 of 42 and 10 of 42 subsurface soil samples, respectively. The naphthalene concentrations ranged from 88 to 2,200 mg/kg. The 2-methylnaphthalene concentrations ranged from 70 to 820 mg/kg. The highest concentrations for both analytes were detected in GP57 (18 to 20 feet bgs) located near the border of the North Treatment Area. The highest concentration (7,850 mg/kg) of total ncPAHs was also located here. Naphthalene exceeded the MTCA Method B direct contact value in two samples. Twelve samples exceeded the MTCA Method B groundwater protection standard for both naphthalene and 2-methylnaphthalene. Two samples exceeded the acenaphthene standard (284 mg/kg), and one sample exceeded the fluorene standard (305 mg/kg) for groundwater protection.

Dioxin

Depth Interval - 0.5 to <6 feet. Both samples collected within this sampling interval contained 2,3,7,8-TCDD TEQ above the EPA PRG and the three MTCA values. Soil borings HSA06 (3 to 4.5 feet bgs) and HSA09 (3 to 4.5 feet bgs) had concentrations of 1,045 and 1,270 mg/kg, respectively. These borings are located between the stormwater collection tanks and the PCP tanks.

Depth Interval - 6 to <12 feet. No samples were analyzed for 2,3,7,8-TCDD TEQ in this depth interval.

Depth Interval - >12 feet. Three of four samples collected contained 2,3,7,8-TCDD TEQ concentrations that exceeded the EPA PRG and the three MTCA values. Soil boring GP63 (13 to 15 feet bgs), located near the border of the North Treatment Area, contained 3,610 mg/kg 2,3,7,8-TCDD TEQ.

Pentachlorophenol

Depth Interval - 0.5 to <6 feet. Two of six samples collected within this depth interval contained PCP above the EPA PRG (2.98 mg/kg), the MTCA Method B direct contact value (8 mg/kg), and the MTCA terrestrial ecological standard (11 mg/kg). Three samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg. PCP was detected in HSA06 and HSA09 at 3 to 4.5 feet bgs.

Depth Interval - 6 to <12 feet. PCP was detected above the EPA PRG in two of 12 subsurface soil samples and above the MTCA Method B direct contact and terrestrial ecological values in one location. Six samples exceeded the groundwater protection standard. The maximum concentration was detected in HSA09 (8 to 9 feet bgs).

Depth Interval - >12 feet. PCP was detected above the EPA PRG in six of 35 subsurface soil samples and above the MTCA value in five of 35 subsurface soil samples. Twelve of 35 samples exceeded the MTCA Method B groundwater protection standard, and five exceeded the MTCA terrestrial ecological standard. A maximum PCP concentration of 140 mg/kg was detected in soil boring GP63 (13 to 15 feet bgs) located north of the concrete PCP enclosure along the PCP fill line. This concentration may result from leaks in the fill line. High concentrations of PCP were detected elsewhere, including a detection of 55 mg/kg at 25 feet bgs (i.e., below the shallow clay layers) at location MW23-D, a deep aquifer monitoring well where PCP has been consistently detected.

Petroleum

Depth Interval - 0.5 to <6 feet. The only sample analyzed for EPHs contained 6,180 mg/kg EPH in HSA09 at 3 to 4.5 feet bgs. This exceeds the MTCA Method A value of 2,000 mg/kg.

Depth Interval - 6 to <12 feet. Neither sample analyzed for EPH had detections exceeding the MTCA screening value of 2000 mg/kg. GP56 and GP62 (10 to 12 feet bgs) contained 640 mg/kg and 1,140 mg/kg, respectively. TPH-D was detected (1,300 mg/kg) below the MTCA criteria in MW22-S.

Depth Interval - >12 feet. Two of three samples analyzed for EPH exceeded the MTCA criteria. Concentrations ranged from 500 to 26,600 mg/kg. The maximum concentration was found in GP57 (18 to 20 feet bgs). TPH-D was detected in four of six samples collected above the MTCA criteria. The maximum concentration (16,000 mg/kg) was detected in MW22-S at 13 to 15 feet bgs. A TPH-D concentration of 11,000 mg/kg was also detected at 25 feet bgs in monitoring well MW23-D.

Other SVOCs

Dibenzofuran and carbazole were each detected (300 and 59 mg/kg, respectively) once, above their EPA PRGs (291 and 24 mg/kg, respectively) in MW22-S at 13 to 15 feet. Dibenzofuran exceeded the MTCA Method B direct contact value of 50 mg/kg in one sample and the MTCA Method B groundwater protection standard of 30 mg/kg in two samples.

4.3.3.7 East Treatment Area

Subsurface soil samples have been collected from several locations throughout the East Treatment Area. Most samples were analyzed for PAHs and PCP only. The majority of the samples from this area were collected from the walls and base of the excavation during EPA's 1998 removal action (E & E 1999g).

While the removal was successful in eliminating source material and removing a large amount of contaminated soil, confirmation samples indicate that high concentrations of contaminants remain around and below the excavation area. Subsurface soil sample analytical results for the East Treatment Area are presented in Table 4-56. The statistical analysis of these data is presented in Table 4-57 for the 0.5- to <6-foot-bgs depth interval, Table 4-58 for the 6- to <12-foot-bgs depth interval, and Table 4-59 for the >12-foot-bgs depth interval. Color-coded distributions based on the relative concentration of selected analytes compared to the PRG for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. In nine of 17 subsurface soil samples, cPAHs were detected above the PRG (0.062 mg/kg) and the MTCA Method B direct contact screening criteria (0.137 mg/kg). Three samples exceeded the MTCA Method B groundwater protection standard (2.32 mg/kg), and one exceeded the MTCA terrestrial ecological standard of 30 mg/kg. The highest concentration was detected at 5 to 7 feet bgs in HA01, located in the southeast corner of the creosote enclosure. Three other samples (SP-06, SP-08, and SP-10), located on the edge of the soil excavation area, contained cPAHs between 10 and 11 mg/kg.

Depth Interval - 6 to <12 feet. Ten of 18 subsurface soil samples within this depth interval contained cPAHs above the EPA PRG and the MTCA Method B direct contact value. Six samples exceeded the groundwater protection standard, and one exceeded the terrestrial ecological standard. The maximum concentrations were detected in SPX-3-BP (45.4 mg/kg), located near the south border of the large removal area; SP-10 (19.2 mg/kg), located near the northern edge of the small western excavation adjacent to the evaporator; and GP09 (13.5 mg/kg), located north of the thermal tank.

Depth Interval - >12 feet. Sixteen of 37 subsurface soil samples within this depth interval contained cPAHs above the EPA PRG and the MTCA Method B direct contact value. Fourteen samples exceeded the groundwater protection standard, and four exceeded the terrestrial ecological standard. The maximum detection (76.2 mg/kg B[a]P equivalents) occurred in soil boring XC1-05 (20

feet bgs) located at the northern portion of the base of the large soil excavation. Ten other samples located at the base of the excavations contained cPAHs ranging from 3.21 to 58.6 mg/kg.

Noncarcinogenic PAHs

Depth Interval - 0.5 to< 6 feet. 2-Methylnaphthalene was detected above the PRG (55.9 mg/kg) in two of 17 samples collected in this depth interval. Both compounds exceeded the MTCA Method B groundwater protection standard (23.5 mg/kg) at three and one locations, respectively. OS45, located south of the large excavation area, and SP-06, located on the northern edge of the large excavation area, contained 64.5 and 70 mg/kg, respectively.

Depth Interval - 6 to <12 feet. Naphthalene and 2-methylnaphthalene were detected above the PRG in three of 18 subsurface soil samples. Both compounds exceeded the MTCA Method B groundwater protection standard at three and four locations, respectively. These analytes were each detected in soil samples SPX-3-BP (6 feet bgs), SP-01 (10 feet bgs), and GP09 (11 to 13 feet bgs).

Depth Interval - >12 feet. Naphthalene and 2-methylnaphthalene were detected above the PRG in three of 37 subsurface soil samples. Both compounds exceeded the MTCA Method B groundwater protection standard at seven locations. These analytes were detected in soil samples located at the base of the excavation (20 feet bgs) in the northern portion of the removal area (XC1-03, XC1-05, and XC1-07).

Dioxin

Subsurface soil samples were not analyzed for dioxins/furans.

Pentachlorophenol

Depth Interval - 0.5 to <6 feet. PCP was detected above the EPA PRG (2.98 mg/kg) in 12 of 17 subsurface soil samples and above the MTCA Method B direct contact and terrestrial ecological criteria (8.33 and 11 mg/kg, respectively) in 10 of 17 subsurface soil samples. Sixteen samples exceeded the MTCA Method B groundwater protection standard of 0.077 mg/kg. The highest concentrations were detected near the edge of the former excavations in samples SP-08 (480 mg/kg), SP-06 (340 mg/kg), and SP-10 (190 mg/kg).

Depth Interval - 6 to <12 feet. PCP was detected above the EPA PRG in 13 of 18 samples, above the MTCA Method B direct contact value in 10 of 18 samples, above the MTCA terrestrial ecological standard in 9 of 18 samples, and above the MTCA Method B groundwater protection standard

in 16 of 18 samples. The highest concentrations were detected near the edges of the former excavations in samples SPX-3-BP (300 mg/kg), SP-08 (250 mg/kg), SP-03 (160 mg/kg), and SP-02 (120 mg/kg).

Depth Interval - >12 feet. In this depth interval, PCP was detected above the PRG in 18 of 37 samples, above the MTCA Method B direct contact value in 15 of 37 samples, above the MTCA terrestrial ecological standard in 13 of 37 samples, and above the MTCA Method B groundwater protection standard in 27 of 37 samples. The maximum concentration was detected in XC1-05 (810 mg/kg) located at the base (northeast corner) of the large excavation. Six of the locations exceeding the PRG were located along the walls of the excavations, and 11 locations exceeding the PRG were located at the base of the excavations.

Petroleum

Subsurface soil samples were not analyzed for petroleum.

Other SVOCs

Carbazole was also detected (65 mg/kg) in one subsurface sample (SPX-3-B) above the PRG of 24.3 mg/kg.

4.3.3.8 Nature and Distribution of Contaminants in Subsurface Soil

The following subsections summarize subsurface contamination beneath the facility in the 0.5- to <6-, 6- to <12-, and >12-foot-bgs depth ranges.

4.3.3.8.1 Depth Interval - 0.5 to <6 feet bgs

Dioxin was detected in subareas throughout the facility, but at relatively lower concentrations as compared to the surface soil sample results (Figure 4-8). Although dioxin is associated with PCP contamination, dioxin concentrations did not correlate with PCP concentrations ($R^2 = 0.16$) within this depth interval. Fifty-four percent of the subsurface soil samples collected from this depth interval exceeded the PRG for dioxin (based on 2,3,7,8-TCDD TEQ). Forty-six percent of the samples exceeded the PRG by at least 100-fold. These samples were located in the North Treatment Area (GP61), West Treatment Area (HSA06 and HSA09), North Pole Yard (BJ-2 and B-B13), and the Wood Storage Area (B-U19). Subsurface soil samples from the East Treatment Area were not analyzed for dioxin or petroleum, but, based on facility process knowledge and data from similar operational areas (e.g., the

West and North Treatment areas), soil in this area can reasonably be expected to exceed PRGs for dioxin and petroleum.

Compared to facility-wide surface soil sample results, cPAHs were detected at relatively high concentrations (Figure 4-6); this is mainly due to the inclusion of subsurface samples from the East and West Treatment areas, the areas containing the highest cPAH contamination. The majority of detections greater than the PRG were located in these areas. Seventy-eight percent of the subsurface soil samples collected exceeded the PRG. Forty-six percent of the samples exceeded the PRG by 10-fold or greater. Over half of these samples were located in the East or West Treatment areas. Samples in the East Treatment Area were located mainly on the perimeter of the excavation areas. Two samples exceeded the PRG by 100-fold: HSA08, located in the West Treatment Area near the stormwater collection area, and B-M20, located south of the retort in the North Treatment Area.

The majority of PCP detections that exceeded the PRG were located on the perimeter of the excavations in the East Treatment Area (Figure 4-9). Fifty-nine percent of the subsurface samples collected within this interval exceeded the PRG. Over half of these samples were located in the East Treatment Area near the perimeter of the excavated areas. Eleven percent of the subsurface soil samples exceeded the PRG by 100-fold. Two of these concentrations were detected in samples collected outside of the facility operational area: MW31-S, located in the eastern portion of the North Treatment Area, and B-J2, located in the western portion of the North Pole Yard. The other two samples, SP-06 and SP-08, were located on the perimeter of the excavation area in the East Treatment subarea.

There were a limited number of samples that exceeded the MTCA screening criteria for petroleum (EPHs and VPHs). Eight percent of the subsurface soil samples collected for EPH analysis within this interval exceeded MTCA Method A values. These samples were located throughout the facility. EPHs were detected above the risk-based screening concentrations in the North Treatment Area (MW31-S and B-M20), the North Pole Yard (B-B13), and the West Treatment Area (HSA09). Eleven percent of the subsurface soil samples collected for VPH analysis exceeded the MTCA Method A value. These samples were located in the North Pole Yard (B-B13 and B-J2) and the North Treatment Area (MW31-S).

4.3.3.8.2 Depth Interval - 6 to <12 feet bgs

Dioxin was detected above the PRG in 33% of the subsurface soil samples collected from this interval (Figure 4-12). Similar to the 0.5- to 6-foot sampling interval, dioxin concentrations did not correlate strongly with PCP concentrations within this depth range ($R^2 = 0.53$). Two samples, B-D7

(northern portion of the North Pole Yard) and MW31-S (eastern portion of the North Treatment Area), had concentrations greater than 10 times the PRG. Three samples had concentrations 100 times the PRG: B-Q26, North Treatment Area; B-M20, North Treatment Area; and B-O7, South Pole Yard. Only B-M20 was located within the facility's main operational area. As previously noted, based on knowledge of facility processes and data from other areas, additional subsurface soil dioxin contamination is probably present within the East and West Treatment areas, but the majority of samples collected from these areas have not been analyzed for dioxin.

Thirty-three percent of the subsurface samples analyzed for cPAHs exceeded the PRG (Figure 4-10). The majority of these samples were detected within the facility operational areas of the North, West, and East Treatment areas. Twenty-five percent of the samples exceeded the PRG by 10-fold. Three percent of the samples exceeded the PRG by 100-fold. The highest concentrations were detected in B-O7, located in the south-central portion of the South Pole Yard, and in HSA07 and HSA09, located between the stormwater collection tank and the PCP tanks in the West Treatment Area. Relatively high concentrations of PAHs were also detected near the perimeter of the excavation (SPX-3-BP and SP-10) in the East Treatment Area. cPAH concentrations were correlated ($R^2 = 0.77$) with total EPH concentrations.

The majority of PCP detections that exceeded the PRG were located within the facility operational areas of the North, West, and East Treatment areas (Figure 4-13). Thirty-three percent of the subsurface soil samples collected within this interval exceeded the PRG. Thirteen percent of the samples exceeded the PRG by 10-fold. The majority of these samples were located near the perimeter of the excavations within the East Treatment Area. The highest concentrations were located in the southwest corner of the excavation (SPX-3-BP), near the perimeter of the excavation (SP-08, SP-03, SP-02, SP-10, SP-01, and SP-09), and at other locations within the facility operations area (GP09, GP06, and GP11). Two samples containing concentrations 10-fold higher than the PRG were also detected outside of the facility operations area: subsurface sample B-O7, located in the south-central portion of the South Pole Yard, and MW31-S, located in the eastern portion of the North Treatment Area.

A limited number of samples exceeded the MTCA Method A screening criteria for petroleum (EPHs or Washington total petroleum hydrocarbon as diesel [WTPH-D] and VPHs or Washington total petroleum hydrocarbon as gasoline [WTPH-G]). Eleven percent of the subsurface soil samples collected for EPH or WTPH-D analysis within this interval exceeded the MTCA Method A value: GP35, located in the East Treatment Area; MW31-S, located in the eastern portion of the North Treatment Area; and B-O7, located in the south-central portion of the South Pole Yard. Twenty-four percent of the subsurface

soil samples collected for VPH or TPH-G analysis exceeded the risk-based screening concentrations. Five of the detections were located within the facility operational area: B-Q20, located directly south of the East Treatment Area; MW36-S and B-M20, located near the retort in the North Treatment Area; and GP54 and MW15-S, located in the Treated Pole Area near the border of the North Treatment Area. Three samples were located outside of the facility operational area: B-B13, located in the northeast corner of the North Pole Yard; B-O7, located in the south central portion of the South Pole Yard; and MW31-S, located in the eastern portion of the North Treatment Area. EPH concentrations correlated with cPAH ($R^2 = 0.77$) and PCP concentrations ($R^2 = 0.76$).

4.3.3.8.3 Depth Interval - >12 feet bgs

Three of the subsurface soil samples that exceeded the dioxin PRGs were located in the West Treatment Area (GP63, HSA06, and GP57; Figure 4-16). One sample was located south of the retort near the railroad tracks (B-M20). In this depth interval, dioxin concentrations correlated strongly with PCP concentrations ($R^2 = 0.96$).

Throughout the facility operational areas, cPAHs were detected above the PRG (Figure 4-14). Fifty-two samples (29%) were detected above the PRG. Twenty-four samples (13%) were detected at greater than 100 times the PRG. The samples with the highest concentrations were detected throughout the West Treatment Area (MW22-S, GP57, and HSA06 [two intervals]) and in the excavation areas in the East Treatment Area (XC1-05). These five samples exceeded the PRG by 1000-fold. In this treatment interval, cPAHs correlated strongly with total EPH ($R^2 = 0.97$).

PCP was detected above the PRG in 36 samples (20%) throughout the facility operational area (Figure 4-17). The highest concentrations (greater than 10 times the PRG) were detected on the perimeter of the excavation area (SP-10, SP-02, and SP-03) or at the base of the excavation area (XC1-05, XC1-03, XC1-07, XC2-01, and XC2-02) in the East Treatment Area, throughout the West Treatment Area (GP63, MW23-D, GP32, and HSA06), and near the retort (GP05 and B-M20) in the North Treatment Area.

A limited number of samples exceeded the MTCA screening criteria for petroleum (EPHs or WTPH-D and VPHs or WTPH-G). Thirteen percent of the subsurface soil samples collected for EPH or WTPH-D analysis within this interval exceeded the risk-based screening concentration. These samples were detected throughout the West Treatment Area (MW22-S, MW23-D, MW14-S, HSA04, GP57, and HSA07), in the North Treatment Area near the retort (B-M20), and near the border of the West Treatment Area (MW21-S and GP60). One sample (2%), located in the North Treatment Area

near the retort (B-M20), exceeded the risk-based screening concentration for VPHs. Samples were not collected from the excavation areas in the East Treatment Area or analyzed for petroleum, but would reasonably be expected to show petroleum contamination based on the above evidence.

4.3.4 South Slope Subsurface Soil Sample Results

Subsurface soil sample analytical results for the South Slope are summarized in Table 4-60. The statistical analysis of these data is presented in Table 4-61 for the 0.5- to <6-foot-bgs depth interval, Table 4-62 for the 6- to <12-foot-bgs depth interval, and Table 4-63 for the >12-foot-bgs depth interval. Samples collected from the South Slope and path located adjacent to Little Squalicum Creek are combined. Color-coded distributions based on the relative concentrations of selected analytes compared to the PRGs for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval; Figure 4-10 for cPAHs (B[a]P equivalents), Figure 4-11 for ncPAHs, Figure 4-12 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-13 for PCP for the 6- to <12-foot-bgs depth interval; and Figure 4-14 for cPAHs (B[a]P equivalents), Figure 4-15 for ncPAHs, Figure 4-16 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-17 for PCP for the >12-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Within this sampling interval, cPAHs were not detected.

Depth Interval - 6 to <12 feet. Within this sampling interval, cPAHs were not detected.

Depth Interval - >12 feet. Within this interval, cPAHs were detected, but the concentrations did not exceed risk-based screening criteria.

Noncarcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Within this interval, ncPAHs were not detected.

Depth Interval - 6 to <12 feet. Within this interval, ncPAHs were not detected.

Depth Interval - >12 feet. Within this interval, ncPAHs were detected at relatively low concentrations (up to 0.0181 mg/kg); however, no single ncPAH was detected above risk-based screening criteria.

Dioxin

Depth Interval - 0.5 to <6 feet. Dioxin was not detected within this sampling interval.

Depth Interval - 6 to <12 feet. Dioxin was detected within this interval; however, concentrations did not exceed risk-based screening criteria.

Depth Interval - >12 feet. Dioxin was detected within this interval; however, concentrations did not exceed risk-based screening criteria.

Pentachlorophenol

PCP was not detected in subsurface soil samples.

Petroleum

Petroleum was not detected in subsurface soil samples.

Other Organics

Depth Interval - 0.5 to <6 feet. Other organics were not detected within this sampling interval.

Depth Interval - 6 to <12 feet. Other organics were not detected within this sampling interval.

Depth Interval - >12 feet. M & p-xylene was detected in one sample, at MWLCS02, below risk-based concentrations.

4.3.5 Little Squalicum Creek Subsurface Soil Sample Results

Subsurface soil sample analytical results for the trench samples from Little Squalicum Creek are presented in Table 4-64. The statistical analysis of these data is presented in Table 4-65 for the 0.5- to <6-foot-bgs depth interval, which was the only interval sampled. Color-coded distributions based on the relative concentrations of selected analytes compared to the PRGs for subsurface soil are illustrated in Figure 4-6 for cPAHs (B[a]P equivalents), Figure 4-7 for ncPAHs, Figure 4-8 for dioxin (2,3,7,8-TCDD TEQs), and Figure 4-9 for PCP for the 0.5- to <6-foot-bgs depth interval.

Carcinogenic PAHs

Depth Interval - 0.5 to <6 feet. Within this interval, cPAHs were detected, but the concentrations did not exceed risk-based screening criteria.

Noncarcinogenic PAHs

Depth Interval - 0.5 to< 6 feet. Within this interval, ncPAHs were detected at relatively low concentrations (up to 0.115 mg/kg); however, no single ncPAH was detected above risk-based screening criteria.

Dioxin

Depth Interval - 0.5 to 6 feet. Dioxin was detected within this interval; however, the concentration did not exceed risk-based screening criteria.

Pentachlorophenol

Depth Interval - 0.5 to 6 feet. PCP was detected within this interval; however, the concentrations did not exceed risk-based screening criteria.

Petroleum

Depth Interval - 0.5 to 6 feet. Petroleum was not detected.

Other Organics

Depth Interval - 0.5 to 6 feet. Dibenzofuran was detected, but the concentration did not exceed risk-based screening criteria.

4.3.6 CPT-LIF-ROST Results

Continuous subsurface CPT-LIF-ROST readings were obtained from 296 CPT-LIF-ROST sample points. Please refer to Section 2.3 for a discussion of the nature of CPT-LIF-ROST testing. The data includes waveforms that were used to identify the type of contamination and total fluorescence readings used to estimate the relative degree of contamination when compared to a proprietary standard used by the driller. Contamination was detected in 95 of the 296 locations. Only 41 of the 296 locations had a total fluorescence intensity reading above approximately 2% of the standard, as compared to the maximum reading of 67% reported at location K21. Only 18 of 296 locations had a reading of >2% at depths greater than 10 feet bgs.

A program was used to “filter” the fluorescence wave forms. The program reads the boring’s location file, the files containing the percent fluorescence, and the files containing the four wavelengths (nanometers) as a percentage of peak area readings.

In the program, a background fluorescence is determined for each boring (the lowest percent fluorescence for that boring). If the percent fluorescence is more than three times above the background, the fluorescence is filtered in a subroutine, based on the four wavelengths signature.

For The Oeser Company facility, four filters were used: creosote, diesel, gasoline, and a mixture of diesel and creosote.

Only two borings had contamination that passed the gasoline filter: P17 and L33. In the eastern area of the site, borings K21, L24, L25, L26, L27, M20, M22, M26, M29, N20, N28, N29, N32, N34, O17, O18, O22, O30, O31, O32, P16, P17, P25, P26, P28, Q17, Q23, Q24, Q25, Q27, Q28, Q29, R23, R24, R25, and R26 passed the creosote and/or mixture filters; boring Q20 passed the diesel and mixture filters. Boring ST2C passed the creosote filter, as did borings O07, O08, P07, and P08. In the northern area of the site, borings A14, A15, B11, B12, B13, B16, C14, and D14 passed the diesel and/or mixture filter; however, the waveforms of the "mixture" in this area are different than the "mixture" found in the eastern area of the site. The second peak (390) is much stronger here (and the fourth peak lower). It could be that this "mixture" is weathered diesel, more than a mixture of diesel and creosote.

The results of the CPT-LIF-ROST investigation are displayed in a series of figures. Figure 4-18 is a two-dimensional x-y plot showing the location of contamination, by type, at any depth below the facility surface. The figure is color-coded to display the type of contamination and the relative intensity reading. This figure shows a series of lines (A-A', B-B', C-C', D-D', E-E', and F-F') through which two-dimensional x-z plots show the location of contamination, by type, relative intensity, and depth below the facility surface. These cross-sections are found in Figures 4-19 through 4-24. Figure 4-25 is a three-dimensional oblique view of contamination of any type detected by the CPT-LIF-ROST in facility subsurface soil. A complete set of LIF-ROST results for all sampling locations is presented as Appendix K; CPT data, illustrating soil types, is presented as Appendix L.

CPT-LIF-ROST results have been compared against the measured concentrations of various analytes from 22 depths in 11 borings to determine if correlations could be established between the LIF data and the analytical results. LIF data were corrected for background, and the average value over the soil sample depth interval was compared against the conventional laboratory result. Total PAH, total EPH, total VPH, PCP, and dioxin (2,3,7,8-TCDD TEQ) analytical data were available for comparison with creosote, diesel, and mixture (creosote and diesel) LIF data. The following comparisons were statistically evaluated using linear regression:

- total PAH vs. creosote,
- total PAH vs. diesel,
- total PAH vs. mixture,
- PCP vs. creosote,
- PCP vs. diesel,
- PCP vs. mixture,
- EPHs vs. creosote,
- EPHs vs. diesel,
- dioxin TEQ vs. creosote,
- dioxin TEQ vs. diesel, and
- dioxin TEQ vs. mixture.

The most significant correlation was between total PAH analytical data and creosote LIF data (R^2= 0.94). All other R^2 values were below 0.18 (except for EPHs vs. creosote LIF (R^2= 0.48). The cPAH analytical data correlation with EPH analytical data ranged from R^2= 0.48 in surface soil to 0.77 in subsurface soil down to 12 feet bgs. Results indicate that the CPT-LIF-ROST data provide a reasonable indication of the presence or absence of wood-treating-related wastes in soil beneath the facility.

4.3.7 Soil Leaching Potential SPLP

Twenty-five soil samples were collected and extracted using SPLP during the RI in August 1999; four samples were also tested during the EPA removal action in 1998 (E & E 1999g). SPLP is a procedure that simulates the leaching effect due to precipitation and infiltration of rainwater through soil. A soil sample is agitated for a specified time with artificial rainwater. The mixture is filtered and the concentrations of contaminants that have dissolved into the aqueous phase are measured. The data can provide information regarding potential impacts to groundwater from contaminated soil. Aqueous extracts from SPLP testing were analyzed for SVOCs (Table 4-66). These data have been compared to residential tap water PRGs, MTCA B values for drinking water, and federal MCLs (Table 4-67).

In 1998, no analytes were detected in any of the four SPLP extracts at concentrations greater than residential tap water PRGs (E & E 1999g). PCP, 2-methylnaphthalene, and naphthalene were detected above residential tap water PRGs in different areas throughout the facility in 1999. The concentration of PCP exceeded the MTCA B value and MCL at four different locations in 1999.

Analyte concentrations in SPLP extracts from two locations in the North Pole Yard, B-J2 and B-B13, exceeded PRGs. B-B13 is located in the northernmost portion of the North Pole Yard and had PRG exceedences of 2-methylnaphthalene, naphthalene, and PCP in soil collected from 4 to 6 feet bgs. The other PRG exceedence in the North Pole Yard was at B-J2 which is located in the westernmost portion of the North Pole Yard. Only PCP exceeded its PRG at this location. The concentration of PCP at both locations not only exceeded the PRG, but also the MTCA B value and MCL.

The concentration of PCP in the SPLP extract exceeded the PRG at MW28-S in the South Pole Yard for the soil sample collected from 6 to 8 feet bgs. The level of PCP in groundwater in this well also exceeds the PRG, the MTCA Method B value, and the MCL, confirming that PCP is leaching from subsurface soils into groundwater.

Concentrations of 2-methylnaphthalene, naphthalene, and PCP in the SPLP extract from the soil sample collected at MW33-S, located at the southern edge of the Wood Storage Area (from 20 to 22 feet bgs) exceeded their respective PRGs; however, no contaminants were detected above PRGs in the SPLP surface soil sample collected at this well. None of these contaminants were detected above the residential tap water PRG in groundwater samples collected from MW-33-S.

The level of 2-methylnaphthalene in the SPLP extract from the soil sample collected in the North Treatment Area, just south of the retort at B-M20 (from 7 to 9 feet bgs), exceeded the residential tap water PRG.

SPLP extract analytical data were compared against the equivalent soil sample data in an attempt to identify, if possible, any relationship between soil concentrations and the potential for contaminants to leach from the soil into groundwater. PAHs were detected in 18 of 25 soil samples. PCP was detected in 13 of 25 soil samples; however, PAHs were detected in SPLP extracts in only five of these 25 samples. PCP was detected in SPLP extracts in only four of these 25 samples. PCP soil concentrations ranged up to 48 mg/kg in the nine samples which had PCP in the soil where none was found in the SPLP extract. Of the four soil samples with corresponding SPLP PCP detections, two samples had soil PCP levels less than 0.011 mg/kg. Similar results are seen for soil versus SPLP PAH comparisons.

Concentrations of analytes detected using SPLP were compared to concentrations in comparable soil samples. The ratios of detected concentrations between the soil and SPLP samples, for all analytes found in all of the SPLP extracts, varied from negative (i.e., the analyte was found in the SPLP extract, but was not detected in the corresponding soil sample) to 23,000. No relationship between soil contaminant concentrations and potential for leaching, based on SPLP results, could be identified.

4.4 GROUNDWATER SAMPLE RESULTS

This section presents analytical results from the extensive groundwater monitoring program conducted at The Oeser Company site during the RI and previous investigations summarized in Section 1.6. Shallow and deep groundwater samples were collected from the facility, the South Slope Area, the Little Squalicum Creek area, the Ershigs facility, the Tilbury Cement facility, and the upgradient deep background well. This section is organized into seven subsections:

- Section 4.4.1 provides criteria and guidelines used to interpret groundwater data;
- Section 4.4.2 provides an overview of the sampling results;
- Section 4.4.3 describes contamination found in the background well;
- Section 4.4.4 presents summaries of historical groundwater data collected at the facility in 1995, 1996, 1997, and 1998;
- Section 4.4.5 presents results for groundwater samples collected during the RI, including both shallow and deep, on- and off-facility wells;
- Section 4.4.6 discusses the nature and extent of shallow and deep groundwater contamination at the site; and
- Section 4.4.7 summarizes free product recovery from shallow on-facility wells.

RI groundwater investigations were accomplished through four quarters of sampling on- and off-facility monitoring wells and off-facility production wells. During the RI field investigation, 11 shallow and four deep wells were installed on site, supplementing the existing wells, in order to determine the nature and extent of contamination in both the discontinuous shallow groundwater zone and the deep groundwater aquifer. Water levels, water quality parameters, and contaminant analytical parameters were measured during four separate sampling events.

4.4.1 Interpretation of Results

Groundwater contaminant concentrations are compared to risk-based screening levels given in the EPA, Region 9, PRGs, MTCA Method B, and federal MCLs. PRGs are more conservative than either MTCA values or MCLs. PRG screening values for residential tap water represent an excess human health risk of one in one million (1 in 1,000,000) for carcinogens or an HQ of 1 for noncarcinogens. For several compounds without PRG screening values, EPA, Region 10, recommends use of surrogate values based on compounds with similar molecular structure and toxicological properties. The PRG for naphthalene was used for 1-methylnaphthalene and 2-methylnaphthalene. The PRG for acenaphthene

was used for acenaphthylene; pyrene for benzo(g,h,i,)perylene; and anthracene for phenanthrene. Risk-based screening levels are described in detail in Section 2.1.4. Risk-based screening levels do not represent cleanup levels for The Oeser Company site; they are presented as references against which detected concentrations can be compared and evaluated. Site-specific COCs reported in the FS will be derived from ARARs, risk-based screening levels, and the human health and ecological risk assessments conducted for the site during the RI.

All analytical data are presented with data validation qualifiers to reflect their reliability. Unless specifically discussed, data usability has not been impacted by qualification of results (Appendix C).

Consistent with EPA guidance, dioxin results are presented both as individual PCDD and PCDF congener/homolog concentrations; dioxin results are also presented as the sum of individual PCDD and PCDF congeners/homologs after conversion to equivalent concentrations of 2,3,7,8-TCDD, the most toxic dioxin isomer, using TEFs (Van den Berg et al. 1998).

Concentrations of cPAHs reported both as individual concentrations and as total B(a)P equivalents are presented. The purpose of providing B(a)P equivalent concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site. To assess risks associated with exposure to cPAHs, individual cPAH concentrations have been used to calculate their total B(a)P equivalents utilizing the relative (compared to B[a]P) potency factors of the individual cPAHs following the methodology described in the EPA guidance (1993). RPFs for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene are provided by NCEA (EPA 1993). Additional RPFs are available from the California EPA for benzo(j)fluoranthene, dibenzo(a,j)acridine, dibenzo(a,h)acridine, 7H-dibenzo(c,g)carbazole, dibenzo(a,e)pyrene, dibenzo(a,h)pyrene, dibenzo(a,i)pyrene, dibenzo(a,l)pyrene, 7,12-dimethylbenzo(a)anthracene, 1,6-dinitropyrene, 1,8-dinitropyrene, 3-methylcholanthrene, 5-methylchrysene, 5-nitroacenaphthene, 6-nitrochrysene, 2-nitrofluorene, 1-nitropyrene, and 4-nitropyrene (CalEPA 1996).

Concentrations of total ncPAHs are presented. ncPAHs include the following 14 compounds: acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, 2-chloronaphthalene, fluoranthene, fluorene, 9H-fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and retene. Again, the purpose of providing a sum of individual concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site.

Concentrations of diesel petroleum are presented as TPH-D or total EPH. Total EPH was determined by summing concentrations for all aromatic and aliphatic carbon chain ranges within the analytical method for each sample.

Concentrations of gasoline are presented as TPH-G or total VPH. Total VPH was determined by summing the concentrations for all aromatic and aliphatic carbon chain ranges within the analytical method for each sample.

Analytes reported as not detected (nondetects) were assigned a concentration of zero for 2,3,7,8-TCDD TEQ, total cPAHs (as BaP equivalents), ncPAHs, EPHs, and VPHs.

Data for the TICs are included in Appendix G. These compounds do not have risk-based screening concentrations; therefore, no comparisons can be made.

Tables 4-68 through 4-99 and Figures 4-26 through 4-58 present the results. Tables presented for each area noted above contain: the range of detected concentrations, the location of maximum detected concentration, the detection frequency, the range of DLs, the frequency exceeding the PRG, the PRG, the frequency exceeding MTCA, the MTCA value, the frequency exceeding the MCL, and the MCL for each analyte detected.

Distributions of selected descriptive contaminants in groundwater are illustrated in several figures. Color-coded sample points that correspond to a selected range of analyte concentrations are presented for total cPAHs as B(a)P equivalents, total ncPAHs, PCP, and dioxin as 2,3,7,8-TCDD TEQs.

4.4.2 Overview of Groundwater Sample Results

Shallow (10 to 15 feet bgs) groundwater is found in isolated zones beneath the facility. Deep (30 to 45 feet bgs) groundwater occurs as a continuous aquifer. Although contamination is present in the deep aquifer, it occurs more consistently and at higher concentrations in shallow groundwater. The extent and concentrations of contaminants appear to have decreased in the deep aquifer since 1995. No contaminants were detected above screening levels in the deep groundwater samples collected from the southeast portion of the South Slope. The source of shallow groundwater contamination, the on-facility dry well, has been excavated; however, it appears that groundwater continues to be contaminated through the downward migration of waste wood-treating product through the vadose zone in the treatment areas on facility. The source of shallow groundwater contamination along the creek may be contaminating soils and sediments along and within the creek bed.

4.4.3 Background Groundwater Samples

The background monitoring well (MW06D) has been sampled on 12 different occasions since 1995. Data is summarized in Table 4-68. No VOCs have been detected since February 1997. Prior to that time, several chlorinated ethanes and ethenes were detected. Aromatic VOCs were detected only during 1995 and have not been identified in later events.

During the RI, several ncPAHs were detected and, with the exception of naphthalene, were found at concentrations four to six orders of magnitude below their individual PRGs. Naphthalene and PCP were detected at concentrations less than one-tenth of their respective PRGs. Dioxin (OCDD only) was detected at less than one-hundredth of its PRG. Petroleum hydrocarbons (EPHs) were detected in this well only one time during RI sampling. The only contaminants detected more than one time during the RI were ncPAHs and OCDD.

4.4.4 Historical Groundwater Sample Results

Site-related groundwater sampling began in 1987; however, routine groundwater sample collection did not begin until 1995. This section summarizes groundwater results beginning in 1995. Table 4-69 summarizes the dates, analyses, and wells sampled since September 1995. Until June 1999, groundwater samples were routinely analyzed for only VOCs, SVOCs, and metals; samples from the wells were tested only once for petroleum hydrocarbons. Although analytical and sampling methods varied between events, the data have been reviewed and their usability verified (Appendix C). RI sampling was conducted on a quarterly basis; however, some shallow wells were dry or produced insufficient water to sample, and others contained LNAPL (petroleum product) floating on the groundwater, and, therefore, were not sampled.

4.4.4.1 1995 Groundwater Results

In 1995, only five deep wells existed and were sampled. A statistical analysis of these data is presented in Table 4-70 and a summary of results above PSLs is presented in Table 4-71. B(a)P was the only cPAH detected, and the concentration was above the PRG and the MTCA Method B value in MW05-D. The highest ncPAH concentration was found in MW05-D. 1,2-Dichloroethane was detected in four wells at different times above the PRG and in two wells above the MTCA Method B value. 1,1-Dichloroethene also was detected above the PRG and the MTCA Method B value in two wells during the December 1995 sampling event. 1,1-Dichloroethene and 1,2-Dichloroethane were detected above PRGs in the background well, MW06-D; therefore, the presence of these two compounds in the deep wells may be attributable to a source other than The Oeser Company.

4.4.4.2 1996 Groundwater Results

In 1996, additional wells were installed on site, including several shallow wells. A statistical analysis of these data is presented in Table 4-72 for deep wells and Table 4-73 for shallow wells. A summary of results above PSLs is presented in Table 4-74. Concentrations of PCP exceeded its PRG, MTCA Method B value, and MCL in deep wells MW01-D and MW05-D. Total cPAH concentrations, as B(a)P equivalents, exceeded the PRG in well MW05-D. B(a)P was the only cPAH detected in the deep wells. The highest concentration of ncPAHs was detected in MW01-D. 1,1-Dichloroethene was found above the PRG and the MTCA Method B value in MW02-D in the October 1996 sampling event, but did not exceed the MCL value. 1,2-Dichloroethane was found above the PRG and the MTCA Method B value in four deep wells at different times in 1996, but concentrations never exceeded its MCL.

PCP concentrations exceeded its PRG, MTCA Method B, and MCL values in all shallow wells. The concentration of B(a)P exceeded its PRG, MTCA Method B value, and MCL in MW07-S in two sampling events. cPAHs exceeded the PRG in well MW07-S. cPAHs, other than B(a)P, also were detected above their respective PRG or MTCA Method B values in well MW07-S, which had the highest concentrations of ncPAHs. These compounds and ncPAHs, including carbazole, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and N-nitrosophenylamine, were found in MW07-S above PRGs and/or MTCA Method B values. 1,2-Dichloroethane was found above the PRG and MTCA Method B value in all of the shallow wells at different times in 1996, but concentrations never exceeded its MCL. 1,2,4-Trimethylbenzene was detected above its PRG in MW07-S during all sampling events in 1996; there are no MTCA or MCL values for this compound.

4.4.4.3 1997 Groundwater Results

In 1997, additional shallow and deep wells were installed on site and sampled. A statistical analysis of these data is presented in Table 4-75 for deep wells and Table 4-76 for shallow wells. A summary of results above PSLs is presented in Table 4-77 for deep wells and Table 4-78 for shallow wells. In general, the highest contaminant concentrations were detected in shallow wells.

PCP was detected above its PRG, MTCA Method B value, and MCL in five deep wells during 1997. B(a)P was detected at concentrations greater than the PRG and MTCA Method B value in two deep wells. Total B(a)P equivalent levels in seven deep wells exceeded the PRG during at least one sampling event in 1997. cPAHs, other than B(a)P, were detected above their respective PRGs and MTCA Method B values in two deep wells. The highest ncPAH concentration in deep wells was found

in MW17-D. TPH-D was detected (up to 6,000 µg/L) in well MW17-D, above the MTCA Method A cleanup level of 500 µg/L for TPH. 1,2-Dichloroethane was found above the PRG and the MTCA Method B value in three deep wells in the February 1997 sampling event, but not above the MCL.

In 1997, PCP was detected above its PRG, MTCA Method B value, and MCL in 10 shallow wells and the Geoprobe® (temporary well) locations. B(a)P was detected at concentrations greater than the PRG, MTCA Method B value, and MCL in five shallow wells and all three Geoprobe® locations. Total cPAH concentrations in six shallow wells and the three Geoprobe® locations exceeded the PRG during at least one sampling event in 1997. cPAHs and other SVOCs were detected above their respective PRGs and MTCA Method B values in seven shallow wells and the Geoprobe® locations. Individual ncPAH compound concentrations exceeded PRGs and MTCA Method B values in several shallow wells. The highest total ncPAH level was found in well MW14-S. Benzene, ethylbenzene, and xylenes were found above either their respective PRGs, MTCA Method B values, or MCLs in MW15-S. This is the same well where TPH-G was detected at a concentration of 45 µg/L. TPH-D was detected in wells MW15-S, MW19-S, MW22-S, and MW26-S, with the highest concentration at MW22-S. TPH-D concentrations in all four wells exceeded the MTCA Method A cleanup level of 1000 µg/L for TPH. 1,2-Dichloroethane was found above the PRG and the MTCA Method B value in four of seven wells during the February 1997 sampling event, but not above the MCL. 1,3,5-Trimethylbenzene was detected above the PRG in MW07-S during one sampling event.

Three temporary wells were installed on the facility using a Geoprobe® (GP05, northeast of the retort; GP23, east of the boiler; and GP22, near the northwest corner of the excavation area), and groundwater was sampled in February 1997. Groundwater samples were analyzed for SVOCs. Since these were not completed as standard monitoring wells, they were not sampled again. The highest level of contamination was found in GP05. cPAHs, carbazole, naphthalene, PCP, dibenzofuran, and 2-methylnapthalene were detected above either PRGs and/or MTCA Method B levels. cPAH concentrations exceeded the PRG at all of the Geoprobe® temporary well locations. In addition, B(a)P and PCP were detected at all three locations above their respective MCLs.

Tilbury Cement Wells

Tilbury Cement deep production wells TC-5 and TC-6 were sampled in April 1997 (Table 4-75). B(a)P concentrations in both wells exceeded the PRG, and the concentration was above the MTCA Method B level in TC-5. Both wells contained cPAH above the PRG (Table 4-77). No detected contaminant concentrations exceeded MCLs.

4.4.4.4 1998 Groundwater Results

No new wells were installed during 1998. Groundwater samples were analyzed only for SVOCs. A statistical analysis of these data is presented in Table 4-79 for deep wells and Table 4-80 for shallow wells. A summary of results above PSLs is presented in Table 4-81 for deep wells and Table 4-82 for shallow wells. Concentrations of B(a)P and PCP exceeded their respective PRGs, MTCA Method B values, and MCLs in both shallow and deep wells.

In deep wells, PCP concentrations exceeded the MCL in four wells, while the B(a)P concentrations exceed the MCL in two of these four wells. cPAH concentrations exceeded the B(a)P PRG in four deep wells, including the background well, MW06-D. Individual cPAHs exceeded either their respective PRG or MTCA Method B values in three wells. The ncPAHs, naphthalene and 2-methylnaphthalene, were found above their PRGs in MW23-D; however, the highest concentration of ncPAHs was found in MW17-D.

PCP concentrations exceeded the MCL in eight shallow wells in 1998. B(a)P concentrations exceeded the MCL in seven of these eight wells. Total cPAH levels exceeded the PRG in the same seven wells where the concentration of B(a)P exceeded its MCL. Other SVOCs typically associated with creosote, such as anthracene, acenaphthene, dibenzofuran, flourene, flouranthene, napthalene, phenanthrene, and pyrene, were found in shallow wells MW07-S, MW13-S, MW14-S, MW22-S, and MW26S. The highest concentrations were detected in wells MW26-S and MW13-S, which had the highest values for ncPAHs. Both of these wells and well MW07-S contained petroleum product (LNAPL) in 1999 and 2000.

4.4.5 RI Investigation - 1999 and 2000 Groundwater Results

The RI investigation began in the summer of 1999. Piezometers installed to help guide monitoring well placement are shown in Figure 4-26. Shortly after the first of four sampling events, 11 additional wells were installed on site. All existing monitoring wells, not just the new wells, were sampled in the fall and winter of 1999 and the spring of 2000. Groundwater samples collected were analyzed not only for VOCs, SVOCs, and metals, but also for dioxin, petroleum hydrocarbons, and water quality parameters. Again, the results of metals analyses are not specifically addressed in this report because metals were not found at concentrations above background levels and because they are not site-related contaminants. Analytical results for deep and shallow groundwater are summarized by event in Table 4-83 (June 1999, deep groundwater), Table 4-84 (June 1999, shallow groundwater), Table 4-85 (September 1999, deep groundwater), Table 4-86 (September 1999, shallow groundwater), Table 4-87 (December 1999, deep

groundwater), Table 4-88 (December 1999, shallow groundwater), Table 4-89 (February/March 2000, deep groundwater), and Table 4-90 (February/March 2000, shallow groundwater). A statistical analysis of these data is presented in Table 4-91 for deep wells and 4-92 for shallow wells. A summary of results above PSLs is presented in Table 4-93 for deep wells and Table 4-94 for shallow wells. Distributions of selected descriptive contaminants detected in groundwater above EPA, Region 9, PRGs are illustrated in figures as noted below:

- June 1999 Groundwater Sampling Event (Deep Wells): Figure 4-27 cPAHs (as B[a]P equivalents), Figure 4-28 ncPAHs, Figure 4-29 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-30 PCP;
- June 1999 Groundwater Sampling Event (Shallow Wells): Figure 4-31 cPAHs (as B[a]P equivalents), Figure 4-32 ncPAHs, Figure 4-33 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-34 PCP;
- September 1999 Groundwater Sampling Event (Deep Wells): Figure 4-35 cPAHs (as B[a]P equivalents), Figure 4-36 ncPAHs, Figure 4-37 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-38 PCP;
- September 1999 Groundwater Sampling Event (Shallow Wells): Figure 4-39 cPAHs (as B[a]P equivalents), Figure 4-40 ncPAHs, Figure 4-41 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-42 PCP;
- December 1999 Groundwater Sampling Event (Deep Wells): Figure 4-43 cPAHs (as B[a]P equivalents), Figure 4-44 ncPAHs, Figure 4-45 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-46 PCP;
- December 1999 Groundwater Sampling Event (Shallow Wells): Figure 4-47 cPAHs (as B[a]P equivalents), Figure 4-48 ncPAHs, Figure 4-49 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-50 PCP;
- February/March 2000 Groundwater Sampling Event (Deep Wells): Figure 4-51 cPAHs (as B[a]P equivalents), Figure 4-52 ncPAHs, Figure 4-53 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-54 PCP; and
- February/March 2000 Groundwater Sampling Event (Shallow Wells): Figure 4-55 cPAHs (as B[a]P equivalents), Figure 4-56 ncPAHs, Figure 4-57 dioxin (as 2,3,7,8-TCDD TEQ), and Figure 4-58 PCP.

Shallow monitoring wells MW26-S, MW13-S, and MW07-S contained petroleum product (LNAPL) during the 1999 and 2000 RI groundwater sampling effort. Wells MW07-S, MW13-S, and MW26-S all contained petroleum product floating on water within the wells. Collection of a truly representative groundwater sample from a well containing petroleum is questionable. More likely, a sample of this type would measure water within the well casing which would essentially depict saturated

(i.e., contaminants present at the solubility limits) conditions within the casing. These wells were sampled prior to the RI, and these data are available for evaluating the nature and distribution of contaminants and for evaluating risk. Although these wells were not sampled during the RI, it is reasonable to assume that elevated levels of site-related contaminants would be present in shallow groundwater directly in contact with this wood-treating waste product.

4.4.5.1 Piezometers

Twenty-five temporary piezometers were installed using a Geoprobe® and were sampled during the initial phase of RI groundwater well installation (Figure 4-26). As previously noted, the sole purpose of these temporary wells was to provide guidance for locating permanent monitoring wells in the discontinuous shallow groundwater zone. Only 10 of the 25 piezometers produced sufficient water for sample collection (Figure 4-26). Groundwater samples collected from these temporary piezometers were analyzed using limited QA/QC for SVOCs, WTPH-G, and WTPH-D, except for two piezometers, P-14 and T-22, which contained only enough water for SVOC analyses. Analytical data from these piezometers are presented in Table 4-95, but are not discussed because of the limited QA/QC procedures used in these fast-turnaround analyses; these data were not utilized in the risk assessment.

4.4.5.2 On-Facility Wells

Analytical results for groundwater samples collected from monitoring wells installed within and immediately south of the facility (MW03-D) and from the background well (MW06-D) are discussed below.

VOCs

Deep. No VOCs were detected above PRGs in the deep wells.

Shallow. Well MW15-S consistently contained the highest levels of VOCs. The following VOCs were detected in MW15-S above their EPA PRGs and MTCA Method B values in one or more sampling events: sec-butylbenzene (maximum value 97.3 µg/L [PRG 60.8]), m & p-xylene (maximum value 3,900 µg/L [PRG 1,431]), o-xylene (maximum value 1,960 µg/L [PRG 1,431]), naphthalene (maximum value 13,500 µg/L [PRG 6.2]), n-propylbenzene (maximum value 283 µg/L [PRG 60.8]), n-butylbenzene (maximum value 94.2 µg/L [PRG 60.8]), benzene (maximum value 49.6 µg/L [PRG 0.35]), 1,2-dichloroethane (maximum value 1 µg/L [PRG 0.12]), 1,3,5-trimethylbenzene (maximum value 648 µg/L [PRG 12.3]), and 1,2,4-trimethylbenzene (maximum value 3,120 µg/L [PRG 12.3]). The

concentration of benzene exceeded the MCL of 5 µg/L in all four sampling events. Benzene, naphthalene, and 1,2,4-trimethylbenzene also were detected in MW22-S above their respective PRGs; however, the concentration of benzene did not exceed the MCL. MW14-S contained naphthalene and 1,3,5-trimethylbenzene above their respective PRGs and tetrachloroethene above its MTCA Method B value. Naphthalene was detected in MW31-S above the PRG.

SVOCs

Deep. PCP was the only SVOC detected above a PRG in the 15 deep wells. PCP (maximum value 16 µg/L) exceeded the PRG (0.56 µg/L), MTCA Method B value (0.73 µg/L), and MCL (1 µg/L) in two deep wells (MW05-D and MW25-D). The highest concentration of ncPAHs (maximum value 8.74 µg/L) was detected in MW05-D. No individual ncPAHs exceeded its EPA PRG, MTCA Method B value, or MCL.

Shallow. PCP (maximum value 16 µg/L) was detected above its PRG, MTCA Method B value, and MCL in nine of 19 wells. The highest concentrations of PCP (approximately 3,700 µg/L) were consistently found in wells MW15-S and MW28-S. B(a)P (maximum value 0.64 µg/L) was detected above the PRG (0.0092) and MTCA Method B value (0.012) in two shallow wells and above the MCL (0.2 µg/L) in one of these wells. The only other cPAH detected above its PRG value was benzo(a)anthracene (maximum value 0.83 µg/L), which was detected in three shallow wells above its MTCA Method B value. Other SVOCs typically associated with creosote, such as acenaphthene, carbazole, dibenzofuran, and napthalenes, were found in shallow wells MW15-S and MW22-D during one or more sampling events above their respective PRG values. The highest level of ncPAHs (maximum value 8,347 µg/L) was found in MW15-S.

Petroleum Hydrocarbons

Deep. Petroleum (approximately 200 µg/L) was found in MW06-D, the deep background well, which suggests that there may be other sources of petroleum contamination in the deep aquifer. The EPH concentration measured in deep wells MW24-D and MW02-D had similar concentrations to those found in the background well. EPH and VPH concentrations did not exceed MTCA Method A values (500 and 800 µg/L, respectively) in any deep wells.

Shallow. EPHs were detected in shallow wells throughout the site; the highest concentrations were found in MW15-S (maximum value 22,812 µg/L) and MW22-S. Petroleum was detected in these wells in all four RI sampling events. EPH concentrations in wells MW14-S and MW28-S, and the two wells mentioned above, exceeded the MTCA Method A value of 500 µg/L.

Benzene (maximum value 49.6 µg/L [PRG 0.35 µg/L]), ethylbenzene (maximum value 1,170 µg/L [MTCA 80 µg/L]), and xylenes (maximum value 3,900 µg/L [PRG 1,431 µg/L]) were found above their respective EPA PRGs and MTCA Method B values in MW15-S in the four RI sampling events. Ethylbenzene and benzene concentrations exceeded their respective MCLs of 700 and 5 µg/L.

Dioxins

Deep. Dioxin (0.703 µg/L) was detected above the 2,3,7,8-TCDD TEQ PRG (0.45 µg/L) and MTCA Method B value (0.6 µg/L) only in MW01-D.

Shallow. Dioxin (maximum value 19 µg/L at MW14-S) was detected in shallow groundwater samples from most wells on site; however, dioxin concentrations were above the TEQ PRG and MTCA Method B value at six on-site wells. The MCL (30 µg/L) was not exceeded in any wells.

Water Quality Parameters

During the RI field investigation, water quality parameters were measured to support the FS. Results are summarized in Table 4-96.

4.4.5.3 Off-Facility Wells

Off-facility wells sampled during the RI included six monitoring wells at the Ershigs facility located adjacent to, and southwest of, The Oeser Company facility (Ershigs shallow wells 1s, 2s, 3s, and 4s and deep wells 1d and 4d); four deep wells in the South Slope area (LSCMW-1 through LSCMW-4), all screened within the deep aquifer; two deep aquifer production wells located at the Tilbury Cement Company; and two shallow temporary well points installed immediately adjacent to Little Squalicum Creek. Shallow groundwater is discontinuous (i.e., it occurs in isolated pockets) at the site. Therefore, a discussion of horizontal gradients is not applicable. Deep groundwater flows south-southwest from the facility (Figures 3-26 through 3-29). Therefore, wells MWLSC01, MWLSC02, MWLSC03, MWLSC04, Ershigs 4A (aka 4d), and temporary well points WP1 and WP2 are all downgradient of The Oeser Company facility. Tilbury wells, TC5 and TC6, and Ershigs 1d are cross-gradient to the groundwater flow direction from the facility.

Ershigs

Shallow Ershigs wells were sampled at the same time as the on-facility wells. Ershigs-2s was consistently dry during this time period, while Ershigs-4s was dry in September 1999. 1,4-Dichlorobenzene and 1,1-dichloroethene were found above their respective PRGs in Ershigs-4s in three different sampling events. No cPAHs, ncPAHs, petroleum, other organics, or dioxins were detected above trace levels, and all concentrations were below PRG, MTCA, and MCL values. The only dioxin congener detected was OCDD and only at concentrations similar to measured laboratory blank levels.

The highest level of ncPAHs found in deep wells were found in Ershigs-1d. Although dioxin was detected in the Ershigs wells, the 2,3,7,8-TCDD TEQ in each well never exceeded the PRG. The only dioxin congener detected was OCDD and only at concentrations similar to measured laboratory blank levels.

South Slope

Four deep wells, MWLSC-1 through MWLSC-4, were installed on the South Slope during the RI field investigation and were sampled from July 1999 to March 2000, except MWLSC-4 which produced insufficient groundwater to allow for sample collection during construction and all subsequent sampling events. The reason for the absence of groundwater is unclear based on the lithology and presence of groundwater water in MWLSC-3, approximately 1 meter from the dry well. Although a statistical evaluation was not performed due to the limited number of analyses, based on a review of the data (except for the February/March 2000 sampling event for MWLSC-2), analytes detected and concentrations found in South Slope wells do not appear to be different from background well contaminant concentrations. No contaminants were detected above EPA PRG, MTCA Method B, or MCL values.

Well Points Along Little Squalicum Creek

Temporary, shallow well points, WP-1 and WP-2, were installed by hand and were sampled in August 1999. Analytical data are presented in Table 4-97. B(a)P (maximum value 150 µg/L) exceeded its PRG (0.0092 µg/L), MTCA B value (0.012 µg/L), and MCL (0.2 µg/L) in both well points. Concentrations of cPAHs and certain ncPAH compounds in both well points exceeded their PRG and MTCA B values. WP-1 contained the higher level of ncPAHs. Diesel and motor oil concentrations (53,000 µg/L and 9,200 µg/L, respectively) were above the MTCA Method A standard of 500 µg/L.

Tilbury Cement Wells

Deep production wells TC-5 and TC-6 were sampled once during the RI. Although statistical evaluation was not performed due to the limited number of analyses, based on a review of the data, analytes detected and concentrations found in Tilbury Cement wells do not appear to be different from those observed in the background well. No contaminants were detected above EPA PRGs, MTCA Method B values, or MCLs.

4.4.6 Nature and Extent of Contamination

Although contamination is present in the deep aquifer which begins between 30 to 45 feet bgs, contamination occurs more consistently and at higher concentrations in shallow groundwater. The discussion of the nature and extent of contamination focuses on contaminants detected above PRG values in more than one well and on PCP and cPAHs, as B(a)P equivalents. These compounds were selected because of their prevalence throughout the site in both soil and groundwater. In this discussion, contamination refers to occurrences of a compound above its PRG.

4.4.6.1 Deep Aquifer

As discussed in Section 3, the deep aquifer is a continuous aquifer composed of coarse material. The lower extent of this aquifer is not known. Deep wells are completed in a "gravelly" zone. The deep aquifer is more transmissive than the shallow aquifer and has higher rates of horizontal flow as noted in Section 3.1.2. Groundwater flow in the deep aquifer is to the southwest with a gradient of 0.009. There appears to be a groundwater mound near MW35-D. Groundwater levels are consistently 2 feet higher at this well than at nearby adjacent wells.

From 1995 to 1997, 1,1-dichloroethene and 1,2-dichloroethane were detected in MW06-D, a background well located northeast of The Oeser Company, suggesting that these contaminants may have originated from a source other than The Oeser Company. Supporting a source other than the facility, concentrations of each contaminant are similar on and off facility; however, both compounds were detected in shallow groundwater wells. Therefore, there may be or may have been an on-site source as well. The distribution of this contamination varies each year. In 1995, both VOCs were detected in MW01-D, which is in the Wood Storage Area, but not at other on-facility wells. In 1996, 1,2-dichloroethane was detected in all of the deep wells, except MW01-D. In 1997, no 1,1-dichloroethene was detected, and 1,2-dichloroethane was found at wells MW03-D and MW05-D. Therefore, 1,2-dichloroethane contamination extended at times from the background well to the furthest

downgradient well (MW03-D), but after 1997, it was not detected above its PRG. At no time did this contamination exceed MCL levels. The temporal and spatial variability in chlorinated ethane and ethene concentrations makes it unlikely that The Oeser Company represents a significant source of these contaminants, especially since there is no evidence (or reason for) their use in the wood-treating processes employed in the past and currently employed at the facility.

In 1995 and 1996, MW05-D was the only deep well that contained concentrations of cPAHs above the PRG and MTCA B value. MW05-D is located adjacent to the southwest corner of the PCP enclosure. Additional deep wells were installed in 1997. During 1997, cPAH contamination was found in deep wells in the West Treatment Area, East Treatment Area, and Wood Storage Area. Contamination did not extend to the edge of the facility (MW02-D). The highest concentration was found at MW17-D during the April 1997 sampling event. cPAH contamination occurred at different times of the year. While cPAH contamination occurred in MW05-D in September, all other PRG exceedences occurred in April. cPAH contamination also was detected at Tillbury Cement wells in 1997. This suggests that there is not a continuous plume under the site in the deep aquifer. In 1998, the cPAH PRG was exceeded in wells MW05-D and MW06-D in January, MW05-D and MW23-D in April, and MW24-D in July. Aside from the exceedence in MW06-D, which is suspected to be an anomaly, cPAH contamination appears to be isolated along the northwest/southeast corridor between the West Treatment Area and the Wood Storage Area. The extent of contamination found in 1998 was reduced as compared to 1997 because it does not occur as far to the northeast (MW25-D) or to the southeast (MW17-D) as previously detected. cPAH contamination was not detected above the PRG in the deep aquifer in the sampling events that occurred from 1999 through 2000; therefore, contaminant concentrations in the deep aquifer have decreased to a level below human-health-based risk values.

In 1995, PCP was not detected above risk-based values in deep wells. In 1996, PCP was detected above its PRG in MW05-D during each sampling event, with the highest concentration occurring in July 1996. Only in April was there an exceedence in MW02-D. In October, there was an exceedence in MW01-D. This distribution of PCP exceedences does not suggest that a plume existed in the deep aquifer under the site. Instead, there appears to be a consistent source associated with MW05-D. It is unlikely that this source is the same as the one contributing to the contamination found at the other wells because the groundwater gradient is to the southwest, and these wells are crossgradient to MW05-D. The levels of PCP in MW01-D and MW05-D exceeded the MCL.

In 1997, additional deep wells were installed between the existing deep wells. PCP was not detected above the PRG at the southwestern-most well, MW02-D, in 1997; however, it was found

throughout the treatment areas to the Wood Storage Area. The distribution of PCP contamination varied within these areas between sampling events. Exceedences of the PCP PRG occurred in wells MW17-D, MW18-D, MW23-D, MW24-D, and MW25-D in April 1997, suggesting a potential continuous plume, but PCP was not detected over the PRG in MW05-D at this time. However, in September 1997, exceedences of the PCP MCL occurred only in wells MW01-D and MW05-D, suggesting that the distribution of PCP was diminishing to a thin corridor. The level of PCP exceeded the MCL in all of the wells in 1997, except MW01-D. The highest concentration of PCP occurred in MW23-D.

In January 1998, exceedences of the PCP PRG occurred in MW05-D and MW25-D, while in April 1998, exceedences occurred in these wells and in MW23-D. These distributions suggest shifting sources of PCP, but no clear pattern of contamination in the deep aquifer. In July 1998, the exceedences were isolated to MW17-D and MW24-D, and the concentrations were higher than at any other time in 1998. During the RI sampling events, exceedences of the PCP MCL only occurred in MW05-D and MW25-D. Exceedences occurred during every sampling event in MW05-D and all but the September 1999 event for MW25-D, suggesting that the sources for PCP contamination found previously in other wells has been removed or that less PCP is leaching into the deep aquifer due to the capping that occurred in 1998. This contamination is therefore limited to a thin corridor south of the PCP enclosure and thermal tank. In summary, the northeastern extent of contamination in the deep aquifer is not definitively known; however, it is not suspected to extend northeast of the PCP enclosure. Previously, PCP contamination in the deep aquifer extended to at least MW02-D; however, currently it appears that the southwestern extent is at the northern edge of the Wood Storage Area.

Total cPAH, as B(a)P equivalents, and PCP contamination in the deep aquifer follow the same general pattern, with a cPAH PRG exceedence occurring 69% of the time when there was an exceedence of PCP. On the other hand, for every exceedence of the PCP PRG, cPAH PRG exceedences occur at a rate of 38%. In general, the extent of PCP in the deep aquifer is larger than the extent of cPAH contamination. Temporal variations in the distribution and extent of PCP and cPAH contamination have been noted; currently, the distribution appears to have stabilized within an isolated area inside facility boundaries.

Petroleum hydrocarbons only were analyzed for in 1997 and 1999 through 2000. Petroleum hydrocarbons are present in the deep aquifer wells, but not at levels exceeding MTCA Method A levels.

Dioxin was only analyzed for from 1999 through 2000. Dioxin is present in the deep aquifer wells, but concentrations of the 2,3,7,8-TCDD TEQ only exceeded the PRG in a single well and during a single sampling event (MW01-D in December 1999).

Table 4-98 presents a summary of PSL exceedences for the deep wells by year.

4.4.6.2 Shallow Groundwater

Shallow groundwater occurs at depths ranging from 4 to 15 feet bgs. Shallow groundwater is perched on silt/clay lenses. As a result, the occurrence of shallow groundwater is discontinuous. Horizontal flow of shallow groundwater is likely to occur over short distances, but in general, shallow groundwater is likely to flow downward to the deep aquifer.

In 1996 and 1997, 1,2-dichoroethane contamination was detected in shallow groundwater wells, but it was not subsequently found in any on-site well. Although this compound was detected in the background well during this same time period, it is unlikely that its presence in MW07-S, MW08-S, MW09-S, and MW10-S is attributable to widespread 1,2-dichloroethane contamination in the area because the shallow aquifer is suspected to be discontinuous. It was not detected above the PRG value after February 1997. As with the deep aquifer, the source of this contamination is unclear. In 1999 and 2000, 1,1-dichloroethene and 1,4-dichlorobenzene were detected above their respective PRG values in Ershigs-4s, a shallow well. These contaminants are not related to The Oeser Company since they were not detected on facility.

The presence of cPAH contamination correlates with the presence of PCP in on-facility wells. Every occurrence of cPAH contamination over the PRG is associated with an occurrence of PCP over its PRG; however, the reciprocal is not true. For every exceedence of the PCP PRG, a cPAH exceedence occurred 53% of the time. In 1996, cPAH and PCP exceedences of their respective PRGs occurred in MW07-S in July and October. PCP exceedences occurred during all sampling events in 1996 in wells MW07-S and MW10-S. Since these compounds were not detected in MW08-S or MW09-S, this indicates that MW10-S represented the southern extent of PCP contamination and that MW07-S was the center of cPAH contamination. In 1997, cPAH contamination was limited to a northwest/southeast corridor extending from MW15-S to MW22-S and MW19-S. PCP contamination also was found in this area. In September and October 1997, PCP contamination also included the area east to MW13-S and the area south to MW09-S. The highest concentrations of PCP were found in MW14-S and MW13-S, while the highest concentration of cPAH was found in MW14-S, but was not detected in MW13-S. In 1998, PCP and cPAH contamination occurred during all sampling events in wells MW07-S, MW13-S, MW14-S, MW15-S, MW19-S, MW22-S, and MW26-S. PCP contamination also was detected in MW10-S. The highest concentrations occurred in wells MW13-S and MW26-S during the April sampling event. These wells later contained free product. Consistently high concentrations of PCP (greater than

1,000 µg/L) were found in MW07-S, MW14-S, and MW15-S, but concentrations of cPAHs were variable. These data confirm that the distribution of PCP and cPAHs extended from the North Treatment Area to the northern end of the Wood Storage Area, but the variability in contaminant concentrations suggest that there may be multiple sources and not a single plume. In 1999 and 2000, cPAH contamination is in a corridor similar to that observed in 1998, extending southwest from MW15-S to MW22-S. This corridor represents the eastern border of PCP contamination, with the exception of an isolated hot spot at MW31-S. The western edge of PCP contamination above the PRG has not been defined, but extends as far as MW29-S. The southern extent appears to be near MW10-S. cPAH compounds were not detected consistently in this corridor during the time period. In general, concentrations are lower than in previous years. PCP concentrations exceeded 1,000 µg/L in MW15-S, MW19-S, and MW28-S.

During the period studied, shallow groundwater appeared to be contaminated from MW14-S to MW22-S and MW10-S because, in 1997 and 1998, the concentration of PCP and cPAH compounds decreased moving progressively southwest between these wells; however, in 1999 and 2000, free product occurred in MW26-S. Currently, the source of free product in MW26-S may also be the source of contamination at MW14-S; historically, MW14-S has had higher concentrations of these contaminants than MW26-S.

Petroleum contamination was found in the shallow aquifer at various sampling locations from 1999 through 2000. The only other year that petroleum hydrocarbons were analyzed for was 1997, but only selected wells were sampled. In that year, diesel was detected in wells MW15-S, MW19-S, MW22-S, and MW26-S. Gasoline was detected in well MW15-S. The presence of BTEX compounds in MW15-S in 1997 and in 1999 through 2000 indicates that VPHs are present. This was confirmed by the detection of high levels of VPHs in this well in 1999 and 2000. This type of contamination appears to be limited to MW15-S.

As stated previously, free product was found in wells MW07-S, MW13-S, and MW26-S in 1999 and 2000. Wells MW14-S, MW15-S, MW22-S, and MW28-S contain petroleum hydrocarbons in excess of the MTCA Method A levels; however, most shallow wells contain detectable concentrations of petroleum hydrocarbons. The highest level of petroleum hydrocarbons occurred in well MW15-S (maximum of 22,812 µg/L EPHs and 35,200 µg/L VPHs), followed by MW22-S (maximum of 12,000 µg/L EPHs). The distribution of contaminant concentrations indicates that there are likely multiple sources of petroleum and that the shallow aquifer is discontinuous on the west side of the facility. On the east side of the facility, petroleum contamination appears to be centered around MW13-S and MW07-S,

where free product was found. Wells southwest of MW22-S and MW07-S have detectable concentrations of petroleum hydrocarbons, but at levels below the MTCA Method A level of 500 µg/L. 1,2,4-Trimethylbenzene and 1,3,5-trimethylbenzene contamination was found in wells MW14-S, MW15-S, and MW-22S. These compounds are common constituents of refined petroleum products, and their distribution appears to reflect the distribution of high levels of EPHs. The linear regression statistical correlation between detected concentrations of EPHs and 1,2,4-trimethylbenzene (r^2=0.7546) and 1,3,5-trimethylbenzene (r^2=0.6803) in 1999 and 2000 supports this conclusion. Similarly, the correlation between EPHs and naphthalene (r^2=0.8589) and 2-methylnaphthalene (r^2=0.8383) indicates that these compounds may be associated with diesel contamination. Petroleum hydrocarbons do not appear to have migrated vertically into the deep aquifer as discussed above.

As discussed above, naphthalene and 2-methylnaphthalene appear to be associated with diesel contamination in 1999 and 2000, but the other SVOCs usually associated with creosote do not because detected concentrations of these compounds (acenaphthene, carbazole, dibenzofuran, fluoranthene, and pyrene) had no significant statistical relationship to the concentration of EPHs (r^2<0.15 for each). These SVOCs associated with creosote were consistently detected in wells which contained free product (MW07-S, MW13-S, and MW26-S), indicating that the source of this contamination may be associated with free product that migrated through the vadose zone until 1999 when it reached groundwater.

The presence of many of these compounds in MW14-S for the same period suggests that the same transport of product through the vadose zone may be occurring at MW14-S and MW22-S, but that the free product has not reached the water table. The contaminant distribution of these compounds is not consistent over time. Generally, in 1997, the highest concentrations, by an order of magnitude, of these compounds were found in MW14-S; however, in 1998, the highest concentrations by an order of magnitude, in general, were found in MW13-S and MW26-S. The following year these wells contained free product. For the period from 1997 to 1998, this type of SVOC contamination appeared to extend from the North Treatment Area to the southern end of the West and East Treatment areas, but contaminant distribution for this time period is difficult to characterize given the variability in contaminant concentrations. This may reflect changes in facility processes or removal actions or the discontinuities of the shallow aquifer.

Dioxin was analyzed for only in the 1999 through 2000 RI sampling events. There appears to be no correlation between the exceedences of the 2,3,7,8-TCDD TEQ PRG and those of PCP, B(a)P equivalent, or petroleum hydrocarbon PRGs. There was no direct relationship between the detected concentrations of 2,3,7,8-TCDD TEQ and PCP, EPHs, and VPHs (r^2<0.1 for each). No statistical

analysis could be done for 2,3,7,8-TCDD TEQ and cPAHs as B(a)P equivalents because only four samples had detections of both. There also does not appear to be a pattern to the distribution of exceedences. In June 1999, there were exceedences in wells MW08-S, MW14-S, and MW15-S. There were no exceedences in September 1999. In December 1999, the only exceedence was in MW09-S, and, in February 2000, the exceedences were in MW22-S and MW29-S. Dioxin is widespread in the environment, and this distribution may reflect site conditions at the time of sampling. The only location where the 2,3,7,8-TCDD TEQ exceeded its MCL was MW14-S.

Table 4-99 presents a summary of PSL exceedences for the shallow wells by year.

4.4.7 Product Recovery

This section summarizes free product (diesel with creosote-like components [LNAPL]) recovery efforts made during the RI at The Oeser Company. Historically, three wells on the facility have had measurable levels of wood-treating waste products: MW07-S, MW13-S, and MW26-S. Maximum measured product thicknesses are given below:

Well	Maximum Thickness (feet)	Date
MW07-S	0.21	10/15/98
MW13-S	0.33	9/1/99
MW26-S	1.63	4/8/99

Product was removed from MW13-S and MW26-S on September 2, 1999, using a peristaltic pump. Product removal volumes and product recovery times are shown below. Measurable product was observed in MW07-S prior to, but not during, the RI. In MW13-S, the measured thickness of product recovered to one-third of its original thickness within 30 hours following removal; however, after 11 days, only a sheen was measured. In MW26-S, product thickness recovered to approximately one-third of its original thickness after 11 days.

Product Information	Well	
	MW13-S	MW26-S
Initial Product Thickness (feet)	0.33	0.41
Product Removed (milliliters)	500	1000
Product Thickness after 11 Hours (feet)	0.13	0.08
Product Thickness after 30 Hours (feet)	0.12	0.09
Product Thickness after 11 Days (feet)	Sheen	0.16

Early action was taken to remove this source of contaminants to groundwater with installation of a passive absorbent system in these three wells. Product recovery "socks" (Soakease™) were installed in MW-7S, MW-13S, and MW-26S on September 13, 1999, to collect product in the wells. The Soakease™ system consists of a chemical-resistant, stainless-steel, refillable canister and a disposable sorbent sock. Socks were installed in canisters and lowered into the wells with the socks straddling the water table. The socks were replaced periodically. Although no product was observed in MW-7S during the RI, a product recovery sock was installed because of the historical presence of product in this well.

By July 26, 2000, free product no longer appeared to be present in these wells based on visual observations of the socks removed from the wells.

4.5 AIR SAMPLE RESULTS

This section presents analytical results from the air monitoring program conducted at The Oeser Company site during the RI. Air samples were collected at multiple locations (Figures 2-11 and 2-12). Samples were analyzed for PAHs, phenols, dioxin, and VOCs. Samples were collected for metals analyses; however, as noted in Section 4.1.1.3.3, metals are not facility-related contaminants. This section is organized into four subsections:

- Section 4.5.1 provides criteria and guidelines for interpreting the air data;
- Section 4.5.2 provides an overview of the sampling results;
- Section 4.5.3 presents the results for SVOC (PAHs, phenols, and dioxin) samples collected at the site; and
- Section 4.5.4 presents the results for VOC samples collected at the site.

4.5.1 Interpretation of Results

Ambient air contaminant concentrations are compared to risk-based screening levels given in the EPA, Region 9, PRGs and to MTCA Method B levels. PRGs are more conservative than MTCA values. Some PAHs have MTCA Method B values, but do not have corresponding EPA PRGs. PRG screening values for ambient air represent an excess human health risk of one in one million (1 in 1,000,000) for carcinogens or an HQ of 1 for noncarcinogens. For several compounds without PRG screening values, EPA, Region 10, recommends use of surrogate values based on compounds with similar molecular structure and toxicological properties. The PRG for naphthalene was used for 1-methylnaphthalene and 2-methylnaphthalene. The PRG for acenaphthene was used for acenaphthylene; pyrene for benzo(g,h,i,)perylene; and anthracene for phenanthrene. Risk-based screening levels are described in detail in Section 2.1.4. Risk-based screening levels do not represent cleanup levels for The Oeser Company site; they are presented as a reference against which detected concentrations can be compared and evaluated. Site-specific COCs reported in the FS will be derived from ARARs, risk-based screening levels, and the human health and ecological risk assessments conducted for the site during the RI.

All analytical data are presented with data validation qualifiers to reflect their reliability. Unless specifically discussed, data usability has not been impacted by qualification of results (Appendix C).

Consistent with EPA guidance, dioxin results are presented both as individual PCDD and PCDF congener/homolog concentrations and as the sum of individual PCDD and PCDF congeners/homologs after conversion to equivalent concentrations of 2,3,7,8-TCDD, the most toxic dioxin isomer, using TEFs (Van den Berg et al. 1998). Refer to Section 4.2.1 for details regarding the interpretation of dioxin data.

Concentrations of cPAH, reported both as individual concentrations and as total B(a)P equivalents, are presented. The purpose of providing B(a)P equivalent concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site. To assess risks associated with exposure to cPAHs, individual cPAH concentrations have been used to calculate their total B(a)P equivalents utilizing the relative (compared to B[a]P) potency factors of the individual cPAHs following the methodology described in the EPA guidance (1993). RPFs for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene are provided (EPA 1993). Additional RPFs are available from the California EPA for benzo(j)fluoranthene; dibenzo(a,j)acridine; dibenzo(a,h)acridine; 7H-dibenzo(c,g)carbazole; dibenzo(a,e)pyrene; dibenzo(a,h)pyrene; dibenzo(a,i)pyrene; dibenzo(a,l)pyrene; 7,12-dimethylbenzo(a)anthracene; 1,6-dinitropyrene; 1,8-dinitropyrene; 3-methylcholanthrene;

5-methylchrysene; 5-nitroacenaphthene; 6-nitrochrysene; 2-nitrofluorene; 1-nitropyrene; and 4-nitropyrene (CalEPA 1996).

Concentrations of total ncPAHs are presented. ncPAHs include the following 14 compounds: acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, 2-chloronaphthalene, fluoranthene, fluorene, 9H-fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and retene. Again, the purpose of providing a sum of individual concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site.

Concentrations of VOCs are presented as individual values.

For all analytes including 2,3,7,8-TCDD TEQ, phenols, total cPAHs (as B[a]P equivalents), ncPAHs, and VOCs, analytes reported as not detected (nondetects) were assigned a concentration of zero.

Data for the TICs are included as Appendix G. Since the identification of these analytes relies on a reduced level of quality assurance, and the concentrations are estimated, these analytes are not addressed further in this report.

Tables 4-100 through 4-116 and Figures 4-59 through 4-82 present results. Tables presented for each location contain the following for each analyte detected: the range of detected concentrations, the location of maximum detected concentration, the detection frequency, the range of DLs, the frequency exceeding the PRG, the PRG, the frequency exceeding MTCA, and the MTCA value.

Distributions of selected descriptive contaminants in air are illustrated in several figures. Color-coded sample points that correspond to a selected range of analyte concentrations are presented for total cPAHs as B(a)P equivalents, total ncPAHs, PCP, and dioxin as 2,3,7,8-TCDD TEQs.

Sampling and analytical results were evaluated to determine if airborne contaminants were collected and analyzed according to the RI work plans, were facility-related, were migrating off facility to surrounding areas, were present at levels exceeding background concentrations, and were present at levels exceeding PRGs, using the following criteria:

- Field and analytical QA/QC criteria were evaluated for each sample. Examples of field QA/QC criteria are flow rate, sample period, and start and stop times. The results of the field and analytical QA/QC evaluation are provided in Appendix C. All analytical data are presented with data validation qualifiers to reflect their reliability. Unless specifically discussed, data usability has not been impacted by qualification of the results;
- To determine which contaminants were facility-related, source samples were collected and analyzed to identify contaminants in facility emissions. In addition, contaminant levels

in samples collected both on and off facility were compared to background levels (presented below). Air samplers were set up adjacent to, and downwind of, the following sources: the tank farm/butt tank (July 1999 event only), the retort, and the evaporator. In addition, grab VOC samples were collected from the retort when charges were removed on July 8 and July 12, 1999. Facility soil sample results from previous studies were used to determine facility-related contaminants that could become airborne as dust (i.e., SVOCs);

- To determine if contaminants were migrating off facility to surrounding areas, the START compared contaminant concentrations in facility source samples to downwind perimeter, as well as upwind and downwind off-facility, samples. A downwind concentration gradient originating on facility was defined as follows: The highest concentration was on facility; lower concentrations were at the downwind perimeter and off-facility locations; and the lowest concentrations were at upwind off-facility and background locations. If a downwind concentration gradient was found, then airborne contaminants were determined to be migrating off facility;
- Comparison to background levels was used to determine if contaminants found in samples collected on and off facility were facility-related. Contaminants present at concentrations that did not exceed background levels were not considered to be facility-related (which was the case for VOCs); and
- Comparison of airborne contaminant concentrations to PRGs was used to determine if facility-related contaminants posed a potential health threat to residents living near the facility. If contaminant concentrations in off-facility samples exceeded PRGs, a potential health threat to residents living near the facility was determined to exist. If levels in off-facility samples were below PRGs, then a potential health threat was not indicated, even if the contaminants were facility related (i.e., were found to be migrating off facility and/or were present at levels exceeding background levels).

4.5.2 Overview

Three sets of air samples were collected during July 1999, with another three taken in September and October 1999. Samples were analyzed for phenols, PAHs, dioxin, and VOCs. Analytical results are summarized by location in Tables 4-100 through 4-111. Distribution of selected descriptive contaminants detected in air above EPA, Region 9, PRGs are illustrated in figures as noted below:

- July 7-8, 1999, Air Sampling Event: Figure 4-59, cPAHs (as B[a]P equivalents); Figure 4-60, ncPAHs; Figure 4-61, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-62, PCP;
- July 9-10, 1999, Air Sampling Event: Figure 4-63, cPAHs (as B[a]P equivalents); Figure 4-64, ncPAHs; Figure 4-65, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-66, PCP;

- July 12-13, 1999, Air Sampling Event: Figure 4-67, cPAHs (as B(a)P equivalents); Figure 4-68, ncPAHs; Figure 4-69, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-70, PCP;
- September 27-28, 1999, Air Sampling Event: Figure 4-71, cPAHs (as B[a]P equivalents); Figure 4-72, ncPAHs; Figure 4-73, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-74, PCP;
- September 29-30, 1999, Air Sampling Event: Figure 4-75, cPAHs (as B[a]P equivalents); Figure 4-76, ncPAHs; Figure 4-77, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-78, PCP; and
- October 1-2, 1999, Air Sampling Event: Figure 4-79, cPAHs (as B[a]P equivalents); Figure 4-80, ncPAHs; Figure 4-81, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-82, PCP.

The Oeser Company was identified as a probable source of PCP, dioxin, and ncPAH contamination found off facility, but not as the source of cPAHs or VOCs found in ambient air around the facility, based on the previously stated criteria.

4.5.3 Ambient Air Samples Analyzed for SVOCs (Phenols, PAHs, and Dioxin)

Air samples were collected at all 10 locations and were analyzed for SVOCs as specified in the FSP. Samplers were operated for 36 hours to obtain the minimum required air volume to achieve adequate DLs and to include two 8-hour work shifts during each sample period. Three 36-hour samples were collected during the first event beginning on July 7, 9, and 12 and during the second event on September 27, September 29, and October 1, 1999. Wind roses for the 36-hour sample periods are presented as Figures 2-13 through 2-18.

Phenols

Phenol, 2-methylphenol, 4-methylphenol, and PCP were detected in air samples. The maximum detected concentrations of phenol, 2-methylphenol, and 4-methylphenol were all less than their respective PRGs by at least a factor of 300. PCP concentrations exceeded the PRG (0.056 µg/m^3) at on-facility and downwind perimeter locations in both sampling events. PCP was not detected in any upwind or background samples. Analytical results were rejected, due to unacceptable analytical spike recoveries for upwind and background samples for the sample period beginning on September 27, 1999. The highest concentrations were detected in samples collected downwind of the evaporator, at AS22 (7.23 µg/m^3 on July 9, 1999, and 10.4 µg/m^3 on July 12, 1999). Downwind concentration gradients from sources to the facility perimeter had average concentrations that exceeded the PRG on July 7, 9, and 12 (Table 4-112).

Concentrations of the downwind gradients (from sources to the perimeter and leaving the facility) had average concentrations that exceeded the PRG on September 27 and 29, 1999 (Table 4-112).

Considering the concentration gradient between on-facility sources and downwind samples, The Oeser Company facility's operations were indicated as a probable source of the airborne PCP, based on the previously stated criteria.

PAHs

cPAH concentrations were evaluated utilizing B(a)P equivalent concentrations. B(a)P equivalent concentrations were compared to the PRG of 0.0022 µg/m^3.

During the first sampling event, B(a)P equivalents did not exceed the PRG in any samples collected on facility, at the perimeter, or off facility. The highest B(a)P equivalent concentration (0.0008 µg/m^3) was detected in an air sample collected from the location downwind of the evaporator (AS22; on July 9, 1999). In addition, there was no apparent concentration gradient between on-facility, perimeter, and off-facility downwind sample locations (Table 4-113).

During the second sampling event, the highest B(a)P equivalent concentrations were detected in air samples collected at two residences, AS32 and AS27, on two sampling days, September 29 and October 1 (AS32 [0.0009 and 0.0008 µg/m^3] and AS27 [0.0009 and 0.0019 µg/m^3]). During both sampling periods, E & E's field crew noted that the chimney at the AS27 residence was emitting wood smoke. This, coupled with the fact that both sampling periods were characterized by calm winds which reduced the likelihood of off-facility migration of airborne contaminants, indicated that the chimney smoke was a potential source of the PAHs. According to the Agency for Toxic Substances and Disease Registry, the largest single source of PAHs to the atmosphere is the burning of wood at homes (ATSDR 1993).

The lack of a concentration gradient between on-facility sources and downwind off-facility locations indicated that facility operations were not a probable source of the airborne PAHs detected at the AS27 or AS32 residences, based on the previously stated criteria. Furthermore, the PRG was not exceeded in any detected results, indicating that detected concentrations did not pose a potential health threat.

To evaluate a downwind release, ncPAH concentrations were totaled. Results in Table 4-113 show that ncPAHs were consistently found in source samples and downwind perimeter location AS29. Because AS29 was located downwind of the Treated Pole Storage Area (on all but the last sampling period beginning on October 1, 1999), it also was considered to be a source for ncPAHs. Downwind

concentration gradients were observed with average concentrations leaving the facility that exceeded background concentrations on July 7, July 12, September 27, and September 29, 1999 (Table 4-113). Concentration gradients indicated that facility operations were a probable source of the airborne ncPAHs, based on previously stated criteria. The only individual ncPAH whose concentration exceeded a PRG was 2-methylnaphthalene, which exceeded its PRG (3.13.µg/m^3) in four of 60 samples; all of these exceedences (maximum concentration 39.6 µg/m^3) occurred at AS21 (at the retort).

Dioxin

Dioxin concentrations were evaluated with respect to the 2,3,7,8-TCDD TEQ. 2,3,7,8-TCDD TEQs were compared to the dioxin PRG of 0.045 picogram per cubic meter (pg/m^3).

Concentrations of the downwind gradients (leaving the facility) had average concentrations that exceeded the PRG on July 9 (0.209 pg/m^3), July 12 (0.217 pg/m^3), and September 27 (0.059 pg/m^3), 1999 (Table 4-112). The dioxin PRG was not exceeded in the upwind (AS24 and AS28) and background (AS30) samples collected on these dates. The highest concentration was detected in samples collected downwind from the evaporator, at AS22 (3.44 pg/m^3 on July 9, 1999, and 6.26 pg/m^3 on July 12, 1999). Considering the concentration gradient between on-facility source samples and downwind off-facility samples on several days, The Oeser Company operations were indicated as a probable source of the airborne dioxin detected at downwind residences, based on the previously stated criteria.

On October 1, 1999, the sampling results differed from those seen in previous days. The only sample that did not exceed the PRG was collected at downwind residential location AS24. The highest concentration of dioxin, as 2,3,7,8-TCDD TEQ (0.74 pg/m^3), was detected in the background sample (AS30). This is approximately three orders of magnitude greater than the other background sample concentrations.

Variable winds during this sampling period may have impacted these sample results. Prevailing winds during the October 1, 1999, sampling period were northerly, and the direction of wind gusts differed from the prevailing direction, unlike in previous sampling periods (See Section 2.6.6 for further discussion of the winds.).

4.5.4 Ambient Air Samples Analyzed for VOCs

VOC samples were collected at all 10 locations specified in the FSP as summarized below.

Source Samples. Charges of treated poles were removed from the retort on July 8 and 12, 1999. When the door was first opened to remove a charge, grab VOC samples were collected (at station

AS21) to characterize maximum VOC concentrations by allowing an evacuated canister to fill up in approximately 30 seconds (according to the subatmospheric sampling method described in EPA Method TO-14A).

Evaporator, tank farm/dip tank, and treated pole emissions were released continuously while each process was in operation. For this reason, time-integrated samples were collected over a 24-hour period to provide a continuous emission record during each sampling event. Flow rates were set for each sample to pressurize the canister during the sample period (as described in the pressurized sampling method described in EPA Method TO-14A).

Perimeter and Off-Facility Samples. Perimeter and off-facility samples were collected to measure airborne VOCs leaving the facility. To avoid diluting samples or collecting emissions from other sources, downwind VOC samples were collected only when facility emissions were blowing toward each perimeter and off-facility sampler using an in-sector sampling method. This method used an anemometer at each sampler that triggered sample collection only when winds were from a preset direction. At each station, two canisters were employed, one to collect in-sector samples when the wind direction was from the facility, and one to collect out-sector samples when the wind direction was away from the facility. The in-sector direction encompassed a 45-degree sector with the midpoint aimed at the emission source (treatment area); the out-sector encompassed the remaining 315 degrees. When winds were southerly, in-sector samples at downwind locations on the north side of the facility and out-sector samples at upwind, south-side locations were submitted for analysis. The opposite was true when winds were northerly. The wind sector samplers were operated for a 36-hour period, concurrent with the SVOC sampling period, or until the downwind canisters were pressurized and were analyzed using the pressurized sampling method EPA Method TO-14A. VOC samples were not collected at AS33.

In addition, the START analyzed both in- and out-sector samples at AS24 and AS28, the proposed upwind locations, because at the time of sample collection the primary wind direction had not been determined. Results are presented in Table 4-114. Based on the analysis of the wind data (Section 2.6.2), AS24 and AS28 were upwind of The Oeser Company for all sample periods except the period beginning on October 1, 1999. Therefore, out-sector sample results were compared to other sample results for all but the last sample period; in-sector results were compared to other sample results for the sample period beginning on October 1, 1999. The analysis of data presented in Table 4-115, including the number of samples with analyte concentrations that exceeded PRGs, includes all VOC sample results.

Background Samples. The background location (AS30) was selected to characterize typical urban emissions upwind of The Oeser Company facility. Because background samples did not measure emissions from a particular source, but rather from all potential sources in the background area, samples were collected independently of wind direction. Samples were collected concurrently with the source samples collection period for 24 hours, using the pressurized sampling method EPA Method TO-14A.

All samples were analyzed for nonchlorinated VOCs on the TO-14A list. The two grab samples collected at the retort (AS21) had the highest concentrations for all VOCs except styrene, which was highest at AS28. The grab samples were expected to contain high concentrations of VOCs because they were collected to measure retort emission, not ambient air. The VOC concentrations in the grab samples exceeded PRGs for all analytes except styrene and n-butylbenzene, which did not exceed PRG levels in any sample. Only benzene and 1,2,4-trimethylbenzene concentrations exceeded PRGs in ambient air samples; these are discussed farther below. Table 4-113 provides a summary of the VOC data.

Results for both sampling events indicate that BTEX and trimethylbenzenes, identified as COPCs in previous studies (E & E 1999b), exceeded PRGs by several orders of magnitude in retort grab source samples; however, only 1,2,4-trimethylbenzene exceeded the PRG in downwind source and perimeter samples, and none (except benzene) exceeded PRGs in downwind off-facility samples. Benzene exceeded the PRG of 0.25 $\mu g/m^3$ in all samples when detected.

These results indicate that although samples collected on the facility, primarily from sources in the treatment area, contained VOCs at concentrations exceeding PRGs on the facility, the VOCs were not migrating off facility at levels exceeding the PRGs, except for benzene, based on the previously stated criteria. In fact, the range of off-facility concentrations including benzene was similar to that found in background levels (Table 4-116). Because background concentrations equaled or exceeded on-facility concentrations, a downwind concentration gradient was not indicated. Consequently, the contributions of airborne benzene concentrations from The Oeser Company facility could not be differentiated from other potential sources in the area.

4.6 ECOLOGICAL SAMPLING RESULTS

This section presents the analytical results for samples collected to evaluate ecological and human health risks in and around Little Squalicum Creek. Surface water, sediment, and berry samples were collected. This section is organized into five subsections:

- Section 4.6.1 provides criteria and guidelines used to interpret the data;

- Section 4.6.2 provides an overview of the sampling results;
- Section 4.6.3 presents results for surface water samples collected from Little Squalicum Creek, two tapped springs that empty into the creek, and one seep that produced sufficient surface water for sampling prior to draining into the creek;
- Section 4.6.4 presents results for sediment samples collected from the creek bed; and
- Section 4.6.5 presents results for berry samples collected from the South Slope and Little Squalicum Creek areas.

4.6.1 Interpretation of Results

Groundwater contaminant concentrations are compared to screening levels in the EPA Ecotox Threshold criteria and ambient water quality criteria (AWQC) Protection of Aquatic Organisms. Sediment concentrations were compared to EPA Ecotox Threshold criteria and State of Washington Freshwater Sediment Quality Values. Screening levels are described in detail in Section 2.1.4. Screening levels do not represent cleanup levels for The Oeser Company site; they are presented as a reference against which detected concentrations can be compared and evaluated. Site-specific COCs reported in the FS will be derived from ARARs, screening levels, and the human health and ecological risk assessments conducted for the site during the RI.

All analytical data are presented with data validation qualifiers to reflect their reliability. Unless specifically discussed, data usability has not been impacted by qualification of results (Appendix C).

Consistent with EPA guidance, dioxin results are presented both as individual PCDD and PCDF congener/homolog concentrations, as well as the sum of individual PCDD and PCDF congeners/homologs after conversion to equivalent concentrations of 2,3,7,8-TCDD, the most toxic dioxin isomer, using TEFs (Van den Berg et al. 1998).

Concentrations of cPAHs, reported both as individual concentrations and as total B(a)P equivalents, are presented. The purpose of providing B(a)P equivalent concentrations is to represent, especially in figures used in this section, the nature and extent of like contaminants at the site. To better assess risks associated with exposure to cPAHs, individual cPAH concentrations have been used to calculate their total B(a)P equivalents utilizing the relative (compared to B[a]P) potency factors of the individual cPAHs following the methodology described in the EPA guidance (1993). RPFs for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene are provided (EPA 1993). Additional RPFs are available from the California EPA for benzo(j)fluoranthene; dibenzo(a,j)acridine; dibenzo(a,h)acridine; 7H-dibenzo(c,g)carbazole; dibenzo(a,e)pyrene; dibenzo(a,h)pyrene; dibenzo(a,i)pyrene;

dibenzo(a,l)pyrene; 7,12-dimethylbenzo(a)anthracene; 1,6-dinitropyrene; 1,8-dinitropyrene; 3-methylcholanthrene; 5-methylchrysene; 5-nitroacenaphthene; 6-nitrochrysene; 2-nitrofluorene; 1-nitropyrene; and 4-nitropyrene (CalEPA 1996).

Concentrations of total ncPAHs are presented. ncPAHs include the following 14 compounds: acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, 2-chloronaphthalene, fluoranthene, fluorene, 9H-fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, and retene. Again, the purpose of providing a sum of individual concentrations is to better represent, especially in figures used in this section, the nature and extent of like contaminants at the site.

Concentrations of diesel petroleum are presented as total EPH which was determined by summing concentrations for all aromatic and aliphatic carbon chain ranges within the analytical method for each sample.

Concentrations of gasoline are presented as total VPH which was determined by summing the concentrations for all aromatic and aliphatic carbon chain ranges within the analytical method for each sample.

For 2,3,7,8-TCDD TEQ, total cPAHs (as B[a]P equivalents), ncPAHs, EPHs, and VPHs, analytes reported as not detected (nondetects) were assigned a concentration of zero.

Data for the TICs are included as Appendix G. Since the identification of these analytes relies on a reduced level of quality assurance, and the concentrations are estimated, these analytes are not addressed further in this report.

Tables summarizing analytical results and comparing data to available benchmarks are presented at the end of Section 4.6. Statistical summaries are not included given the relatively small numbers of samples collected for each matrix.

Distributions of selected descriptive contaminants in groundwater are illustrated in several figures. Color-coded sample points that correspond to a selected range of analyte concentrations are presented for total cPAHs as B(a)P equivalents, total ncPAHs, PCP, and dioxin as 2,3,7,8-TCDD TEQs.

4.6.2 Overview of Ecological Sampling

Surface water and sediment samples were collected in July 1999. Berry samples were collected during August 1999. A second round of surface water samples was taken in December 1999.

PAHs, phenols, and dioxin were detected in surface water and sediment collected from Little Squalicum Creek. At several locations in the creek, concentrations of these contaminants exceeded conservative screening benchmarks for effects on benthic life; however, no growth or survival effects

were observed in sediment toxicity tests with laboratory-reared organisms. Berry analyses were limited and did not demonstrate a clear impact from the facility.

4.6.3 Surface Water Samples

Surface water samples were collected from Little Squalicum Creek in July and December 1999 and were analyzed for SVOCs, dioxin, metals, EPHs, VPHs, and additional parameters (such as alkalinity, hardness, major anions, and TDS) to characterize the general quality of creek water. Analytical data from July 1999 are discussed and then are followed by a description of December 1999 data. Sample locations, moving from downstream to upstream, are:

- SW1 - Creek terminal pool at the beach on Bellingham Bay;
- SW9 - Groundwater from a tapped spring enters the creek about midway between SW1 and SW2;
- SW2 - Creek downstream from the Marine Drive Outfall;
- SW4 - Creek upstream from the Marine Drive Outfall, as well as downstream from where groundwater from the tapped spring (SW3) enters the creek;
- SW3 - Second tapped spring about 40 feet north of SW4;
- SW8 - Seep about 150 feet northeast of SW3;
- SW5 - Creek downstream from where water from the Oeser Outfall enters the creek;
- SW6 - Creek downstream from where water from the Birchwood Outfall enters the creek (headwaters of the creek); and
- SW7 - Isolated pool at the east end of the creek ravine, near the BTC parking lot.

Analytical results are summarized by location in Table 4-117 for the July 1999 sampling event and in Table 4-118 for the December 1999 event. Distributions of selected descriptive contaminants detected in surface water above available aquatic benchmarks are illustrated in figures as noted below:

- July 1999 Surface Water Sampling Event: Figure 4-83, cPAHs (as B[a]P equivalents); Figure 4-84, ncPAHs; Figure 4-85, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-86, PCP; and
- December 1999 Surface Water Sampling Event: Figure 4-87, cPAHs (as B[a]P equivalents); Figure 4-88, ncPAHs; Figure 4-89, dioxin (as 2,3,7,8-TCDD TEQ); and Figure 4-90, PCP.

4.6.3.1 July 1999 Surface Water Results

July 1999 groundwater data are summarized in Table 4-117. Contaminants detected in at least one sample are reported in the table. Appendix G contains a complete list of target analytes.

Background Pool

Four PAHs and three VOCs were detected in the background sample. Concentrations of all seven were less than available aquatic-life-screening benchmarks (Table 4-117).

Creek

Fourteen PAHs were detected in creek water. The highest concentration found was for pyrene (0.12 µg/L) at SW1. B(a)P was the only PAH with a concentration that exceeded an Ecotox screening threshold; however, the maximum concentration was more than 8,000 times below the AWQC. No other PAHs exceeded Ecotox or AWQC thresholds.

Eight other SVOCs, including PCP, were detected. Concentrations of these compounds did not exceed available screening benchmarks.

Four dioxin congeners were detected. 2,3,7,8-TCDD TEQs at these locations did not exceed the screening value for fish (10 picograms per liter [pg/L]). 2,3,7,8-TCDD TEQs for fish were calculated from detected dioxin congener concentrations and TEFs for fish from Van den Berg et al. (1998).

Petroleum hydrocarbons (EPH and VPH) were not detected in surface water from the creek.

Three VOCs (xylene, toluene, and MTBE) were detected below available screening benchmarks.

Concentrations of the major cations and anions, alkalinity, and TDS increased in the downstream direction. Based on a comparison with tapped spring (groundwater) data, this likely reflects the input of groundwater to the creek.

Seep

The seep was sampled once in June 1999 and was tested for SVOCs and EPHs. Seep samples were tested for SVOCs and dioxin in July 1999. Seven PAHs and EPHs were detected in June 1999. Four of these PAHs were detected during the July event, together with three PAHs not found in June. Dioxin was detected (2.28 pg/L) below the screening value for fish.

Tapped Spring

Three PAHS were detected in water from the tapped spring at concentrations similar to what was later identified in monitoring wells placed along the old railbed/path above the creek. MTBE and o-xylene were also detected. No analytes were present above screening levels.

Summary of July 1999 Surface Water Results

Water from the creek below the Oeser Outfall contained the largest number of detected analytes. Concentrations measured at the Oeser Outfall exceeded upstream (Birchwood Outfall) and background (pool) concentrations. VPH was not detected in any samples. A distinct gradient (upstream to downstream) of contaminant (phenols, PAHs, VOCs, dioxin, and EPHs) concentrations could not be identified within the creek.

4.6.3.2 December 1999 Surface Water Results

December 1999 groundwater data are summarized in Table 4-118. All samples were analyzed for VOCs, SVOCs, dioxin, petroleum hydrocarbons, and conventional water quality parameters. Contaminants detected in at least one sample are reported in the table. Appendix G contains a complete list of target analytes.

Background Pool

Five PAHs, two of which had been previously detected in the pool, and PCP were detected in this background sample. Concentrations of all six contaminants were less than available aquatic-life-screening benchmarks.

Creek

Fifteen PAHs were detected in creek water. The highest concentration found was 2-methylnaphthalene (0.26 µg/L) at SW5. B(a)P was the only PAH with a concentration that exceeded an Ecotox screening threshold (0.914 µg/L); however, the maximum concentration was less than the lowest chronic value for all aquatic organisms (0.3 µg/L) from Suter and Tsao (1996). No other PAH concentrations exceeded Ecotox or AWQC thresholds.

Six other SVOCs, including PCP, were detected. PCP concentrations at SW5 and SW1 exceeded the Ecotox threshold and AWQC of 13 µg/L. Concentrations of other contaminants did not exceed available screening benchmarks (Table 4-118).

Six dioxin congeners were detected. 2,3,7,8-TCDD TEQs in several creek water samples exceeded the screening value for fish (10 pg/L) from Suter and Tsao (1996). 2,3,7,8-TCDD TEQs for fish were calculated from detected dioxin congener concentrations and TEFs for fish from Van den Berg et al. (1998).

Petroleum hydrocarbons were detected in surface water at several locations, including estimated concentrations of 87 µg/L at the Birchwood Outfall and 121 µg/L at the Oeser Outfall.

The only VOCs detected during this event (benzene, m & p-xylene, and o-xylene) were found at the Oeser Outfall. All were detected below available screening benchmarks.

As in July 1999, concentrations of the major cations and anions, alkalinity, and TDS increased in the downstream direction. Based on a comparison with tapped spring (groundwater) data, this likely reflects the input of groundwater to the creek.

Seep

Thirteen PAHs (including eight of the nine previously identified in seep samples), EPHs, and four other SVOCs (including PCP and tetrachlorophenol) were detected in the seep sample (SWOB). Dioxin was detected (14.2 pg/L) above the screening value for fish. Seep results are likely impacted by the TSS measured in this sample. The TSS value was more than 10 times the values found in most groundwater and surface water samples.

Tapped Spring

Two tapped springs were sampled during this event. Three PAHS (two of which had been detected in the July 1999 spring sample) were detected in water from the tapped spring at concentrations similar to those measured in December 1999 in monitoring wells placed along the old railbed/path above the creek. Dioxin was detected in one of the spring samples at 0.211 µg/L. No analytes were present above screening levels.

Summary of December 1999 Surface Water Results

As in July 1999, water from the creek below the Oeser Outfall contained the largest number of detected analytes. Concentrations of contaminants at this sampling point exceeded upstream (Birchwood Outfall) and background (pool) concentrations and were generally above levels found in July 1999. A decreasing gradient (upstream to downstream) of contaminant (phenols, PAHs, and dioxin) concentrations was identified within the creek. A clear gradient could not be identified for VOCs or EPHs based on the data available.

4.6.4 Sediment Sample Results

Sediment was collected from Little Squalicum Creek and background areas in July 1999 and was analyzed for SVOCs, dioxin, EPHs, TOC, and sediment toxicity. At selected locations, sediment also was collected for bioaccumulation tests. Results of these analyses and tests are summarized in this section. Complete analytical results are included in Appendix G. Results are summarized in Table 4-119. Distributions of selected descriptive contaminants detected in sediment above available benchmarks are illustrated in Figures 4-91 (cPAHs [as B(a)P equivalents]), 4-92 (ncPAHs), 4-93 (dioxin [as 2,3,7,8-TCDD TEQ]), and 4-94 (PCP).

Background

Sediment was collected from two background locations: the Birchwood Outfall (location SD-09), which lies at the upstream end of Little Squalicum Creek, and a pond near BTC (location SD-11; Figure 4-91).

The pool background location (SD-11) was relatively free of contamination. Benzoic acid and three PAHs were detected. Concentrations of all four compounds were less than 0.1 mg/kg and did not exceed benchmarks for benthic life protection. PCP was not detected. The 2,3,7,8-TCDD TEQ (5.34 ng/kg) for the pond background sample was the lowest of all sediment samples collected. The pool background sample had the highest TOC concentration (12%) of all of the samples, which may in part account for its relatively high estimated total EPH concentration (390 mg/kg). The components of natural organic matter are chemically similar to petroleum hydrocarbons and may be detected by the EPH analysis method. A high TOC concentration in the pond probably is the result of leaf litter inputs and the depositional nature of the pool (i.e., lack of flow).

Compared with the pool background sample, the Birchwood Outfall background sample was characterized by lower TOC and EPH concentrations and higher concentrations of dioxin, PAHs, and other SVOCs (Table 4-119). PCP was detected in this background sediment. Higher contaminant concentrations at the Birchwood Outfall compared with the pond may reflect adsorption and deposition of contaminants from untreated stormwater.

Creek Sediment

Sediment samples SD8 through SD1 were collected from depositional areas of the creek moving from upstream to downstream. SD 10 was collected from the downstream side of the culvert that allows stormwater from the Oeser Outfall to enter Little Squalicum Creek. Twenty-three PAHs, four phenols,

and three other SVOCs were detected in these samples. Four of these contaminants were found at only one of the 10 creek locations. Between 20 and 25 of the remaining 26 contaminants were detected in all sediments from SD2 through SD10. SD1, taken from the terminal pool at the beach on Bellingham Bay, was composed primarily of sand and contained 11 of these analytes. Sediment benchmarks for six PAHs and PCP were exceeded in at least one location:

- SD10 - 4 exceedences,
- SD8 - 1 exceedence,
- SD7 - 0 exceedences,
- SD6 - 4 exceedences,
- SD5 - 0 exceedences,
- SD4 - 0 exceedences,
- SD3 - 1 exceedence,
- SD2 - 4 exceedences, and
- SD1 - 0 exceedences.

Contaminant concentrations were compared statistically for TOC versus PCP, TOC versus 2,3,7,8-TCDD TEQ, TOC versus B(a)P, and TOC versus EPHs. The regression correlation coefficient (r^2) was less than 0.13 for all but TOC versus EPHs, where the correlation was 0.99.
No clear pattern (upstream/downstream) of contaminant distribution could be identified.

Dioxin sediment concentration at the Oeser Outfall was two orders of magnitude greater than concentrations at both background locations. Except for background, all sediment concentrations exceeded the benchmark for dioxin. As with PAH and PCP, no pattern in dioxin distribution was apparent.

EPH concentrations exceeded the pond background level of 390 mg/kg only at location SD-06. This location had a TOC concentration of 11%, which may in part explain the high EPH result.

4.6.4.1 Sediment Biological Testing

10-day Amphipod Test—A 10-day growth and survival test with *Hyalella azteca*, a freshwater amphipod, was conducted with sediment from eight locations (SD1 through SD8) in Little Squalicum Creek and one location in the channel that leads from the Oeser Outfall to the creek (SD10). Only one of the site-specific background samples was tested, the Birchwood Outfall sample (SD9), which is upstream from the confluence of the Oeser Outfall channel with the creek. A clean laboratory control sediment

sample also was included in the study. A copy of the summary report for this test is included at the end of Appendix G.

The survival and growth results are summarized in Figure 4-95. The average percentage of survival in the laboratory control was 88%. This was greater than the minimum acceptable control survival rate of 80% and indicates that the test system was suitable for amphipod survival (EPA 1994c, 2000a). The average percentage of survival in samples from the creek system ranged from 78 to 93%. None of the samples differed significantly from the laboratory control or site-specific background sample for survival. Growth of the test organisms in sediment from the creek system was intermediate between the laboratory control and background sample. Overall, toxicity testing results suggest that current levels of sediment contamination in the creek do not pose a hazard to benthic life.

Bioaccumulation Test—A 28-day bioaccumulation test with *Lumbriculus variegatus*, a freshwater oligochaete, was conducted with sediment from three locations in Little Squalicum Creek (SD-02, SD-05, and SD-6). Three locations were assumed to be sufficient to provide a representative measure of bioaccumulation for the creek system. A clean laboratory control sediment sample also was included in the study. The oligochaetes were grown in sediment samples for 28 days, were separated from sediment, and were analyzed for bioaccumulative COCs. A copy of the summary report for this test is included at the back of Appendix G.

The laboratory control sediment sample was included to verify that the test system was suitable for oligochaete survival and to provide information on baseline levels of bioaccumulative chemicals in oligochaetes. Average biomass per replicate in the control at 28 days (8.9 grams) was similar to the starting biomass (10 grams) and indicates that the test system was suitable for oligochaete survival. Average biomass in sample SD-06 (11.2 grams) was similar to the control organism biomass. Average biomass in samples SD-02 (3.7 grams) and SD-05 (2.9 grams) was less than the control biomass, perhaps indicating that adverse affects may be associated with these samples.

Oligochaete biomass recovered at termination of the bioaccumulation study was analyzed for SVOCs and dioxin; however, because of the limited biomass per sample, each sample could not be analyzed for all chemicals. Sample SD-06 was analyzed for SVOCs. The biomass from samples SD-02 and SD-05 were pooled and analyzed for dioxin. Evaluation of sediment data indicates that these analyses should be reasonably representative of creek sediment. The biomass from the laboratory control was divided into two samples of equal mass, one for analysis of SVOCs and one for dioxin analysis. Results are summarized in Table 4-120. Eleven PAHs, six phenols, and two other SVOCs were detected in organisms exposed to sediment from location SD-06. Three of the 19 analytes detected had not been

identified in any sediment samples. Seven dioxin/furan congeners were detected in the organisms exposed to sediment from locations SD-02 and SD-05. The data have been used in the ERA.

4.6.4.2 Summary of Surface Water and Sediment Results

Contaminants detected in surface water from Little Squalicum Creek included PAHs, chlorinated phenols, and dioxin. Except for B(a)P, PCP, and dioxin, concentrations were less than available aquatic-life-screening benchmarks. Data indicate that The Oeser Company is the probable source of these contaminants.

Similarly, PAHs, phenols, and dioxin in sediment from the creek appear to be related to The Oeser Company. Sediment concentrations at the Oeser Outfall were elevated when compared to background locations, and many locations downstream from the Oeser Outfall also were elevated above background levels. At several locations in the creek, concentrations of these contaminants exceeded conservative screening benchmarks for effects on benthic life; however, no growth or survival effects were observed in sediment toxicity tests with laboratory-reared organisms.

4.6.5 Berry Sampling Results

Berries from Himalayan blackberry (*Rubus discolor*) bushes were collected and analyzed for VOCs, SVOCs, and dioxin. All berry results are reported on an as-received (wet weight) basis. One sample was collected by the railroad tracks immediately south of The Oeser Company facility, one was collected along the old railbed/path above Little Squalicum Creek, one was collected from the ravine on the south side of the creek (Figure 2-19), and one was collected from the residential background area (Figure 2-4). Each sample was split, and one aliquot from each was rinsed with distilled water. Results for the unwashed and washed samples are summarized in Table 4-121. Only chemicals detected in at least one sample are listed in the table. Appendix G includes all analytical results.

Six PAHs, three other SVOCs, two VOCs, and three dioxin/furan congeners were detected in the samples. Except for benzyl alcohol, which was elevated in all locations when compared to background levels, there was no clear difference in analyte concentrations between locations or between washed and unwashed samples. Unwashed berry 2,3,7,8-TCDD TEQs are above washed berry TEQs, suggesting that atmospheric fallout may be the source of dioxin in these berries. Instances where washed berry concentrations exceed unwashed berry concentrations can be accounted for based on acceptable field and analytical precision. Several components (e.g., p-isopropyl toluene, benzoic acid, and benzyl alcohol) are naturally occurring in berries. The data have been used in the human health risk assessment.

Table 4-1

INFREQUENTLY DETECTED ANALYTES
NUMBER OF DETECTIONS/NUMBER OF TESTS BY MEDIA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Total Hits/Total Test (All Matrices)	Total Hits/Total Test (Air)	Total Hits/Total Test (Ash)	Total Hits/Total Test (Bay Sediment)	Total Hits/Total Test (Berry Unwash)	Total Hits/Total Test (Berry Wash)
1,1-Dichloroethane	3/255	0/27			0/4	0/4
1,2,3-Trichlorobenzene	1/240	0/15			0/4	1/4
1,2,4-Trichlorobenzene	4/1096	0/33	0/1	0/3	0/8	0/8
1,2-Dichlorobenzene	1/1108	0/45	0/1	0/3	0/8	0/8
1,3,5-Tribromophenol	4/30			0/3		
1-Nitropyrene	1/295				0/4	0/4
2,4-Dinitrophenol	4/1040	0/88	0/1		0/4	0/4
2-Nitroaniline	1/903	0/18	0/1	0/3	0/4	0/4
3-Nitroaniline	2/847	0/18	0/1	0/3	0/4	0/4
3,3'-Dichlorobenzidine	3/900	0/18	0/1	0/3	0/4	04
4-Bromophenyl-phenyl ether	2/903	0/18	0/1	0/3	0/4	0/4
4-Chlorophenyl-phenyl ether	2/903	0/18	0/1	0/3	0/4	0/4
4-Chlorotoluene	1/240	0/15			0/4	0/4
4-Nitroaniline	1/903	0/18	0/1	0/3	0/4	0/4
Benzidine	1/462			0/3		
bis(2-chloroethyl)ether	1/903	0/18	0/1	0/3	0/4	0/4
bis(2-chloroisopropyl)ether	2/903	0/18	0/1	0/3	0/4	0/4
cis-Dichloroethene	2/252	0/27			0/4	0/4
Hexachlorobenzene	2/902	0/18	0/1	0/3	0/4	0/4
Hexachlorocyopentadiene	1/891	1/18	0/1	0/3	0/4	0/4
Hexachloroethane	1/992	0/33	0/1	0/3	0/4	0/4
n-Nitroso-di-n-propyl amine	2/903	0/18	0/1	0/3	0/4	0/4
Nitrobenzene	1/904	0/18	0/1	0/3	0/4	0/4
Vinyl Acetate	2/15	2/12				

Table 4-1

INFREQUENTLY DETECTED ANALYTES
NUMBER OF DETECTIONS/NUMBER OF TESTS BY MEDIA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Total Hits/Total Test (Drain Sediment)	Total Hits/Total Test (Drain Water)	Total Hits/Total Test (Evaporator Air)	Total Hits/Total Test (Groundwater)	Total Hits/Total Test (O/W separator)	Total Hits/Total Test (Peeler Sump)
1,1-Dichloroethane				2/184		
1,2,3-Trichlorobenzene				0/181		
1,2,4-Trichlorobenzene	0/2	0/5		0/400	0/1	0/1
1,2-Dichlorobenzene	0/2	0/5		0/400	0/1	0/1
1,3,5-Tribromophenol	0/2					
1-Nitropyrene				0/181		
2,4-Dinitrophenol	0/2	0/5		1/265	0/1	0/1
2-Nitroaniline	0/2	0/5		0/266	0/1	0/1
3-Nitroaniline	0/2	0/5		0/256	0/1	0/1
3,3'-Dichlorobenzidine	0/2	0/5		1/264	0/1	0/1
4-Bromophenyl-phenyl ether	0/2	0/5		1/266	0/1	0/1
4-Chlorophenyl-phenyl ether	0/2	0/5		0/266	0/1	0/1
4-Chlorotoluene				1/181		
4-Nitroaniline	0/2	0/5		0/266	0/1	0/1
Benzidine	0/2	0/5		0/85	0/1	0/1
bis(2-chloroethyl)ether	0/2	0/5		1/266	0/1	0/1
bis(2-chloroisopropyl)ether	0/2	0/5		0/266	0/1	0/1
cis-Dichloroethene				1/181		
Hexachlorobenzene	0/2	0/5		1/266	0/1	0/1
Hexachlorocyopentadiene	0/2	0/5		0/266	0/1	0/1
Hexachloroethane	0/2	0/5		0/400	0/1	0/1
n-Nitroso-di-n-propyl amine	0/2	0/5		0/266	0/1	0/1
Nitrobenzene	0/2	0/5		0/267	0/1	0/1
Vinyl Acetate				0/3		

Table 4-1

INFREQUENTLY DETECTED ANALYTES
NUMBER OF DETECTIONS/NUMBER OF TESTS BY MEDIA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Total Hits/Total Test (Pore water)	Total Hits/Total Test (Product)	Total Hits/Total Test (Sediment)	Total Hits/Total Test (Sediment Bioaccumulation)	Total Hits/Total Test (Seep)	Total Hits/Total Test (Spring)
1,1-Dichloroethane		0/1			0/1	0/2
1,2,3-Trichlorobenzene		0/1			0/1	0/2
1,2,4-Trichlorobenzene	0/5	0/9	0/42	0/2	0/4	0/4
1,2-Dichlorobenzene	0/5	0/9	0/42	0/2	0/4	0/4
1,3,5-Tribromophenol			0/9			
1-Nitropyrene				0/2	0/2	0/1
2,4-Dinitrophenol	0/10	0/8	2/51	0/2	0/3	0/2
2-Nitroaniline	0/5	0/8	0/42	0/2	0/3	0/2
3-Nitroaniline	1/5	0/7	0/30	0/2	0/3	0/2
3,3'-Dichlorobenzidine	0/5	0/8	0/42	0/2	0/3	0/2
4-Bromophenyl-phenyl ether	0/5	0/8	1/42	0/2	0/3	0/2
4-Chlorophenyl-phenyl ether	0/5	0/8	0/42	0/2	0/3	0/2
4-Chlorotoluene		0/1			0/1	0/2
4-Nitroaniline	0/5	0/8	0/42	0/2	0/3	0/2
Benzidine		0/8	0/16			
bis(2-chloroethyl)ether	0/5	0/8	0/42	0/2	0/3	0/2
bis(2-chloroisopropyl)ether	0/5	0/8	2/42	0/2	0/3	0/2
cis-Dichloroethene		0/1			0/1	0/2
Hexachlorobenzene	085	0/8	0/42	0/2	0/3	0/2
Hexachlorocyopentadiene	0/5	0/8	0/41	0/2	0/3	0/2
Hexachloroethane	0/5	0/9	0/42	0/2	0/4	0/3
n-Nitroso-di-n-propyl amine	0/5	0/8	0/42	0/2	0/3	0/2
Nitrobenzene	0/5	0/8	0/42	0/2	0/3	0/2
Vinyl Acetate						

Table 4-1

INFREQUENTLY DETECTED ANALYTES
NUMBER OF DETECTIONS/NUMBER OF TESTS BY MEDIA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Total Hits/Total Test (Subsurface Soil)	Total Hits/Total Test (Surface Soil)	Total Hits/Total Test (Surface Water)	Total Hits/Total Test (Thermal Tank)
1,1-Dichloroethane	1/19		0/13	
1,2,3-Trichlorobenzene	0/19		0/13	
1,2,4-Trichlorobenzene	3/392	1/143	0/32	0/1
1,2-Dichlorobenzene	1/392	0/143	0/32	0/1
1,3,5-Tribromophenol	2/10	2/7		
1-Nitropyrene	0/95	0/16	0/7	
2,4-Dinitrophenol	1/428	0/143	0/19	0/1
2-Nitroaniline	1/373	0/143	0/19	0/1
3-Nitroaniline	1/350	0/139	0/13	0/1
3,3'-Dichlorobenzidine	2/373	0/143	0/19	
4-Bromophenyl-phenyl ether	0/373	0/143	0/19	0/1
4-Chlorophenyl-phenyl ether	2/373	0/143	0/19	0/1
4-Chlorotoluene	0/19		0/13	
4-Nitroaniline	1/373	0/143	0/19	0/1
Benzidine	0/231	1/107	0/4	0/1
bis(2-chloroethyl)ether	0/373	0/143	0/19	0/1
bis(2-chloroisopropyl)ether	0/373	0/143	0/19	0/1
cis-Dichloroethene	1/19		0/13	
Hexachlorobenzene	1/373	0/143	0/32	0/1
Hexachlorocyopentadiene	0/364	0/142	0/18	0/1
Hexachloroethane	1/392	0/143	0/26	0/1
n-Nitroso-di-n-propyl amine	2/373	0/143	0/19	0/1
Nitrobenzene	1/373	0/143	019	0/1
Vinyl Acetate				

Table 4-2

INFREQUENTLY DETECTED ANALYTES
NUMBER OF SAMPLES ABOVE EPA REGION 9 PRGs
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	PRGs	All Matrices	Air	Ash	Bay Sediment	Berry Unwash	Berry Wash	Drain Sediment	Drain Water	Evaporator Air	Groundwater	O/W Separator
1,1-Dichloroethane	2 ug/L	1/255	0/27			0/4	0/4				1/184	
1,2,3-Trichlorobenzene		0/240	0/15			0/4	0/4				0/181	
1,2,4-Trichlorobenzene		0/1096	0/33	0/1	0/3	0/8	0/8	0/2	0/5		0/400	0/1
1,2-Dichlorobenzene		0/1108	0/45	0/1	0/3	0/8	0/8	0/2	0/5		0/400	0/1
1,3,5-Tribromophenol		0/30			0/3			0/2				
1-Nitropyrene		0/295				0/4	0/4				0/181	
2,4-Dinitrophenol		0/1040	0/88	0/1		0/4	0/4	0/2	0/5		0/265	0/1
2-Nitroaniline		0/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
3-Nitroaniline		0/847	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/256	0/1
3,3'-Dichlorobenzidine	0.15 ug/L	1/900	0/18	0/1	0/3	0/4	0/4	0/2	0/5		1/264	0/1
4-Bromophenyl-phenyl ether		0/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
4-Chlorophenyl-phenyl ether		0/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
4-Chlorotoluene		0/240	0/15			0/4	0/4				0/181	
4-Nitroaniline		0/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
Benzidine	0.0021 mg/kg	1/462			0/3			0/2	0/5		0/85	0/1
bis(2-chloroethyl)ether	0.0098 ug/L	1/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		1/266	0/1
bis(2-chloroisopropyl)ether		0/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
cis-Dichloroethene		0/252	0/27			0/4	0/4				0/181	
Hexachlorobenzene	0.042 ug/L	1/902	0/18	0/1	0/3	0/4	0/4	0/2	0/5		1/266	0/1
Hexachlorocyopentadiene		0/891	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
Hexachloroethane		0/992	0/33	0/1	0/3	0/4	0/4	0/2	0/5		0/400	0/1
n-Nitroso-di-n-propyl amine	0.069 mg/kg	2/903	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/266	0/1
Nitrobenzene		0/904	0/18	0/1	0/3	0/4	0/4	0/2	0/5		0/267	0/1
Vinyl Acetate		0/15	0/12								0/3	

Table 4-2

INFREQUENTLY DETECTED ANALYTES
NUMBER OF SAMPLES ABOVE EPA REGION 9 PRGs
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	PRGs	Peeler Sump	Pore water	Product	Sediment	Sediment Bioaccumulation	Seep	Spring	Subsurface Soil	Surface Soil	Surface Water	Thermal Tank
1,1-Dichloroethane	2 ug/L			0/1			0/1	0/2	0/19		0/13	
1,2,3-Trichlorobenzene				0/1			0/1	0/2	0/19		0/13	
1,2,4-Trichlorobenzene		0/1	0/5	0/9	0/42	0/2	0/4	0/4	0/392	0/143	0/32	0/1
1,2-Dichlorobenzene		0/1	0/5	0/9	0/42	0/2	0/4	0/4	0/392	0/143	0/32	0/1
1,3,5-Tribromophenol					0/9				0/10	0/7		
1-Nitropyrene						0/2	0/2	0/1	0/95	0/16	0/7	
2,4-Dinitrophenol		0/1	0/10	0/8	0/51	0/2	0/3	0/2	0/428	0/143	0/19	0/1
2-Nitroaniline		0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
3-Nitroaniline		0/1	0/5	0/7	0/30	0/2	0/3	0/2	0/350	0/139	0/13	0/1
3,3'-Dichlorobenzidine	0.15 ug/L	0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	
4-Bromophenyl-phenyl ether		0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
4-Chlorophenyl-phenyl ether		0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
4-Chlorotoluene				0/1			0/1	0/2	0/19		0/13	
4-Nitroaniline		0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
Benzidine	0.0021 mg/kg	0/1		0/8	0/16				0/231	1/107	0/4	0/1
bis(2-chloroethyl)ether	0.0098 ug/L	0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
bis(2-chloroisopropyl)ether		0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
cis-Dichloroethene				0/1			0/1	0/2	0/19		0/13	
Hexachlorobenzene	0.042 ug/L	0/1	085	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/32	0/1
Hexachlorocyopentadiene		0/1	0/5	0/8	0/41	0/2	0/3	0/2	0/364	0/142	0/18	0/1
Hexachloroethane		0/1	0/5	0/9	0/42	0/2	0/4	0/3	0/392	0/143	0/26	0/1
n-Nitroso-di-n-propyl amine	0.069 mg/kg	0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	2/143	0/19	0/1
Nitrobenzene		0/1	0/5	0/8	0/42	0/2	0/3	0/2	0/373	0/143	0/19	0/1
Vinyl Acetate												

Key:

mg/kg = Milligrams per kilogram.
O/W = Oil/water.
PRGs = Preliminary remediation goals.
ug/L = Micrograms per liter.

Table 4-3

SUMMARY OF RESULTS FROM OPEN FIELD BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number		99234008	99234009	99234010	99234011	99234013	99234014	99234015	99234016	99234020	99234025
Sample Location		RES-B-18	RES-B-19	RES-B-20	RES-B-01A	RES-B-12	RES-B-13	RES-B-03	RES-B-02	RES-B-06	RES-B-07
Sample Date	PSLs[a]	6/1/99	6/1/99	6/1/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99	6/3/99
SVOCs (mg/kg)											
Benzo(a)pyrene	0.062[b]	0.358 U	0.314 U	0.308 U	0.307 U	0.323 U	0.338 U	0.288 U	0.312 U	0.152 J	0.323 U
Benzo(b)fluoranthene	0.62[b]	0.179 U	0.157 U	0.154 U	0.154 U	0.162 U	0.136 J	0.144 U	0.156 U	0.322	0.161 U
Benzo(g,h,i)perylene	2,300[c]	0.179 U	0.157 U	0.154 U	0.154 U	0.162 U	0.152 J	0.144 U	0.156 U	0.242	0.161 U
Benzo(k)fluoranthene	6.2[b]	0.179 U	0.157 U	0.154 U	0.154 U	0.162 U	0.169 U	0.144 U	0.156 U	0.103 J	0.161 U
Benzoic acid	100,000[b]	1.07	0.908	0.96	0.768 U	0.956	0.976	1.05	1.19	0.798	0.807 U
Chrysene	62[b]	0.179 U	0.157 U	0.154 U	0.154 U	0.162 U	0.16 J	0.144 U	0.0678 J	0.279	0.0596 J
Dibenzofuran	290[b]	0.179 U	0.157 U	0.154 U	0.154 U	0.162 U	0.169 U	0.144 U	0.156 U	0.0715 J	0.161 U
Fluoranthene	2,300[b]	0.0887 J	0.0491 J	0.0975 J	0.154 U	0.105 J	0.41	0.0817 J	0.142 J	0.615	0.0967 J
Indeno(1,2,3-cd)pyrene	0.62[b]	0.358 U	0.314 U	0.308 U	0.307 U	0.323 U	0.332 J	0.288 U	0.312 U	0.392	0.323 U
Naphthalene	56[b]	0.179 U	0.157 U	0.0574 J	0.154 U	0.162 U	0.107 J	0.0764 J	0.0795 J	0.144 J	0.161 U
Phenanthrene	22,000[c]	0.0614 J	0.157 U	0.0804 J	0.154 U	0.0695 J	0.287	0.0814 J	0.107 J	0.43	0.161 U
Pyrene	2,300[b]	0.179 U	0.157 U	0.0422 J	0.154 U	0.162 U	0.17	0.0491 J	0.0799 J	0.409	0.0626 J
Retene	NA	0.179 U	0.157 U	0.154 U	0.154 U	0.162 U	0.122 J	0.144 U	0.156 U	0.145 U	0.161 U
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9[b]	0.116	1.035	0.325	0.33	1.772	1.296	1.617	1.086	2.48	2.814
2,3,7,8-TCDF	NA	0.805 U	0.906 U	1.15 U	0.918 JH	2.643	3.217	0.58 U	0.884 U	5.654	3.91
1,2,3,7,8-PeCDF	NA	0.24 U	0.205 U	0.363 U	0.543 U	0.135 U	0.317 U	0.34 U	0.409 U	0.434 U	0.71 U
1,2,3,4,7,8-HxCDD	NA	0.239 U	0.264 U	0.475	0.323 U	0.836 U	1.177 U	1.25	1.151	2.006	1.235 U
1,2,3,4,7,8-HxCDF	NA	0.764 U	4.256	0.775 U	0.622 U	2.205 U	2.208 U	3.043 U	2.415 U	2.015 U	5.711 U
1,2,3,6,7,8-HxCDD	NA	0.168 U	1.562	0.957	0.569	1.285	2.373	2.725	2.291	2.696	6.332
1,2,3,7,8,9-HxCDD	NA	0.191 U	0.842 U	0.834 U	0.257 U	1.269	2.297	2.046	1.633 U	2.595	2.989
1,2,3,4,6,7,8-HpCDD	NA	9.978	37.472	17.302	14.302 JH	21.421	42.319	87.179	60.745	45.573	124.704
1,2,3,4,6,7,8-HpCDF	NA	1.577	4.403	2.319 U	2.902 JH	10.02	6.516	9.363	10.278	12.424 U	17.126
OCDD	NA	38.472 U	336.421	82.307	88.142 JH	86.819	168.991	484.148	302.94	187.473	730.676
OCDF	NA	2.437	7.66	3.863	4.71 JH	7.509	16.725	11.707	10.943	10.417	34.36 U
Total TCDD	NA	7.195	4.722	16.915	2.227 JH	32.02	47.069	4.009	15.251	118.822	19.238
Total TCDF	NA	0.527 U	3.394	0.967 U	0.918 JH	9.449	9.533	0.58 U	3.451	15.109	14.547
Total PeCDD	NA	4.556	1.696	5.351	0.508 U	20.258	33.362	2.3	3.102	57.312	15.95
Total PeCDF	NA	3.207	8.569	2.126	1.524 JH	3.339	8.458	6.617	15.255	22.914	9.709
Total HxCDD	NA	17.215	11.465	21.46	4.301 JH	35.943	75.423	28.405	28.396	134.681	53.312
Total HxCDF	NA	1.914	10	0.247 U	0.328 U	6.33	6.686	11.983	8.63	7.919	26.912
Total HpCDD	NA	16.997	65.705	30.567	26.54 JH	35.901	67.422	140.934	104.164	83.902	216.926
Total HpCDF	NA	1.577	4.403	0.336 U	2.902 JH	10.02	6.516	9.363	10.278	0.567 U	17.126

Key is on the next page.

Table 4-3

SUMMARY OF RESULTS FROM OPEN FIELD BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[c] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), updated February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JH	= The analyte was positively identified. The associated numerical result is estimated, biased high.
mg/kg	= Milligrams per kilograms.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
SVOCs	= Semivolatile Organic Compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalency Quotient
U	= The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-4

STATISTICAL ANALYSIS OF RESULTS FROM OPEN FIELD BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRG	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0000596 - 0.224709	RES-B-06	4/10	-	1/10	0.062	0/10	2.32	1/10	0.137	0/10	30
Benzo(a)pyrene	0.152	RES-B-06	1/10	0.288 - 0.358	1/10	0.062	0/10	2.32	1/10	0.137	0/10	30
Benzo(b)fluoranthene	0.136 - 0.322	RES-B-06	2/10	0.144 - 0.179	0/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Benzo(k)fluoranthene	0.103	RES-B-06	1/10	0.144 - 0.179	0/10	6.21	0/10	232.30	0/10	13.699	NA	NA
Chrysene	0.0596 - 0.279	RES-B-06	4/10	0.144 - 0.179	0/10	62.1	0/10	2322.99	0/10	136.986	NA	NA
Indeno(1,2,3-cd)pyrene	0.332 - 0.392	RES-B-06	2/10	0.288 - 0.358	0/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Dioxin/Furan (ng/kg)												
1,2,3,4,6,7,8-HpCDD	9.978 - 124.704	RES-B-07	10/10	-	0/10	390	0/10	31383	0/10	667	NA	NA
1,2,3,4,6,7,8-HpCDF	1.577 - 17.126	RES-B-07	8/10	2.319 - 12.424	0/10	390	0/10	31383	0/10	667	NA	NA
1,2,3,4,7,8-HxCDD	0.475 - 2.006	RES-B-06	4/10	0.239 - 1.235	0/10	39	0/10	3138	0/10	67	NA	NA
1,2,3,4,7,8-HxCDF	4.256	RES-B-19	1/10	0.622 - 5.711	0/10	39	0/10	3138	0/10	67	NA	NA
1,2,3,6,7,8-HxCDD	0.569 - 6.332	RES-B-07	9/10	0.168 - 0.168	0/10	39	0/10	3138	0/10	67	NA	NA
1,2,3,7,8,9-HxCDD	1.269 - 2.989	RES-B-07	5/10	0.191 - 1.633	0/10	39	0/10	3138	0/10	67	NA	NA
2,3,4,7,8-PeCDF	1.419	RES-B-06	1/10	0.139 - 0.917	0/10	7.8	0/10	627	0/10	13	NA	NA
2,3,7,8-TCDD TEQ	0.12 - 2.81	RES-B-07	10/10	-	0/10	3.9	0/10	314	0/10	6.7	0/10	5
2,3,7,8-TCDF	0.918 - 5.654	RES-B-06	5/10	0.58 - 1.15	0/10	39	0/10	3138	0/10	67	NA	NA
OCDD	82.307 - 730.676	RES-B-07	9/10	38.472 - 38.472	0/10	39000	0/10	3138356	0/10	66666	NA	NA
OCDF	2.437 - 16.725	RES-B-13	9/10	34.36 - 34.36	0/10	39000	0/10	3138356	0/10	66666	NA	NA
Total HpCDD	16.997 - 216.926	RES-B-07	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	1.577 - 17.126	RES-B-07	8/10	0.336 - 0.567	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	4.301 - 134.681	RES-B-06	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	1.914 - 26.912	RES-B-07	8/10	0.247 - 0.328	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	1.696 - 57.312	RES-B-06	9/10	0.508 - 0.508	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	1.524 - 22.914	RES-B-06	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	2.227 - 118.822	RES-B-06	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	0.918 - 15.109	RES-B-06	7/10	0.527 - 0.967	NA	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg/kg)												
Benzo(g,h,i)perylene	0.152 - 0.242	RES-B-06	2/10	0.144 - 0.179	0/10	2308.68	0/10	1959.13	0/10	2400	NA	NA
Fluoranthene	0.0491 - 0.615	RES-B-06	9/10	0.154 - 0.154	0/10	2293.61	0/10	6287.36	0/10	3200	NA	NA
Naphthalene	0.0574 - 0.144	RES-B-06	5/10	0.154 - 0.179	0/10	55.92	0/10	23.51	0/10	1600	NA	NA
ncPAH	0.0491 - 1.84	RES-B-06	9/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0614 - 0.43	RES-B-06	7/10	0.154 - 0.161	0/10	21896.12	0/10	6777.61	0/10	24000	NA	NA
Pyrene	0.0422 - 0.409	RES-B-06	6/10	0.154 - 0.179	0/10	2308.68	0/10	1959.13	0/10	2400	NA	NA
Retene	0.122	RES-B-13	1/10	0.144 - 0.179	NA	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.798 - 1.19	RES-B-02	8/10	0.768 - 0.807	0/10	100000.00	0/10	263.04	0/10	320000	NA	NA
Dibenzofuran	0.0715	RES-B-06	1/10	0.144 - 0.179	0/10	290.53	0/10	29.93	0/10	320	NA	NA

Table 4-4

STATISTICAL ANALYSIS OF RESULTS FROM OPEN FIELD BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polynuclear aromatic hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act (State of Washington).
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polynuclear aromatic hydrocarbon.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalency Quotient

Table 4-5

SUMMARY OF RESULTS FROM RESIDENTIAL BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99234000	99234006	99234007	99234012	99234017	99234018	99234019	99234021	99234022	99234024
Sample Location		RES-B-11	RES-B-04	RES-B-17	RES-B-01	RES-B-15	RES-B-05	RES-B-16	RES-B-08	RES-B-09	RES-B-10
Sample Date		6/1/99	6/1/99	6/1/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99
Semivolatiles (mg/kg)											
Carbazole	24[c]	0.188 U	0.188 U	0.157 U	0.148 U	0.175 U	0.145 U	0.151 U	0.161 U	0.139 U	0.057 J
Anthracene	22,000[c]	0.188 U	0.188 U	0.157 U	0.148 U	0.175 U	0.145 U	0.151 U	0.161 U	0.139 U	0.0513 J
Benzo(a)anthracene	0.62[c]	0.188 U	0.188 U	0.157 U	0.148 U	0.175 U	0.145 U	0.151 U	0.161 U	0.278 U	0.377
Benzo(a)pyrene	0.062[c]	0.376 U	0.376 U	**0.146 J**	0.296 U	0.351 U	0.29 U	0.301 U	0.321 U	0.278 U	**0.455**
Benzo(b)fluoranthene	0.62[c]	0.168 J	0.188 U	0.27	0.123 J	0.228	0.0962 J	0.151 U	0.161 U	0.136 J	**0.663**
Benzo(g,h,i)perylene	2,300[d]	0.188 U	0.188 U	0.236	0.148 U	0.212	0.145 U	0.16	0.161 U	0.159	0.422
Benzo(k)fluoranthene	6.2[c]	0.188 U	0.188 U	0.0942 J	0.148 U	0.0622 J	0.145 U	0.151 U	0.161 U	0.0447 J	0.241
Benzoic acid	100,000[c]	0.941 U	0.941 U	1.32	2.03	1.7	1.04	0.915	0.803 U	0.733	1.19
Chrysene	62[c]	0.186 J	0.188 U	0.252	0.114 J	0.224	0.0958 J	0.115 J	0.161 U	0.15	0.628
Dibenzo(a,h)anthracene	0.062[c]	0.376 U	0.376 U	0.314 U	0.296 U	0.351 U	0.29 U	0.301 U	0.321 U	0.278 U	**0.313 J**
Fluoranthene	2,300[c]	0.314	0.0905 J	0.374	0.193	0.512	0.202	0.235	0.137 J	0.21	0.921
Indeno(1,2,3-cd)pyrene	0.62[c]	0.376 U	0.376 U	0.393	0.296 U	0.389	0.29 U	0.301 U	0.313 J	0.299	0.612
Naphthalene	56[c]	0.188 U	0.188 U	0.135 J	0.148 U	0.192	0.196	0.102 J	0.161 U	0.139 U	0.165 U
Phenanthrene	22,000[d]	0.229	0.0635 J	0.239	0.141 J	0.402	0.172	0.228	0.0783 J	0.108 J	0.422
Pyrene	2,300[c]	0.14 J	0.188 U	0.276	0.151	0.255	0.101 J	0.15 J	0.114 J	0.213	0.884
Retene	NA	0.188 U	0.188 U	0.157 U	0.148 U	0.175 U	0.0805 J	0.064 J	0.161 U	0.139 U	0.102 J
Dioxin/Furan (ng/kg)											
2,3,7,8-TCDD TEQ	3.9[c]	**7.221**	**10.793**	**4.241**	1.772	**5.378**	**18.835**	1.998	**6.738**	0.777	2.22
2,3,7,8-TCDD	3.9[c]	1.862 U	**4.354**	0.51 U	0.417 U	0.983 U	5.712 U	12.321 U	1.198 U	0.332 U	0.448 U
2,3,7,8-TCDF	NA	17.701	3.262	12.348	1.338 U	6.03	48.809 U	39.63 U	10.437	1.723	4.959
1,2,3,7,8-PeCDD	NA	1.577	2.164	1.102 U	0.307 U	0.825 U	2.332 U	1.284 U	1.296 U	0.335 U	0.519 U
1,2,3,7,8-PeCDF	NA	3.819 U	0.391 U	4.441 U	0.304 U	1.691	3.706 U	3.473 U	3.013	0.386 U	1.259 U
2,3,4,7,8-PeCDF	NA	2.951 U	0.994	1.99 U	0.395 U	1.92	3.843 U	3.601 U	4.379	0.407 U	1.469 U
1,2,3,4,7,8-HxCDD	NA	4.585 U	2.498	2.786	1.367	3.264	5.503	1.843	2.376	0.389 U	0.76 U
1,2,3,4,7,8-HxCDF	NA	10.457 U	3.881	13.641 U	2.296 U	10.727 U	66.863 U	8.175 U	8.483 U	3.148 U	5.262
1,2,3,6,7,8-HxCDD	NA	10.658	6.219	6.767	2.895	5.464	19.178	4.076 U	5.609	1.422	2.571 U
1,2,3,6,7,8-HxCDF	NA	1.411 U	8.983 U	2.108	0.319 U	0.353 U	3.275 U	1.836 U	2.393	0.28 U	1.288 U
1,2,3,7,8,9-HxCDD	NA	9.005	4.563	5.947	2.078	5.784	11.646 U	3.496	5.467	0.31 U	2.132 U
1,2,3,7,8,9-HxCDF	NA	0.928 U	0.63	0.559	0.497 U	0.548	5.092 U	2.855 U	0.415	0.435 U	2.002 U
1,2,3,4,6,7,8-HpCDD	NA	163.853	100.706	95.802	93.877	173.29	1272.626	115.887 JH	140.514	36.872	94.818
1,2,3,4,6,7,8-HpCDF	NA	17.214	57.743	17.304	13.33	36.925	159.281	22.712 JH	24.142	6.722	18.988

Key is at the end of the table.

Table 4-5 (CONTINUED)

SUMMARY OF RESULTS FROM RESIDENTIAL BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99234000	99234006	99234007	99234012	99234017	99234018	99234019	99234021	99234022	99234024
Sample Location		RES-B-11	RES-B-04	RES-B-17	RES-B-01	RES-B-15	RES-B-05	RES-B-16	RES-B-08	RES-B-09	RES-B-10
Sample Date		6/1/99	6/1/99	6/1/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99	6/2/99
Dioxin/Furan (ng/kg)											
1,2,3,4,7,8,9-HpCDF	NA	2.82 U	2.172	0.703 U	1.503 U	4.725 U	40.286 U	3.184 U	5.466 U	1.059 U	4.633 U
OCDD	NA	972.824	603.888	551.974	635.512	1102.235	20059.584	739.25 JH	784.902	246.631	602.303
OCDF	NA	53.698 U	61.398	32.668	21.68	120.094	423.312	45.11 JH	33.155	17.364	36.523 U
Total TCDD	NA	201.699 J	61.339	77.434	12.41	48.903	5.712 U	67.31	26.434	11.85	37.076
Total TCDF	NA	129.734	8.293	83.703	1.138	39.111	48.809 U	39.63 U	54.995	9.941	28.735
Total PeCDD	NA	60.9	41.036	44.46	3.434	28.578	2.332 U	35.028	11.693	3.058	20.229
Total PeCDF	NA	81.676 J	40.939	71.612	9.123	49.109	3.843 U	17.288	48.99	19.891	32.817
Total HxCDD	NA	267.472 J	121.516	145.182	30.441	93.338	170.288	73.052	75.738	15.305	59.144
Total HxCDF	NA	38.867 J	64.813	34.479	13.649	40.361	106.094	10.145	29.761	10.753	33.106
Total HpCDD	NA	294.614	183.335	178.198	162.111	285.081	1931.335	213.88 JH	243.418	64.201	167.435
Total HpCDF	NA	17.214	120.286	17.304	13.33	36.925	159.281	22.712 JH	53.414	6.722	18.988

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), updated February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JH = The analyte was positively identified. The associated numerical result is estimated, biased high.
mg/kg = Milligrams per kilogram.
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OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
SVOCs = Semivolatile organic compounds.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalency Quotient.
U = The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-6

STATISTICAL ANALYSIS OF RESULTS FROM RESIDENTIAL BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.000115 - 0.936238	RES-B-10	9/10	-	3/10	0.062	0/10	2.32	2/10	0.137	0/10	30
Benzo(a)anthracene	0.377	RES-B-10	1/10	0.145 - 0.278	0/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Benzo(a)pyrene	0.146 - 0.455	RES-B-10	2/10	0.278 - 0.376	2/10	0.062	0/10	2.32	2/10	0.137	0/10	30
Benzo(b)fluoranthene	0.0962 - 0.663	RES-B-10	7/10	0.151 - 0.188	1/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Benzo(k)fluoranthene	0.0447 - 0.241	RES-B-10	4/10	0.145 - 0.188	0/10	6.215	0/10	232.30	0/10	13.699	NA	NA
Chrysene	0.0958 - 0.628	RES-B-10	8/10	0.161 - 0.188	0/10	62.148	0/10	2322.99	0/10	136.986	NA	NA
Dibenzo(a,h)anthracene	0.313	RES-B-10	1/10	0.278 - 0.376	1/10	0.062	0/10	2.32	1/10	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.299 - 0.612	RES-B-10	5/10	0.29 - 0.376	0/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	36.872 - 1272.626	RES-B-05	10/10	-	1/10	390	0/10	31383	1/10	667.0	NA	NA
1,2,3,4,6,7,8-HpCDF	6.722 - 159.281	RES-B-05	10/10	-	0/10	390	0/10	31383	0/10	667.0	NA	NA
1,2,3,4,7,8,9-HpCDF	2.172	RES-B-04	1/10	0.703 - 40.286	0/10	390	0/10	31383	0/10	667.0	NA	NA
1,2,3,4,7,8-HxCDD	1.367 - 5.503	RES-B-05	7/10	0.389 - 4.585	0/10	39	0/10	3138	0/10	66.7	NA	NA
1,2,3,4,7,8-HxCDF	3.881 - 5.262	RES-B-10	2/10	2.296 - 66.863	0/10	39	0/10	3138	0/10	66.7	NA	NA
1,2,3,6,7,8-HxCDD	1.422 - 19.178	RES-B-05	8/10	2.571 - 4.076	0/10	39	0/10	3138	0/10	66.7	NA	NA
1,2,3,6,7,8-HxCDF	2.108 - 2.393	RES-B-08	2/10	0.28 - 8.983	0/10	39	0/10	3138	0/10	66.7	NA	NA
1,2,3,7,8,9-HxCDD	2.078 - 9.005	RES-B-11	7/10	0.31 - 11.646	0/10	78	0/10	3138	0/10	66.7	NA	NA
1,2,3,7,8,9-HxCDF	0.415 - 0.63	RES-B-04	4/10	0.435 - 5.092	0/10	39	0/10	3138	0/10	66.7	NA	NA
1,2,3,7,8-PeCDD	1.577 - 2.164	RES-B-04	2/10	0.307 - 2.332	0/10	3.9	0/10	314	0/10	6.7	NA	NA
1,2,3,7,8-PeCDF	1.691 - 3.013	RES-B-08	2/10	0.304 - 4.441	0/10	78	0/10	6277	0/10	133.3	NA	NA
2,3,4,7,8-PeCDF	0.994 - 4.379	RES-B-08	3/10	0.395 - 3.843	0/10	7.8	0/10	628	0/10	13.3	NA	NA
2,3,7,8-TCDD	4.354	RES-B-04	1/10	0.332 - 12.321	1/10	3.9	0/10	314	0/10	6.7	NA	NA
2,3,7,8-TCDD TEQ	0.777 - 18.8	RES-B-05	10/10	-	6/10	3.9	0/10	314	4/10	6.7	5/10	5
2,3,7,8-TCDF	1.723 - 17.701	RES-B-11	7/10	1.338 - 48.809	0/10	39	0/10	3138	0/10	66.7	NA	NA
OCDD	246.631 - 20059.584	RES-B-05	10/10	-	0/10	39000	0/10	3138357	0/10	66666.7	NA	NA
OCDF	17.364 - 423.312	RES-B-05	8/10	36.523 - 53.698	0/10	39000	0/10	3138357	0/10	66666.7	NA	NA
Total HpCDD	64.201 - 1931.335	RES-B-05	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	6.722 - 159.281	RES-B-05	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	15.305 - 267.472	RES-B-11	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	10.145 - 106.094	RES-B-05	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	3.058 - 60.9	RES-B-11	9/10	2.332 - 2.332	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	9.123 - 81.676	RES-B-11	9/10	3.843 - 3.843	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	11.85 - 201.699	RES-B-11	9/10	5.712 - 5.712	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	1.138 - 129.734	RES-B-11	8/10	39.63 - 48.809	0/10	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg/kg)												
Anthracene	0.0513	RES-B-10	1/10	0.139 - 0.188	0/10	21896.12	0/10	6777.61	0/10	24000	NA	NA
Benzo(g,h,i)perylene	0.159 - 0.422	RES-B-10	5/10	0.145 - 0.188	0/10	2308.68	0/10	1959.13	0/10	2400	NA	NA
Fluoranthene	0.0905 - 0.921	RES-B-10	10/10	-	0/10	2293.61	0/10	6287.36	0/10	3200	NA	NA
Naphthalene	0.102 - 0.196	RES-B-05	4/10	0.139 - 0.188	0/10	55.92	0/10	23.51	0/10	1600	NA	NA
ncPAH	0.154 - 2.8023	RES-B-10	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0635 - 0.422	RES-B-10	10/10	-	0/10	21896.12	0/10	6777.61	0/10	24000	NA	NA
Pyrene	0.101 - 0.884	RES-B-10	9/10	0.188 - 0.188	0/10	2308.68	0/10	1959.13	0/10	2400	NA	NA
Retene	0.064 - 0.102	RES-B-10	3/10	0.139 - 0.188	0/10	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
Carbazole	0.057	RES-B-10	1/10	0.139 - 0.188	0/10	24.32	NA	NA	0/10	50	NA	NA
Benzoic acid	0.733 - 2.03	RES-B-01	7/10	0.803 - 0.941	0/10	100000.00	0/10	263.04	0/10	320000	NA	NA

Table 4-6

STATISTICAL ANALYSIS OF RESULTS FROM RESIDENTIAL BACKGROUND SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polynuclear aromatic hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act (State of Washington).
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polynuclear aromatic hydrocarbon.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalency Quotient

Table 4-7

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224001	99224003	99224004	99224006	99224007	99224017	99224018	99224019	99224021
Sample Location		RES-02	RES-36	RES-06	RES-07	RES-08	RES-11	RES-12	RES-16	RES-43
Sample Date		5/24/99	5/24/99	5/24/99	5/24/99	5/24/99	5/25/99	5/25/99	5/25/99	5/25/99
Semivolatile Organic Compounds (mg/kg)										
1-Methylnaphthalene	56[c]	0.226 U	0.168 U	0.265 U	0.0597 J	0.233 U	0.234 U	0.23 U	0.191 U	0.0917 J
2-Methylnaphthalene	56[c]	0.226 U	0.168 U	0.265 U	0.159 J	0.094 J	0.118 J	0.23 U	0.191 U	0.141
Carbazole	24[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.132 U
Acenaphthylene	3700[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.132 U
Anthracene	22,000[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.132 U
Benzo(a)pyrene	0.062[c]	0.452 U	0.337 U	0.53 U	0.497 U	0.465 U	0.468 U	0.46 U	0.382 U	0.264 U
Benzo(b)fluoranthene	0.62[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.0728 J
Benzo(g,h,i)perylene	2,300[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.156
Benzo(k)fluoranthene	6.2[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.132 U
Benzoic acid	100,000[c]	1.13 U	2.55	1.32 U	1.24 U	1.16 U	1.17 U	1.15 U	0.955 U	0.661 U
Benzyl alcohol	18,000[c]	1.13 U	0.842 U	1.32 U	1.24 U	1.16 U	1.17 U	1.15 U	0.955 U	0.661 U
Chrysene	62[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.056 J
Dibenzo(a,h)anthracene	0.062[c]	0.452 U	0.337 U	0.53 U	0.497 U	0.465 U	0.468 U	0.46 U	0.382 U	0.264 U
Dibenzofuran	290[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.191 U	0.0382 J
Fluoranthene	2,300[c]	0.226 U	0.168 U	0.265 U	0.0718 J	0.0552 J	0.234 U	0.23 U	0.0627 J	0.0539 J
Indeno(1,2,3-cd)pyrene	0.62[c]	0.452 U	0.337 U	0.53 U	0.497 U	0.465 U	0.468 U	0.46 U	0.382 U	0.279
Naphthalene	56[c]	0.226 U	0.168 U	0.265 U	0.16 J	0.118 J	0.234 U	0.23 U	0.191 U	0.102 J
Pentachlorophenol	3[c]	1.13 U	0.842 U	1.32 U	1.24 U	1.16 U	1.17 U	1.15 U	0.955 U	0.661 U
Phenanthrene	22,000[c]	0.226 U	0.168 U	0.265 U	0.101 J	0.0827 J	0.0742 J	0.23 U	0.066 J	0.0727 J
Pyrene	2,300[c]	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.0484 J	0.0444 J
Retene	NA	0.226 U	0.168 U	0.265 U	0.249 U	0.233 U	0.234 U	0.23 U	0.107 J	0.248

Key is at the end of the table.

Table 4-7 (CONTINUED)

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224001	99224003	99224004	99224006	99224007	99224017	99224018	99224019	99224021
Sample Location		RES-02	RES-36	RES-06	RES-07	RES-08	RES-11	RES-12	RES-16	RES-43
Sample Date		5/24/99	5/24/99	5/24/99	5/24/99	5/24/99	5/25/99	5/25/99	5/25/99	5/25/99
Dioxin/Furan (ng/kg)										
2,3,7,8-TCDD TEQ	3.9[c]	1.894	1.778	**15.823**	**7.059**	**11.442**	**26.992**	**9.538**	3.093	**57.872**
2,3,7,8-TCDD	3.9[c]	0.22 U	0.248 U	0.585 U	0.408 U	0.799 U	0.5 U	0.382 U	0.297 U	0.187 U
2,3,7,8-TCDF	NA	1.853	2.43	1.951	1.262	0.755 U	0.424 U	1.046 U	0.317 U	4.24
1,2,3,7,8-PeCDD	NA	0.632 U	0.561 U	2.223	1.412	2.537	3.49	1.86	0.485 U	15.357
1,2,3,7,8-PeCDF	NA	0.345 U	0.494 U	1.697	0.706 U	0.813 U	2.029	0.534 U	0.347 U	13.338
2,3,4,7,8-PeCDF	NA	0.365 U	0.522 U	0.8 U	0.747 U	0.86 U	1.744	0.564 U	0.367 U	11.788
1,2,3,4,7,8-HxCDD	NA	1.412	1.31 U	6.497	2.859 U	7.249 U	11.413	4.711	2.187	23.675
1,2,3,4,7,8-HxCDF	NA	7.005 U	5.845 U	40.016 U	18.826 U	16.993 U	68.005 U	30.727 U	14.315 U	180.931 U
1,2,3,6,7,8-HxCDD	NA	4.056	4.018	22.577	12.805	21.798	40.427	15.411 U	6.903 U	93.892
1,2,3,6,7,8-HxCDF	NA	0.475 U	1.132 U	2.708 U	1.134 U	2.183 U	3.262 U	2.349 U	1.009 U	13.797 U
1,2,3,7,8,9-HxCDD	NA	2.447 U	2.009 U	12.13	5.681 U	13.72 U	19.819 U	10.019	4.155 U	62.915
1,2,3,7,8,9-HxCDF	NA	0.602 U	1.436 U	4.815 U	2.016 U	3.882 U	5.8 U	4.177 U	1.795 U	24.529 U
2,3,4,6,7,8-HxCDF	NA	0.844 U	2.013 U	3.434 U	1.438 U	2.768 U	4.136 U	2.978 U	1.28 U	17.493 U
1,2,3,4,6,7,8-HpCDD	NA	95.588	89.873	698.485	357.138	577.53	1253.135	524.04	241.731	622.6
1,2,3,4,6,7,8-HpCDF	NA	13.459	15.137	71.085	41.391	55.062	141.255	57.136	27.204	591.661
1,2,3,4,7,8,9-HpCDF	NA	6.175 U	5.761 U	28.369 U	9.814 U	11.546 U	38.949 U	30.91 U	12.716 U	44.54 U
OCDD	NA	676.046	782.404	14791.004	2433.142 JL	3855.323	33359.242	3701.57	1733.41	48291.5
OCDF	NA	40.249	48.648	247.682	113.902	133.927	652.124	229.68	114.882	5100.9
Total TCDD	NA	21.573	2.471	2.839	1.924	10.306	9.637	7.529	1.755	5.467
Total TCDF	NA	7.783	4.215	6.108	2.716	1.06	9.419	2.295	1.362	24.113
Total PeCDD	NA	15.148	2.187	3.399	0.927 U	12.333	20.1	8.935	3.133	31.224
Total PeCDF	NA	9.045	9.658	44.951	14.448	25.041	53.156	21.978	10.671	302.639
Total HxCDD	NA	29.018	11.549	172.616	93.344	157.688	159.65	110.594	39.018	534.043
Total HxCDF	NA	27.11	27.212	151.884	69.372	106.973	208.415	81.431	42.34	1123.476
Total HpCDD	NA	167.698	162.788	1342.264	651.826	1033.588	2208.801	928.808	420.463	11232.4
Total HpCDF	NA	13.459	15.137	71.085	41.391	55.062	141.255	57.136	27.204	591.661

Key is at the end of the table.

Table 4-7 (CONTINUED)

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224022	99224025	99224034	99224035	99224036	99224038	99224043	99224046	99224047
Sample Location		RES-46	RES-18	RES-48	RES-49	RES-47A	RES-28	RES-32A	RES-38	RES-41
Sample Date		5/25/99	5/25/99	5/26/99	5/26/99	5/26/99	5/27/99	5/27/99	5/28/99	5/28/99
Semivolatile Organic Compounds (mg/kg)										
1-Methylnaphthalene	56[c]	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.149 U	0.181 U	0.129 U	0.219 U
2-Methylnaphthalene	56[c]	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.149 U	0.181 U	0.129 U	0.0557 J
Carbazole	24[c]	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.149 U	0.181 U	0.129 U	0.219 U
Acenaphthylene	3700[c]	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.149 U	0.181 U	0.129 U	0.219 U
Anthracene	22,000[c]	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.149 U	0.181 U	0.129 U	0.219 U
Benzo(a)pyrene	0.062[c]	0.381 U	0.366 U	0.312 U	0.271 U	0.0657 J	0.298 U	0.363 U	0.258 U	0.438 U
Benzo(b)fluoranthene	0.62[c]	0.191 U	0.167 J	0.156 U	0.136 U	0.175	0.149 U	0.181 U	0.129 U	0.219 U
Benzo(g,h,i)perylene	2,300[c]	0.191 U	0.183 J	0.156 U	0.143	0.177	0.149 U	0.181 U	0.129 U	0.219 U
Benzo(k)fluoranthene	6.2[c]	0.191 U	0.0488 J	0.156 U	0.136 U	0.0372 J	0.149 U	0.181 U	0.129 U	0.219 U
Benzoic acid	100,000[c]	1.05	1.04	0.781 U	0.88	0.807	0.745 U	1.13	0.646 U	1.09 U
Benzyl alcohol	18,000[c]	0.953 U	0.916 U	0.781 U	0.102 J	0.713 U	0.745 U	0.907 U	0.646 U	1.09 U
Chrysene	62[c]	0.191 U	0.15 J	0.156 U	0.068 J	0.102 J	0.149 U	0.0746 J	0.129 U	0.219 U
Dibenzo(a,h)anthracene	0.062[c]	0.381 U	0.366 U	0.312 U	0.271 U	0.285 U	0.298 U	0.363 U	0.258 U	0.438 U
Dibenzofuran	290[c]	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.149 U	0.181 U	0.129 U	0.219 U
Fluoranthene	2,300[c]	0.0638 J	0.146 J	0.156 U	0.0871 J	0.0368 J	0.149 U	0.0986 J	0.129 U	0.0703 J
Indeno(1,2,3-cd)pyrene	0.62[c]	0.381 U	0.366 U	0.312 U	0.272	0.336	0.298 U	0.363 U	0.258 U	0.438 U
Naphthalene	56[c]	0.191 U	0.183 U	0.156 U	0.0546 J	0.143 U	0.149 U	0.181 U	0.129 U	0.0569 J
Pentachlorophenol	3[c]	0.953 U	0.916 U	0.781 U	0.678 U	0.713 U	0.745 U	0.907 U	0.646 U	1.09 U
Phenanthrene	22,000[c]	0.191 U	0.0677 J	0.156 U	0.066 J	0.143 U	0.0437 J	0.0618 J	0.129 U	0.219 U
Pyrene	2,300[c]	0.191 U	0.11 J	0.156 U	0.0646 J	0.143 U	0.149 U	0.0822 J	0.129 U	0.219 U
Retene	NA	0.191 U	0.183 U	0.156 U	0.136 U	0.143 U	0.0691 J	0.106 J	0.129 U	0.219 U

Key is at the end of the table.

Table 4-7 (CONTINUED)

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224022	99224025	99224034	99224035	99224036	99224038	99224043	99224046	99224047
Sample Location		RES-46	RES-18	RES-48	RES-49	RES-47A	RES-28	RES-32A	RES-38	RES-41
Sample Date		5/25/99	5/25/99	5/26/99	5/26/99	5/26/99	5/27/99	5/27/99	5/28/99	5/28/99
Dioxin/Furans (ng/kg)										
2,3,7,8-TCDD TEQ	3.9[c]	3.684						0.563	0.279	**12.794**
2,3,7,8-TCDD	3.9[c]	0.223 U	0.413 U	0.279 U	0.273 U	0.239 U	0.216 U	0.283 U	0.026 U	0.276
2,3,7,8-TCDF	NA	0.831 U	0.422 U	4.226	2.971	2.162	1.213	1.24 U	0.411	1.015
1,2,3,7,8-PeCDD	NA	0.422 U	1.504 U	1.463	1.491	0.364 U	0.266 U	0.489 U	0.07 U	2.158
1,2,3,7,8-PeCDF	NA	0.264 U	0.312 U	1.961 U	1.324 U	0.374 U	0.423 U	0.546 U	0.113 U	1.318
2,3,4,7,8-PeCDF	NA	0.28 U	0.33 U	2.542	2.081	0.932	0.547 U	0.559 U	0.115 U	1.556
1,2,3,4,7,8-HxCDD	NA	2.101	8.269	3.418	2.109 U	1.345	0.815 U	0.512 U	0.06 U	4.917
1,2,3,4,7,8-HxCDF	NA	10.918 U	132.626 U	6.81 U	13.165 U	4.102 U	6.655 U	3.626 U	0.362	8.004
1,2,3,6,7,8-HxCDD	NA	6.808	19.532	6.702	5.416	2.811 U	3.03	1.166	0.484 U	15.9
1,2,3,6,7,8-HxCDF	NA	0.582 U	1.324 U	1.325 U	0.256 U	0.477 U	0.744 U	0.436 U	0.579 U	14.861 U
1,2,3,7,8,9-HxCDD	NA	3.422	12.673	6.006	6.702	5.416	2.811 U	0.403 U	0.562	9.823
1,2,3,7,8,9-HxCDF	NA	1.035 U	2.355 U	1.308 U	0.398 U	0.741 U	1.156 U	0.62 U	0.145 U	1.498
2,3,4,6,7,8-HxCDF	NA	0.738 U	1.679 U	0.992 U	2.699 U	0.85 U	0.861 U	0.485 U	0.113 U	1.741
1,2,3,4,6,7,8-HpCDD	NA	209.733	956.893	115.35	105.061	59.359	74.143	35.907	11.269	397.932
1,2,3,4,6,7,8-HpCDF	NA	19.181	148.222	19.905	21.385	16.306	13.87	5.825	2.314	83.694
1,2,3,4,7,8,9-HpCDF	NA	9.123 U	15.45 U	2.416 U	2.778 U	1.603 U	0.884 U	1.13 U	0.183 U	4.009
OCDD	NA	1559.6 J	18756	891.773	769.657	489.04	521.332	269.6	92.704	3373.6
OCDF	NA	60.623	803.987	62.072	65.958	58.804	28.822	18.309	7.141	327.939
Total TCDD	NA	9.887	3.684	42.343	29.19	19.676	0.216 U	6.625	1.319	8.556
Total TCDF	NA	1.179	2.278	17.51	20.2	7.745	2.397	3.123	1.113	4.416
Total PeCDD	NA	6.777	3.493	40.059	30.856	15.23	1.58	2.055	0.322	11.733
Total PeCDF	NA	10.214	16.917	30.976 J	65.106 J	7.836 J	13.6 J	0.559 U	0.863	33.368
Total HxCDD	NA	55.112	101.36	101.942	76.022 J	26.007 J	14.479 J	9.843	6.288	98.865
Total HxCDF	NA	38.161	139.246 J	28.069 J	45.665 J	18.903 J	22.414 J	8.449	2.67	149.797
Total HpCDD	NA	393.351	1519.168	219.454	190.261	108.354	126.337	63.929	20.744	714.244
Total HpCDF	NA	19.181	148.222	19.905	21.385	16.306	13.87	5.825	6.494	346.032

Key is at the end of the table.

Table 4-7 (CONTINUED)

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224048	99224049	99224050	99234001	99234002	99234003	99234004	99234005	99234028	99234029
Sample Location		RES-42	RES-42A	RES-56	RES-50	RES-51	RES-53	RES-54	RES-55	RES-52	RES-57
Sample Date		5/28/99	5/28/99	5/28/99	6/1/99	6/1/99	6/1/99	6/1/99	6/1/99	6/3/99	6/3/99
Semivolatile Organic Compounds (mg/kg)											
1-Methylnaphthalene	56[c]	0.114 J	0.0949 J	0.218 U	0.437	0.209 U	0.592	0.361	0.221 U	0.179 U	0.17 U
2-Methylnaphthalene	56[c]	0.156 J	0.12 J	0.218 U	0.5	0.209 U	0.752	0.441	0.221 U	0.179 U	0.17 U
Carbazole	24[c]	0.201 U	0.157 U	0.218 U	0.126 J	0.209 U	0.099 J	0.0888 J	0.221 U	0.179 U	0.17 U
Acenaphthylene	3700[c]	0.201 U	0.157 U	0.218 U	0.162 J	0.209 U	0.178 U	0.178 U	0.221 U	0.179 U	0.17 U
Anthracene	22,000[c]	0.201 U	0.0418 J	0.218 U	0.243	0.209 U	0.196	0.161 J	0.221 U	0.179 U	0.17 U
Benzo(a)pyrene	0.062[c]	0.402 U	**0.0872 J**	0.437 U	**0.34 J**	0.419 U	**0.322 J**	**0.325 J**	0.442 U	0.358 U	0.34 U
Benzo(b)fluoranthene	0.62[c]	0.201 U	0.182	0.218 U	**0.931**	0.209 U	**0.925**	**0.702**	0.221 U	0.179 U	0.17 U
Benzo(g,h,i)perylene	2,300[c]	0.201 U	0.226	0.218 U	0.856	0.209 U	0.63	0.735	0.221 U	0.179 U	0.17 U
Benzo(k)fluoranthene	6.2[c]	0.201 U	0.0457 J	0.218 U	0.253	0.209 U	0.243	0.189	0.221 U	0.179 U	0.17 U
Benzoic acid	100,000[c]	1 U	0.785 U	1.09 U	0.855 U	1.05 U	0.892 U	0.89 U	1.1 U	0.895 U	0.851 U
Benzyl alcohol	18,000[c]	1 U	0.785 U	1.09 U	0.855 U	1.05 U	0.892 U	0.89 U	1.1 U	0.895 U	0.851 U
Chrysene	62[c]	0.055 J	0.141 J	0.218 U	0.482	0.209 U	0.518	0.388	0.221 U	0.179 U	0.17 U
Dibenzo(a,h)anthracene	0.062[c]	0.402 U	0.314 U	0.437 U	**0.364**	0.419 U	**0.369**	0.356 U	0.442 U	0.358 U	0.34 U
Dibenzofuran	290[c]	0.201 U	0.157 U	0.218 U	0.318	0.209 U	0.388	0.265	0.221 U	0.179 U	0.17 U
Fluoranthene	2,300[c]	0.0734 J	0.0984 J	0.218 U	0.489	0.209 U	0.522	0.354	0.0638 J	0.0598 J	0.17 U
Indeno(1,2,3-cd)pyrene	0.62[c]	0.402 U	0.372	0.437 U	**0.961**	0.419 U	**0.746**	**0.802**	0.442 U	0.358 U	0.34 U
Naphthalene	56[c]	0.115 J	0.157 U	0.218 U	0.438	0.209 U	0.592	0.368	0.221 U	0.179 U	0.17 U
Pentachlorophenol	3[c]	1 U	0.785 U	1.09 U	0.855 U	1.05 U	1.53	0.89 U	1.1 U	0.895 U	0.851 U
Phenanthrene	22,000[c]	0.0723 J	0.0957 J	0.218 U	0.404	0.209 U	0.476	0.272	0.0636 J	0.05 J	0.17 U
Pyrene	2,300[c]	0.201 U	0.0908 J	0.218 U	0.405	0.209 U	0.491	0.319	0.221 U	0.179 U	0.17 U
Retene	NA	0.513	0.268	0.218 U	1.47	0.106 J	1.66	1.09	0.221 U	0.179 U	0.0912 J

Key is at the end of the table.

Table 4-7 (CONTINUED)

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224048	99224049	99224050	99234001	99234002	99234003	99234004	99234005	99234028	99234029
Sample Location		RES-42	RES-42A	RES-56	RES-50	RES-51	RES-53	RES-54	RES-55	RES-52	RES-57
Sample Date		5/28/99	5/28/99	5/28/99	6/1/99	6/1/99	6/1/99	6/1/99	6/1/99	6/3/99	6/3/99
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9[c]	**10.452**	**195.086**	**5.894**	**137.361**	0.804	**434.898**	**147.648**	1.217	**7.385**	1.862
2,3,7,8-TCDD	3.9[c]	0.052 U	2.239	0.124 U	2.087	0.067 U	2.066	1.735	0.097 U	6.725 U	3.97 U
2,3,7,8-TCDF	NA	1.229	7.946	4.498	4.369	0.73	20.5	2.684	1.023	16.914 U	11.706 U
1,2,3,7,8-PeCDD	NA	1.699	26.571	1.226	21.583	0.204 U	27.786	15.905	0.225 U	4.114 U	3.828 U
1,2,3,7,8-PeCDF	NA	0.65	25.602	1.42	10.838	0.095 U	62.884	5.015	0.151 U	2.772 U	6.321 U
2,3,4,7,8-PeCDF	NA	0.766	24.106	2.149	9.737	0.274	51.463	6.857	0.284 U	5.518	5.796 U
1,2,3,4,7,8-HxCDD	NA	4.703	64.043	1.758	57.378	0.606	72.556	38.343	0.826 U	3.725 U	4.499 U
1,2,3,4,7,8-HxCDF	NA	5.19 U	125.165 U	4.123	60.974	0.23 U	273.502	55.123	0.706	8.291 U	26.764 U
1,2,3,6,7,8-HxCDD	NA	14.121	233.028	4.296	153.609	1.189	409.581	137.796	2.273 U	13.554	3.158 U
1,2,3,6,7,8-HxCDF	NA	0.218 U	175.254 U	3.724 U	175.598 U	0.809 U	7.089 U	3.685	0.321 U	4.615 U	9.022 U
1,2,3,7,8,9-HxCDD	NA	9.168	129.203	4.465	107.609	1.112	131.049	73.676	1.761	2.963 U	3.579 U
1,2,3,7,8,9-HxCDF	NA	0.824 U	26.475	0.579 U	8.005	0.272 U	57.733	6.246	0.457 U	7.174 U	14.026 U
2,3,4,6,7,8-HxCDF	NA	1.351	20.918	1.317	16.955	0.213 U	48.341	12.609 U	0.357 U	5.34 U	10.44 U
1,2,3,4,6,7,8-HpCDD	NA	404.25	7803.5	114.898	5155	24.025	21364	7130	65.429	268.134	65.99
1,2,3,4,6,7,8-HpCDF	NA	79.481	1640	20.988	1055	4.543	3960	1585	15.289	44.098	81.926
1,2,3,4,7,8,9-HpCDF	NA	4.44	76.84	1.334	58.342	0.596 U	143.853	59.364	0.894 U	6.249 U	30.637
OCDD	NA	3595.8	80675	966.313	42448	168.587	192124	59300	559.804	1383.212	551.789
OCDF	NA	393.89	15112	75.371	4626	11.174	9527	9003	52.676	102.869	216.867
Total TCDD	NA	11.139	16.739	19.685	37.178	10.637	29.585	22.106	11.148	300.865	3.97 U
Total TCDF	NA	7.394	33.331	22.332	30.264	3.54	75.847	24.444	4.37	63.21	40.349
Total PeCDD	NA	10.41	84.632	13.434	91.93	8.702	73.098	53.53	8.303	145.881	3.828 U
Total PeCDF	NA	19.116	480.14	25.516	293.969	2.645	1609	193.434	4.081	65.577	56.042
Total HxCDD	NA	110.837	1296.215	52.086	1226.153	20.69	3605	924.092	26.487	321.827	3.158 U
Total HxCDF	NA	94.034	2206.368	29.55	1500.791 J	4.8	8436	1502	15.019	30.88	9.022 U
Total HpCDD	NA	814.288	15281	212.06	11042.28	43.032	38343	13556.9	123.67	480.573	117.689
Total HpCDF	NA	337.59	6583.137	69.956	4529.389 J	13.667	4139	5293.61 J	57.587	44.098	140.854

Key is on the next page.

Table 4-7

SUMMARY OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), updated February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
SVOCs	= Semivolatile organic compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalency Quotient.
U	= The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-8

STATISTICAL ANALYSIS OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.000055 - 0.896212	RES-50	10/28	-	5/28	0.062	0/28	2.32	4/28	0.137	0/28	30
Benzo(a)pyrene	0.0657 - 0.34	RES-50	5/28	0.258 - 0.53	5/28	0.062	0/28	2.32	3/28	0.137	0/28	30
Benzo(b)fluoranthene	0.0728 - 0.931	RES-50	7/28	0.129 - 0.265	3/28	0.621	0/28	23.23	0/28	1.370	NA	NA
Benzo(k)fluoranthene	0.0372 - 0.253	RES-50	6/28	0.129 - 0.265	0/28	6.215	0/28	232.30	0/28	13.699	NA	NA
Chrysene	0.055 - 0.518	RES-53	10/28	0.129 - 0.265	0/28	62.148	0/28	2322.99	0/28	136.986	NA	NA
Dibenzo(a,h)anthracene	0.364 - 0.369	RES-53	2/28	0.258 - 0.53	2/28	0.062	0/28	2.32	2/28	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.272 - 0.961	RES-50	7/28	0.258 - 0.53	3/28	0.621	0/28	23.23	0/28	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	11.269 - 21364	RES-53	28/28	-	12/28	390	0/28	31384	7/28	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	2.314 - 3960	RES-53	28/28	-	5/28	390	0/28	31384	4/28	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	1.334 - 143.853	RES-53	8/28	0.183 - 44.54	0/28	390	0/28	31384	0/28	666.7	NA	NA
1,2,3,4,7,8-HxCDD	0.606 - 72.556	RES-53	18/28	0.06 - 7.249	3/28	39	0/28	3138	1/28	66.7	NA	NA
1,2,3,4,7,8-HxCDF	0.362 - 273.502	RES-53	7/28	0.23 - 180.931	3/28	39	0/28	3138	1/28	66.7	NA	NA
1,2,3,6,7,8-HxCDD	1.166 - 409.581	RES-53	22/28	0.484 - 15.411	6/28	39	0/28	3138	5/28	66.7	NA	NA
1,2,3,6,7,8-HxCDF	3.685	RES-54	1/28	0.218 - 175.598	0/28	39	0/28	3138	0/28	66.7	NA	NA
1,2,3,7,8,9-HxCDD	0.562 - 131.049	RES-53	18/28	0.403 - 19.819	3/28	78	0/28	3138	4/28	66.7	NA	NA
1,2,3,7,8,9-HxCDF	1.498 - 57.733	RES-53	5/28	0.145 - 24.529	1/28	39	0/28	3138	0/28	66.7	NA	NA
1,2,3,7,8-PeCDD	1.226 - 27.786	RES-53	15/28	0.07 - 4.114	5/28	3.9	0/28	314	5/28	6.7	NA	NA
1,2,3,7,8-PeCDF	0.65 - 62.884	RES-53	10/28	0.095 - 6.321	0/28	78	0/28	6277	0/28	133.3	NA	NA
2,3,4,6,7,8-HxCDF	1.317 - 48.341	RES-53	6/28	0.113 - 17.493	1/28	39	0/28	3138	0/28	66.7	NA	NA
2,3,4,7,8-PeCDF	0.274 - 51.463	RES-53	14/28	0.115 - 5.796	4/28	7.8	0/28	628	2/28	13.3	NA	NA
2,3,7,8-TCDD	0.276 - 2.239	RES-42A	5/28	0.026 - 6.725	0/28	3.9	0/28	314	0/28	6.7	NA	NA
2,3,7,8-TCDD TEQ	0.279 - 434.90	RES-53	28/28	-	17/28	3.9	1/28	314	14/28	6.7	16/28	5
2,3,7,8-TCDF	0.411 - 20.5	RES-53	19/28	0.317 - 16.914	0/28	3.899E-05	0/28	3138	0/28	66.7	NA	NA
OCDD	92.704 - 192124	RES-53	28/28	-	5/28	39000	0/28	3138357	2/28	66666.7	NA	NA
OCDF	7.141 - 15112	RES-42A	28/28	-	0/28	39000	0/28	3138357	0/28	66666.7	NA	NA
Total HpCDD	20.744 - 38343	RES-53	28/28	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	5.825 - 6583.137	RES-42A	28/28	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	6.288 - 3605	RES-53	27/28	3.158 - 3.158	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	2.67 - 8436	RES-53	27/28	9.022 - 9.022	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	0.322 - 145.881	RES-52	26/28	0.927 - 3.828	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	0.863 - 1609	RES-53	27/28	0.559 - 0.559	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	1.319 - 300.865	RES-52	26/28	0.216 - 3.97	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	1.06 - 75.847	RES-53	28/28	-	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-8

STATISTICAL ANALYSIS OF RESULTS FROM OPEN FIELD OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
ncPAHs (mg/kg)												
1-Methylnaphthalene	0.0597 - 0.592	RES-53	7/28	0.129 - 0.265	0/28	55.92	0/28	23.51	0/28	1600	NA	NA
2-Methylnaphthalene	0.0557 - 0.752	RES-53	10/28	0.129 - 0.265	0/28	55.92	0/28	23.51	0/28	1600	NA	NA
Acenaphthylene	0.162	RES-50	1/28	0.129 - 0.265	0/28	3681.71	0/28	284.05	0/28	4800	NA	NA
Anthracene	0.0418 - 0.243	RES-50	4/28	0.129 - 0.265	0/28	21896.12	0/28	6777.61	0/28	24000	NA	NA
Benzo(g,h,i)perylene	0.143 - 0.856	RES-50	8/28	0.129 - 0.265	0/28	2308.68	0/28	1959.13	0/28	2400	NA	NA
Fluoranthene	0.0368 - 0.522	RES-53	17/28	0.129 - 0.265	0/28	2293.61	0/28	6287.36	0/28	3200	NA	NA
Naphthalene	0.0546 - 0.592	RES-53	9/28	0.129 - 0.265	0/28	55.92	0/28	23.51	0/28	1600	NA	NA
ncPAH	0.0638 - 5.911	RES-53	21/28	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0437 - 0.476	RES-53	16/28	0.129 - 0.265	0/28	21896.12	0/28	6777.61	0/28	24000	NA	NA
Pyrene	0.0444 - 0.491	RES-53	9/28	0.129 - 0.265	0/28	2308.68	0/28	1959.13	0/28	2400	NA	NA
Retene	0.0691 - 1.66	RES-53	11/28	0.129 - 0.265	NA	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
Carbazole	0.0888 - 0.126	RES-50	3/28	0.129 - 0.265	0/28	24.32	NA	NA	0/28	50	NA	NA
Benzoic acid	0.807 - 2.55	RES-36	6/28	0.646 - 1.32	0/28	100000.00	0/28	263.04	0/28	320000	NA	NA
Benzyl alcohol	0.102	RES-49	1/28	0.646 - 1.32	0/28	18330.93	0/28	28.99	0/28	24000	NA	NA
Dibenzofuran	0.0382 - 0.388	RES-53	4/28	0.129 - 0.265	0/28	290.53	0/28	29.93	0/28	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	1.53	RES-53	1/28	0.646 - 1.32	0/28	2.98	1/28	0.077	0/28	8.33	0/28	11

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act (State of Washington).
NA = Not applicable.
ncPAHs = Non-carcinogenic polynuclear aromatic hydrocarbon.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalency Quotient.

Table 4-9

SUMMARY OF RESULTS FROM RESIDENTIAL OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99224000	99224005	99224008	99224011	99224012	99224013	99224020	99224023	99224024	99224026	99224027
Sample Location	Screening	RES-01	RES-06	RES-09	RES-03	RES-10	RES-13	RES-04	RES-17	RES-14	RES-19	RES-20
Sample Date	Levels[ab]	5/24/99	5/24/99	5/24/99	5/24/99	5/25/99	5/25/99	5/25/99	5/25/99	5/25/99	5/26/99	5/26/99
Semivolatiles (mg/kg)												
1-Methylnaphthalene	56[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.0622 J	0.188 U	0.151 U
2-Methylnaphthalene	56[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.105 J	0.188 U	0.151 U
Carbazole	24[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.196 U	0.188 U	0.151 U
Fluorene	2,600[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.196 U	0.188 U	0.151 U
Acenaphthene	3,700[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.196 U	0.188 U	0.151 U
Acenaphthylene	3,700[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.196 U	0.188 U	0.151 U
Anthracene	22,000[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.0496 J	0.196 U	0.188 U	0.151 U
Benzo(a)anthracene	0.62[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.239 U	0.196 U	0.188 U	0.151 U
Benzo(a)pyrene	0.062[c]	0.434 U	0.51 U	0.441 U	**0.1 J**	0.389 U	0.015 J	0.298 U	0.339 U	0.392 U	0.376 U	0.301 U
Benzo(b)fluoranthene	0.62[c]	0.217 U	0.255 U	0.22 U	0.185 J	0.194 U	0.251	0.149 U	0.398	0.194 J	0.188 U	0.151 U
Benzo(g,h,i)perylene	2,300[c]	0.217 U	0.255 U	0.22 U	0.227	0.194 U	0.303	0.149 U	0.273	0.196 U	0.188 U	0.151 U
Benzo(k)fluoranthene	6.2[c]	0.217 U	0.255 U	0.22 U	0.0636 J	0.194 U	0.0876 J	0.149 U	0.139 J	0.196 U	0.188 U	0.151 U
Benzoic acid	100,000[c]	1.08 U	1.27 U	1.1 U	1.04 U	1.15	1.22	0.746 U	0.985	1.09	1.15	0.753 U
Chrysene	62[c]	0.217 U	0.103 J	0.143 J	0.176 U	0.194 U	0.231	0.149 U	0.345	0.171 J	0.188 U	0.151 U
Dibenzo(a,h)anthracene	0.062[c]	0.434 U	0.51 U	0.441 U	0.414 U	0.389 U	0.461 U	0.298 U	0.339 U	0.392 U	0.376 U	0.301 U
Dibenzofuran	290[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.0499 J	0.188 U	0.151 U
Fluoranthene	2,300[c]	0.071 J	0.0993 J	0.166 J	0.167 J	0.194 U	0.363	0.0487 J	0.689	0.133 J	0.0917 J	0.0375 J
Indeno(1,2,3-cd)pyrene	0.62[c]	0.434 U	0.51 U	0.441 U	0.436	0.389 U	0.55	0.298 U	0.473	0.415	0.376 U	0.301 U
Naphthalene	56[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.048 J	0.096 J	0.0477 J	0.151 U
Phenanthrene	22,000[c]	0.217 U	0.091 J	0.15 J	0.0672 J	0.194 U	0.169 J	0.0422 J	0.393	0.104 J	0.0711 J	0.151 U
Phenol	3,700[c]	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.149 U	0.17 U	0.196 U	0.188 U	0.151 U
Pyrene	2,300[c]	0.217 U	0.0783 J	0.203 J	0.151 J	0.194 U	0.323	0.149 U	0.544	0.105 J	0.0577 J	0.151 U
Retene	NA	0.217 U	0.255 U	0.22 U	0.207 U	0.194 U	0.231 U	0.189	0.121 J	0.149 J	0.188 U	0.0962 J
Dioxin/Furans (ng/kg)												
2,3,7,8-TCDD TEQ	3.9[c]	**6.122**	**22.834**	3.789	**21.228**	3.004	**8.170**	**7.825**	**18.580**	**10.584**	**9.462**	**11.266**
2,3,7,8-TCDD	3.9[c]	1.012 U	0.907 U	0.529 U	0.509 U	0.394 U	0.306 U	0.303 U	0.189 U	0.273 U	0.293 U	0.183 U
2,3,7,8-TCDF	NA	2.695	3.513	0.469 U	3.063	1.507 U	2.18 U	1.984	2.313	4.045	2.344 U	0.659
1,2,3,7,8-PeCDD	NA	0.659 U	1.317 U	1.201 U	1.773 U	0.413 U	1.39 U	2.155	3.113	2.3	1.779	1.309
1,2,3,7,8-PeCDF	NA	0.921 U	2.445 U	0.618 U	2.583	0.397 U	0.732 U	0.809 U	1.363 U	3.062	1.005	0.72 U
2,3,4,7,8-PeCDF	NA	0.974 U	2.509	0.654 U	3.437	0.678 U	0.774 U	0.856 U	1.441 U	0.833 U	0.946 U	0.942
1,2,3,4,7,8-HxCDD	NA	3.255	11.911 U	1.798 U	5.959 U	2.431	5.441	4.562	7.608	4.696	5.01	4.233
1,2,3,6,7,8-HxCDD	NA	13.053	45.296	8.422	26.128	5.663	16.591	7.704	25.865	12.799	14.335	28.01
1,2,3,7,8,9-HxCDD	NA	6.003 U	30.188 U	4.813	12.295	3.415	9.454 U	7.236	14.551	8.853	10.364	10.711
1,2,3,7,8,9-HxCDF	NA	2.257 U	7.983 U	3.931 U	3.794 U	1.328 U	2.576 U	2.366 U	16.182 U	1.84 U	4.271 U	0.981
1,2,3,4,6,7,8-HpCDD	NA	339.445	1392.734	226.125	1115.446 JH	151.242	502.444	328.863	851.43	406.751	374.325	429.079
1,2,3,4,6,7,8-HpCDF	NA	56.887	142.284 U	29.301 U	221.85 JH	20.767	57	56.565 U	96.73	72.544	58.92	46.673
OCDD	NA	2401.546 JL	27295.692	1955.71	17617.943 JH	1271.038	3526.886 JL	2195	9215	2747	3082	2625
OCDF	NA	182.208	413.646	89.768	968.738 JH	60.994	198.007	131.704	305.63	237.321	207.441	70.115
Total TCDD	NA	24.512	22.942	5.859	22.672	10.426	20.22	15.454	17.229	18.626	12.486	4.453
Total TCDF	NA	33.417	23.215	3.438	22.531	1.504	7.94	7.048	16.908	35.155	6.619	2.623
Total PeCDD	NA	17.305	1.317 U	6.704	23.722	8.609	13.08	12.38	24.824	6.36	10.887	4.257
Total PeCDF	NA	16.073	85.065	16.596	57.537	10.928	23.408	23.485	50.922	63.403 J	25.259 J	20.363 J
Total HxCDD	NA	108.615	339.604	71.222	186.978	44.085	149.579	72.467	217.742	126.848	126.304	139.938
Total HxCDF	NA	104.327	275.66	48.907	263.692	31.646	85.476	68.066 J	148.356 J	99.922 J	74.098 J	94.883 J
Total HpCDD	NA	619.354	2664.454	429.29	1921.836	297.999	945.496	599.901	1549.108	753.612	679.503	928.882
Total HpCDF	NA	56.887	40.444 U	6.115 U	221.85	20.767	57	6.318 U	96.73	72.544	58.92	46.673

Key is at the end of the table.

Table 4-9

SUMMARY OF RESULTS FROM RESIDENTIAL OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99224028	99224029	99224030	99224031	99224032	99224033	99224037	99224039	99224040	99224041
Sample Location	Screening	RES-44A	RES-22	RES-23	RES-25	RES-24	RES-26	RES-15	RES-29	RES-30	RES-31
Sample Date	Levels[ab]	5/26/99	5/26/99	5/26/99	5/26/99	5/26/99	5/26/99	5/27/99	5/27/99	5/27/99	5/27/99
Semivolatiles (mg/kg)											
1-Methylnaphthalene	56[c]	0.175 U	0.135 J	0.171 U	0.165 U	0.183 U	0.172 U	0.186 U	0.165 U	0.171 U	0.178 U
2-Methylnaphthalene	56[c]	0.175 U	0.208	0.171 U	0.165 U	0.183 U	0.172 U	0.186 U	0.165 U	0.171 U	0.178 U
Carbazole	24[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.183 U	0.189	0.186 U	0.165 U	0.171 U	0.178 U
Fluorene	2,600[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.183 U	0.183	0.186 U	0.165 U	0.171 U	0.178 U
Acenaphthene	3,700[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.183 U	0.192	0.186 U	0.165 U	0.171 U	0.178 U
Acenaphthylene	3,700[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.183 U	0.172 U	0.186 U	0.165 U	0.171 U	0.178 U
Anthracene	22,000[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.183 U	0.339	0.186 U	0.165 U	0.171 U	0.178 U
Benzo(a)anthracene	0.62[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.183 U	**0.998**	0.186 U	0.165 U	0.171 U	0.178 U
Benzo(a)pyrene	0.062[c]	0.351 U	0.369 U	0.342 U	0.33 U	0.366 U	**1.37**	0.372 U	0.33 U	0.342 U	0.356 U
Benzo(b)fluoranthene	0.62[c]	0.175 U	0.335	0.171 U	0.0909 J	0.183 U	**1.7**	0.186 U	0.165 U	0.171 U	0.184
Benzo(g,h,i)perylene	2,300[c]	0.175 U	0.261	0.171 U	0.161 J	0.183 U	1.01	0.186 U	0.165 U	0.171 U	0.246
Benzo(k)fluoranthene	6.2[c]	0.175 U	0.126 J	0.171 U	0.165 U	0.183 U	0.611	0.186 U	0.165 U	0.171 U	0.0569 J
Benzoic acid	100,000[c]	0.877 U	1.4	0.856 U	0.998	7.2	1.01	1.16	0.824 U	0.995	0.984
Chrysene	62[c]	0.175 U	0.237	0.171 U	0.087 J	0.183 U	1.43	0.186 U	0.165 U	0.171 U	0.153 J
Dibenzo(a,h)anthracene	0.062[c]	0.351 U	0.369 U	0.342 U	0.33 U	0.366 U	**0.44**	0.372 U	0.33 U	0.342 U	0.356 U
Dibenzofuran	290[c]	0.175 U	0.0564 J	0.171 U	0.165 U	0.183 U	0.119 J	0.186 U	0.165 U	0.171 U	0.178 U
Fluoranthene	2,300[c]	0.108 J	0.359	0.0509 J	0.147 J	0.0693 J	2.92	0.0853 J	0.0716 J	0.0852 J	0.258
Indeno(1,2,3-cd)pyrene	0.62[c]	0.351 U	0.452	0.342 U	0.33 U	0.366 U	**1.24**	0.372 U	0.33 U	0.311 J	0.356 U
Naphthalene	56[c]	0.175 U	0.161 J	0.171 U	0.165 U	0.183 U	0.172 U	0.0495 J	0.165 U	0.171 U	0.178 U
Phenanthrene	22,000[c]	0.0778 J	0.189	0.171 U	0.0992 J	0.0531 J	2.18	0.0771 J	0.045 J	0.0656 J	0.161 J
Phenol	3,700[c]	0.175 U	0.184 U	0.171 U	0.165 U	0.304	0.172 U	0.186 U	0.165 U	0.171 U	0.178 U
Pyrene	2,300[c]	0.0786 J	0.299	0.171 U	0.118 J	0.183 U	2.71	0.0485 J	0.0649 J	0.171 U	0.239
Retene	NA	0.101 J	0.245	0.171 U	0.165 U	0.183 U	0.172 U	0.186 U	0.0862 J	0.171 U	0.0799 J
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9[c]	2.282	**47.362**	1.002	**4.733**	1.829	**9.626**	**4.939**	1.896	3.197	**4.044**
2,3,7,8-TCDD	3.9[c]	0.146 U	0.2 U	0.287 U	0.192 U	0.324 U	0.278 U	0.415 U	1.409 U	0.277 U	1.129
2,3,7,8-TCDF	NA	1.434	4.158 U	0.914	1.859 U	0.985 U	2.194	1.116 U	1.798 U	1.903	4.072
1,2,3,7,8-PeCDD	NA	0.398 U	8.386	0.417 U	0.766	0.269 U	1.804	1.537 U	1.273 U	0.347 U	0.542 U
1,2,3,7,8-PeCDF	NA	0.543 U	1.826 U	0.317 U	0.871 U	0.318 U	1.101 U	1.028	0.991 U	1.304 U	0.865 U
2,3,4,7,8-PeCDF	NA	0.572 U	3.104 U	0.329 U	0.813 U	0.33 U	0.851 U	0.567 U	1.028 U	1.333 U	1.313
1,2,3,4,7,8-HxCDD	NA	1.488	26.617	0.842 U	1.819	1.328 U	4.439 U	4.153	4.239 U	2.27	1.125 U
1,2,3,6,7,8-HxCDD	NA	4.05	70.748	2.95 U	7.39	5.031	19.71	11.576	3.153	5.073	3.052 U
1,2,3,7,8,9-HxCDD	NA	2.619	54.04	1.865 U	3.914	2.77 U	11.339	7.441	3.372 U	2.396	2.313
1,2,3,7,8,9-HxCDF	NA	0.5	2.438	0.957 U	1.316 U	1.554 U	3.204 U	0.786	2.753 U	3.684 U	3.764 U
1,2,3,4,6,7,8-HpCDD	NA	103.181	1851.16	84.109	206.295	105.951	418.47	211.196	131.101	151.412	123.156
1,2,3,4,6,7,8-HpCDF	NA	15.121	305.053	17.373 U	40.005	17.214	57.743 U	24.819	17.535	37.278	28.357
OCDD	NA	848.728	19199	647.154	1782.159	895.737	2957	1265.66	899.383	1266.399	951.721
OCDF	NA	46.841	1093.696	52.654	134.48	49.694	173.918	52.481	44.793	195.212	93.92
Total TCDD	NA	3.974	30.795	2.535	6.056	4.943	27.641	5.78	6.759	7.395	20.486
Total TCDF	NA	8.997	19.848	0.184 U	6.193	4.389	11.188	2.356	1.798 U	6.184	32.023
Total PeCDD	NA	2.261 J	60.674	0.417 U	11.806	1.825	21.613	5.232	1.273 U	2.847	11.778
Total PeCDF	NA	16.721 J	95.494 J	4.296	11.541 J	50.632	22.06 J	18.83 J	12.047	8.046	99.447 J
Total HxCDD	NA	29.344	529.785	14.725 J	55.92	34.403 J	136.26 J	78.073	14.037	44.863	50.09 J
Total HxCDF	NA	26.198 J	396.418 J	22.232 J	54.572 J	26.855 J	83.105 J	41.296 J	11.311	20.785 J	33.983 J
Total HpCDD	NA	181.605	3185.848	143.785	350.069	188.522	707.465	357.993	228.701	257.106	220.675
Total HpCDF	NA	15.121	305.053	1.928 U	40.005	17.214	5.411 U	24.819	17.535	37.278	28.357

Key is at the end of the table.

Table 4-9

SUMMARY OF RESULTS FROM RESIDENTIAL OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99224042	99224044	99224045	99234023	99234026	99234027
Sample Location	Screening	RES-33	RES-34	RES-35	RES-21A	RES-37	RES-58
Sample Date	Levels[ab]	5/27/99	5/27/99	5/27/99	6/2/99	6/3/99	6/3/99
Semivolatiles (mg/kg)							
1-Methylnaphthalene	56[c]	0.0641 J	0.187 U	0.118 J	0.146 U	0.168 U	0.17 U
2-Methylnaphthalene	56[c]	0.103 J	0.0774 J	0.184	0.146 U	0.168 U	0.17 U
Carbazole	24[c]	0.185 U	0.0728 J	0.181 U	0.146 U	0.168 U	0.17 U
Fluorene	2,600[c]	0.185 U	0.0535 J	0.181 U	0.146 U	0.168 U	0.17 U
Acenaphthene	3,700[c]	0.185 U	0.187 U	0.181 U	0.146 U	0.168 U	0.17 U
Acenaphthylene	3,700[c]	0.185 U	0.124 J	0.181 U	0.146 U	0.168 U	0.17 U
Anthracene	22,000[c]	0.185 U	0.153 J	0.181 U	0.146 U	0.168 U	0.17 U
Benzo(a)anthracene	0.62[c]	0.185 U	**0.752**	0.181 U	0.146 U	0.168 U	0.17 U
Benzo(a)pyrene	0.062[c]	0.37 U	**1.13**	0.362 U	0.293 U	0.336 U	0.34 U
Benzo(b)fluoranthene	0.62[c]	0.185 U	**1.38**	0.181 U	0.0871 J	0.168 U	0.17 U
Benzo(g,h,i)perylene	2,300[c]	0.197	0.989	0.188	0.146 U	0.162 J	0.17 U
Benzo(k)fluoranthene	6.2[c]	0.185 U	0.512	0.181 U	0.146 U	0.168 U	0.17 U
Benzoic acid	100,000[c]	1.09	0.934 U	1.05	0.881	0.841 U	0.923
Chrysene	62[c]	0.123 J	1.18	0.107 J	0.0971 J	0.168 U	0.17 U
Dibenzo(a,h)anthracene	0.062[c]	0.37 U	**0.422**	0.362 U	0.293 U	0.336 U	0.34 U
Dibenzofuran	290[c]	0.185 U	0.0539 J	0.0492 J	0.146 U	0.168 U	0.17 U
Fluoranthene	2,300[c]	0.14 J	2.3	0.128 J	0.0953 J	0.0704 J	0.0682 J
Indeno(1,2,3-cd)pyrene	0.62[c]	0.37 U	**1.12**	0.362 U	0.293 U	0.336 U	0.318 J
Naphthalene	56[c]	0.0765 J	0.187 U	0.133 J	0.146 U	0.168 U	0.0485 J
Phenanthrene	22,000[c]	0.103 J	1.33	0.15 J	0.0643 J	0.0663 J	0.0645 J
Phenol	3,700[c]	0.185 U	0.187 U	0.181 U	0.146 U	0.168 U	0.17 U
Pyrene	2,300[c]	0.131 J	2.39	0.101 J	0.0899 J	0.0586 J	0.0517 J
Retene	NA	0.213	0.182 J	0.346	0.146 U	0.15 J	0.164 J
Dioxin/Furans (ng/kg)							
2,3,7,8-TCDD TEQ	3.9[c]	2.502	1.226	**7.022**	8.932	**7.898**	0.570
2,3,7,8-TCDD	3.9[c]	0.231 U	0.285 U	1.195 U	0.458 U	0.54 U	0.349 U
2,3,7,8-TCDF	NA	1.913 U	2.417 U	3.021	2.269	3.777	0.328 U
1,2,3,7,8-PeCDD	NA	0.492 U	0.426 U	0.753 U	1.624	1.231	0.462 U
1,2,3,7,8-PeCDF	NA	0.757 U	0.538 U	4.471	1.774 U	1.514 U	0.382 U
2,3,4,7,8-PeCDF	NA	0.774 U	0.653 U	1.054	1.569	1.896	0.396 U
1,2,3,4,7,8-HxCDD	NA	2.037 U	1.474 U	2.555	2.892 U	3.928	0.619 U
1,2,3,6,7,8-HxCDD	NA	5.874 U	2.719 U	9.703	12.423	7.29	1.169 U
1,2,3,7,8,9-HxCDD	NA	4.402	1.492 U	5.64	7.279	6.909	0.953 U
1,2,3,7,8,9-HxCDF	NA	2.632 U	1.847 U	7.307 U	1.913 U	1.54	0.68 U
1,2,3,4,6,7,8-HpCDD	NA	154.55	96.961	305.471	347.043	263.21	42.845
1,2,3,4,6,7,8-HpCDF	NA	37.108	17.703	73.093	54.778	48.256	11.031
OCDD	NA	1280.935	737.002	3519	2917.602 JL	2344.016	318.231
OCDF	NA	170.115	61.817	424	166.74	253.497	29.125 U
Total TCDD	NA	22.52	11.284	32.244	7.598	20.531	1.808
Total TCDF	NA	23.19	15.373	29.222	5.731	13.625	3.547
Total PeCDD	NA	7.451	1.301	0.753 U	16.319	15.962	0.462 U
Total PeCDF	NA	43.923	28.846	55.21	24.476	43.191	5.097
Total HxCDD	NA	60.31	39.956	106.177	97.388	80.241	4.106
Total HxCDF	NA	46.222	26.311	35.775	78.114	57.176	12.808
Total HpCDD	NA	273.664	176.759	548.878	625.888	454	76.903
Total HpCDF	NA	37.108	17.703	73.093	54.778	48.256	12.159

Key is on the next page.

Table 4-9

SUMMARY OF RESULTS FROM RESIDENTIAL OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample Concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), updated February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JH	= The analyte was positively identified. The associated numerical result is estimated, biased high.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
SVOCs	= Semivolatile organic compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalency Quotient.
U	= The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-10

STATISTICAL ANALYSIS OF RESULTS FROM RESIDENTIAL OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.000103 - 2.21134	RES-26	16/27	-	6/27	0.062	0/27	2.32	3/27	0.137	0/27	30
Benzo(a)anthracene	0.752 - 0.998	RES-26	2/27	0.146 - 0.255	2/27	0.621	0/27	23.23	0/27	1.370	NA	NA
Benzo(a)pyrene	0.015 - 1.37	RES-26	4/27	0.293 - 0.51	3/27	0.062	0/27	2.32	2/27	0.137	NA	30
Benzo(b)fluoranthene	0.0871 - 1.7	RES-26	10/27	0.149 - 0.255	2/27	0.621	0/27	23.23	2/27	1.370	NA	NA
Benzo(k)fluoranthene	0.0569 - 0.611	RES-26	7/27	0.146 - 0.255	0/27	6.215	0/27	232.30	0/27	13.699	NA	NA
Chrysene	0.087 - 1.43	RES-26	13/27	0.149 - 0.217	0/27	62.148	0/27	2322.99	0/27	136.986	NA	NA
Dibenzo(a,h)anthracene	0.422 - 0.44	RES-26	2/27	0.293 - 0.51	2/27	0.062	0/27	2.32	2/27	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.311 - 1.24	RES-26	9/27	0.293 - 0.51	2/27	0.621	0/27	23.23	0/27	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	42.845 - 1851.16	RES-22	27/27	-	8/27	390	0/27	31384	4/27	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	11.031 - 305.053	RES-22	22/27	17.373 - 142.284	0/27	390	0/27	31384	0/27	666.7	NA	NA
1,2,3,4,7,8-HxCDD	1.488 - 26.617	RES-22	15/27	0.619 - 11.911	0/27	39	0/27	3138	0/27	66.7	NA	NA
1,2,3,6,7,8-HxCDD	3.153 - 70.748	RES-22	22/27	1.169 - 5.874	2/27	39	0/27	3138	1/27	66.7	NA	NA
1,2,3,7,8,9-HxCDD	2.313 - 54.04	RES-22	19/27	0.953 - 30.188	0/27	78	0/27	3138	0/27	66.7	NA	NA
1,2,3,7,8,9-HxCDF	0.5 - 2.438	RES-22	5/27	0.68 - 16.182	0/27	39	0/27	3138	0/27	66.7	NA	NA
1,2,3,7,8-PeCDD	0.766 - 8.386	RES-22	10/27	0.269 - 1.773	1/27	3.9	0/27	314	1/27	6.7	NA	NA
1,2,3,7,8-PeCDF	1.005 - 4.471	RES-35	5/27	0.317 - 2.445	0/27	78	0/27	628	0/27	133.3	NA	NA
2,3,4,7,8-PeCDF	0.942 - 3.437	RES-03	7/27	0.329 - 3.104	0/27	7.8	0/27	628	0/27	13.3	NA	NA
2,3,7,8-TCDD	1.129	RES-31	1/27	0.146 - 1.409	0/27	3.9	0/27	314	0/27	6.7	NA	NA
2,3,7,8-TCDD TEQ	0.571 - 47.36	RES-22	27/27	-	17/27	3.9	0/27	314	13/27	6.7	14/27	5
2,3,7,8-TCDF	0.659 - 4.072	RES-31	15/27	0.328 - 4.158	0/27	3.9	0/27	3138	0/27	66.7	NA	NA
OCDD	318.231 - 27295.692	RES-06	27/27	-	0/27	39000	0/27	3138357	0/27	66666.7	NA	NA
OCDF	44.793 - 1093.696	RES-22	26/27	29.125 - 29.125	0/27	39000	0/27	3138357	0/27	66666.7	NA	NA
Total HpCDD	76.903 - 3185.848	RES-22	27/27	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	12.159 - 305.053	RES-22	22/27	1.928 - 40.444	0/27	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	4.106 - 529.785	RES-22	27/27	-	0/27	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	11.311 - 396.418	RES-22	27/27	-	0/27	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	1.301 - 60.674	RES-22	22/27	0.417 - 1.317	0/27	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	4.296 - 99.447	RES-31	27/27	-	0/27	NA	NA	NA	NA	NA	NA	NA
Total TCDD	1.808 - 32.244	RES-35	27/27	-	0/27	NA	NA	NA	NA	NA	NA	NA
Total TCDF	1.504 - 35.155	RES-14	25/27	0.184 - 1.798	0/27	NA	NA	NA	NA	NA	NA	NA

Table 4-10

STATISTICAL ANALYSIS OF RESULTS FROM RESIDENTIAL OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
ncPAHs (mg/kg)												
1-Methylnaphthalene	0.0622 - 0.135	RES-22	4/27	0.146 - 0.255	0/27	55.92	0/27	23.51	0/27	1600	NA	NA
2-Methylnaphthalene	0.0774 - 0.208	RES-22	5/27	0.146 - 0.255	0/27	55.92	0/27	23.51	0/27	1600	NA	NA
Fluorene	0.0535 - 0.183	RES-24	2/27	0.146 - 0.255	0/27	2643.61	0/27	304.64	0/27	3200	NA	NA
Acenaphthene	0.192	RES-26	1/27	0.146 - 0.255	0/27	3681.71	0/27	284.05	0/27	4800	NA	NA
Acenaphthylene	0.124	RES-34	1/27	0.146 - 0.255	0/27	3681.71	0/27	284.05	0/27	4800	NA	NA
Anthracene	0.0496 - 0.339	RES-26	3/27	0.146 - 0.255	0/27	21896.12	0/27	6777.61	0/27	24000	NA	NA
Benzo(g,h,i)perylene	0.161 - 1.01	RES-26	11/27	0.146 - 0.255	0/27	2308.68	0/27	1959.13	0/27	2400	NA	NA
Fluoranthene	0.0375 - 2.92	RES-26	26/27	0.194 - 0.194	0/27	2293.61	0/27	6287.36	0/27	3200	NA	NA
Naphthalene	0.0477 - 0.161	RES-22	8/27	0.146 - 0.255	0/27	55.92	0/27	23.51	0/27	1600	NA	NA
ncPAH	0.0509 - 9.534	RES-26	26/27	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0422 - 2.18	RES-26	23/27	0.151 - 0.217	0/27	21896.12	0/27	6777.61	0/27	24000	NA	NA
Pyrene	0.0485 - 2.71	RES-26	20/27	0.149 - 0.217	0/27	2308.68	0/27	1959.13	0/27	2400	NA	NA
Retene	0.0799 - 0.346	RES-35	13/27	0.146 - 0.255	NA	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
Carbazole	0.0728 - 0.189	RES-26	2/27	0.146 - 0.255	0/27	24.32	NA	NA	0/27	50	NA	NA
Benzoic acid	0.881 - 7.2	RES-24	16/27	0.746 - 1.27	0/27	100000.00	0/27	263.04	0/27	320000	NA	NA
Dibenzofuran	0.0492 - 0.119	RES-26	5/27	0.146 - 0.255	0/27	290.53	0/27	29.93	0/27	320	NA	NA
Phenols (mg/kg)												
Phenol	0.304	RES-24	1/27	0.146 - 0.255	0/27	36661.86	0/27	80.64	0/27	48000	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act (State of Washington).
NA = Not applicable.
ncPAHs = Non-carcinogenic polynuclear aromatic hydrocarbon.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalency Quotient.

Table 4-11

SUMMARY OF RESULTS FROM BIASED OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224002	99224009	99224010	99224014	99224015	99224016
Sample Location		RES-R-1	RES-R-2	RES-R-3	RES-D-4	RES-D-5	RES-D-6
Sample Date		5/24/99	5/24/99	5/24/99	5/25/99	5/25/99	5/25/99
SVOCs (mg/kg)							
2-Methylnaphthalene	56[c]	0.209 U	0.192 U	0.182 U	0.224 U	0.21 U	0.102 J
Chrysene	62[c]	0.209 U	0.192 U	0.0535 J	0.224 U	0.21 U	0.219 U
Fluoranthene	2,300[c]	0.209 U	0.192 U	0.0988 J	0.0937 J	0.21 U	0.0552 J
Naphthalene	56[c]	0.0682 J	0.192 U	0.182 U	0.224 U	0.21 U	0.219 U
Phenanthrene	22,000[c]	0.0722 J	0.192 U	0.0701 J	0.0788 J	0.21 U	0.0651 J
Pyrene	2300[c]	0.0545 J	0.192 U	0.0648 J	0.056 J	0.21 U	0.219 U
Retene	NA	0.0832 J	0.192 U	0.182 U	0.315	0.21 U	0.219 U
Dioxin/Furans (ng/kg)							
2,3,7,8-TCDD TEQ	3.9[c]	**14.658**	**10.949**	**9.614**	**17.630**	**192.496**	**89.608**
2,3,7,8-TCDF	NA	2.91	3.046 U	1.619 U	1.234 U	7.94	1.839
1,2,3,7,8-PeCDD	NA	2.333	2.692	2.673	1.961 U	11.538	7.323
2,3,4,7,8-PeCDF	NA	5.96 U	1.44	0.993 U	2.441 U	30.129	2.245 U
1,2,3,4,7,8-HxCDD	NA	6.977		4.736	8.557	39.549	20.837
1,2,3,6,7,8-HxCDD	NA	19.014	14.624	11.14	28.845	195.493	75.682
1,2,3,7,8,9-HxCDD	NA	11.678	11.117	10.806	16.003	80.925	42.349
1,2,3,4,6,7,8-HpCDD	NA	580.237	412.918	331.512	935.822	11437.712	6126.318
1,2,3,4,6,7,8-HpCDF	NA	127.472	47.752	41.597	97.585	922.045	280.095
OCDD	NA	11261.752	3427.321	5288.116 JL	19124.413	94094.721	40464.975
OCDF	NA	638.637 JH	134.474	130.877	432.094	4961.422	1031.823
Total TCDD	NA	7.881	15.256	11.722	13.516	13.995	7.951
Total TCDF	NA	48.081	6.304	9.573	7.315	30.269	6.81
Total PeCDD	NA	2.333	12.235	10.747	5.625	40.34	25.957
Total PeCDF	NA	53.103	28.419	17.442	27.848	496.287	69.471
Total HxCDD	NA	118.141	119.845	58.815	201.916	930.241	491.236
Total HxCDF	NA	188.607	85.362	52.872	159.663	2250.72	399.836
Total HpCDD	NA	977.593	797.227	607.88	1733.593	10408.318 JL	10838.518
Total HpCDF	NA	127.472	47.752	41.597	97.585	922.045	280.095

Key is on the next page.

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample Concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), updated February 1996. Values are based on revised MTCA (February 2001).

Table 4-11

SUMMARY OF RESULTS FROM BIASED OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JH = The analyte was positively identified. The associated numerical result is estimated, biased high.
JL = The analyte was positively identified. The associated numerical result is estimated, biased low.
mg/kg = Milligrams per kilograms.
ng/kg = Nanograms per kilogram.
NA = Not applicable.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
SVOCs = Semivolatile organic compounds.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-12

STATISTICAL ANALYSIS OF RESULTS FROM BIASED OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0000535	RES-R-3	1/6	-	0/6	0.062	0/6	2.32	0/6	0.137	0/6	30
Chrysene	0.0535	RES-R-3	1/6	0.192 - 0.224	0/6	62.148	0/6	2322.99	0/6	136.986	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	331.512 - 11437.712	RES-D-5	6/6	-	5/6	390.0	0/6	31384	3/6	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	41.597 - 922.045	RES-D-5	6/6	-	1/6	390.0	0/6	31384	1/6	666.7	NA	NA
1,2,3,4,7,8-HxCDD	4.736 - 39.549	RES-D-5	5/6	4.746	1/6	39.0	0/6	3138	0/6	66.7	NA	NA
1,2,3,6,7,8-HxCDD	11.14 - 195.493	RES-D-5	6/6	-	2/6	39.0	0/6	3138	2/6	66.7	NA	NA
1,2,3,7,8,9-HxCDD	10.806 - 80.925	RES-D-5	6/6	-	1/6	7.8	0/6	3138	1/6	66.7	NA	NA
1,2,3,7,8-PeCDD	2.333 - 11.538	RES-D-5	5/6	1.961	2/6	3.9	0/6	314	2/6	6.7	NA	NA
2,3,4,7,8-PeCDF	1.44 - 30.129	RES-D-5	2/6	0.993 - 5.96	1/6	7.8	0/6	628	1/6	13.3	NA	NA
2,3,7,8-TCDD TEQ	9.61419 - 192.49638	RES-D-5	6/6	-	6/6	3.9	0/6	314	6/6	6.7	6/6	5
2,3,7,8-TCDF	1.839 - 7.94	RES-D-5	3/6	1.234 - 3.046	0/6	39.0	0/6	3138	0/6	66.7	NA	NA
OCDD	3427.321 - 94094.721	RES-D-5	6/6	-	2/6	39000.0	0/6	3138357	1/6	66666.7	NA	NA
OCDF	130.877 - 4961.422	RES-D-5	6/6	-	0/6	39000.0	0/6	3138357	0/6	66666.7	NA	NA
Total HpCDD	607.88 - 10838.518	RES-D-6	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	41.597 - 922.045	RES-D-5	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	58.815 - 930.241	RES-D-5	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	52.872 - 2250.72	RES-D-5	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	2.333 - 40.34	RES-D-5	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	17.442 - 496.287	RES-D-5	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	7.881 - 15.256	RES-R-2	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	6.304 - 48.081	RES-R-1	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg.kg)												
2-Methylnaphthalene	0.102	RES-D-6	1/6	0.182 - 0.224	0/6	55.92	0/6	23.51	0/6	1600	NA	NA
Fluoranthene	0.0552 - 0.0988	RES-R-3	3/6	0.192 - 0.21	0/6	2293.61	0/6	6287.36	0/6	3200	NA	NA
Naphthalene	0.0682	RES-R-1	1/6	0.182 - 0.224	0/6	55.92	0/6	23.51	0/6	1600	NA	NA
ncPAH	0.2223 - 0.5435	RES-D-4	4/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0651 - 0.0788	RES-D-4	4/6	0.192 - 0.21	0/6	21896.12	0/6	6777.61	0/6	24000	NA	NA
Pyrene	0.0545 - 0.0648	RES-R-3	3/6	0.192 - 0.219	0/6	2308.68	0/6	1959.13	0/6	2400	NA	NA
Retene	0.0832 - 0.315	RES-D-4	2/6	0.182 - 0.219	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-12

STATISTICAL ANALYSIS OF RESULTS FROM BIASED OFF-FACILITY SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polynuclear aromatic hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act (State of Washington).
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polynuclear aromatic hydrocarbon.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.

Table 4-13

DIOXIN CONGENER DISTRIBUTION IN ON-FACILITY SOIL
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	97020411		97020416		97020421		97020430		97020432	
Analyte	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total
2,3,7,8-TCDD	0.061	0.001	0.0084	0.002	0.01	0.001	0.0045	0.001	0.036	0.001
1,2,3,7,8-PeCDD	1.7	0.031	0.14	0.032	0.18	0.019	0.069	0.022	0.82	0.021
1,2,3,4,7,8-HxCDD	5.3	0.098	0.51	0.118	0.49	0.052	0.24	0.077	2.5	0.065
1,2,3,6,7,8-HxCDD	34	0.628	2.5	0.580	2.7	0.286	1.2	0.385	11	0.287
1,2,3,7,8,9-HxCDD	7.2	0.133	0.95	0.220	0.9	0.095	0.51	0.163	4.5	0.117
1,2,3,4,6,7,8-HpCDD	670	12.370	58	13.460	76	8.042	26	8.331	250	6.518
OCDD	4400	81.239	310	71.941	800	84.648	260	83.315	3400	88.643
2,3,7,8-TCDF	0.3	0.006	0.061	0.014	0.038	0.004	0.013	0.004	0.12	0.003
1,2,3,7,8-PeCDF	1.2	0.022	0.14	0.032	0.12	0.013	0.043	0.014	0.44	0.011
2,3,4,7,8-PeCDF	3.1	0.057	0.68	0.158	0.28	0.030	0.13	0.042	1.1	0.029
1,2,3,4,7,8-HxCDF	5.5	0.102	0.83	0.193	0.59	0.062	0.21	0.067	2	0.052
1,2,3,6,7,8-HxCDF	2.1	0.039	0.15	0.035	0.2	0.021	0.1	0.032	1.3	0.034
1,2,3,7,8,9-HxCDF	0.57	0.011	0.2	0.046	0.06	0.006	0.11	0.035	0.29	0.008
2,3,4,6,7,8-HxCDF	2.4	0.044	0.53	0.123	0.15	0.016	0.23	0.074	1.6	0.042
1,2,3,4,6,7,8-HpCDF	68	1.256	9.6	2.228	9.6	1.016	4.9	1.570	28	0.730
1,2,3,4,7,8,9-HpCDF	4.7	0.087	0.61	0.142	0.77	0.081	0.31	0.099	1.9	0.050
OCDF	210	3.877	46	10.675	53	5.608	18	5.768	130	3.389

Table 4-13

DIOXIN CONGENER DISTRIBUTION IN ON-FACILITY SOIL
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Technical PCP [a]		Rural Soil [a]		Urban Background [a]	
	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total
2,3,7,8-TCDD	ND (0.05)	0	0.000017	0.002	0.00087	0.03
1,2,3,7,8-PeCDD	ND (1)	0	0.00028	0.04	0.0024	0.08
1,2,3,4,7,8-HxCDD	8	0.0003	0.00053	0.07	0.0027	0.09
1,2,3,6,7,8-HxCDD	600	0.02	0.0037	0.48	0.0053	0.18
1,2,3,7,8,9-HxCDD	13	0.0004	0.0024	0.31	0.0051	0.18
1,2,3,4,6,7,8-HpCDD	89,000	2.89	0.72	9.35	0.099	3.41
OCDD	2,723,000	88.55	0.630	81.8	2.700	93.0
2,3,7,8-TCDF	ND (0.5)	0	0.0013	0.17	0.0023	0.08
1,2,3,7,8-PeCDF	ND (1)	0	0.00034	0.04	0.0018	0.06
2,3,4,7,8-PeCDF	ND (1)	0	0.00052	0.07	0.0032	0.11
1,2,3,4,7,8-HxCDF	67	0.002	0.0010	0.13	0.0040	0.14
1,2,3,6,7,8-HxCDF	2	0.00007	0.00066	0.09	0.0036	0.12
1,2,3,7,8,9-HxCDF	ND (1)	0	0.00040	0.05	0.00075	0.03
2,3,4,6,7,8-HxCDF	ND (1)	0	0.00077	0.10	0.0026	0.09
1,2,3,4,6,7,8-HpCDF	22,000	0.72	0.018	2.34	0.017	0.59
1,2,3,4,7,8,9-HpCDF	3,400	0.11	0.00059	0.08	0.0015	0.05
OCDF	237,000	7.71	0.040	5.19	0.023	0.79

[a] Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, EPA September 2000.

Key:

HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
µg/kg = Micrograms per kilogram.
ND = Not detected. Number in parentheses is detection limit.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PCP = Pentachlorophenol.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDF = Tetrachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-p-dioxin.

Table 4-14

DIOXIN CONGENER DISTRIBUTION IN ON-FACILITY SOURCE (EVAPORATOR) AIR
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	99070214		99070246		99070299		99090114		99090149	
Analyte	Concentration (pg/m^3)	Percentage of Total	Concentration (pg/m^3)	Percentage of Total	Concentration (pg/m^3)	Percentage of Total	Concentration (pg/m^3)	Percentage of Total	Concentration (pg/m^3)	Percentage of Total
2,3,7,8-TCDD	0.0648	0.012	0.16	0.014	0.179	0.008	0.0485	0.017	0.0416	0.015
1,2,3,7,8-PeCDD	0.311	0.057	0.723	0.063	0.845	0.038	0.129	0.044	0.16	0.058
1,2,3,4,7,8-HxCDD	0.337	0.062	1.35	0.118	3.14	0.140	0.177	0.061	0.439	0.160
1,2,3,6,7,8-HxCDD	1.92	0.352	4.24	0.369	9.66	0.431	0.631	0.216	1.06	0.387
1,2,3,7,8,9-HxCDD	0.855	0.157	2.24	0.195	4.83	0.215	0.267	0.091	0.486	0.177
1,2,3,4,6,7,8-HpCDD	51.8	9.505	127	11.061	266	11.855	17.7	6.059	27.8	10.148
OCDD	440	80.736	922	80.301	1790	79.776	243	83.189	217	79.212
2,3,7,8-TCDF	0.0829	0.015	0.222	0.019	0.213	0.009	0.0558	0.019	0.0509	0.019
1,2,3,7,8-PeCDF	0.114	0.021	0.274	0.024	0.29	0.013	0.0655	0.022	0.0601	0.022
2,3,4,7,8-PeCDF	0.15	0.028	0.349	0.030	0.411	0.018	0.109	0.037	0.102	0.037
1,2,3,4,7,8-HxCDF	0.44	0.081	0.847	0.074	1.81	0.081	0.243	0.083	0.393	0.143
1,2,3,6,7,8-HxCDF	0.0881	0.016	0.324	0.028	0.435	0.019	0.0922	0.032	0.134U	0.049
1,2,3,7,8,9-HxCDF	0.0518	0.010	0.0798	0.007	0.167	0.007	0.0243	0.008	0.0208	0.008
2,3,4,6,7,8-HxCDF	0.249U	0.046	0.548	0.048	1.14	0.051	0.291	0.100	0.15	0.055
1,2,3,4,6,7,8-HpCDF	14.2U	2.606	24.4U	2.125	48.3U	2.153	4.61U	1.578	5.78U	2.110
1,2,3,4,7,8,9-HpCDF	0.622	0.114	1.12	0.098	2.37	0.106	0.364	0.125	0.37	0.135
OCDF	33.7	6.184	62.3	5.426	114	5.081	24.3	8.319	19.9	7.264

Table 4-14

DIOXIN CONGENER DISTRIBUTION IN ON-FACILITY SOURCE (EVAPORATOR) AIR
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Rural Background [a]		Urban Background [a]	
	Concentration (pg/m^3)	Percentage of Total	Concentration (pg/m^3)	Percentage of Total
2,3,7,8-TCDD	0.0001	0.01	0.0007	0.02
1,2,3,7,8-PeCDD	0.0029	0.34	0.0039	0.12
1,2,3,4,7,8-HxCDD	0.0042	0.50	0.0110	0.35
1,2,3,6,7,8-HxCDD	0.0057	0.67	0.0248	0.79
1,2,3,7,8,9-HxCDD	0.0061	0.72	0.0280	0.89
1,2,3,4,6,7,8-HpCDD	0.1473	17.4	0.5561	17.8
OCDD	0.5591	66.0	1.8547	59.3
2,3,7,8-TCDF	0.0016	0.19	0.2158	6.89
1,2,3,7,8-PeCDF	0.0039	0.46	0.0567	1.81
2,3,4,7,8-PeCDF	0.0065	0.76	0.0213	0.68
1,2,3,4,7,8-HxCDF	0.0074	0.87	0.0436	1.39
1,2,3,6,7,8-HxCDF	0.0066	0.78	0.0671	2.14
1,2,3,7,8,9-HxCDF	0.0010	0.12	0.0008	0.03
2,3,4,6,7,8-HxCDF	0.0060	0.71	0.0204	0.65
1,2,3,4,6,7,8-HpCDF	0.0379	4.47	0.1264	4.04
1,2,3,4,7,8,9-HpCDF	0.0079	0.93	0.0070	0.22
OCDF	0.0430	5.08	0.0919	2.94

[a] Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, EPA September 2000.

Key:

HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
pg/m^3 = Picograms per cubic meter.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
U = Not detected at the associated detection limit.

Table 4-15

DIOXIN CONGENER DISTRIBUTION IN OFF-FACILITY SURFACE SOIL
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	99224000		99224001		99224011	
Analyte	Concentration (ng/kg)	Percentage of Total	Concentration (ng/kg)	Percentage of Total	Concentration (ng/kg)	Percentage of Total
2,3,7,8-TCDD	1.012 U	0.033	0.22 U	0.026	0.509 U	0.003
1,2,3,7,8-PeCDD	0.659 U	0.021	0.632 U	0.074	1.773 U	0.009
1,2,3,4,7,8-HxCDD	3.255	0.106	1.412 U	0.166	5.959 U	0.030
1,2,3,6,7,8-HxCDD	13.053	0.425	4.056	0.476	26.128	0.130
1,2,3,7,8,9-HxCDD	6.003 U	0.195	2.447 U	0.287	12.295	0.061
1,2,3,4,6,7,8-HpCDD	339.445	11.048	95.588	11.222	1115.446	5.558
OCDD	2401.546	78.167	676.046	79.369	17617.943	87.794
2,3,7,8-TCDF	2.695	0.088	1.853	0.218	3.063	0.015
1,2,3,7,8-PeCDF	0.921 U	0.030	0.345 U	0.041	2.583	0.013
2,3,4,7,8-PeCDF	0.974 U	0.032	0.365 U	0.043	3.437	0.017
1,2,3,4,7,8-HxCDF	36.222	1.179	7.005 U	0.822	51.116 U	0.255
1,2,3,6,7,8-HxCDF	1.78 U	0.058	0.475 U	0.056	2.134 U	0.011
1,2,3,7,8,9-HxCDF	2.257 U	0.073	0.602 U	0.071	3.794 U	0.019
2,3,4,6,7,8-HxCDF	3.165 U	0.103	0.844 U	0.099	2.705 U	0.013
1,2,3,4,6,7,8-HpCDF	56.887	1.852	13.459	1.580	221.85	1.106
1,2,3,4,7,8,9-HpCDF	20.256 U	0.659	6.175 U	0.725	27.932 U	0.139
OCDF	182.208	5.931	40.249	4.725	968.738	4.827

Table 4-15

DIOXIN CONGENER DISTRIBUTION IN OFF-FACILITY SURFACE SOIL
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Technical PCP [a]		Rural Soil [a]		Urban Background [a]	
	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total	Concentration (µg/kg)	Percentage of Total
2,3,7,8-TCDD	ND (0.05)	0	0.000017	0.002	0.00087	0.03
1,2,3,7,8-PeCDD	ND (1)	0	0.00028	0.04	0.0024	0.08
1,2,3,4,7,8-HxCDD	8	0.0003	0.00053	0.07	0.0027	0.09
1,2,3,6,7,8-HxCDD	600	0.02	0.0037	0.48	0.0053	0.18
1,2,3,7,8,9-HxCDD	13	0.0004	0.0024	0.31	0.0051	0.18
1,2,3,4,6,7,8-HpCDD	89,000	2.89	0.72	9.35	0.099	3.41
OCDD	2,723,000	88.55	0.630	81.8	2.700	93.0
2,3,7,8-TCDF	ND (0.5)	0	0.0013	0.17	0.0023	0.08
1,2,3,7,8-PeCDF	ND (1)	0	0.00034	0.04	0.0018	0.06
2,3,4,7,8-PeCDF	ND (1)	0	0.00052	0.07	0.0032	0.11
1,2,3,4,7,8-HxCDF	67	0.002	0.0010	0.13	0.0040	0.14
1,2,3,6,7,8-HxCDF	2	0.00007	0.00066	0.09	0.0036	0.12
1,2,3,7,8,9-HxCDF	ND (1)	0	0.00040	0.05	0.00075	0.03
2,3,4,6,7,8-HxCDF	ND (1)	0	0.00077	0.10	0.0026	0.09
1,2,3,4,6,7,8-HpCDF	22,000	0.72	0.018	2.34	0.017	0.59
1,2,3,4,7,8,9-HpCDF	3,400	0.11	0.00059	0.08	0.0015	0.05
OCDF	237,000	7.71	0.040	5.19	0.023	0.79

[a] Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, EPA, September 2000.

Key:

HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
ND = Not detected. Number in parentheses is detection limit.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
pg/m^3 = Picograms per cubic meter.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
U = Not detected at the associated detection limit.

Table 4-16

SUMMARY OF RESULTS FROM FACILITY NORTH POLE YARD SURFACE SOIL SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels	99070552	99070556	99070560	99070567
Sample Location		B-J2	B-F3	B-D7	B-B13
Sample Date		8/3/99	8/3/99	8/3/99	8/4/99
Semivolatile Organic Compounds (mg/kg)					
2,4-Dichlorophenol	180[a]	0.01 U	0.013	0.0059 J	0.01 U
2,4-Dinitrotoluene	120[a]	0.01 U	0.012 U	0.013 U	0.036 JN
2-Methylnaphthalene	56[a]	0.0027	0.012	0.011	0.0046
3&4-Methylphenol	310[a]	0.01 U	0.0039 J	0.013 U	0.01 U
Acenaphthene	3700[a]	0.0041	0.0032	0.0026 U	0.002 U
Acenaphthylene	3700[a]	0.024	0.048	0.018	0.002 U
Anthracene	22000[a]	0.042	0.1	0.035	0.002 U
Benzo(a)anthracene	0.62[a]	0.033	0.1	0.025	0.0077
Benzo(a)pyrene	0.062[a]	0.049	0.1	0.028	0.002 U
Benzo(b)fluoranthene	0.62[a]	0.028 J	0.065 J	0.008 J	0.002 U
Benzo(g,h,i)perylene	2300[a]	0.037	0.0023 U	0.0026 U	0.002 U
Benzo(j)fluoranthene	1.37[b]	0.028 J	0.065 J	0.008 J	0.02 UJ
Benzo(k)fluoranthene	6.2[a]	0.028 J	0.065 J	0.008 J	0.002 U
Chrysene	62[a]	0.054	0.13	0.0098	0.0083
Dibenzo(a,h)anthracene	0.062[a]	0.0043	0.0023 U	0.0026 U	0.002 U
Fluoranthene	2300[a]	0.054	0.12	0.023	0.012
Fluorene	2600[a]	0.029	0.017	0.01	0.0024
Indeno(1,2,3-cd)pyrene	0.62[a]	0.036	0.0023 U	0.0026 U	0.002 U
Naphthalene	56[a]	0.0037	0.013	0.014	0.0022
Pentachlorophenol	3[a]	0.58 J	4.6	1.7	0.077
Phenanthrene	22000[a]	0.017	0.052	0.0089	0.013
Pyrene	2300[a]	0.061	0.19	0.032	0.0089
Tetrachlorophenols	180[a]	0.054	0.39 J	0.12 J	0.01 U
Petroleum Hydrocarbons (mg/kg)					
C21-C28 Aliphatics	NA	5.2 U	6 U	14	9.7
C28-C36 Aliphatics	NA	5.2 U	6 U	23	16
C28-C36 Aromatics	NA	5.2 U	6 U	6.8 U	13
Dioxin/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	3.9[a]	**278.266**	**2578.87**	**4896.767**	**38.039**
2,3,7,8-TCDD	3.9[a]	0.385 U	5.92 U	**7.683**	0.588 U
2,3,7,8-TCDF	NA	5.874	84.221	154.937	1.772
1,2,3,7,8-PeCDD	NA	61.923	183.473	357.344	6.867
1,2,3,7,8-PeCDF	NA	23.747	494.72	799.291	1.193
2,3,4,7,8-PeCDF	NA	34.542	492.938	659.901	3.554
1,2,3,4,7,8-HxCDD	NA	146.62	418.901	1073.22	14.177
1,2,3,4,7,8-HxCDF	NA	422.112 U	4098	9083.58 U	111.817 U
1,2,3,6,7,8-HxCDD	NA	590.285	3009	7472.478	51.569

Key is at the end of the table.

Table 4-16 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH POLE YARD SURFACE SOIL SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels	99070552	99070556	99070560	99070567
Sample Location		B-J2	B-F3	B-D7	B-B13
Sample Date		8/3/99	8/3/99	8/3/99	8/4/99
Dioxin/Furans (ng/kg)					
1,2,3,6,7,8-HxCDF	NA	67.91 U	666.06	588.394 U	15.942 U
1,2,3,7,8,9-HxCDD	NA	382.632	1396	3297.152	34.833
1,2,3,7,8,9-HxCDF	NA	107.505 U	875.671	100.684	25.238 U
2,3,4,6,7,8-HxCDF	NA	79.403 U	614.357 U	1763.91	18.64 U
1,2,3,4,6,7,8-HpCDD	NA	6806	83671	213232.513	1565.101
1,2,3,4,6,7,8-HpCDF	NA	1282.757	15594	37109.357	223.245
1,2,3,4,7,8,9-HpCDF	NA	310.521 U	953.268	1848.622	65.285 U
OCDD	NA	42919	649893	2467278	11159.933
OCDF	NA	1637	22351	69539.871	1005.455
Total TCDD	NA	3.021	65.846	156.382	5.438
Total TCDF	NA	30.017	376.461	876.843	20.473
Total PeCDD	NA	170.087	863.87	2791.129	26.772
Total PeCDF	NA	619.11	8599.93	6657.461	146.644
Total HxCDD	NA	2675.34	12317.659 J	16237.719	301.569
Total HxCDF	NA	2616.371 J	32234.069 J	68742.249 JH	328.269
Total HpCDD	NA	14619.292 J	116170.787 J	398289.684	2702.619
Total HpCDF	NA	1282.757	13537.425 J	37109.357	223.245

Note: PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
Sample Concentrations above PSLs are bolded.

[a] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[b] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JN = The analyte was tentatively identified and the numerical result is estimated.
mg/kg = Milligrams per kilogram.
ng/kg = Nanograms per kilogram.
NA = Not applicable.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-17

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
CPAHs (mg/kg)												
B(a)P Equivalent	0.000041 - 0.12378	B-F3	6/6	-	3/6	0.062	0/6	2.32	0/6	0.137	0/6	30
Benzo(a)anthracene	0.0077 - 0.1	B-F3	5/6	0.04 - 0.04	0/6	0.621	0/6	23.23	0/6	1.370	NA	NA
Benzo(a)pyrene	0.028 - 0.1	B-F3	4/6	0.002 - 0.04	2/6	0.062	0/6	2.32	0/6	0.137	0/6	30
Benzo(b)fluoranthene	0.008 - 0.16	SS17	4/6	0.002 - 0.04	0/6	0.621	0/6	23.23	0/6	1.370	NA	NA
Benzo(j)fluoranthene	0.008 - 0.065	B-F3	3/4	0.02 - 0.02	0/4	0.621	0/4	23.23	0/4	1.370	NA	NA
Benzo(k)fluoranthene	0.008 - 0.1	SS17	4/6	0.002 - 0.04	0/6	6.215	0/6	232.30	0/6	13.699	NA	NA
Chrysene	0.0083 - 0.38	SS17	6/6	-	0/6	62.148	0/6	2322.99	0/6	136.986	NA	NA
Dibenzo(a,h)anthracene	0.0043	B-J2	1/6	0.002 - 0.05	0/6	0.062	0/6	2.32	0/6	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.036 - 0.04	SS17	2/6	0.002 - 0.04	0/6	0.621	0/6	23.23	0/6	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	1565.101 - 860000	SS17	6/6	-	6/6	390	4/6	31384	6/6	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	223.245 - 230000	SS17	6/6	-	5/6	390	2/6	31384	5/6	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	953.268 - 30000	SS17	4/6	65.285 - 310.521	4/6	390	0/6	31384	4/6	666.7	NA	NA
1,2,3,4,7,8-HxCDD	14.177 - 4000	SS17	5/6	240	4/6	39	1/6	3138	4/6	66.7	NA	NA
1,2,3,4,7,8-HxCDF	4098 - 14000	SS17	2/6	111.817 - 9083.58	2/6	39	2/6	3138	2/6	66.7	NA	NA
1,2,3,6,7,8-HxCDD	51.569 - 26000	SS17	6/6	-	6/6	39	3/6	3138	5/6	66.7	NA	NA
1,2,3,6,7,8-HxCDF	666.06 - 1800	SS17	2/6	15.942 - 2510	2/6	39	0/6	3138	2/6	66.7	NA	NA
1,2,3,7,8,9-HxCDD	34.833 - 8700	SS17	6/6	-	5/6	78	2/6	3138	5/6	66.7	NA	NA
1,2,3,7,8,9-HxCDF	100.684 - 1800	SS17	3/6	25.238 - 2510	3/6	39	0/6	3138	3/6	66.7	NA	NA
1,2,3,7,8-PeCDD	6.867 - 750	SS17	5/6	1020	5/6	3.9	2/6	314	5/6	6.7	NA	NA
1,2,3,7,8-PeCDF	1.193 - 799.291	B-D7	5/6	820	3/6	78	0/6	6277	3/6	133.3	NA	NA
2,3,4,6,7,8-HxCDF	440 - 1763.91	B-D7	2/6	18.64 - 2510	2/6	39	0/6	3138	2/6	66.7	NA	NA
2,3,4,7,8-PeCDF	3.554 - 1100	SS17	5/6	820	4/6	7.8	2/6	628	4/6	13.3	NA	NA
2,3,7,8-TCDD	7.683 - 27	SS17	2/6	0.385 - 190	2/6	3.9	0/6	314	2/6	6.7	NA	NA
2,3,7,8-TCDD TEQ	38.04 - 19084.5	SS17	6/6	-	6/6	3.9	4/6	314	6/6	6.7	6/6	5
2,3,7,8-TCDF	1.772 - 230	SS17	5/6	110	3/6	39	0/6	3138	3/6	66.7	NA	NA
OCDD	11159.933 - 6400000	SS17	6/6	-	5/6	39000	1/6	3138357	4/6	66666.7	NA	NA
OCDF	1005.455 - 1900000	SS17	6/6	-	3/6	39000	0/6	3138357	2/6	66666.7	NA	NA
Total HpCDD	2702.619 - 1400000	SS17	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	223.245 - 1200000	SS17	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	301.569 - 86000	SS17	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	328.269 - 240000	SS17	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	26.772 - 279.1129	B-D7	5/6	1020	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	146.644 - 16000	SS17	5/6	820	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	3.021 - 240	SS17	5/6	190	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	20.473 - 2000	SS17	5/6	110	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-17

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C21-C28 Aliphatics	9.7 - 14	B-D7	2/4	5.2 - 6	NA	NA	NA		NA	NA	NA	NA
C28-C36 Aliphatics	16 - 23	B-D7	2/4	5.2 - 6	NA	NA	NA		NA	NA	NA	NA
C28-C36 Aromatics	13	B-B13	1/4	5.2 - 6.8	NA	NA	NA		NA	NA	NA	NA
EPH	37 - 38.7	B-B13	2/2	-	NA	NA	0/2	2000	NA	NA	0/2	460
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0027 - 0.17	SS17	5/6	0.04 - 0.04	0/6	55.92	0/6	23.51	0/6	1600	NA	NA
Acenaphthene	0.0032 - 0.0041	B-J2	2/6	0.002 - 0.05	0/6	3681.71	0/6	284.05	0/6	4800	NA	NA
Acenaphthylene	0.018 - 0.24	SS17	4/6	0.002 - 0.04	0/6	3681.71	0/6	284.05	0/6	4800	NA	NA
Anthracene	0.035 - 0.46	SS17	4/6	0.002 - 0.04	0/6	21896.12	0/6	6777.61	0/6	24000	NA	NA
Benzo(g,h,i)perylene	0.037	B-J2	1/6	0.002 - 0.05	0/6	2308.68	0/6	1959.13	0/6	2400	NA	NA
Fluoranthene	0.012 - 0.15	SS17	5/6	0.04 - 0.04	0/6	2293.61	0/6	6287.36	0/6	3200	NA	NA
Fluorene	0.0024 - 0.42	SS17	5/6	0.04 - 0.04	0/6	2643.61	0/6	304.64	0/6	3200	NA	NA
Naphthalene	0.0022 - 0.054	SS17	5/6	0.04 - 0.04	0/6	55.92	0/6	23.51	0/6	1600	NA	NA
ncPAH	0.0431 - 4.294	SS17	5/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0089 - 1.5	SS17	5/6	0.04 - 0.04	0/6	21896.12	0/6	6777.61	0/6	24000	NA	NA
Pyrene	0.0089 - 1.3	SS17	5/6	0.04 - 0.04	0/6	2308.68	0/6	1959.13	0/6	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.036	B-B13	1/6	0.01 - 0.2	0/6	122.21	0/6	0.45	0/6	160	NA	NA
Carbazole	0.91	SS17	1/2	0.04 - 0.04	0/2	24.32	NA	NA	0/2	50	NA	NA
Dibenzofuran	0.052	SS17	1/6	0.01 - 0.04	0/6	290.53	0/6	29.93	0/6	320	NA	NA
Phenols (mg/kg)												
2,4-Dichlorophenol	0.0059 - 0.013	B-F3	2/6	0.01 - 0.05	0/6	183.31	0/6	1.54	0/6	240	NA	NA
3&4-Methylphenol	0.0039	B-F3	1/4	0.01 - 0.013	0/4	305.52	0/4	1.06	0/4	400	NA	NA
Pentachlorophenol	0.077 - 110	SS17	6/6	-	2/6	2.98	6/6	0.077	1/6	8	1/6	11
Tetrachlorophenols	0.054 - 0.39	B-F3	3/4	0.01 - 0.01	0/4	1833.09	0/4	25.82	0/4	2400	NA	NA

Key:

cPAHs	= Carcinogenic polycyclic aromatic hydrocarbon.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbon.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalent quotient.

Table 4-18

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070549	99070615	99070618	99070666	99070671	99080022
Sample Location		B-N3	B-O13	MW35-S	B-O7	MW28-S	MW29-S
Sample Date		8/3/99	8/9/99	8/9/99	8/13/99	8/13/99	8/20/99
Semivolatile Organic Compounds (mg/kg)							
2,4-Dimethylphenol	1200[c]	0.11 U	0.0097 U	0.12	0.0085 U	NA	0.0099 U
2-Methylnaphthalene	56[c]	2.6	0.0031 J	0.033 J	0.0067	NA	0.0079
2-Methylphenol	3100[c]	0.11 U	0.0097 U	0.48	0.0085 U	NA	0.0099 U
3&4-Methylphenol	310[c]	0.11 U	0.0097 U	0.13	0.0085 U	NA	0.0099 U
7,12-Dimethylbenz(a)anthracene	NA	0.51 JN	0.0019 U	0.12 JN	0.0017 U	NA	0.002 U
Acenaphthene	3700[c]	0.21	0.0019 U	0.0023 U	0.0017 U	NA	0.002
Acenaphthylene	3700[c]	1.2	0.0025	0.0023 U	0.0044	NA	0.002 U
Anthracene	22000[c]	79	0.012	0.12	0.064	NA	0.0052
Benzo(a)anthracene	0.62[c]	5.9	0.0049	0.14	0.015	NA	0.0054
Benzo(a)pyrene	0.062[c]	8	0.017 U	0.24	0.046	NA	0.0034 J
Benzo(b)fluoranthene	0.62[c]	5 J	0.0081 J	0.083 J	0.027 J	NA	0.003 J
Benzo(g,h,i)perylene	2300[c]	3.9	0.0072 J	0.19 J	0.018	NA	0.0032
Benzo(j)fluoranthene	1.37[d]	5 J	0.0081 J	0.083 J	0.027 J	NA	0.003 J
Benzo(k)fluoranthene	6.2[c]	5 J	0.081 J	0.083 J	0.027 J	NA	0.003 J
Benzoic acid	100,000[c]	0.22 U	0.019 UJ	2.7 J	0.017 J	NA	0.022 J
Benzyl alcohol	18000[c]	0.11 U	0.0097 UJ	0.012 UJ	0.0017 J	NA	0.0099 U
Chrysene	62[c]	43	0.023	0.24	0.079	NA	0.037
Dibenzo(a,e)pyrene	0.137[d]	0.84	0.0019 U	0.11	0.0017 U	NA	0.002 U
Dibenzo(a,h)acridine	NA	0.22 JN	0.0019 U	0.0023 U	0.0017 U	NA	0.002 U
Dibenzo(a,h)anthracene	0.062[c]	0.95	0.0019 U	0.042 JN	0.0041	NA	0.002 U
Dibenzo(a,h)pyrene	0.0137[d]	0.56	0.0019 U	0.007	0.0017 U	NA	0.002 U
Dibenzo(a,i)pyrene	0.0137[d]	0.19	0.0019 U	0.073	0.0017 U	NA	0.002 U
Dibenzo(a,j)acridine	1.37[d]	0.19 JN	0.0019 U	0.0023 U	0.0017 U	NA	0.002 U
Dibenzofuran	290[c]	3.7	0.0014 J	0.021 J	0.0039 J	NA	0.0018 J
Fluoranthene	2300[c]	5.4	0.017	0.22	0.029	NA	0.011
Fluorene	2600[c]	12	0.0027	0.04	0.0085	NA	0.0038
Indeno(1,2,3-cd)pyrene	0.62[c]	3.3	0.0052 U	0.11	0.017	NA	0.0028
Naphthalene	56[c]	2.1	0.0023	0.041	0.0051 U	NA	0.0071
Pentachlorophenol	3[c]	18	0.035	6.6 J	0.28	NA	0.22
Phenanthrene	22000[c]	11	0.011	0.11	0.016	NA	0.0067
Phenol	37000[c]	0.11 U	0.0097 U	3.1	0.0085 U	NA	0.0099 U
Pyrene	2300[c]	7.5	0.011	0.23	0.03	NA	0.0095
Tetrachlorophenols	1800[c]	1.8	0.0097 U	0.4	0.012	NA	0.0073 J
Petroleum Hydrocarbons (mg/kg)							
C12-C16 Aliphatics	NA	5.6 U	5.2 U	6 U	5.2 U	NA	13
C16-C18 Aliphatics	NA	10	5.2 U	6 U	5.2 U	NA	5.2 U
C16-C18 Aromatics	NA	7.9	5.2 U	6 U	5.2 U	NA	5.2 U
C18-C21 Aliphatics	NA	28	5.2 U	8.8	5.2 U	NA	5.2 U
C18-C21 Aromatics	NA	130	5.2 U	9	5.2 U	NA	5.2 U
C21-C28 Aliphatics	NA	58	5.2 U	35	5.2 U	NA	5.2 U

Key is at the end of the table.

Table 4-18 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070549	99070615	99070618	99070666	99070671	99080022
Sample Location		B-N3	B-O13	MW35-S	B-O7	MW28-S	MW29-S
Sample Date		8/3/99	8/9/99	8/9/99	8/13/99	8/13/99	8/20/99
Petroleum Hydrocarbons (mg/kg)							
C21-C28 Aromatics	NA	79	5.2 U	8.9	5.2 U	NA	5.2 U
C28-C36 Aliphatics	NA	44	5.2 U	28	5.2 U	NA	5.2 U
C28-C36 Aromatics	NA	87 J	5.2 U	14	5.2 U	NA	5.2 U
Dioxin/Furans (ng/kg)							
2,3,7,8-TCDD TEQ	3.9[c]	**0.886**	**21.94**	**7691.572**	**35.516**	**1127.353**	**9.546**
2,3,7,8-TCDD	3.9[c]	0.906 U	0.934 U	**44.718**	0.309 U	4.307 U	0.587 U
2,3,7,8-TCDF	NA	0.624 U	0.673 U	85.161	1.535	26.068	0.365 U
1,2,3,7,8-PeCDD	NA	0.895 U	1.735 U	1029.192	4.401	131.46	1.641
1,2,3,7,8-PeCDF	NA	0.43 U	1.074 U	213.908 U	5.403	117.85 U	0.259 U
2,3,4,7,8-PeCDF	NA	0.435 U	0.996 U	319.035	5.576	105.352	0.262 U
1,2,3,4,7,8-HxCDD	NA	0.75 U	7.032	3130	11.521 U	515.063	4.832
1,2,3,6,7,8-HxCDD	NA	7.289 U	37.687	10119	60.778	1130	15.585
1,2,3,6,7,8-HxCDF	NA	0.59 U	9.221 U	1133.25 U	5.455 U	122.901	1.366
1,2,3,7,8,9-HxCDD	NA	0.579 U	18.971	6491	25.614	765.904	9.001
1,2,3,7,8,9-HxCDF	NA	0.934 U	14.598 U	200.911 U	5.839 U	22.604 U	3.066
1,2,3,4,6,7,8-HpCDD	NA	70.955	1237	331553.6	1509.2	52228.8	351.426
1,2,3,4,6,7,8-HpCDF	NA	4.666 U	192.308	85581	255.597	10200.2	60.516
1,2,3,4,7,8,9-HpCDF	NA	1.852 U	38.252 U	2721.851	20.88	583.621	4.985
OCDD	NA	1751.895	11705	2486858	13383.449 J	526031.6	3129
OCDF	NA	16.859	1072	283784	687.319	44942	382.166
Total TCDD	NA	0.906 U	0.934 U	255.06	0.309 U	25.925	0.587 U
Total TCDF	NA	0.624 U	0.673 U	978.728	2.857	134.829	0.365 U
Total PeCDD	NA	0.895 U	1.735 U	3322.03	8.923	367.798	1.641
Total PeCDF	NA	0.435 U	48.661	18530.936 J	92.938	2810.21	13.15
Total HxCDD	NA	18.534	176.763	54078	324.18 J	8962.917 J	71.29
Total HxCDF	NA	7.164 J	239.071	66695.863 J	496.691 J	13591.011	90.904 J
Total HpCDD	NA	133.534	2002.412	543922	2625.945	92231.7	593.057
Total HpCDF	NA	1.315 U	192.308	90465	276.478	10200.2	65.501

Key is on the next page.

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Table 4-18 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identified and the numerical result is estimated.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-19

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	0.12 - 0.51	B-N3	2/5	0.0017 - 0.002	2/5	0.003	2/5	0.12	2/5	0.007	NA	NA
B(a)P Equivalent	0.002943 - 29.544	B-N3	5/5	-	2/5	0.062	2/5	2.32	2/5	0.137	0/5	30
Benzo(a)anthracene	0.0049 - 5.9	B-N3	5/5	-	1/5	0.621	0/5	23.23	1/5	1.370	NA	NA
Benzo(a)pyrene	0.0034 - 8	B-N3	4/5	0.017 - 0.017	2/5	0.062	1/5	2.32	2/5	0.137	0/5	30
Benzo(b)fluoranthene	0.003 - 5	B-N3	5/5	-	1/5	0.621	0/5	23.23	1/5	1.370	NA	NA
Benzo(j)fluoranthene	0.003 - 5	B-N3	5/5	-	1/5	0.621	0/5	23.23	1/5	1.370	NA	NA
Benzo(k)fluoranthene	0.003 - 5	B-N3	5/5	-	0/5	6.215	0/5	232.30	0/5	13.699	NA	NA
Chrysene	0.023 - 43	B-N3	5/5	-	0/5	62.148	0/5	2322.99	0/5	136.986	NA	NA
Dibenzo(a,e)pyrene	0.11 - 0.84	B-N3	2/5	0.0017 - 0.002	2/5	0.062	0/5	2.32	1/5	0.137	NA	NA
Dibenzo(a,h)acridine	0.22	B-N3	1/5	0.0017 - 0.0023	0/5	0.621	0/5	23.23	0/5	1.370	NA	NA
Dibenzo(a,h)anthracene	0.0041 - 0.95	B-N3	3/5	0.0019 - 0.002	1/5	0.062	0/5	2.32	1/5	0.137	NA	NA
Dibenzo(a,h)pyrene	0.007 - 0.56	B-N3	2/5	0.0017 - 0.002	2/5	0.006	1/5	0.23	1/5	0.014	NA	NA
Dibenzo(a,i)pyrene	0.073 - 0.19	B-N3	2/5	0.0017 - 0.002	2/5	0.006	0/5	0.23	2/5	0.014	NA	NA
Dibenzo(a,j)acridine	0.19	B-N3	1/5	0.0017 - 0.0023	0/5	0.621	0/5	23.23	0/5	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	0.0028 - 3.3	B-N3	4/5	0.0052 - 0.0052	1/5	0.621	0/5	23.23	1/5	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	70.955 - 331553.6	MW35-S	9/9	-	7/9	390	5/9	31384	7/9	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	60.516 - 85581	MW35-S	8/9	4.666 - 4.666	5/9	390	2/9	31384	5/9	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	4.985 - 3740	SS50	7/9	1.852 - 38.252	5/9	390	0/9	31384	4/9	666.7	NA	NA
1,2,3,4,7,8-HxCDD	4.832 - 3130	MW35-S	5/9	0.75 - 250	3/9	39	0/9	3138	3/9	66.7	NA	NA
1,2,3,4,7,8-HxCDF	590 - 4740	SS50	2/9	0.888 - 11406.296	2/9	39	1/9	3138	2/9	66.7	NA	NA
1,2,3,6,7,8-HxCDD	15.585 - 12310	SS50	8/9	7.289 - 7.289	6/9	39	3/9	3138	5/9	66.7	NA	NA
1,2,3,6,7,8-HxCDF	1.366 - 200	SS11	3/9	0.59 - 2560	2/9	39	0/9	3138	2/9	66.7	NA	NA
1,2,3,7,8,9-HxCDD	9.001 - 6491	MW35-S	8/9	0.579 - 0.579	5/9	78	1/9	3138	5/9	66.7	NA	NA
1,2,3,7,8,9-HxCDF	3.066 - 60	SS11	2/9	0.934 - 2560	1/9	39	0/9	3138	0/9	66.7	NA	NA
1,2,3,7,8-PeCDD	1.641 - 1029.192	MW35-S	5/9	0.895 - 1040	4/9	3.9	1/9	314	3/9	6.7	NA	NA
1,2,3,7,8-PeCDF	5.403 - 120	SS11	2/9	0.259 - 840	1/9	78	0/9	6277	0/9	133.3	NA	NA
2,3,4,6,7,8-HxCDF	150	SS11	1/9	0.69 - 2560	1/9	39	0/9	3138	1/9	66.7	NA	NA
2,3,4,7,8-PeCDF	5.576 - 319.035	MW35-S	4/9	0.262 - 840	3/9	7.8	0/9	628	3/9	13.3	NA	NA
2,3,7,8-TCDD	10 - 44.718	MW35-S	2/9	0.309 - 200	2/9	3.9	0/9	314	2/9	6.7	NA	NA
2,3,7,8-TCDD TEQ	0.8864 - 7691.572	MW35-S	9/9	-	8/9	3.9	5/9	314	8/9	6.7	8/9	5
2,3,7,8-TCDF	1.535 - 85.161	MW35-S	4/9	0.365 - 110	1/9	39	0/9	3138	1/9	66.7	NA	NA
OCDD	1751.895 - 3639470	SS50	9/9	-	5/9	39000	1/9	3138357	5/9	66666.7	NA	NA
OCDF	16.859 - 283784	MW35-S	9/9	-	5/9	39000	0/9	3138357	2/9	66666.7	NA	NA
Total HpCDD	133.534 - 636580	SS50	9/9	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	65.501 - 260250	SS50	8/9	1.315 - 1.315	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	18.534 - 62820	SS50	9/9	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	7.164 - 66695.863	MW35-S	9/9	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	1.641 - 3322.03	MW35-S	5/9	0.895 - 1040	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	13.15 - 18530.936	MW35-S	8/9	0.435 - 0.435	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	25.925 - 255.06	MW35-S	3/9	0.309 - 200	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	2.857 - 978.728	MW35-S	4/9	0.365 - 110	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-19

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C12-C16 Aliphatics	13	MW29-S	1/5	5.2 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	10	B-N3	1/5	5.2 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	7.9	B-N3	1/5	5.2 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	8.8 - 28	B-N3	2/5	5.2 - 5.2	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	9 - 130	B-N3	2/5	5.2 - 5.2	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	35 - 58	B-N3	2/5	5.2 - 5.2	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	8.9 - 79	B-N3	2/5	5.2 - 5.2	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	28 - 44	B-N3	2/5	5.2 - 5.2	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	14 - 87	B-N3	2/5	5.2 - 5.2	NA	NA	NA	NA	NA	NA	NA	NA
EPH	13 - 443.9	B-N3	3/5	-	NA	NA	0/5	2000	NA	NA	0/5	460
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0031 - 2.6	B-N3	5/5	-	0/5	55.92	0/5	23.51	0/5	1600	NA	NA
Acenaphthene	0.002 - 0.21	B-N3	2/5	0.0017 - 0.0023	0/5	3681.71	0/5	284.05	0/5	4800	NA	NA
Acenaphthylene	0.0025 - 1.2	B-N3	3/5	0.002 - 0.0023	0/5	3681.71	0/5	284.05	0/5	4800	NA	NA
Anthracene	0.0052 - 79	B-N3	5/5	-	0/5	21896.12	0/5	6777.61	0/5	24000	NA	NA
Benzo(g,h,i)perylene	0.0032 - 3.9	B-N3	5/5	-	0/5	2308.68	0/5	1959.13	0/5	2400	NA	NA
Fluoranthene	0.011 - 5.4	B-N3	5/5	-	0/5	2293.61	0/5	6287.36	0/5	3200	NA	NA
Fluorene	0.0027 - 12	B-N3	5/5	-	0/5	2643.61	0/5	304.64	0/5	3200	NA	NA
Naphthalene	0.0023 - 2.1	B-N3	4/5	0.0051 - 0.0051	0/5	55.92	0/5	23.51	0/5	1600	NA	NA
ncPAH	0.0564 - 124.91	B-N3	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0067 - 11	B-N3	5/5	-	0/5	21896.12	0/5	6777.61	0/5	24000	NA	NA
Pyrene	0.0095 - 7.5	B-N3	5/5	-	0/5	2308.68	0/5	1959.13	0/5	2400	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.017 - 2.7	MW35-S	3/5	0.019 - 0.22	0/5	100000.00	0/5	263.04	0/5	320000	NA	NA
Benzyl alcohol	0.0017	B-O7	1/5	0.0097 - 0.11	0/5	18330.93	0/5	28.99	0/5	24000	NA	NA
Dibenzofuran	0.0014 - 3.7	B-N3	5/5	-	0/5	290.53	0/5	29.93	0/5	320	NA	NA
Phenols (mg/kg)												
2,4-Dimethylphenol	0.12	MW35-S	1/5	0.0085 - 0.11	0/5	1222.06	0/5	9.34	0/5	1600	NA	NA
2-Methylphenol	0.48	MW35-S	1/5	0.0085 - 0.11	0/5	3055.15	0/5	11.74	0/5	4000	NA	NA
3&4-Methylphenol	0.13	MW35-S	1/5	0.0085 - 0.11	0/5	305.52	0/5	1.06	0/5	400	NA	NA
Pentachlorophenol	0.035 - 18	B-N3	5/5	-	2/5	2.98	4/5	0.077	1/5	8	1/5	11
Phenol	3.1	MW35-S	1/5	0.0085 - 0.11	0/5	36661.86	0/5	80.64	0/5	48000	NA	NA
Tetrachlorophenols	0.0073 - 1.8	B-N3	4/5	0.0097 - 0.0097	0/5	1833.09	0/5	25.82	0/5	2400	NA	NA

Key:

cPAHs	= Carcinogenic polycyclic aromatic hydrocarbon.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbon.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalent quotient.

Table 4-20

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070583	99070604	99070627	99070634	99080028
Sample Location		B-R18	B-Q20	B-R28	B-U19	MW33-S
Sample Date		8/4/99	8/8/99	8/10/99	8/11/99	8/20/99
Semivolatile Organic Compounds (mg/kg)						
2,4-Dichlorophenol	180[c]	0.0097 U	0.084 U	0.087 U	0.083 U	0.0052 J
2,6-Dinitrotoluene	61[c]	0.0058 JQ	0.084 U	0.087 U	0.083 U	0.012 U
2-Methylnaphthalene	56[c]	0.037	0.051	0.035	0.093	0.022
3&4-Methylphenol	310[c]	0.0097 U	0.084 U	0.082 J	0.03 J	0.012 U
Acenaphthene	3700[c]	0.0058	0.017 U	0.017 U	0.017 U	0.0048
Acenaphthylene	3700[c]	0.022	0.037	0.031	0.093	0.061
Anthracene	22000[c]	0.055	0.078	0.26	0.18	0.066
Benzo(a)anthracene	0.62[c]	0.048	0.083	0.061	0.15	0.032
Benzo(a)pyrene	0.062[c]	0.14	0.041 JN	0.16 JN	0.4	0.16 J
Benzo(b)fluoranthene	0.62[c]	0.06 JK	0.107 J	0.081 J	0.33 J	0.029 J
Benzo(g,h,i)perylene	2300[c]	0.072	0.017 U	0.017 U	0.017 U	0.19
Benzo(j)fluoranthene	1.37[d]	0.06 JK	0.107 J	0.081 J	0.33 J	0.029 J
Benzo(k)fluoranthene	6.2[c]	0.06 JK	0.107 J	0.081 J	0.33 J	0.029 J
Benzoic acid	100,000[c]	0.019 U	0.17 UJ	0.17 UJ	0.17 UJ	0.037 J
Benzyl alcohol	18000[c]	0.0097 U	0.084 U	0.087 U	0.083 U	0.045
Chrysene	62[c]	0.15	0.17	0.14	0.41	0.09
Dibenzo(a,e)pyrene	0.137[d]	0.0019 U	0.017 U	0.017 U	0.017 U	0.078
Dibenzo(a,h)anthracene	0.062[c]	0.0019 U	0.017 U	0.017 U	0.017 U	0.023 J
Dibenzo(a,h)pyrene	0.0137[d]	0.0019 U	0.017 U	0.017 U	0.017 U	0.054
Dibenzofuran	290[c]	0.014	0.029 J	0.021 J	0.035 J	0.012
Fluoranthene	2300[c]	0.1	0.17	0.1	0.24	0.065
Fluorene	2600[c]	0.018	0.027	0.057	0.048	0.012
Indeno(1,2,3-cd)pyrene	0.62[c]	0.062	0.017 U	0.017 U	0.017 U	0.15
Naphthalene	56[c]	0.029	0.042	0.028	0.07	0.04
Pentachlorophenol	3[c]	0.71	1.8	5.2	6.4	0.14
Phenanthrene	240000[c]	0.069	0.074	0.12	0.21	0.039
Phenol	37000[c]	0.0097 U	0.084 U	0.087 U	0.083 U	0.006 J
Pyrene	2300[c]	0.11	0.21	0.15	0.32	0.05
Tetrachlorophenols	1800[c]	0.04	0.1	0.31 J	0.33 J	0.01 J
Petroleum Hydrocarbons (mg/kg)						
C12-C16 Aliphatics	NA	5.1 U	5.4 U	5.9	5.2 U	17
C16-C18 Aliphatics	NA	5.1 U	5.4 U	5.7 U	5.9	6 U
C18-C21 Aliphatics	NA	5.1 U	5.4 U	17	17	6 U
C18-C21 Aromatics	NA	5.1 U	5.4 U	8	5.2 U	6.3
C21-C28 Aliphatics	NA	15	18	46	58	6 U
C21-C28 Aromatics	NA	5.1 U	5.4 U	5.9	5.4	7.1 J
C28-C36 Aliphatics	NA	22	19	36	58	6 U
C28-C36 Aromatics	NA	6.5 J	10 J	10 J	18 J	13 J

Key is at the end of the table.

Table 4-20

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99070583	99070604	99070627	99070634	99080028
Sample Location	Screening	B-R18	B-Q20	B-R28	B-U19	MW33-S
Sample Date	Levels[ab]	8/4/99	8/8/99	8/10/99	8/11/99	8/20/99
Dioxin/Furans (ng/kg)						
2,3,7,8-TCDD TEQ	3.9[c]	**621.565**	**1431.113**	**1129.214**	**3769.577**	**52.167**
2,3,7,8-TCDD	3.9[c]	**16.332**	8.633 U	**3.284**	**14.183**	0.664 U
2,3,7,8-TCDF	NA	15.6	33.273 U	57.378	132.932	2.308
1,2,3,7,8-PeCDD	NA	213.126	300.282	108.011	336.779	6.378
1,2,3,7,8-PeCDF	NA	55.362	8.716 U	179.946	577.378	5.38 U
2,3,4,7,8-PeCDF	NA	50.468	8.812 U	144.681	357.656	4.666 U
1,2,3,4,7,8-HxCDD	NA	319.621	812.302	258.532	1077.224	17.791
1,2,3,6,7,8-HxCDD	NA	960.57	3236.746 J	1986	6818	73.152
1,2,3,6,7,8-HxCDF	NA	51.389 U	373.13 U	135.402	558.6	5.734 U
1,2,3,7,8,9-HxCDD	NA	685.555	2131.442 J	801.823	2268.122	34.347
1,2,3,7,8,9-HxCDF	NA	12.009 U	590.683 U	52.446	78.023 U	2.929 U
2,3,4,6,7,8-HxCDF	NA	100.387	436.28 U	134.545 U	811.5	3.966 U
1,2,3,4,6,7,8-HpCDD	NA	12451.03	43005	48317	163378	2655
1,2,3,4,6,7,8-HpCDF	NA	1770.063	5547	7623	23999.8	360.471
1,2,3,4,7,8,9-HpCDF	NA	194.504	1907.008 J	350.411	1081.626	22.908
OCDD	NA	112256.699	67013	443008	1541047	25211.35
OCDF	NA	5500.202	14908	2184	55810.9	1239.295
Total TCDD	NA	59.891	191.06	33.609	87.215	5.665
Total TCDF	NA	138.922	380.99	187.013	496.611	13.757
Total PeCDD	NA	788.162	2318.836 J	502.247	1457.379	29.783
Total PeCDF	NA	2068.694	9927.464 J	3806.579	9464.322	38.309 J
Total HxCDD	NA	1367.286	21164.608 J	6957.365	22720	267.566
Total HxCDF	NA	5165.248 JH	18729.24 J	14732.977 J	17298.759 J	492.841 J
Total HpCDD	NA	22597.743	74980	79508.31	266348.8	1996.112
Total HpCDF	NA	1770.063	5546.8	7623.4	23999.8	444.622

Key is on the next page.

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample Concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Table 4-20

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JH	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
JK	= The analyte was positively identified. The associated numerical result is an estimate, biased high.
JN	= The analyte was tentatively identified and the numerical result is estimated.
JQ	= The analyte was positively identified. The associated numerical result is below the reporting limit and is estimated.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-21

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.07194 - 5.95967	SI-OS04	7/7	-	7/7	0.062	1/7	2.32	6/7	0.137	0/7	30
Benzo(a)anthracene	0.032 - 3.36	SI-OS04	6/7	0.151 - 0.151	1/7	0.621	0/7	23.23	1/7	1.370	NA	NA
Benzo(a)pyrene	0.041 - 2.97	SI-OS04	7/7	-	6/7	0.062	1/7	2.32	6/7	0.137	0/7	30
Benzo(b)fluoranthene	0.029 - 11.1	SI-OS04	7/7	-	1/7	0.621	0/7	23.23	1/7	1.370	NA	NA
Benzo(j)fluoranthene	0.029 - 0.33	B-U19	5/5	-	0/5	0.621	0/5	23.23	0/5	1.370	NA	NA
Benzo(k)fluoranthene	0.029 - 4.34	SI-OS04	7/7	-	0/7	6.215	0/7	232.30	0/7	13.699	NA	NA
Chrysene	0.09 - 6.27	SI-OS04	7/7	-	0/7	62.148	0/7	2322.99	0/7	136.986	NA	NA
Dibenzo(a,e)pyrene	0.078	MW33-S	1/5	0.0019 - 0.017	1/5	0.062	0/5	2.32	0/5	0.137	NA	NA
Dibenzo(a,h)anthracene	0.023 - 1.19	SI-OS04	3/7	0.0019 - 0.017	1/7	0.062	0/7	2.32	1/7	0.137	NA	NA
Dibenzo(a,h)pyrene	0.054	MW33-S	1/5	0.0019 - 0.017	1/5	0.006	0/5	0.23	1/5	0.014	NA	NA
Indeno(1,2,3-cd)pyrene	0.062 - 3.04	SI-OS04	4/7	0.017 - 0.017	1/7	0.621	0/7	23.23	1/7	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	2655 - 163378	B-U19	5/5	-	5/5	390	3/5	31384	5/5	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	360.471 - 23999.8	B-U19	5/5	-	4/5	390	0/5	31384	4/5	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	22.908 - 1907.008	B-Q20	5/5	-	2/5	390	0/5	31384	2/5	666.7	NA	NA
1,2,3,4,7,8-HxCDD	17.791 - 1077.224	B-U19	5/5	-	4/5	39	0/5	3138	4/5	66.7	NA	NA
1,2,3,6,7,8-HxCDD	73.152 - 6818	B-U19	5/5	-	5/5	39	2/5	3138	5/5	66.7	NA	NA
1,2,3,6,7,8-HxCDF	135.402 - 558.6	B-U19	2/5	5.734 - 373.13	2/5	39	0/5	3138	2/5	66.7	NA	NA
1,2,3,7,8,9-HxCDD	34.347 - 2268.122	B-U19	5/5	-	4/5	78	0/5	3138	4/5	66.7	NA	NA
1,2,3,7,8,9-HxCDF	52.446	B-R28	1/5	2.929 - 590.683	1/5	39	0/5	3138	0/5	66.7	NA	NA
1,2,3,7,8-PeCDD	6.378 - 336.779	B-U19	5/5	-	5/5	3.9	1/5	314	4/5	6.7	NA	NA
1,2,3,7,8-PeCDF	55.362 - 577.378	B-U19	3/5	5.38 - 8.716	2/5	78	0/5	6277	2/5	133.3	NA	NA
2,3,4,6,7,8-HxCDF	100.387 - 811.5	B-U19	2/5	3.966 - 436.28	2/5	39	0/5	3138	2/5	66.7	NA	NA
2,3,4,7,8-PeCDF	50.468 - 357.656	B-U19	3/5	4.666 - 8.812	3/5	7.8	0/5	628	3/5	13.3	NA	NA
2,3,7,8-TCDD	3.284 - 16.332	B-R18	3/5	0.664 - 8.633	2/5	3.9	0/5	314	2/5	6.7	NA	NA
2,3,7,8-TCDD TEQ	52.167 - 3769.577	B-U19	5/5	-	5/5	3.9	4/5	314	5/5	6.7	5/5	5
2,3,7,8-TCDF	2.308 - 132.932	B-U19	4/5	33.273 - 33.273	2/5	39	0/5	3138	1/5	66.7	NA	NA
OCDD	25211.35 - 1541047	B-U19	5/5	-	4/5	39000	0/5	3138357	4/5	66666.7	NA	NA
OCDF	1239.295 - 55810.9	B-U19	5/5	-	1/5	39000	0/5	3138357	0/5	66666.7	NA	NA
Total HpCDD	1996.112 - 266348.8	B-U19	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	444.622 - 23999.8	B-U19	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	267.566 - 22720	B-U19	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	492.841 - 18729.24	B-Q20	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	29.783 - 2318.836	B-Q20	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	38.309 - 9927.464	B-Q20	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	5.665 - 191.06	B-Q20	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	13.757 - 496.611	B-U19	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-21

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum (mg/kg)												
C12-C16 Aliphatics	5.9 - 17	MW33-S	2/5	5.1 - 5.4	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	5.9	B-U19	1/5	5.1 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	17	B-R28	2/5	5.1 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	6.3 - 8	B-R28	2/5	5.1 - 5.4	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	15 - 58	B-U19	4/5	6 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	5.4 - 7.1	MW33-S	3/5	5.1 - 5.4	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	19 - 58	B-U19	4/5	6 - 6	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	6.5 - 18	B-U19	5/5	-	NA	NA	0/5	NA	NA	NA	NA	NA
EPH	43.4 - 162.3	B-U19	5/5	-	NA	NA	0/5	2000	NA	NA	0/5	460
ncPAHs (mg/kg)												
1-Methylnaphthalene	0.223	SI-OS04	1/1	-	0/1	55.92	0/1	23.51	0/1	1600	NA	NA
2-Methylnaphthalene	0.022 - 0.273	SI-OS04	7/7	-	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
Acenaphthene	0.0048 - 0.263	SI-OS04	3/7	0.017 - 0.151	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Acenaphthylene	0.022 - 0.834	SI-OS04	7/7	-	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Anthracene	0.055 - 2.46	SI-OS04	7/7	-	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Benzo(g,h,i)perylene	0.072 - 1.76	SI-OS04	4/7	0.017 - 0.017	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Fluoranthene	0.065 - 6.49	SI-OS04	7/7	-	0/7	2293.61	0/7	6287.36	0/7	3200	NA	NA
Fluorene	0.012 - 0.601	SI-OS04	7/7	-	0/7	2643.61	0/7	304.64	0/7	3200	NA	NA
Naphthalene	0.028 - 0.418	SI-OS04	7/7	-	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
ncPAH	0.5178 - 21.032	SI-OS04	7/7	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.039 - 1.67	SI-OS04	7/7	-	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Pyrene	0.05 - 6.04	SI-OS04	7/7	-	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Other Organics (mg/kg)												
2,6-Dinitrotoluene	0.0058	B-R18	1/7	0.012 - 0.83	0/7	61.10	0/7	0.20	0/7	80	NA	NA
Benzoic acid	0.037 - 0.37	MW02-D	2/7	0.019 - 0.83	0/7	100000.00	0/7	263.04	0/7	320000	NA	NA
Benzyl alcohol	0.045	MW33-S	1/7	0.0097 - 0.332	0/7	18330.93	0/7	28.99	0/7	24000	NA	NA
Carbazole	0.074 - 0.346	SI-OS04	2/2	-	0/2	24.32	NA	NA	0/2	50	NA	NA
Dibenzofuran	0.012 - 0.707	SI-OS04	7/7	-	0/7	290.53	0/7	29.93	0/7	320	NA	NA
Phenols (mg/kg)												
2,4-Dichlorophenol	0.0052	MW33-S	1/7	0.0097 - 0.332	0/7	183.31	0/7	1.54	0/7	240	NA	NA
3&4-Methylphenol	0.03 - 0.082	B-R28	2/5	0.0097 - 0.084	0/5	305.52	0/5	1.06	0/5	400	NA	NA
Pentachlorophenol	0.14 - 7.87	SI-OS04	7/7	-	3/7	2.98	7/7	0.077	0/7	8	0/7	11
Phenol	0.006 - 0.443	MW02-D	2/7	0.0097 - 0.332	0/7	36661.86	0/7	80.64	0/7	48000	NA	NA
Tetrachlorophenols	0.01 - 0.33	B-U19	5/5	-	0/5	1833.09	0/5	25.82	0/5	2400	NA	NA

Table 4-21

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalent quotient.

Table 4-22

SUMMARY OF RESULTS FROM FACILITY TREATED POLE AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070573	99070657
Sample Location		B-J20	B-B16
Sample Date		8/4/99	8/12/99
Semivolatile Organic Compounds (µg/kg)			
2,4-Dichlorophenol	180[c]	NA	0.012
2-Methylnaphthalene	56[c]	NA	0.054
Acenaphthylene	3700[c]	NA	0.015
Anthracene	22000[c]	NA	0.037
Benzo(a)anthracene	0.62[c]	NA	0.079
Benzo(a)pyrene	0.062[c]	NA	0.12
Benzo(b)fluoranthene	0.62[c]	NA	0.065 J
Benzo(g,h,i)perylene	2300[c]	NA	0.03
Benzo(j)fluoranthene	1.37[d]	NA	0.065 J
Benzo(k)fluoranthene	6.2[c]	NA	0.065 J
Benzoic acid	100,000[c]	NA	0.057 J
Benzyl alcohol	18000[c]	NA	0.002 J
Chrysene	62[c]	NA	0.14 J
Dibenzo(a,e)pyrene	0.137[d]	NA	0.006
Dibenzo(a,h)anthracene	0.62[c]	NA	0.0085
Dibenzo(a,h)pyrene	0.0137[d]	NA	0.004
Dibenzo(a,j)acridine	1.37[d]	NA	0.0035 JN
Dibenzofuran	290[c]	NA	0.0087
Fluoranthene	2300[c]	NA	0.11
Fluorene	2600[c]	NA	0.023
Indeno(1,2,3-cd)pyrene	0.62[c]	NA	0.036
Naphthalene	56[c]	NA	0.012
Pentachlorophenol	3[c]	NA	1.4
Phenanthrene	22000[c]	NA	0.043
Pyrene	2300[c]	NA	0.091
Tetrachlorophenols	1800[c]	NA	0.035
Dioxin/Furans (ng/kg)			
2,3,7,8-TCDD TEQ	3.9[c]	**643.804**	**299.193**
2,3,7,8-TCDD	3.9[c]	0.72 U	0.464
2,3,7,8-TCDF	NA	10.891	1.881 U
1,2,3,7,8-PeCDD	NA	100.2	11.03
1,2,3,7,8-PeCDF	NA	57.901	2.981 U
2,3,4,7,8-PeCDF	NA	37.516	7.372
1,2,3,4,7,8-HxCDD	NA	372.728	42.193
1,2,3,6,7,8-HxCDD	NA	933.003	164.306
1,2,3,6,7,8-HxCDF	NA	87.919	36.822 U
1,2,3,7,8,9-HxCDD	NA	517.509	84.224

Key is at the end of the table.

Table 4-22

SUMMARY OF RESULTS FROM FACILITY TREATED POLE AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070573	99070657
Sample Location		B-J20	B-B16
Sample Date		8/4/99	8/12/99
Dioxin/Furans (ng/kg)			
2,3,4,6,7,8-HxCDF	NA	129.757	43.054 U
1,2,3,4,6,7,8-HpCDD	NA	25709.043	24407
1,2,3,4,6,7,8-HpCDF	NA	3337.167	769.046
1,2,3,4,7,8,9-HpCDF	NA	49.83 U	64.987
OCDD	NA	254852.308	23212
OCDF	NA	8234.128	2089.6
Total TCDD	NA	2.714	1.794
Total TCDF	NA	53.226	7.388 J
Total PeCDD	NA	230.394	20.497
Total PeCDF	NA	1193.341	72.898 J
Total HxCDD	NA	6412.812	771.069
Total HxCDF	NA	2502.883 JH	925.947 J
Total HpCDD	NA	46475.834	4647
Total HpCDF	NA	3337.167	834.034

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample Concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JH = The analyte was positively identified. The associated numerical result is an estimate, biased high.
JN = The analyte was tentatively identified and the numerical result is estimated.
µg/kg = Micrograms per kilograms.
ng/kg = Nanograms per kilogram.
NA = Not applicable.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-23

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.006687 - 12.887	SS19	7/7	-	4/7	0.062	2/7	2.32	4/7	0.137	0/7	30
Benzo(a)anthracene	0.0208 - 16	SS19	5/7	0.185 - 0.345	3/7	0.621	0/7	23.23	2/7	1.370	NA	NA
Benzo(a)pyrene	0.015 - 7.7	SS19	6/7	0.345 - 0.345	4/7	0.062	1/7	2.32	3/7	0.137	0/7	30
Benzo(b)fluoranthene	0.0399 - 17	SS19	7/7	-	3/7	0.621	0/7	23.23	3/7	1.370	NA	NA
Benzo(j)fluoranthene	0.065	B-B16	1/1	-	0/1	0.621	0/1	23.23	0/1	1.370	NA	NA
Benzo(k)fluoranthene	0.0164 - 9.2	SS19	7/7	-	1/7	6.215	0/7	232.30	0/7	13.699	NA	NA
Chrysene	0.021 - 25	SS19	7/7	-	0/7	62.148	0/7	2322.99	0/7	136.986	NA	NA
Dibenzo(a,e)pyrene	0.006	B-B16	1/1	-	0/1	0.062	0/1	2.32	0/1	0.137	NA	NA
Dibenzo(a,h)anthracene	0.0085 - 1.5	SS19	4/7	0.0438 - 0.345	3/7	0.062	0/7	2.32	3/7	0.137	NA	NA
Dibenzo(a,h)pyrene	0.004	B-B16	1/1	-	0/1	0.006	0/1	0.23	0/1	0.014	NA	NA
Dibenzo(a,j)acridine	0.0035	B-B16	1/1	-	0/1	0.621	0/1	23.23	0/1	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	0.0349 - 2.7	SS19	6/7	0.8625 - 0.8625	2/7	0.621	0/7	23.23	2/7	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	24407 - 250000	SS22	4/4	-	4/4	390	1/4	31384	4/4	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	769.046 - 28000	SS22	4/4	-	4/4	390	0/4	31384	4/4	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	64.987 - 1900	SS22	3/4	49.83 - 49.83	1/4	390	0/4	31384	1/4	666.7	NA	NA
1,2,3,4,7,8-HxCDD	42.193 - 2500	SS22	4/4	-	4/4	39	0/4	3138	3/4	66.7	NA	NA
1,2,3,4,7,8-HxCDF	210 - 2000	SS22	2/4	293.277 - 705.717	2/4	39	0/4	3138	2/4	66.7	NA	NA
1,2,3,6,7,8-HxCDD	164.306 - 11000	SS22	4/4	-	4/4	39	1/4	3138	4/4	66.7	NA	NA
1,2,3,6,7,8-HxCDF	87.919 - 1300	SS22	3/4	36.822 - 36.822	3/4	39	0/4	3138	3/4	66.7	NA	NA
1,2,3,7,8,9-HxCDD	84.224 - 4500	SS22	4/4	-	4/4	78	1/4	3138	4/4	66.7	NA	NA
1,2,3,7,8,9-HxCDF	110 - 290	SS22	2/4	6.592 - 58.291	2/4	39	0/4	3138	2/4	66.7	NA	NA
1,2,3,7,8-PeCDD	11.03 - 820	SS22	4/4	-	4/4	3.9	1/4	314	4/4	6.7	NA	NA
1,2,3,7,8-PeCDF	43 - 440	SS22	3/4	2.981 - 2.981	1/4	78	0/4	6277	1/4	133.3	NA	NA
2,3,4,6,7,8-HxCDF	129.757 - 1600	SS22	3/4	43.054 - 43.054	3/4	39	0/4	3138	3/4	66.7	NA	NA
2,3,4,7,8-PeCDF	7.372 - 1100	SS22	4/4	-	3/4	7.8	1/4	628	3/4	13.3	NA	NA
2,3,7,8-TCDD	0.464 -36	SS22	3/4	0.72 - 0.72	2/4	3.9	0/4	314	1/4	6.7	NA	NA
2,3,7,8-TCDD TEQ	299.193 - 6911	SS22	4/4	-	4/4	3.9	3/4	314	4/4	6.7	4/4	5
2,3,7,8-TCDF	10.891 - 120	SS22	3/4	1.881 - 1.881	1/4	39	0/4	3138	1/4	66.7	NA	NA
OCDD	23212 - 3400000	SS22	4/4	-	3/4	39000	1/4	3138357	3/4	66666.7	NA	NA
OCDF	2089.6 - 130000	SS22	4/4	-	1/4	39000	0/4	3138357	1/4	66666.7	NA	NA
Total HpCDD	4647 - 420000	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	834.034 - 100000	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	771.069 - 45000	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	925.947 - 47000	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	20.497 - 2200	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	72.898 - 8500	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	1.794 - 230	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	7.388 - 850	SS22	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-23

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
nCPAHs (mg/kg)												
1-Methylnaphthalene	0.0296	SI-OS01	1/3	0.185 - 0.345	0/3	55.92	0/3	23.51	0/3	1600	NA	NA
2-Methylnaphthalene	0.0318 - 0.362	OS08	4/7	0.185 - 0.55	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
Acenaphthene	0.079 - 0.083	SS22	2/7	0.0017 - 0.55	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Acenaphthylene	0.015 - 0.506	OS08	3/7	0.0438 - 0.55	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Anthracene	0.0188 - 1.5	SS19	6/7	0.345 - 0.345	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Benzo(g,h,i)perylene	0.0232 - 2.4	SS19	6/7	0.345 - 0.345	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Fluoranthene	0.0103 - 31	SS19	6/7	0.345 - 0.345	0/7	2293.61	0/7	6287.36	0/7	3200	NA	NA
Fluorene	0.0171 - 0.62	SS19	5/7	0.185 - 0.345	0/7	2643.61	0/7	304.64	0/7	3200	NA	NA
Naphthalene	0.012 - 0.195	OS08	4/7	0.185 - 0.55	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
ncPAH	0.0299 - 78.02	SS19	7/7	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.043 - 2.5	SS19	5/7	0.185 - 0.345	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Pyrene	0.02 - 40	SS19	7/7	-	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Retene	0.132	SI-OS01	1/3	0.185 - 0.345	NA	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.0316 - 0.257	OS08	4/7	0.81 - 11	0/7	100000.00	0/7	263.04	0/7	320000	NA	NA
Benzyl alcohol	0.002	B-B16	1/7	0.041 - 0.55	0/7	18330.93	0/7	28.99	0/7	24000	NA	NA
Carbazole	0.0125 - 0.62	SS19	4/6	0.185 - 0.345	0/6	24.32	NA	NA	0/6	50	NA	NA
Dibenzofuran	0.0087 - 0.134	OS08	4/7	0.185 - 0.55	0/7	290.53	0/7	29.93	0/7	320	NA	NA
Phenols (mg/kg)												
2,4-Dichlorophenol	0.012	B-B16	1/7	0.041 - 0.55	0/7	183.31	0/7	1.54	0/7	240	NA	NA
2,4-Dimethylphenol	0.0182	OS08	1/7	0.0083 - 0.55	0/7	1222.06	0/7	9.34	0/7	1600	NA	NA
4-Methylphenol	0.0375	OS08	1/6	0.041 - 0.55	0/6	305.52	0/6	1.06	0/6	400	NA	NA
Pentachlorophenol	0.151 - 34	SS19	6/7	0.185 - 0.185	3/7	2.98	6/7	0.077	2/7	8.3	2/7	11
Phenol	0.0333	OS08	1/7	0.0083 - 0.55	0/7	36661.86	0/7	80.64	0/7	48000	NA	NA
Tetrachlorophenols	0.035	B-B16	1/1	-	0/1	1833.09	0/1	25.82	0/1	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.

Table 4-24

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99070578	99070579	99070598	99070605	99070611	99070622	99080023
Sample Location	Screening	B-L25	B-Q26	B-L17	B-Q27	MW32-S	B-L30	MW36-S
Sample Date	Levels[ab]	8/4/99	8/4/99	8/8/99	8/8/99	8/8/99	8/9/99	8/20/99
Semivolatile Organic Compounds (mg/kg)								
2-Chloronaphthalene	NA	0.0056	0.0049 U	NA	0.038 U	NA	0.037 U	NA
2-Methylnaphthalene	56[c]	0.013	0.19	NA	0.12	NA	0.031	NA
3&4-Methylphenol	310[c]	0.0097 U	0.25	NA	0.038 J	NA	0.092 U	NA
Acenaphthene	3700[c]	0.012	0.0024 U	NA	0.021	NA	0.018 U	NA
Acenaphthylene	3700[c]	0.013	0.1	NA	0.13	NA	0.092	NA
Anthracene	22000[c]	0.04	0.39 U	NA	0.76	NA	0.22	NA
Benzo(a)anthracene	0.62[c]	0.034	0.11	NA	0.61	NA	0.24	NA
Benzo(a)pyrene	0.62[c]	0.085	0.43	NA	0.53	NA	0.29	NA
Benzo(b)fluoranthene	0.62[c]	0.046 JK	0.15 JK	NA	0.53 J	NA	0.36 J	NA
Benzo(g,h,i)perylene	2300[c]	0.03	0.25	NA	0.019 U	NA	0.018 U	NA
Benzo(j)fluoranthene	1.37[d]	0.046 JK	0.15 JK	NA	0.53 J	NA	0.36 J	NA
Benzo(k)fluoranthene	6.2[c]	0.046 JK	0.15 JK	NA	0.53 J	NA	0.36 J	NA
Chrysene	62[c]	0.081	0.23	NA	1.5	NA	0.9	NA
Dibenzo(a,h)anthracene	0.062[c]	0.0079	0.0024 U	NA	0.019 U	NA	0.018 U	NA
Dibenzofuran	290[c]	0.018	0.056	NA	0.053 J	NA	0.017 J	NA
Fluoranthene	2300[c]	0.1	0.17	NA	0.8	NA	0.33	NA
Fluorene	2600[c]	0.011	0.07	NA	0.15	NA	0.04	NA
Indeno(1,2,3-cd)pyrene	0.62[c]	0.023	0.088	NA	0.019 U	NA	0.018 U	NA
Naphthalene	56[c]	0.017	0.083	NA	0.08	NA	0.033	NA
Pentachlorophenol	3[c]	0.76	1.9 J	NA	6.8	NA	1.8	NA
Phenanthrene	22000[c]	0.093	0.22	NA	0.31	NA	0.11	NA
Pyrene	2300[c]	0.083	0.21	NA	0.79	NA	0.41	NA
Tetrachlorophenols	1800[c]	0.057	0.32	NA	0.53	NA	0.062 J	NA
Petroleum Hydrocarbons (mg/kg)								
C10-C12 Aliphatics	NA	5.1 U	5.6	NA	5.6 U	NA	5.4 U	NA
C10-C12 Aromatics	NA	5.1 U	9.8	NA	5.6 U	NA	5.4 U	NA
C12-C13 Aromatics	NA	5 U	39	NA	5 U	NA	5 U	NA
C18-C21 Aliphatics	NA	5.1 U	20	NA	18	NA	8.8	NA
C18-C21 Aromatics	NA	5.1 U	13	NA	12 J	NA	7.9	NA
C21-C28 Aliphatics	NA	5.1 U	100	NA	80	NA	99	NA
C21-C28 Aromatics	NA	5.1 U	13	NA	17 J	NA	15	NA
C28-C36 Aliphatics	NA	5.1 U	120	NA	84	NA	76	NA
C28-C36 Aromatics	NA	5.1 U	26 J	NA	33 J	NA	27	NA
Dioxin/Furans (ng/kg)								
2,3,7,8-TCDD TEQ	3.9[c]	**217.408**	**1180.504**	**2128.748**	**669.841**	**6.701**	**1650.112**	**13.322**
2,3,7,8-TCDD	3.9[c]	0.668 U	4.063 U	**7.566**	0.63 U	0.551 U	17.914 U	0.695 U
2,3,7,8-TCDF	NA	6.061	39.753	25.363	10.999	0.427 U	28.336	0.545 U
1,2,3,7,8-PeCDD	NA	46.154	154.425	214.093	25.085 U	0.859 U	309.524	2.527
1,2,3,7,8-PeCDF	NA	20.75	136.357	75.499 U	44.619 U	0.596 U	82.104 U	0.37 U
2,3,4,7,8-PeCDF	NA	20.074	131.572	12.488	17.317	0.603 U	44.436	0.374 U
1,2,3,4,7,8-HxCDD	NA	75.88	339.039	349.581	124.925	0.724 U	583.62	12.788
1,2,3,6,7,8-HxCDD	NA	314.24	2419.163	2618	704.997	13.651	2443.404 J	17.849
1,2,3,7,8,9-HxCDD	NA	173.262	664.692	1010.984	281.466	4.897	1316.158	30.011
2,3,4,6,7,8-HxCDF	NA	33.322 U	166.952	6.402 U	63.178 U	3.139 U	208.695	2.851 U

Key is at the end of the table.

Table 4-24 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA
SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99070578	99070579	99070598	99070605	99070611	99070622	99080023
Sample Location	Screening	B-L25	B-Q26	B-L17	B-Q27	MW32-S	B-L30	MW36-S
Sample Date	Levels[ab]	8/4/99	8/4/99	8/8/99	8/8/99	8/8/99	8/9/99	8/20/99
Dioxin/Furans (ng/kg)								
1,2,3,4,6,7,8-HpCDD	NA	8691.946	48442.323	105049	35314	380.472	70363	398.23
1,2,3,4,6,7,8-HpCDF	NA	837.652	6256.097	42490	14731	55.32	8787	46.784
1,2,3,4,7,8,9-HpCDF	NA	147.196 U	550.116 U	333.178	663.46 U	5.435 U	291.03	4.005
OCDD	NA	76986.124	419542.733	105804	452905	4673	632019	2023.896
OCDF	NA	2406.706	15765.357	111501	32037	209.485	27366	380.539
Total TCDD	NA	26.829	12.742	40.068	4.18	0.551 U	82.495	1.832
Total TCDF	NA	38.447	172.685	163.672	51.404	0.427 U	308.582	0.545 U
Total PeCDD	NA	233.165	652.245	615.32 J	119.756	0.859 U	1721.621	49.003
Total PeCDF	NA	504.065	3455.319	688.674	1399.139	19.29	4029.223	6.257
Total HxCDD	NA	1800.278	6422.836	17927	3081.726	56.227	14464.358 J	286.996
Total HxCDF	NA	1451.047	12364.497	6124.611	2619.868 J	69.993	10730.688 J	49.296 J
Total HpCDD	NA	16247.218	85349.561	175908	59725	701.198	127742	1010.297
Total HpCDF	NA	837.652	6256.097	44946	15426	55.32	8787	50.788

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JK = The analyte was positively identified. The associated numerical result is an estimate, unknown biased.
mg/kg = Milligrams per kilogram.
ng/kg = Nanograms per kilogram.
NA = Not applicable.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-25

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.108341 - 4.20344	SI-SD2	7/7	-	7/7	0.062	1/7	2.32	6/7	0.137	0/7	30
Benzo(a)anthracene	0.034 - 1.5	SS04	7/7	-	2/7	0.621	0/7	23.23	1/7	1.370	NA	NA
Benzo(a)pyrene	0.085 - 2.21	SI-SD2	7/7	-	7/7	0.062	0/7	2.32	6/7	0.137	0/7	30
Benzo(b)fluoranthene	0.046 - 6.1	SI-SD2	7/7	-	3/7	0.621	0/7	23.23	3/7	1.370	NA	NA
Benzo(j)fluoranthene	0.046 - 0.53	B-Q27	4/4	-	0/4	0.621	0/4	23.23	0/4	1.370	NA	NA
Benzo(k)fluoranthene	0.046 - 2.95	SI-SD2	7/7	-	0/7	6.215	0/7	232.30	0/7	13.699	NA	NA
Chrysene	0.081 - 3.94	SI-SD2	7/7	-	0/7	62.148	0/7	2322.99	0/7	136.986	NA	NA
Dibenzo(a,h)anthracene	0.0079 - 0.858	SI-SD2	4/7	0.0024 - 0.019	3/7	0.062	0/7	2.32	3/7	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.023 - 3.59	SI-SD2	5/7	0.018 - 0.019	3/7	0.621	0/7	23.23	1/7	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	380.472 - 670000	SS01	13/13	-	12/13	390	9/13	31384	11/13	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	46.784 - 68000	SS01	13/13	-	11/13	390	4/13	31384	11/13	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	4.005 - 4700	SS01	7/13	5.435 - 790	4/13	390	0/13	31384	2/13	666.7	NA	NA
1,2,3,4,7,8-HxCDD	12.788 - 5300	SS01	9/13	0.724 - 1530	8/13	39	1/13	3138	8/13	66.7	NA	NA
1,2,3,4,7,8-HxCDF	830 - 7770	SS24	5/13	11.528 - 3160	5/13	39	3/13	3138	5/13	66.7	NA	NA
1,2,3,6,7,8-HxCDD	13.651 - 43690	SS24	13/13	-	11/13	39	4/13	3138	11/13	66.7	NA	NA
1,2,3,6,7,8-HxCDF	150 - 2100	SS01	4/13	1.801 - 3160	4/13	39	0/13	3138	4/13	66.7	NA	NA
1,2,3,7,8,9-HxCDD	4.897 - 7200	SS01	12/13	310 - 310	10/13	78	2/13	3138	10/13	66.7	NA	NA
1,2,3,7,8,9-HxCDF	200 - 2300	SS66	4/13	2.106 - 3160	4/13	39	0/13	3138	4/13	66.7	NA	NA
1,2,3,7,8-PeCDD	2.527 - 1700	SS01	9/13	0.859 - 1280	8/13	3.9	2/13	314	8/13	6.7	NA	NA
1,2,3,7,8-PeCDF	20.75 - 3600	SS24	7/13	0.37 - 1030	6/13	78	0/13	6277	5/13	133.3	NA	NA
2,3,4,6,7,8-HxCDF	166.952 - 2400	SS01	6/13	2.851 - 3160	6/13	39	0/13	3138	6/13	66.7	NA	NA
2,3,4,7,8-PeCDF	12.488 - 3100	SS01	9/13	0.374 - 1030	9/13	7.8	3/13	628	8/13	13.3	NA	NA
2,3,7,8-TCDD	7.566 - 61	SS01	3/13	0.551 - 370	3/13	3.9	0/13	314	3/13	6.7	NA	NA
2,3,7,8-TCDD TEQ	6.701 - 16996	SS01	13/13	-	13/13	3.9	10/13	314	13/13	6.7	13/13	5
2,3,7,8-TCDF	6.061 - 1620	SS24	9/13	0.427 - 130	5/13	39	0/13	3138	3/13	66.7	NA	NA
OCDD	2023.896 - 6630450	SS24	13/13	-	11/13	39000	2/13	3138357	11/13	66666.7	NA	NA
OCDF	209.485 - 210000	SS01	13/13	-	5/13	39000	0/13	3138357	3/13	66666.7	NA	NA
Total HpCDD	701.198 - 1363900	SS66	13/13	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	50.788 - 282370	SS24	13/13	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	56.227 - 410000	SS06	13/13	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	49.296 - 316880	SS24	13/13	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	49.003 - 4000	SS01	10/13	0.859 - 1280	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	6.257 - 110830	SS24	12/13	1030 - 1030	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	1.832 - 370	SS01	9/13	0.551 - 370	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	38.447 - 1800	SS01	10/13	0.427 - 130	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C10-C12 Aliphatics	5.6	B-Q26	1/8	5 - 5.6	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	9.8	B-Q26	1/8	5 - 5.6	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	39	B-Q26	1/4	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	8.8 - 20	B-Q26	3/4	5.1 - 5.1	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	7.9 - 13	B-Q26	3/4	5.1 - 5.1	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	80 - 100	B-Q26	3/4	5.1 - 5.1	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	13 - 17	B-Q27	3/4	5.1 - 5.1	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-25

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum (mg/kg)												
C28-C36 Aliphatics	76 - 120	B-Q26	3/4	5.1 - 5.1	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	26 - 33	B-Q27	3/4	5.1 - 5.1	NA	NA	NA	NA	NA	NA	NA	NA
EPH	233.7 - 292	B-Q26	3/4	-	NA	NA	0/3	2000	NA	NA	0/4	460
VPH	54.4	B-Q26	1/4	-	NA	NA	1/1	30	NA	NA	0/4	200
ncPAHs (mg/kg)												
1-Methylnaphthalene	0.034 - 0.0723	SI-SD2	2/2	-	0/2	55.92	0/2	23.51	0/2	1600	NA	NA
2-Chloronaphthalene	0.0056	B-L25	1/7	0.0049 - 0.356	0/7	3852.60	0/7	121.61	0/7	6400	NA	NA
2-Methylnaphthalene	0.013 - 0.19	B-Q26	7/7	-	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
Acenaphthene	0.012 - 0.16	SS04	4/7	0.0024 - 0.356	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Acenaphthylene	0.013 - 0.568	SI-SD2	7/7	-	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Anthracene	0.04 - 2.77	SI-SD2	6/7	0.39 - 0.39	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Benzo(g,h,i)perylene	0.03 - 1.63	SI-SD2	5/7	0.018 - 0.019	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Fluoranthene	0.1 - 2.23	SI-SD2	7/7	-	0/7	2293.61	0/7	6287.36	0/7	3200	NA	NA
Fluorene	0.011 - 0.47	SS04	6/7	0.356 - 0.356	0/7	2643.61	0/7	304.64	0/7	3200	NA	NA
Naphthalene	0.017 - 0.11	SI-SD2	7/7	-	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
ncPAH	0.4176 - 11.468	SS04	7/7	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.093 - 0.75	SS04	7/7	-	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Pyrene	0.083 - 5.3	SS04	7/7	-	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.0908	SI-OS05	1/7	0.019 - 0.93	0/7	100000.00	0/7	263.04	0/7	320000	NA	NA
Carbazole	0.0924 - 0.318	SI-SD2	3/3	-	0/3	24.32	NA	NA	0/3	50	NA	NA
Dibenzofuran	0.017 - 0.0927	SI-SD2	7/7	-	0/7	290.53	0/7	29.93	0/7	320	NA	NA
Phenols (mg/kg)												
2,4-Dimethylphenol	0.0191	SI-SD2	1/7	0.0097 - 0.356	0/7	1222.06	0/7	9.34	0/7	1600	NA	NA
3&4-Methylphenol	0.038 - 0.25	B-Q26	2/4	0.0097 - 0.092	0/4	305.52	0/4	1.06	0/4	400	NA	NA
Pentachlorophenol	0.76 - 72	SS04	7/7	-	4/7	2.98	7/7	0.077	2/7	8	1/7	11
Tetrachlorophenols	0.057 - 0.53	B-Q27	4/4	-	0/4	1833.09	0/4	25.82	0/4	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
VPH = Volatile petroleum hydrocarbon.

Table 4-26

SUMMARY OF RESULTS FROM SOUTH SLOPE SURFACE SOIL TPH FIELD-SCREENING SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Sample ID	Sample Location	TPH (mg/kg)
Background		
SP-FS29	Background (overgrown field near Bellingham Technical College)	119
SP-FS29 Dup	Background (field duplicate)	120
South Slope Grid Cell Locations		
SS-FS01	AA1	58
SS-FS02	AA2	101
SS-FS02 Dup	AA2* (field duplicate)	133
SS-FS03	AA3	76
SS-FS04	AA4*	116
SS-FS05	AA5	475
SS-FS06	AA6*	235
SS-FS07	AA7	57
SS-FS08	BB1	93
SS-FS09	BB2	50
SS-FS10	BB3*	113
SS-FS11	BB4	212
SS-FS12	BB5*	80
SS-FS13	BB6	81
SS-FS14	CC5	65
SS-FS14 Dup	CC5 (field duplicate)	73
SS-FS15	CC4*	160
SS-FS16	CC3	67
SS-FS17	CC2	110
SS-FS18	CC1	103
SS-FS19	DD1	127
SS-FS20	DD2	99
SS-FS21	DD3	78

* Samples for laboratory analysis also collected.

Key:

Dup = Field duplicate.
ID = Identification.
mg/kg = Milligrams per kilogram.
TPH = Total petroleum hydrocarbon.

Table 4-27

SUMMARY OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[(a)(b)]	99070511	99070512	99070513	99070514	99070532	99070533	99070534	99070535	99070536	99070537
Sample Location		MWLSC01	MWLSC02	MWLSC03	MWLSC04	B-AA2	B-AA4	B-AA6	B-BB3	B-BB5	B-CC4
Sample Date		8/5/99	8/5/99	8/5/99	8/5/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99
Analyte											
Semivolatile Organic Compounds (mg/kg)											
1,2,4-Trichlorobenzene	650 [(c)]	0.01 U	0.011 U	0.01 U	0.0098 U	0.013 U	0.011 U	0.011 U	0.012 U	0.0038 J	0.012 U
1-Methylnaphthalene	56 [(c)]	0.0021 U	0.0021 U	0.0021 U	0.002 U	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
2,4-Dinitrotoluene	120 [(c)]	0.01 U	0.042 JN	0.01 U	0.0098 U	0.013 U	0.011 U	0.011 U	0.045 JN	0.036 JN	0.015 JN
2,6-Dinitrotoluene	61 [(c)]	0.01 U	0.011 U	0.01 U	0.0098 U	0.013 U	0.011 U	0.011 U	0.012 U	0.022 JN	0.012 U
2-Methylnaphthalene	56 [(c)]	0.4	0.069	0.0056	0.0043	0.0059	0.006	0.0043	0.0052	0.0047	0.0049
4,6-Dinitro-2-methylphenol	NA	0.01 U	0.011 U	0.01 U	0.0098 U	0.013	0.011 UJ	0.011 U	0.012 U	0.011 U	0.012 U
7,12-Dimethylbenz(a)anthracene	NA	0.026 JN	0.0021 U	0.0021 U	0.016 JN	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Acenaphthylene	3,700 [(c)]	0.0021 U	0.024	0.0021 U	0.03	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Anthracene	22,000 [(c)]	0.023	0.016	0.0023	0.056	0.0026 U	0.0025	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Benzo(a)anthracene	0.62 [(c)]	0.026	0.025	0.0021 U	0.002 U	0.0089	0.0023 U	0.0047 JN	0.0025 U	0.0023 U	0.0025 U
Benzo(a)pyrene	0.062 [(c)]	0.016	0.012	0.013 JN	0.24	0.0071	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Benzo(b)fluoranthene	0.62 [(c)]	0.0075 J	0.0078 J	0.0036 J	0.073 J	0.0049 J	0.0023 U	0.0063	0.0025 U	0.011	0.0025 U
Benzo(g,h,i)perylene	2300 [(c)]	0.015	0.0095	0.0021 U	0.17	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Benzo(j)fluoranthene	1.37 [d]	0.0075 J	0.0078 J	0.0036 J	0.073 J	0.0049 J	0.0034 J	0.023 U	0.025 U	0.023 U	0.025 U
Benzo(k)fluoranthene	6.2 [(c)]	0.0075 J	0.0078 J	0.0036 J	0.073 J	0.0049 J	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Benzoic acid	100,000 [(c)]	0.021 U	0.036 JN	0.021 U	0.02 U	0.046	0.021 J	0.023 U	0.025 U	0.023 U	0.025 U
Benzyl alcohol	18,000 [(c)]	0.01 U	0.011 U	0.01 U	0.0098 U	0.013 U	0.011 U	0.011 U	0.012 U	0.0068 J	0.012 U
Chrysene	62 [(c)]	0.039	0.042	0.0021 U	0.12	0.019	0.016	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzo(a,e)pyrene	0.137 [d]	0.0021 U	0.0021 U	0.0021 U	0.064	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzo(a,h)anthracene	0.062 [(c)]	0.0021 U	0.0021 U	0.0021 U	0.034	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.0021 U	0.0021 U	0.0021 U	0.0073	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzo(a,i)pyrene	0.0137 [d]	0.0021 U	0.0021 U	0.0021 U	0.029	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzo(a,j)acridine	1.37	0.0021 U	0.0021 U	0.0021 U	0.002 U	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzo(a,l)pyrene	NA	0.0021 U	0.0021 U	0.0021 U	0.0039 JN	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Dibenzofuran	290 [(c)]	0.084	0.018	0.0019 J	0.0014 J	0.013 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U
Fluoranthene	2,300 [(c)]	0.044	0.041	0.014	0.011	0.014	0.013 JN	0.0097	0.025	0.011	0.013
Fluorene	2,600 [(c)]	0.0021 U	0.0021 U	0.0021 U	0.012	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Indeno(1,2,3-cd)pyrene	0.62 [(c)]	0.011	0.0067	0.0021 U	0.21	0.0041	0.0023 U	0.0023 U	0.0025 U	0.0023 U	0.0025 U
Naphthalene	56 [(c)]	0.39	0.08	0.0079	0.0059	0.0084	0.01	0.0061	0.0059	0.0061	0.0061
Pentachlorophenol	3 [(c)]	0.026	0.015	0.0056 J	0.41	0.015 J	0.0085 J	0.011 J	0.012 U	0.011 U	0.012 U
Phenanthrene	22,000 [(c)]	0.14	0.041	0.0099	0.0065	0.0097	0.011	0.0023 U	0.013	0.0023 U	0.012
Phenol	37,000 [(c)]	0.01 U	0.011 U	0.01 U	0.0098 U	0.013 U	0.011 U	0.011 U	0.012 U	0.0041 J	0.012 U
Pyrene	2,300 [(c)]	0.052	0.044	0.0097	0.024	0.012 JN	0.011 JN	0.0023 U	0.012	0.0023 U	0.0025 U
Retene	NA	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Tetrachlorophenols	1,800 [(c)]	0.01 U	0.011 U	0.01 U	0.023 J	0.013 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U
Petroleum Hydrocarbons (mg/kg)											
C12-C16 Aliphatics	NA	16	8.7	11	5.3 U	6.4 U	6.1 U	6 U	6.3 U	6 U	6.3 U
C12-C16 Aromatics	NA	5.5 U	5.6 U	5.4 U	5.3 U	6.4 U	6.1 U	6 U	6.5	6 U	6.3 U

Key is at the end of the table.

Table 4-27

SUMMARY OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels (PSLs)[a][b]	99070511	99070512	99070513	99070514	99070532	99070533	99070534	99070535	99070536	99070537
Sample Location		MWLSC01	MWLSC02	MWLSC03	MWLSC04	B-AA2	B-AA4	B-AA6	B-BB3	B-BB5	B-CC4
Sample Date		8/5/99	8/5/99	8/5/99	8/5/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99
Analyte											
C21-C28 Aliphatics	NA	10	5.6 U	5.4 U	5.3 U	6.4 U	6.1 U	6 U	6.3 U	6 U	6.3 U
C28-C36 Aliphatics	NA	8.2	5.6 U	6.5	5.3 U	6.4 U	6.1 U	6 U	6.3 U	6 U	6.3 U
C28-C36 Aromatics	NA	7.6 J	5.6 U	5.9 J	5.3 U	6.4 U	6.1 U	6 U	6.3 U	6 U	6.3 U
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9 [c]	21.318	18.774	10.806	90.402	8.020	5.590	5.268	5.444	2.717	3.160
2,3,7,8-TCDD	3.9 [c]	0.501 U	0.717 U	0.462 U	0.369 U	0.383 U	0.488 U	0.53 U	0.361 U	0.531 U	0.455 U
2,3,7,8-TCDF	NA	2.489	2.023	2.125	1.999	0.343 U	1.92	1.568	0.38 U	2.482	3.362
1,2,3,7,8-PeCDD	NA	4.786	4.513	3.053	2.42	0.827 U	1.105	0.92 U	1.021	0.952 U	0.865 U
1,2,3,7,8-PeCDF	NA	1.295	0.801 U	0.509 U	0.484 U	0.483 U	0.469 U	0.536 U	0.368 U	0.609 U	0.772 U
2,3,4,7,8-PeCDF	NA	1.573	0.809 U	1.007	0.489 U	0.489 U	0.474 U	0.542 U	0.372 U	0.616 U	1.054
1,2,3,4,7,8-HxCDD	NA	8.268	30.776	4.493 U	6.84 U	4.644	2.545 U	3.297	3.011	1.933 U	2.296 U
1,2,3,4,7,8-HxCDF	NA	49.295 U	31.493 U	22.526 U	356.537 U	15.568 U	10.931 U	22.377 U	10.534 U	5.742 U	6.171 U
1,2,3,6,7,8-HxCDD	NA	26.957 U	20.721	15.257	143.697	17.672	10.383	14.35 U	9.359	6.183	5.163
1,2,3,7,8,9-HxCDD	NA	19.758	18.176	10.3	27.677	9.812	6.942	7.62	6.478	4.307 U	4.152 U
1,2,3,7,8,9-HxCDF	NA	16.501 U	11.077 U	8.209 U	35.995 U	394.271	207.866	307.831	209.879	154.642	146.535
2,3,4,6,7,8-HxCDF	NA	12.187 U	8.182 U	6.063 U	26.586 U	2.309 U	1.331 U	4.136 U	1.245 U	1.341 U	1.443 U
1,2,3,4,6,7,8-HpCDD	NA	1005.77	556.078	344.117	5129	394.271	207.866	307.831	209.879	154.642	146.535
1,2,3,4,6,7,8-HpCDF	NA	144.151	88.408	64.259	1278.309	44.285	28.408	54.799	24.66	16.208	18.185
1,2,3,4,7,8,9-HpCDF	NA	29.296 U	23.213 U	6.58 U	150.275 U	7.367 U	8.728 U	13.497 U	8.859 U	6.618 U	5.271 U
OCDD	NA	10328.576	5920	3610	56534	4055.11	1889.108	3683.4	1840.345	1349.065	1270.286
OCDF	NA	968.506	547.13	368.435	9178	165.276	91.359	247.06	90.902	70.521	65.834
Total TCDD	NA	17.431	36.668	44.428	29.089	12.246	16.023	16.74	22.326	21.418	49.7
Total TCDF	NA	15.923	0.568 U	7.595	3.407	1.533	7.405	0.454 U	3.849	11.485	13.681
Total PeCDD	NA	28.922	28.496	35.436	30.754	12.523	16.707	17.865 J	20.018	17.508	34.305
Total PeCDF	NA	61.396	26.555	25.306	14.825	17.967	9.005	18.962	13.688	8.078	14.767
Total HxCDD	NA	194.121	224.81	144.029	473.325	135.468	88.703 J	80.533 J	94.165	79.539	77.066
Total HxCDF	NA	133.655	100.918	71.531	830.522	71.155 J	43.112 J	94.459 J	37.326 J	21.576	21.77
Total HpCDD	NA	1799.311	1034.819	606.637	8629.14	726.1	387.568	567.886	376.805	280.9	273.604
Total HpCDF	NA	144.151	88.408	64.259	1278.309	44.285	28.408	54.799	24.66	16.208	18.185

Key is at the end of the table.

Table 4-27

SUMMARY OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels (PSLs)[a][b]	99224021	99224022	99224047	99224048	99224049
Sample Location		RES-43	RES-46	RES-41	RES-42	RES-42A
Sample Date		5/25/99	5/25/99	5/28/99	5/28/99	5/28/99
Analyte						
Semivolatile Organic Compounds (mg/kg)						
1,2,4-Trichlorobenzene	650 [c]	0.132 U	0.191 U	0.219 U	0.201 U	0.157 U
1-Methylnaphthalene	56 [c]	0.0917 J	0.191 U	0.219 U	0.114 J	0.0949 J
2,4-Dinitrotoluene	120 [c]	0.264 U	0.381 U	0.438 U	0.402 U	0.314 U
2,6-Dinitrotoluene	61 [c]	0.661 U	0.953 U	1.09 U	1 U	0.785 U
2-Methylnaphthalene	56 [c]	0.141	0.191 U	0.0557 J	0.156 J	0.12 J
4,6-Dinitro-2-methylphenol	NA	0.661 U	0.953 U	1.09 U	1 U	0.785 U
7,12-Dimethylbenz(a)anthracene	NA	NT	NT	NT	NT	NT
Acenaphthylene	3,700 [c]	0.132 U	0.191 U	0.219 U	0.201 U	0.157 U
Anthracene	22,000 [c]	0.132 U	0.191 U	0.219 U	0.201 U	0.0418 J
Benzo(a)anthracene	0.62 [c]	0.132 U	0.191 U	0.219 U	0.201 U	0.157 U
Benzo(a)pyrene	0.062 [c]	0.264 U	0.381 U	0.438 U	0.402 U	0.0872 J
Benzo(b)fluoranthene	0.62 [c]	0.0728 J	0.191 U	0.219 U	0.201 U	0.182
Benzo(g,h,i)perylene	2300 [c]	0.156	0.191 U	0.219 U	0.201 U	0.226
Benzo(j)fluoranthene	1.37 [d]	0.132 U	0.191 U	0.219 U	0.201 U	0.157 U
Benzo(k)fluoranthene	6.2 [c]	0.132 U	0.191 U	0.219 U	0.201 U	0.0457 J
Benzoic acid	100,000 [c]	0.661 U	1.05	1.09 U	1 U	0.785 U
Benzyl alcohol	18,000 [c]	0.661 U	0.953 U	1.09 U	1 U	0.785 U
Chrysene	62 [c]	0.056 J	0.191 U	0.219 U	0.055 J	0.141 J
Dibenzo(a,e)pyrene	0.137 [d]	NT	NT	NT	NT	NT
Dibenzo(a,h)anthracene	0.062 [c]	0.264 U	0.381 U	0.438 U	0.402 U	0.314 U
Dibenzo(a,h)pyrene	0.0137 [d]	NT	NT	NT	NT	NT
Dibenzo(a,i)pyrene	0.0137 [d]	NT	NT	NT	NT	NT
Dibenzo(a,j)acridine	1.37	NT	NT	NT	NT	NT
Dibenzo(a,l)pyrene	NA	NT	NT	NT	NT	NT
Dibenzofuran	290 [c]	0.0382 J	0.191 U	0.219 U	0.201 U	0.157 U
Fluoranthene	2,300 [c]	0.0539 J	0.0638 J	0.0703 J	0.0734 J	0.0984 J
Fluorene	2,600 [c]	NT	NT	NT	NT	NT
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.279	0.381 U	0.438 U	0.402 U	0.372
Naphthalene	56 [c]	0.102 J	0.191 U	0.0569 J	0.115 J	0.157 U
Pentachlorophenol	3 [c]	0.661 U	0.953 U	1.09 U	1 U	0.785 U
Phenanthrene	22,000 [c]	0.0727 J	0.191 U	0.219 U	0.0723 J	0.0957 J
Phenol	37,000 [c]	0.132 U	0.191 U	0.219 U	0.201 U	0.157 U
Pyrene	2,300 [c]	0.0444 J	0.191 U	0.219 U	0.201 U	0.0908 J
Retene	NA	0.248	0.191 U	0.219 U	0.513	0.268
Tetrachlorophenols	1,800 [c]	NT	NT	NT	NT	NT
Petroleum Hydrocarbons (mg/kg)						
C12-C16 Aliphatics	NA	NT	NT	NT	NT	NT
C12-C16 Aromatics	NA	NT	NT	NT	NT	NT

Key is at the end of the table.

Table 4-27

SUMMARY OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels (PSLs)[a][b]	99224021	99224022	99224047	99224048	99224049
Sample Location		RES-43	RES-46	RES-41	RES-42	RES-42A
Sample Date		5/25/99	5/25/99	5/28/99	5/28/99	5/28/99
Analyte						
C21-C28 Aliphatics	NA	NT	NT	NT	NT	NT
C28-C36 Aliphatics	NA	NT	NT	NT	NT	NT
C28-C36 Aromatics	NA	NT	NT	NT	NT	NT
Dioxin/Furans (ng/kg)						
2,3,7,8-TCDD TEQ	3.9[c]	57.872	3.684	12.794	10.452	195.086
2,3,7,8-TCDD	3.9[c]	0.187 U	0.223 U	0.276	0.052 U	2.239
2,3,7,8-TCDF	NA	4.24	0.831 U	1.015	1.229	7.946
1,2,3,7,8-PeCDD	NA	15.357	0.422 U	2.158	1.699	26.571
1,2,3,7,8-PeCDF	NA	13.338	0.264 U	1.318	0.65	25.602
2,3,4,7,8-PeCDF	NA	11.788	0.28 U	1.556	0.766	24.106
1,2,3,4,7,8-HxCDD	NA	2.187	23.675	4.917	4.703	64.043
1,2,3,4,7,8-HxCDF	NA	14.315 U	180.931 U	8.004	5.19 U	125.165 U
1,2,3,6,7,8-HxCDD	NA	6.903 U	93.892	15.9	14.121	233.028
1,2,3,7,8,9-HxCDD	NA	4.155 U	62.915	9.823	9.168	129.203
1,2,3,7,8,9-HxCDF	NA	1.795 U	24.529 U	1.498	0.824 U	26.475
2,3,4,6,7,8-HxCDF	NA	1.28 U	17.493 U	1.741	1.351	20.918
1,2,3,4,6,7,8-HpCDD	NA	241.731	622.6	397.932	404.25	7803.5
1,2,3,4,6,7,8-HpCDF	NA	27.204	591.661	83.694	79.481	1640
1,2,3,4,7,8,9-HpCDF	NA	12.716 U	44.54 U	4.009	4.44	76.84
OCDD	NA	1733.41	48291.5	3373.6	3595.8	80675
OCDF	NA	114.882	5100.9	327.939	393.89	15112
Total TCDD	NA	1.755	5.467	8.556	11.139	16.739
Total TCDF	NA	1.362	24.113	4.416	7.394	33.331
Total PeCDD	NA	3.133	31.224	11.733	10.41	84.632
Total PeCDF	NA	10.671	302.639	33.368	19.116	480.14
Total HxCDD	NA	39.018	534.043	98.865	110.837	1296.215
Total HxCDF	NA	42.34	1123.476	149.797	94.034	2206.368
Total HpCDD	NA	420.463	11232.4	714.244	814.288	15281
Total HpCDF	NA	27.204	591.661	346.032	337.59	6583.137

Key is on the next page.

Table 4-27

SUMMARY OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample Concentrations above PSLs are shaded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 1999, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (Draft 2000 version).

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identified and the numerical result is estimated.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
NT	= Not tested.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalency Quotient
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-28

STATISTICAL ANALYSIS OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	0.016 - 0.026	MWLSC01	2/10	0.0021 - 0.0026	2/10	0.003	0/10	0.12	2/10	0.007	NA	NA
B(a)P Equivalent	0.000055 - 1.09645	MWLSC04	11/15	-	3/15	0.062	0/15	2.32	3/15	0.137	0/15	30
Benzo(a)anthracene	0.0047 - 0.026	MWLSC01	4/15	0.002 - 0.219	0/15	0.621	0/15	23.23	0/15	1.370	NA	NA
Benzo(a)pyrene	0.0071 - 0.24	MWLSC04	6/15	0.0023 - 0.438	2/15	0.062	0/15	2.32	1/15	0.137	0/15	30
Benzo(b)fluoranthene	0.0036 - 0.182	RES-42A	9/15	0.0023 - 0.219	0/15	0.621	0/15	23.23	0/15	1.370	NA	NA
Benzo(j)fluoranthene	0.0034 - 0.073	MWLSC04	6/10	0.023 - 0.025	0/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Benzo(k)fluoranthene	0.0036 - 0.073	MWLSC04	6/15	0.0023 - 0.219	0/15	6.215	0/15	232.30	0/15	13.699	NA	NA
Chrysene	0.016 - 0.141	RES-42A	8/15	0.0021 - 0.219	0/15	62.148	0/15	2322.99	0/15	136.986	NA	NA
Dibenzo(a,e)pyrene	0.064	MWLSC04	1/10	0.0021 - 0.0026	1/10	0.062	0/10	2.32	0/10	0.137	NA	NA
Dibenzo(a,h)anthracene	0.034	MWLSC04	1/15	0.0021 - 0.438	0/15	0.062	0/15	2.32	0/15	0.137	NA	NA
Dibenzo(a,h)pyrene	0.0073	MWLSC04	1/10	0.0021 - 0.0026	1/10	0.006	0/10	0.23	0/10	0.014	NA	NA
Dibenzo(a,i)pyrene	0.029	MWLSC04	1/10	0.0021 - 0.0026	1/10	0.006	0/10	0.23	1/10	0.014	NA	NA
Dibenzo(a,l)pyrene	0.0039	MWLSC04	1/10	0.0021 - 0.0026	0/10	0.006	0/10	0.23	0/10	0.014	NA	NA
Indeno(1,2,3-cd)pyrene	0.0041 - 0.372	RES-42A	6/15	0.0021 - 0.438	0/15	0.621	0/15	23.23	0/15	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	146.535 - 7803.5	RES-42A	15/15	-	8/15	390	0/15	31384	3/15	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	16.208 - 1640	RES-42A	15/15	-	3/15	390	0/15	31384	2/15	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	4.009 - 76.84	RES-42A	3/15	5.271 - 150.275	0/15	390	0/15	31384	0/15	666.7	NA	NA
1,2,3,4,7,8-HxCDD	2.101 - 64.043	RES-42A	10/15	1.933 - 6.84	1/15	39	0/15	3138	0/15	66.7	NA	NA
1,2,3,4,7,8-HxCDF	8.004	RES-41	1/15	5.19 - 356.537	0/15	39	0/15	3138	0/15	66.7	NA	NA
1,2,3,6,7,8-HxCDD	5.163 - 233.028	RES-42A	13/15	14.35 - 26.957	3/15	39	0/15	3138	3/15	66.7	NA	NA
1,2,3,7,8,9-HxCDD	3.422 - 129.203	RES-42A	13/15	4.152 - 4.307	1/15	78	0/15	3138	1/15	66.7	NA	NA
1,2,3,7,8,9-HxCDF	1.498 - 26.475	RES-42A	2/15	0.824 - 35.995	0/15	39	0/15	3138	0/15	66.7	NA	NA
1,2,3,7,8-PeCDD	1.021 - 26.571	RES-42A	10/15	0.422 - 0.952	4/15	3.9	0/15	314	2/15	6.7	NA	NA
1,2,3,7,8-PeCDF	0.65 - 25.602	RES-42A	5/15	0.264 - 0.801	0/15	78	0/15	6277	0/15	133.3	NA	NA
2,3,4,6,7,8-HxCDF	1.351 - 20.918	RES-42A	3/15	0.738 - 26.586	0/15	39	0/15	3138	0/15	66.7	NA	NA
2,3,4,7,8-PeCDF	0.766 - 24.106	RES-42A	7/15	0.28 - 0.809	2/15	7.8	0/15	628	1/15	13.3	NA	NA
2,3,7,8-TCDD	0.276 - 2.239	RES-42A	2/15	0.052 - 0.717	0/15	3.9	0/15	314	0/15	6.7	NA	NA
2,3,7,8-TCDD TEQ	2.717 - 195.0865	RES-42A	15/15	-	12/15	3.9	0/15	314	9/15	6.7	12/15	5
2,3,7,8-TCDF	1.015 - 7.946	RES-42A	12/15	0.343 - 0.831	0/15	39	0/15	3138	0/15	66.7	NA	NA
OCDD	1270.286 - 80675	RES-42A	15/15	-	3/15	39000	0/15	3138357	1/15	66666.7	NA	NA
OCDF	60.623 - 15112	RES-42A	15/15	-	0/15	39000	0/15	3138357	0/15	66666.7	NA	NA
Total HpCDD	273.604 - 15281	RES-42A	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	16.208 - 6583.137	RES-42A	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	55.112 - 1296.215	RES-42A	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	21.576 - 2206.368	RES-42A	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	6.777 - 84.632	RES-42A	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	8.078 - 480.14	RES-42A	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	5.467 - 49.7	B-CC4	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	1.179 - 33.331	RES-42A	13/15	0.454 - 0.568	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-28

STATISTICAL ANALYSIS OF RESULTS FROM SOUTH SLOPE SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Standard	MTCA Terrestrial Ecological Standard
Petroleum (mg/kg)												
C12-C16 Aliphatics	8.7 - 16	MWLSC01	3/10	5.3 - 6.4	0/10		0/10		0/10		NA	NA
C12-C16 Aromatics	6.5	B-BB3	1/10	5.3 - 6.4	0/10		0/10		0/10		0/10	NA
C21-C28 Aliphatics	10	MWLSC01	1/10	5.3 - 6.4	0/10		0/10		0/10		0/10	NA
C28-C36 Aliphatics	6.5 - 8.2	MWLSC01	2/10	5.3 - 6.4	0/10		0/10		0/10		0/10	NA
C28-C36 Aromatics	5.9 - 7.6	MWLSC01	2/10	5.3 - 6.4	0/10		0/10		0/10		0/10	NA
EPH	6.5 - 41.8	MWLSC01	4/10	-	0/4		0/4	2000	0/4		0/4	460
ncPAHs (mg/kg)												
1-Methylnaphthalene	0.0917 - 0.114	RES-42	3/5	0.191 - 0.219	0/5	55.92	0/5	23.51	0/5	1600	NA	NA
2-Methylnaphthalene	0.0043 - 0.4	MWLSC01	14/15	0.191 - 0.191	0/15	55.92	0/15	23.51	0/15	1600	NA	NA
Acenaphthylene	0.024 - 0.03	MWLSC04	2/15	0.0021 - 0.219	0/15	3681.71	0/15	284.05	0/15	4800	NA	NA
Anthracene	0.0023 - 0.056	MWLSC04	6/15	0.0023 - 0.219	0/15	21896.12	0/15	6777.61	0/15	24000	NA	NA
Benzo(g,h,i)perylene	0.0095 - 0.226	RES-42A	5/15	0.0021 - 0.219	0/15	2308.68	0/15	1959.13	0/15	2400	NA	NA
Fluoranthene	0.0097 - 0.0984	RES-42A	15/15	-	0/15	2293.61	0/15	6287.36	0/15	3200	NA	NA
Fluorene	0.012	MWLSC04	1/10	0.0021 - 0.0026	0/10	2643.61	0/10	304.64	0/10	3200	NA	NA
Naphthalene	0.0059 - 0.39	MWLSC01	13/15	0.157 - 0.191	0/15	55.92	0/15	23.51	0/15	1600	NA	NA
ncPAH	0.0201 - 1.064	MWLSC01	15/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0065 - 0.14	MWLSC01	11/15	0.0023 - 0.219	0/15	21896.12	0/15	6777.61	0/15	24000	NA	NA
Pyrene	0.0097 - 0.0908	RES-42A	9/15	0.0023 - 0.219	0/15	2308.68	0/15	1959.13	0/15	2400	NA	NA
Retene	0.248 - 0.513	RES-42	3/5	0.191 - 0.219	NA	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.015 - 0.045	B-BB3	4/15	0.0098 - 0.438	0/15	122.21	0/15	0.45	0/15	160	NA	NA
2,6-Dinitrotoluene	0.022	B-BB5	1/15	0.0098 - 1.09	0/15	61.10	0/15	0.20	0/15	80	NA	NA
Benzoic acid	0.021 - 1.05	RES-46	4/15	0.02 - 1.09	0/15	100000.00	0/15	263.04	0/15	320000	NA	NA
Benzyl alcohol	0.0068	B-BB5	1/15	0.0098 - 1.09	0/15	18330.93	0/15	28.99	0/15	24000	NA	NA
Dibenzofuran	0.0014 - 0.084	MWLSC01	5/15	0.011 - 0.219	0/15	290.53	0/15	29.93	0/15	320	NA	NA
Phenols (mg/kg)												
4,6-Dinitro-2-methylphenol	0.013	B-AA2	1/15	0.0098 - 1.09	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.0056 - 0.41	MWLSC04	7/15	0.011 - 1.09	0/15	2.98	1/15	0.077	0/15	8	0/15	11
Phenol	0.0041	B-BB5	1/15	0.0098 - 0.219	0/15	36661.86	0/15	80.64	0/15	48000	NA	NA
Tetrachlorophenols	0.023	MWLSC04	1/10	0.01 - 0.013	0/10	1833.09	0/10	25.82	0/10	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polynuclear aromatic hydrocarbon.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act (State of Washington).
NA = Not applicable.
ncPAHs = Non-carcinogenic polynuclear aromatic hydrocarbon.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Pacific Groundwater Group.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.

Table 4-29

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK BANK (SPOILS PILES)
SURFACE SOIL TPH FIELD-SCREENING SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Sample Location	TPH (mg/kg)	Field Observations
Background Samples			
SP-FS21	Background No. 1 (bank soil from pond near college parking lot).	2 J	No petroleum contamination evident.
SP-FS21 Dup 1	Background No. 1 (bank soil from pond near college parking lot).	157 J	No petroleum contamination evident.
SP-FS21 Dup 2	Background No. 1 (bank soil from pond near college parking lot).	65 J	No petroleum contamination evident.
SP-FS21 Dup 3	Background No. 1 (bank soil from pond near college parking lot).	57 J	No petroleum contamination evident.
SP-FS26	Background No. 2 (Beach sand from shore of Bellingham Bay).	ND	No petroleum contamination evident.
SP-FS28	Background No. 3 (Birchwood Outfall, bank soil from under blackberry bushes).	667 J	No petroleum contamination evident.
SP-FS28 Dup	Background No. 3 (Birchwood Outfall, bank soil from under blackberry bushes).	664 J	No petroleum contamination evident.
Little Squalicum Creek Bank Samples			
SP-FS01	North bank, adjacent to foot path that crosses creek.	>2000 J	Dark loamy soil.
SP-FS02	North bank, 40 feet downstream from footpath crossing.	346 J	Petroleum odor.
SP-FS03	North bank, 80 feet downstream from footpath crossing.	221 J	No petroleum contamination evident.
SP-FS04	North bank, 120 feet downstream from footpath crossing.	86 J	Petroleum odor.
SP-FS05	North bank, 160 feet downstream from footpath crossing.	38 J	No petroleum contamination evident. Very rooty.
SP-FS06	North bank, 200 feet downstream from footpath crossing.	159 J	No petroleum contamination evident. At a small seep. Loamy at top, clay below 5 inches.
SP-FS06 Dup	North bank, 200 feet downstream from footpath crossing.	163 J	No petroleum contamination evident. At a small seep. Loamy at top, clay below 5 inches.
SP-FS07	North bank, 240 feet downstream from footpath crossing.	136-J	No petroleum contamination evident. Loamy at top, clay blow 5 inches.
SP-FS08	North bank, 280 feet downstream from footpath crossing.	420 J	No petroleum contamination evident. Loamy.
SP-FS09	North bank, 280 feet downstream from footpath crossing.	464 J	No petroleum contamination evident. Loamy at top, sand and clay at depth.
SP-FS10	North bank, 360 feet downstream from footpath crossing.	2083 J	Petroleum odor, oily texture. Bottom of soil core below creek water level.

Key is at the end of the table.

Table 4-29 (CONTINUED)

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK BANK (SPOILS PILES)
SURFACE SOIL TPH FIELD-SCREENING SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Sample Location	TPH (mg/kg)	Field Observations
SP-FS11	North bank, 400 feet downstream from footpath crossing (8 feet upstream from Marine Drive Outfall).	393 J	Petroleum odor. Bottom of core below creek water level.
SP-FS12	North bank, 34 feet upstream from footpath crossing.	558 J	No petroleum contamination evident. Very rooty.
SP-FS13	North bank, 60 feet upstream from footpath crossing.	578 J	No petroleum contamination evident. Very rooty.
SP-FS14	North bank, 100 feet upstream from footpath crossing.	336 J	No petroleum contamination evident. Gravelly loam.
SP-FS15	South bank, 98 feet downstream from footpath crossing.	830 J	No petroleum contamination evident. Gravelly loam.
SP-FS16	South bank, 68 feet downstream from footpath crossing.	519 J	Slight petroleum odor. Loamy at top, clay at bottom.
SP-FS16 Dup 1	South bank, 68 feet downstream from footpath crossing.	380 J	Slight petroleum odor. Loamy at top, clay at bottom.
SP-FS16 Dup 2	South bank, 68 feet downstream from footpath crossing.	530 J	Slight petroleum odor. Loamy at top, clay at bottom.
SP-FS16 Dup 3	South bank, 68 feet downstream from footpath crossing.	469 J	Slight petroleum odor. Loamy at top, clay at bottom.
SP-FS17	South bank, 32 feet downstream from footpath crossing.	1490 J	No petroleum contamination evident. Gravelly loam.
SP-FS18	South bank, 24 feet upstream from footpath crossing.	865 J	No petroleum contamination evident. Loamy, rooty.
SP-FS19	South bank, 53 feet upstream from footpath crossing.	1404 J	No petroleum contamination evident. Gravelly.
SP-FS20	South bank, 77 feet upstream from footpath crossing.	1297 J	No petroleum contamination evident.
SP-FS22	North bank, 5 feet uphill from SP-FS01.	228 J	No petroleum contamination evident.
SP-FS23	North bank, 10 feet uphill from SP-FS01.	85 J	No petroleum contamination evident.
SP-FS24	South bank, across gravel road in grassy area (lines up with transect formed by FS01, 22, 23).	837 J	No petroleum contamination evident.
SP-FS25A	North bank, 8 feet uphill from SP-FS10 (bottom 4 inches of 12-inch soil core).	>2000 J	Petroleum odor; silvery, oily color.
SP-FS25B	North bank, 8 feet uphill from SP-FS10 (upper 4 inches of 12-inch soil core).	1154 J	No petroleum contamination evident.
SP-FS27	Trench No. 1 (dug by backhoe on 8/5/99).	22 J	No petroleum contamination evident.
SP-FS27 Dup	Trench No. 1 (dug by backhoe on 8/5/99).	ND	No petroleum contamination evident.
SP-FS30	Transect 1, 10 feet south of creek.	1877 J	No petroleum odor. Gravelly, sandy silt.

Key is at the end of the table.

Table 4-29 (CONTINUED)

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK BANK (SPOILS PILES)
SURFACE SOIL TPH FIELD-SCREENING SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Sample Location	TPH (mg/kg)	Field Observations
SP-FS30 Dup	Transect 1, 10 feet south of creek.	2030 J	No petroleum odor. Gravelly, sandy silt.
SP-FS31	Transect 1, 20 feet south of creek.	1061 J	No petroleum odor. Gravelly silt.
SP-FS32	Transect 1, 30 feet south of creek.	1281 J	No petroleum odor. Gravelly, sandy silt.
SP-FS33	Transect 1, 10 feet north of creek.	1058 J	No petroleum odor. Loamy, gravelly silt.
SP-FS34	Transect 1, 20 feet north of creek.	267 J	No petroleum odor. Gravelly, silty sand.
SP-FS35	Transect 1, 30 feet north of creek.	650 J	No petroleum odor. Silty, sandy gravel.
SP-FS36	Transect 2, 10 feet south of creek.	1258 J	No petroleum odor. Gravelly silt.
SP-FS37	Transect 2, 20 feet south of creek.	1933 J	No petroleum odor. Gravelly silt with organic matter.
SP-FS38	Transect 2, 30 feet south of creek.	1280 J	No petroleum odor. Gravelly silt.
SP-FS39	Transect 2, 10 feet north of creek.	978 J	No petroleum odor. Silty, sandy gravel with organic matter.
SP-FS40	Transect 2, 20 feet north of creek.	43 J	No petroleum odor. Silt with high organic matter.
SP-FS41	Transect 2, 30 feet north of creek.	204 J	No petroleum odor. Gravelly sand.
SP-FS50	From north bank, 5 feet upstream from culvert draining creek into bay.	1999 J	No petroleum odor. Loamy sand.
SP-FS50 Dup	From north bank, 5 feet upstream from culvert draining creek into bay.	2212 J	No petroleum odor. Loamy sand.
SP-FS51	From north bank, 120 feet upstream from culvert draining creek into bay.	425 J	Slight petroleum odor. Wet, sandy silt.
SP-FS52	From north bank, 200 feet upstream from culvert draining creek into bay.	2070 J	Petroleum odor. Silt with silvery, oily material.
SP-FS53	From north bank, 300 feet upstream from culvert draining creek into bay.	418 J	No petroleum odor. Loamy silt.
SP-FS54	From north bank, 380 feet upstream from culvert draining creek into bay.	651 J	No petroleum odor. Wet silt.

Key is on the next page.

Table 4-29 (CONTINUED)

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK BANK (SPOILS PILES)
SURFACE SOIL TPH FIELD-SCREENING SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Note: Shading indicates that a result exceeds the highest background concentration (667 mg/kg).
At seven of the above locations, samples also were collected for laboratory analysis. The correspondence between the field-screening samples and laboratory samples is: SP-FS28=SP07, SP-FS01=SP03, SP-FS11=SP01, SP-FS14=SP04, SP-FS17=SP05, SP-FS19=SP06, and SP-FS25A=SP02.

Key:

Dup	= Duplicate.
ID	= Identification.
J	= Estimated value.
mg/kg	= Milligrams per kilogram.
ND	= Not detected.
TPH	= Total petroleum hydrocarbons.

Table 4-30

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224034	99224035	99224036	99070650	99070651	99070652	99070653	99070654	99070655	99070656
Sample Location		RES-48	RES-49	RES-47A	SP01	SP02	SP03	SP04	SP05	SP06	SP07
Sample Date		5/26/99	5/26/99	5/26/99	8/6/99	8/6/99	8/6/99	8/6/99	8/6/99	8/6/99	8/6/99
SVOCs (mg/kg)											
2,4-Dinitrotoluene	120[c]	0.312 U	0.271 U	0.285 U	0.18 U	0.15 U	0.18 U	0.011 U	0.011 U	0.01 U	0.016 U
2-Methylnaphthalene	56[c]	0.156 U	0.136 U	0.143 U	0.048	11	0.074	0.0022 U	0.013	0.011	0.058
3&4-Methylphenol	310[d]	0.156 U	0.136 U	0.143 U	0.18 UJ	0.15 U	0.11 J	0.011 U	0.011 U	0.01 U	0.016 U
7,12-Dimethylbenz(a)anthracene	NA	0.156 U	0.136 U	0.143 U	0.037 U	3.4 JN	0.31 JN	0.0022 U	0.11 JN	0.0021 R	0.0032 R
7H-Dibenzo(c,g)carbazole	NA	0.156 U	0.136 U	0.143 U	0.099 JN	0.03 U	0.31 JN	0.0022 U	0.05 JN	0.0021 R	0.14
Acenaphthene	370[c]	0.156 U	0.136 U	0.143 U	0.7	72	0.23	0.0022 U	0.0067	0.012	0.025
Acenaphthylene	370[c]	0.156 U	0.136 U	0.143 U	0.64	1.2 JN	0.53	0.0022 U	0.24	0.27	0.26
Anthracene	22,000[c]	0.156 U	0.136 U	0.143 U	5.2	78	2.1	0.0022 U	0.46	0.47	0.6
Benzo(a)anthracene	0.62[c]	0.156 U	0.136 U	0.143 U	**4.2**	**51**	**2.8**	0.0022 U	0.39	0.21	0.12
Benzo(a)pyrene	0.062[c]	0.312 U	0.271 U	0.0657 J	**6.7**	**35 J**	**3.2**	0.0022 U	**1.3 J**	**1 J**	**2.9 J**
Benzo(b)fluoranthene	0.62[c]	0.156 U	0.136 U	0.175	**2.2 J**	**11 J**	**1.2 J**	0.0022 U	**0.7 J**	0.52 J	**0.97 J**
Benzo(g,h,i)perylene	2,300[c]	0.156 U	0.143	0.177	3.3	7.3	2.1	0.0022 UJ	1.4	0.97	2.5
Benzo(j)fluoranthene	1.37[d]	0.156 U	0.136 U	0.143 U	**2.2 J**	**11 J**	1.2 J	0.022 U	0.46 J	0.52 J	0.97 J
Benzo(k)fluoranthene	6.2[c]	0.156 U	0.136 U	0.0372 J	2.2 J	**11 J**	1.2 J	0.0022 U	0.7 J	0.52 J	0.97 J
Benzoic acid	100,000[c]	0.781 U	0.88	0.807	0.37 U	0.3 UJ	0.37 U	0.022 UJ	0.022 UJ	0.021 UJ	0.032 UJ
Benzyl alcohol	18,000[c]	0.781 U	0.102 J	0.713 U	0.18 UJ	0.15 U	1.1 J	0.011 U	0.011 U	0.01 U	0.016 U
Chrysene	62[c]	0.156 U	0.068 J	0.102 J	24	**74**	12	0.0022 U	1.1	1.2	5.2
Dibenzo(a,e)pyrene	0.137[d]	0.156 U	0.136 U	0.143 U	**1.3**	**2.6**	**1.5**	0.0022 U	**0.47**	**0.87 JN**	**0.42 JN**
Dibenzo(a,h)anthracene	0.062[c]	0.156 U	0.136 U	0.143 U	**0.63**	**2.2**	**0.42**	0.0022 U	**0.15**	0.26 JN	**0.47**
Dibenzo(a,h)pyrene	0.0137[d]	0.156 U	0.136 U	0.143 U	**0.65**	**1.4**	**0.85**	0.0022 U	**0.48**	0.44 JN	0.066 JN
Dibenzo(a,i)pyrene	0.0137[d]	0.156 U	0.136 U	0.143 U	**0.13**	**0.47**	**0.24**	0.0022 U	**0.16**	0.093 JN	0.32 JN
Dibenzo(a,j)acridine	1.37[d]	0.156 U	0.136 U	0.143 U	0.037 U	0.03 U	0.037 U	0.0022 U	0.036 JN	0.0021 R	0.0032 R
Dibenzo(a,l)pyrene	NA	0.156 U	0.136 U	0.143 U	0.037 U	0.1	0.037 U	0.0022 U	0.032	0.0021 R	0.061 JN
Dibenzofuran	290[c]	0.156 U	0.136 U	0.143 U	0.11 J	9.9	0.11 J	0.011 U	0.013	0.0072 J	0.04
Fluoranthene	2,300[c]	0.156 U	0.0871 J	0.0368 J	3.7	150	1.1	0.0022 U	0.18	0.14	0.66
Fluorene	2,600[c]	0.156 U	0.136 U	0.143 U	0.98	57	0.73	0.0022 U	0.075	0.085	0.17
Indeno(1,2,3-cd)pyrene	0.62[c]	0.312 U	0.272	0.336	**2.7**	**9.2 J**	**1.7**	0.0022 U	**1 J**	**1.5 J**	**2 J**
Naphthalene	56[c]	0.156 U	0.0546 J	0.143 U	0.096	5.5	0.037 U	0.0022 U	0.03	0.035	0.088
Pentachlorophenol	3[c]	0.156 U	0.136 U	0.143 U	1.1	0.15 UJ	1.8	0.011 U	1.2	1.4 J	2.2 J
Phenanthrene	22,000[c]	0.156 U	0.066 J	0.143 U	0.91	200	1.1	0.0022 U	0.08	0.044	0.55
Phenol	37,000[c]	0.156 U	0.136 U	0.143 U	0.18 UJ	0.15 U	0.33 J	0.011 U	0.011 U	0.01 U	0.016 U
Pyrene	2,300[c]	0.156 U	0.0646 J	0.143 U	3.2	170	1	0.0022 U	0.3	0.25	0.46
Tetrachlorophenols	1,800[c]	0.156 U	0.136 U	0.143 U	0.11 J	0.15 U	0.2 J	0.011 U	0.071	0.072	0.19
Petroleum Hydrocarbons (mg/kg)											
C10-C12 Aromatics	NA	NA	NA	NA	6 U	12	6 U	6.3 U	6.2 U	5.6 U	6 U
C12-C13 Aromatics	NA	NA	NA	NA	5 U	74	5 U	5 U	5 U	5 U	5 U
C12-C16 Aliphatics	NA	NA	NA	NA	6 U	300 J	6 U	6.3 U	6.2 U	5.6 U	6 U

Key is at the end of the table.

Table 4-30 (CONTINUED)

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99224034	99224035	99224036	99070650	99070651	99070652	99070653	99070654	99070655	99070656
Sample Location		RES-48	RES-49	RES-47A	SP01	SP02	SP03	SP04	SP05	SP06	SP07
Sample Date		5/26/99	5/26/99	5/26/99	8/6/99	8/6/99	8/6/99	8/6/99	8/6/99	8/6/99	8/6/99
Petroleum Hydrocarbons (mg/kg)											
C12-C16 Aromatics	NA	NA	NA	NA	6 U	480 J	6 U	6.3 U	6.2 U	5.6 U	6 U
C16-C18 Aliphatics	NA	NA	NA	NA	7.4	250 J	7.1	6.3 U	6.2 U	5.6 U	9
C16-C18 Aromatics	NA	NA	NA	NA	6 U	510 J	6 U	6.3 U	6.2 U	5.6 U	6 U
C18-C21 Aliphatics	NA	NA	NA	NA	15	220	20	6.3 U	6.2 U	6.7	33
C18-C21 Aromatics	NA	NA	NA	NA	24 J	2500 J	9.6	6.3 U	6.2 U	5.6 U	20 J
C21-C28 Aliphatics	NA	NA	NA	NA	94	77	150	6.3 U	23	12	240
C21-C28 Aromatics	NA	NA	NA	NA	34 J	700 J	28	6.3 U	11	7.9	49 J
C28-C36 Aliphatics	NA	NA	NA	NA	78	34	140	6.3 U	17	5.6 U	210
C28-C36 Aromatics	NA	NA	NA	NA	51 J	450 J	53 J	6.3 U	27	22 J	81 J
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9[c]	**6.217**	**4.718**	1.863	**156.610**	**1101.593**	**867.571**	0.843	**312.126**	**265.227**	**1560.985**
2,3,7,8-TCDD	3.9[c]	0.279 U	0.273 U	0.239 U	1.49 U	42.975 U	2.004	0.151 U	1.143	0.669	**5.949**
2,3,7,8-TCDF	NA	4.226	2.971	2.162	0.825 U	129.797 U	9.058	0.268	7.626	3.352	17.256
1,2,3,7,8-PeCDD	NA	1.463	1.491	0.364 U	5.376 U	3.289 U	32.341	0.354 U	16.581	5.678	134.812
1,2,3,7,8-PeCDF	NA	1.961 U	1.324 U	0.374 U	3.997	41.764	28.302 U	0.223 U	19.924 U	8.481 U	54.043 U
2,3,4,7,8-PeCDF	NA	2.542	2.081	0.932	1.55 U	0.43 U	28.747	0.228 U	19.136	3.946	47.831
1,2,3,4,7,8-HxCDD	NA	3.418	2.109 U	1.345	16.202	1.989 U	100.57	0.343 U	49.665 U	23.526	422.902
1,2,3,6,7,8-HxCDD	NA	6.702	5.416	2.811 U	144.262	703.688	2188	0.729	545.615	422.712	2918
1,2,3,7,8,9-HxCDD	NA	6.006	6.702	5.416	29.691 U	1.535 U	208.157	0.27 U	140.598	76.078	745.056
1,2,3,7,8,9-HxCDF	NA	1.308 U	0.398 U	0.741 U	7.207 U	114.774 U	7.419	0.291 U	5.27	1.822 U	17.963
2,3,4,6,7,8-HxCDF	NA	0.992 U	2.699 U	0.85 U	5.323 U	84.773 U	42.618	0.227 U	44.175	38.355	153.591
1,2,3,4,6,7,8-HpCDD	NA	115.35	105.061	59.359	12202	75724	47078	55.513	15902	15118.343 J	77982
1,2,3,4,6,7,8-HpCDF	NA	19.905	21.385	16.306	554.192	17368	4998	12.013	2958	3963.62 J	10142
1,2,3,4,7,8,9-HpCDF	NA	2.416 U	2.778 U	1.603 U	24.308	450.848	102.503	1.944 U	214.474	244.209	406.367
OCDD	NA	891.773	769.657	489.04	118049	789982	395756	605.145	180070	48191.465 J	785123
OCDF	NA	62.072	65.958	58.804	7542	147093	19099	78.643	17544	24241.378 J	50154
Total TCDD	NA	42.343	29.19	19.676	1.49 U	42.975 U	38.984	0.151 U	59.989	64.121	62.763
Total TCDF	NA	17.51	20.2	7.745	0.825 U	129.797 U	32.899	0.237 U	35.961	17.893	111.548
Total PeCDD	NA	40.059	30.856	15.23	1.908 U	3.564	100.81	0.354 U	86.073	59.005	403.896
Total PeCDF	NA	30.976 J	65.106 J	7.836 J	43.03	72.297	663.131	0.228 U	443.898	99.12	3044
Total HxCDD	NA	101.942	76.022 J	26.007 J	394.252	2124.613	8518	2.402	2235.162	1493.974 J	13228
Total HxCDF	NA	28.069 J	45.665 J	18.903 J	519.833	263.563	9421 J	4.812	3709.296 J	3235.63 J	13727
Total HpCDD	NA	219.454	190.261	108.354	21881	128175	80681	103.469	27950	26806.18 J	133799
Total HpCDF	NA	19.905	21.385	16.306	1768	17368	4998	12.013	2958	4207.828 J	10827

Table is on the next page.

Table 4-30

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), updated February 1996. Values are based on revised MTCA (February 2001).

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identifiedand the numerical result is estimated.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
R	= Quality control indicates that the data are unusable for all purposes. The analyte was analyzed for, but the presence or absence of the analyte has not been verified.
SVOCs	= Semivolatile organic compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-31

STATISTICAL ANALYSIS OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	0.11 - 3.4	SP02	3/5	0.0022 - 0.037	3/5	0.003	2/5	0.12	3/5	0.007	NA	NA
7H-Dibenzo(c,g)carbazole	0.05 - 0.31	SP03	4/6	0.0022 - 0.03	3/6	0.062	0/6	2.32	2/6	0.137	NA	NA
B(a)P Equivalent	0.027268 - 135.904	SP02	8/10	-	7/10	0.062	6/10	2.32	6/10	0.137	1/10	30
Benzo(a)anthracene	0.12 - 51	SP02	6/10	0.0022 - 0.156	3/10	0.621	1/10	23.23	3/10	1.370	NA	NA
Benzo(a)pyrene	0.0657 - 35	SP02	7/10	0.0022 - 0.312	7/10	0.062	4/10	2.32	6/10	0.137	1/10	30
Benzo(b)fluoranthene	0.175 - 11	SP02	7/10	0.0022 - 0.156	5/10	0.621	0/10	23.23	2/10	1.370	NA	NA
Benzo(j)fluoranthene	0.46 - 11	SP02	6/7	0.022 - 0.022	4/7	0.621	0/7	23.23	2/7	1.370	NA	NA
Benzo(k)fluoranthene	0.0372 - 11	SP02	7/10	0.0022 - 0.156	1/10	6.215	0/10	232.30	0/10	13.699	NA	NA
Chrysene	0.068 - 74	SP02	8/10	0.0022 - 0.156	1/10	62.148	0/10	2322.99	0/10	136.986	NA	NA
Dibenzo(a,e)pyrene	0.42 - 2.6	SP02	6/7	0.0022 - 0.0022	6/7	0.062	1/7	2.32	6/7	0.137	NA	NA
Dibenzo(a,h)anthracene	0.15 - 2.2	SP02	6/10	0.0022 - 0.312	6/10	0.062	0/10	2.32	6/10	0.137	NA	NA
Dibenzo(a,h)pyrene	0.066 - 1.4	SP02	6/7	0.0022 - 0.0022	6/7	0.006	5/7	0.23	6/7	0.014	NA	NA
Dibenzo(a,i)pyrene	0.093 - 0.47	SP02	6/7	0.0022 - 0.0022	6/7	0.006	3/7	0.23	6/7	0.014	NA	NA
Dibenzo(a,j)acridine	0.036	SP05	1/5	0.0022 - 0.037	0/5	0.621	0/5	23.23	0/5	1.370	NA	NA
Dibenzo(a,l)pyrene	0.032 - 0.1	SP02	3/6	0.0022 - 0.037	3/6	0.006	0/6	0.23	3/6	0.014	NA	NA
Indeno(1,2,3-cd)pyrene	0.272 - 9.2	SP02	8/10	0.0022 - 0.312	6/10	0.621	0/10	23.23	5/10	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	55.513 - 77982	SP07	10/10	-	6/10	390	3/10	31384	6/10	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	12.013 - 17368	SP02	10/10	-	6/10	390	0/10	31384	5/10	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	24.308 - 450.848	SP02	6/10	1.603 - 2.778	2/10	390	0/10	31384	0/10	666.7	NA	NA
1,2,3,4,7,8-HxCDD	1.345 - 422.902	SP07	6/10	0.343 - 49.665	2/10	39	0/10	3138	2/10	66.7	NA	NA
1,2,3,6,7,8-HxCDD	0.729 - 2918	SP07	9/10	2.811 - 2.811	6/10	39	0/10	3138	6/10	66.7	NA	NA
1,2,3,7,8,9-HxCDD	2.346 - 745.056	SP07	6/10	0.27 - 29.691	3/10	78	0/10	3138	4/10	66.7	NA	NA
1,2,3,7,8,9-HxCDF	5.27 - 17.963	SP07	3/10	0.291 - 114.774	0/10	39	0/10	3138	0/10	66.7	NA	NA
1,2,3,7,8-PeCDD	1.463 - 134.812	SP07	6/10	0.354 - 5.376	4/10	3.9	0/10	314	3/10	6.7	NA	NA
1,2,3,7,8-PeCDF	3.997 - 41.764	SP02	2/10	0.223 - 54.043	0/10	78	0/10	6277	0/10	133.3	NA	NA
2,3,4,6,7,8-HxCDF	38.355 - 153.591	SP07	4/10	0.227 - 84.773	3/10	39	0/10	3138	1/10	66.7	NA	NA
2,3,4,7,8-PeCDF	0.932 - 47.831	SP07	7/10	0.228 - 1.55	3/10	7.8	0/10	628	3/10	13.3	NA	NA
2,3,7,8-TCDD	0.669 - 5.949	SP07	4/10	0.151 - 42.975	1/10	3.9	0/10	314	0/10	6.7	NA	NA
2,3,7,8-TCDD TEQ	0.843 - 1560.985	SP07	10/10	-	8/10	3.9	3/10	314	6/10	6.7	7/10	5
2,3,7,8-TCDF	0.268 - 17.256	SP07	8/10	0.825 - 129.797	0/10	39	0/10	3138	0/10	66.7	NA	NA
OCDD	489.04 - 789982	SP02	10/10	-	6/10	39000	0/10	3138357	5/10	66666.7	NA	NA
OCDF	58.804 - 147093	SP02	10/10	-	2/10	39000	0/10	3138357	1/10	66666.7	NA	NA
Total HpCDD	103.469 - 133799	SP07	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	12.013 - 17368	SP02	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	2.402 - 13228	SP07	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	4.812 - 13727	SP07	10/10	-	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-31

STATISTICAL ANALYSIS OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Total PeCDD	3.564 - 403.896	SP07	8/10	0.354 - 1.908	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	7.836 - 3044	SP07	9/10	0.228 - 0.228	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	19.676 - 64.121	SP06	7/10	0.151 - 42.975	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	7.745 - 111.548	SP07	7/10	0.237 - 129.797	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C10-C12 Aromatics	12 - 13	SP02	2/14	5 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	74	SP02	1/7	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	300	SP02	1/7	5.6 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	480	SP02	1/7	5.6 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	7.1 - 250	SP02	4/7	5.6 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	510	SP02	1/7	5.6 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	6.7 - 220	SP02	5/7	6.2 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	9.6 - 2500	SP02	4/7	5.6 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	12 - 240	SP07	6/7	6.3 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	7.9 - 700	SP02	6/7	6.3 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	17 - 210	SP07	5/7	5.6 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	22 - 450	SP02	6/7	6.3 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
EPH	48.6 - 5533	SP02	6/6	-	NA	NA	1/6	2000	NA	NA	2/6	460
VPH	87	SP02	1/1	-	NA	NA	1/1	30	NA	NA	0/1	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.011 - 11	SP02	6/10	0.0022 - 0.156	0/10	55.92	0/10	23.51	0/10	1600	NA	NA
Acenaphthene	0.0067 - 72	SP02	6/10	0.0022 - 0.156	0/10	3681.71	0/10	284.05	0/10	4800	NA	NA
Acenaphthylene	0.24 - 1.2	SP02	6/10	0.0022 - 0.156	0/10	3681.71	0/10	284.05	0/10	4800	NA	NA
Anthracene	0.46 - 78	SP02	6/10	0.0022 - 0.156	0/10	21896.12	0/10	6777.61	0/10	24000	NA	NA
Benzo(g,h,i)perylene	0.143 - 7.3	SP02	8/10	0.0022 - 0.156	0/10	2308.68	0/10	1959.13	0/10	2400	NA	NA
Fluoranthene	0.0368 - 150	SP02	8/10	0.0022 - 0.156	0/10	2293.61	0/10	6287.36	0/10	3200	NA	NA
Fluorene	0.075 - 57	SP02	6/7	0.0022 - 0.0022	0/7	2643.61	0/7	304.64	0/7	3200	NA	NA
Naphthalene	0.03 - 5.5	SP02	6/10	0.0022 - 0.156	0/10	55.92	0/10	23.51	0/10	1600	NA	NA
ncPAH	0.2138 - 752	SP02	8/8	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.044 - 200	SP02	7/10	0.0022 - 0.156	0/10	21896.12	0/10	6777.61	0/10	24000	NA	NA
Pyrene	0.0646 - 170	SP02	7/10	0.0022 - 0.156	0/10	2308.68	0/10	1959.13	0/10	2400	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.807 - 0.88	RES-49	2/10	0.021 - 0.781	0/10	100000.00	0/10	263.04	0/10	320000	NA	NA
Benzyl alcohol	0.102 - 1.1	SP03	2/10	0.01 - 0.781	0/10	18330.93	0/10	28.99	0/10	24000	NA	NA
Dibenzofuran	0.0072 - 9.9	SP02	6/10	0.011 - 0.156	0/10	290.53	0/10	29.93	0/10	320	NA	NA

Table 4-31

STATISTICAL ANALYSIS OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Phenols (mg/kg)												
3&4-Methylphenol	0.11	SP03	1/7	0.01 - 0.18	0/7	305.52	0/7	1.06	0/7	400	NA	NA
Pentachlorophenol	1.1 - 2.2	SP07	5/10	0.011 - 0.781	0/10	2.98	5/10	0.077	0/10	8	0/10	11
Phenol	0.33	SP03	1/10	0.01 - 0.18	0/10	36661.86	0/10	80.64	0/10	48000	NA	NA
Tetrachlorophenols	0.071 - 0.2	SP03	5/7	0.011 - 0.15	0/7	1833.09	0/7	25.82	0/7	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary remediation goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
VPH = Volatile petroleum hydrocarbon.

Table 4-32

SUMMARY OF RESULTS FROM FACILITY NORTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070553	99070554	99070555	99070557	99070558	99070559	99070561	99070562	99070563	99070564	99070565	99070566
Sample Location		B-J2	B-J2	B-J2	B-F3	B-F3	B-F3	B-D7	B-D7	B-D7	B-B13	B-B13	B-B13
Sample Depth (feet bgs)		2-4	6-8	14-16	4-6	10-12	12-14	2-4	6-8	14-16	4-6	8-10	14-16
Sample Date		8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/4/99	8/4/99	8/4/99
Semivolatile Organic Compounds (mg/kg)													
2,4-Dinitrotoluene	120 [c]	0.12 U	0.012 U	0.041 JN	0.012 U	0.012 U	0.013 U	0.012 U	0.053 JN	0.048 JN	0.011 R	1.4 JN	0.014 U
2,6-Dinitrotoluene	61 [c]	0.12 U	0.012 U	0.016 JN	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.014 U	0.011 R	0.11 R	0.014 U
2-Methylnaphthalene	56 [c]	0.023 U	0.0024 UJ	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	6.9 J	22 J	0.0029 U
7,12-Dimethylbenz(a)anthracene	NA	0.54 JN	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 UJ	0.0028 UJ	0.0023 R	0.023 R	0.0029 UJ
7H-Dibenzo(c,g)carbazole	NA	0.058 JN	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Acenaphthene	3700 [c]	29 J	0.017	0.0034	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	1.4 J	4.8 J	0.0029 U
Acenaphthylene	3700 [c]	1.2 J	0.01	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Anthracene	22000 [c]	13 J	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.71 J	1.8 J	0.0029 U
Benzo(a)anthracene	0.62 [c]	**22 J**	0.0024 U	0.009	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.11 J	0.16 J	0.0029 U
Benzo(a)pyrene	0.062 [c]	**8.4 J**	0.0055	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.027 J	0.0029 U
Benzo(b)fluoranthene	0.62 [c]	**6.2 J**	0.0047 J	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.027 J	0.0029 U
Benzo(g,h,i)perylene	2300 [c]	1.9 J	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Benzo(j)fluoranthene	1.37 [d]	**6.2 J**	0.0047 J	0.024 U	0.024 U	0.024 U	0.026 U	0.024 U	0.025 UJ	0.028 UJ	0.0099 J	0.027 J	0.029 UJ
Benzo(k)fluoranthene	6.2 [c]	**6.2 J**	0.0047 J	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Benzoic acid	100000 [c]	0.23 U	0.018 J	0.024 U	0.024 U	0.024 U	0.026 U	0.024 U	0.025 U	0.028 U	0.023 R	0.23 R	0.029 U
Carbazole	24 [c]	1 U	NA	NA	NA	1 U	NA	NA	1 UJ	NA	1.7 J	NA	NA
Chrysene	62 [c]	23 J	0.02	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.16 J	0.28 J	0.0029 U
Dibenzo(a,e)pyrene	0.137 [d]	**0.6 J**	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Dibenzo(a,h)anthracene	0.062 [c]	**0.79 J**	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Dibenzo(a,h)pyrene	0.0137 [d]	**0.12 J**	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Dibenzo(a,j)acridine	1.37 [d]	0.16 JN	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Dibenzofuran	290 [c]	0.73 J	0.012 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.014 U	0.58 J	1.1 J	0.014 U
Fluoranthene	2300 [c]	120 J	0.095	0.037	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.5 J	0.82 J	0.0029 U
Fluorene	2600 [c]	7.2 J	0.025	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	2.2 J	6 J	0.0029 U
Indeno(1,2,3-cd)pyrene	0.62 [c]	**1.7 J**	0.0024 U	0.0024 U	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.0023 R	0.023 R	0.0029 U
Naphthalene	56 [c]	0.023 U	0.0024 UJ	0.0017 J	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	1.5 J	1.3 J	0.0029 U
Pentachlorophenol	3 [c]	**490**	0.19 J	0.038	0.012 U	0.012 U	0.013 U	0.0092 J	0.013 U	0.014 U	**96 J**	0.11 R	0.014 U
Phenanthrene	22000 [c]	4.2 J	0.0024 U	0.0027 JN	0.0024 U	0.0024 JN	0.0026 U	0.0024 U	0.0025 U	0.0028 U	5 J	14 J	0.0037
Pyrene	2300 [c]	73 J	0.069	0.023	0.0024 U	0.0024 U	0.0026 U	0.0024 U	0.0025 U	0.0028 U	0.69 J	1.5 J	0.0029 U
Tetrachlorophenols	1800 [c]	3	0.032	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.013 U	0.014 U	0.011 R	0.11 R	0.014 U
Petroleum Hydrocarbons (mg/kg)													
C10-C12 Aliphatics	NA	11	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	23 J	5.8	6.8 U
C10-C12 Aromatics	NA	29	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	13	8.8	6.8 U
C12-C13 Aromatics	NA	130 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	120 J	320 J	5 U
C12-C16 Aliphatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	410	320	6.8 U
C12-C16 Aromatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	300	280	6.8 U
C16-C18 Aliphatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	350	290	6.8 U
C16-C18 Aromatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	230	200	6.8 U

Key is at the end of the table.

Table 4-32 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070553	99070554	99070555	99070557	99070558	99070559	99070561	99070562	99070563	99070564	99070565	99070566
Sample Location		B-J2	B-J2	B-J2	B-F3	B-F3	B-F3	B-D7	B-D7	B-D7	B-B13	B-B13	B-B13
Sample Depth (feet bgs)		2-4	6-8	14-16	4-6	10-12	12-14	2-4	6-8	14-16	4-6	8-10	14-16
Sample Date		8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/3/99	8/4/99	8/4/99	8/4/99
Petroleum Hydrocarbons Continued (mg/kg)													
C18-C21 Aliphatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	260	210	6.8 U
C18-C21 Aromatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	520	450	6.8 U
C21-C28 Aliphatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	110	76	6.8 U
C21-C28 Aromatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	52	39	6.8 U
C28-C36 Aromatics	NA	5.7 R	6.2 U	6.2 U	6.7 U	6.3 U	6.7 U	6.6 U	6.8 U	6.8 U	17 J	13 J	6.8 U
C8-C10 Aromatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.5	13	NA
Dioxin/Furans (ng/kg)													
2,3,7,8-TCDD TEQ	3.9 [c]	**1119.613**	NA	0.346	0.046	0.131	NA	NA	**51.030**	NA	**754.709**	NA	NA
2,3,7,8-TCDF	NA	243.189	NA	0.601 U	0.435 U	0.245 U	NA	NA	1.646	NA	60.984	NA	NA
1,2,3,7,8-PeCDD	NA	4.731 U	NA	0.74 U	0.832 U	0.495 U	NA	NA	9.484	NA	7.045	NA	NA
1,2,3,7,8-PeCDF	NA	625.187 U	NA	0.733 U	0.451 U	0.373 U	NA	NA	1.17	NA	313.903	NA	NA
2,3,4,7,8-PeCDF	NA	321.85	NA	0.741 U	0.456 U	0.377 U	NA	NA	3.548 U	NA	271.612	NA	NA
1,2,3,4,7,8-HxCDD	NA	2.582 U	NA	1.756 U	0.607 U	0.595 U	NA	NA	22.791	NA	2.977 U	NA	NA
1,2,3,4,7,8-HxCDF	NA	829.024	NA	2.766 U	0.996 U	0.454 U	NA	NA	62.462 U	NA	2263.85 U	NA	NA
1,2,3,6,7,8-HxCDD	NA	1955	NA	1.396	0.409 U	0.4 U	NA	NA	98.045	NA	1649.691	NA	NA
1,2,3,6,7,8-HxCDF	NA	270.535	NA	2.075 U	0.373 U	0.305 U	NA	NA	5.988 U	NA	37.673 U	NA	NA
1,2,3,7,8,9-HxCDD	NA	106.324	NA	1.355 U	0.469 U	0.459 U	NA	NA	47.108	NA	142.821	NA	NA
1,2,3,7,8,9-HxCDF	NA	0.545 U	NA	3.284 U	0.59 U	0.482 U	NA	NA	9.479	NA	447.35	NA	NA
2,3,4,6,7,8-HxCDF	NA	0.403 U	NA	2.426 U	0.436 U	0.356 U	NA	NA	9.577 U	NA	323.426	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	51767	NA	93.329 U	18.175 U	10.14	NA	NA	2004.729 JL	NA	24015.859	NA	NA
1,2,3,4,6,7,8-HpCDF	NA	5484	NA	7.567	2.985	1.935	NA	NA	202.259	NA	6411.419	NA	NA
1,2,3,4,7,8,9-HpCDF	NA	234.086 U	NA	2.708 U	0.856 U	0.353 U	NA	NA	83.888 U	NA	612.84	NA	NA
OCDD	NA	452722	NA	1288.806	159.158	102.37	NA	NA	14503.071 JL	NA	224622.719	NA	NA
OCDF	NA	4983.18	NA	15.537	5.016	3.227	NA	NA	605.364	NA	8726.305	NA	NA
Total TCDD	NA	5.884	NA	0.676 U	0.545 U	0.495 U	NA	NA	0.424 U	NA	0.923	NA	NA
Total TCDF	NA	436.192	NA	0.601 U	0.435 U	0.245 U	NA	NA	6.83	NA	245.974	NA	NA
Total PeCDD	NA	43.035 J	NA	0.74 U	0.832 U	0.495 U	NA	NA	21.778	NA	13.054	NA	NA
Total PeCDF	NA	6031.442 J	NA	1.999	0.456 U	0.377 U	NA	NA	121.582	NA	1665.09	NA	NA
Total HxCDD	NA	7322.119	NA	1.396	0.409 U	0.4 U	NA	NA	450.707	NA	4198.885	NA	NA
Total HxCDF	NA	10133.814	NA	2.926	8.265	3.044	NA	NA	413.304	NA	8694.219 JH	NA	NA
Total HpCDD	NA	134346.326	NA	182.569	13.104	18.562	NA	NA	3654.248 JL	NA	38538.471	NA	NA
Total HpCDF	NA	31158.944	NA	7.567	2.985	1.935	NA	NA	202.259	NA	6411.419	NA	NA

Key is on the next page.

Table 4-32

SUMMARY OF RESULTS FROM FACILITY NORTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] - PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] - Sample Concentrations above PSLs are in bold type.
[c] - EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] - State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

bgs = Below ground surface.
EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JH = The analyte was positively identified. The associated numerical result is an estimate, biased high.
JL = The analyte was positively identified. The associated numerical result is an estimate, biased low.
JN = The analyte was tentatively identified and the numerical result is estimated.
mg/kg = Milligrams per kilogram.
ng/kg = Nanograms per kilogram.
NA = Not applicable.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
R = Quality Control indicates that data are unusable for all purposes. The analyte was analyzed for, but the presence or absence of the analyte has not been verified.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for but was not detected. The associated value is an estimated sample quantitation limit.

Table 4-33

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD
SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	0.54	B-J2	1/3	0.0024 - 0.0024	1/3	0.003	1/3	0.12	1/3	0.007	NA	NA
7H-Dibenzo(c,g)carbazole	0.058	B-J2	1/3	0.0024 - 0.0024	0/3	0.062	0/3	2.32	0/3	0.137	NA	NA
B(a)P Equivalent	0.01215 - 25.559	B-J2	2/4	-	1/4	0.062	1/4	2.32	1/4	0.137	0/4	30
Benzo(a)anthracene	0.11 - 22	B-J2	2/4	0.0024 - 0.0024	1/4	0.621	0/4	23.23	1/4	1.370	NA	NA
Benzo(a)pyrene	8.4	B-J2	1/3	0.0024 - 0.0024	1/3	0.062	1/3	2.32	1/3	0.137	0/3	30
Benzo(b)fluoranthene	6.2	B-J2	1/3	0.0024 - 0.0024	1/3	0.621	0/3	23.23	1/3	1.370	NA	NA
Benzo(j)fluoranthene	0.0099 - 6.2	B-J2	2/4	0.024 - 0.024	1/4	0.621	0/4	23.23	1/4	1.370	NA	NA
Benzo(k)fluoranthene	6.2	B-J2	1/3	0.0024 - 0.0024	0/3	6.215	0/3	232.30	0/3	13.699	NA	NA
Chrysene	0.16 - 23	B-J2	2/4	0.0024 - 0.0024	0/4	62.148	0/4	2322.99	0/4	136.986	NA	NA
Dibenzo(a,e)pyrene	0.6	B-J2	1/3	0.0024 - 0.0024	1/3	0.062	0/3	2.32	1/3	0.137	NA	NA
Dibenzo(a,h)anthracene	0.79	B-J2	1/3	0.0024 - 0.0024	1/3	0.062	0/3	2.32	1/3	0.137	NA	NA
Dibenzo(a,h)pyrene	0.12	B-J2	1/3	0.0024 - 0.0024	1/3	0.006	0/3	0.23	1/3	0.014	NA	NA
Dibenzo(a,j)acridine	0.16	B-J2	1/3	0.0024 - 0.0024	0/3	0.621	0/3	23.23	0/3	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	1.7	B-J2	1/3	0.0024 - 0.0024	1/3	0.621	0/3	23.23	1/3	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	24015.86 - 51767	B-J2	2/3	18.175 - 18.175	2/3	390	1/3	31384	2/3	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	2.985 - 6411.419	B-B13	3/3	-	2/3	390	0/3	31384	2/3	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	612.84	B-B13	1/3	0.856 - 234.086	1/3	390	0/3	31384	0/3	666.7	NA	NA
1,2,3,4,7,8-HxCDF	829.024	B-J2	1/3	0.996 - 2263.85	1/3	39	0/3	3138	1/3	66.7	NA	NA
1,2,3,6,7,8-HxCDD	1649.691 - 1955	B-J2	2/3	0.409 - 0.409	2/3	39	0/3	3138	2/3	66.7	NA	NA
1,2,3,6,7,8-HxCDF	270.535	B-J2	1/3	0.373 - 37.673	1/3	39	0/3	3138	1/3	66.7	NA	NA
1,2,3,7,8,9-HxCDD	106.324 - 142.821	B-B13	2/3	0.469 - 0.469	2/3	78	0/3	3138	2/3	66.7	NA	NA
1,2,3,7,8,9-HxCDF	447.35	B-B13	1/3	0.545 - 0.59	1/3	39	0/3	3138	1/3	66.7	NA	NA
1,2,3,7,8-PeCDD	7.045	B-B13	1/3	0.832 - 4.731	1/3	3.9	0/3	314	1/3	6.7	NA	NA
1,2,3,7,8-PeCDF	313.903	B-B13	1/3	0.451 - 625.187	1/3	78	0/3	6277	1/3	133.3	NA	NA
2,3,4,6,7,8-HxCDF	323.426	B-B13	1/3	0.403 - 0.436	1/3	39	0/3	3138	1/3	66.7	NA	NA
2,3,4,7,8-PeCDF	271.612 - 321.85	B-J2	2/3	0.456 - 0.456	2/3	7.8	0/3	628	2/3	13.3	NA	NA
2,3,7,8-TCDD TEQ	.046267 - 1119.613	B-J2	3/3	-	2/3	3.9	2/3	314	2/3	6.7	2/3	5
2,3,7,8-TCDF	60.984 - 243.189	B-J2	2/3	0.435 - 0.435	2/3	39	0/3	3138	1/3	66.7	NA	NA
OCDD	159.158 - 452722	B-J2	3/3	-	2/3	39000	0/3	3138357	2/3	66666.7	NA	NA
OCDF	5.016 - 8726.305	B-B13	3/3	-	0/3	39000	0/3	3138357	0/3	66666.7	NA	NA
Total HpCDD	13.104 - 134346.326	B-J2	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	2.985 - 31158.944	B-J2	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	4198.885 - 7322.119	B-J2	2/3	0.409 - 0.409	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	8.265 - 10133.814	B-J2	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	13.054 - 43.035	B-J2	2/3	0.832 - 0.832	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	1665.09 - 6031.442	B-J2	2/3	0.456 - 0.456	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	0.923 - 5.884	B-J2	2/3	0.545 - 0.545	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	245.974 - 436.192	B-J2	2/3	0.435 - 0.435	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-33

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD
SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C10-C12 Aliphatics	11 - 23	B-B13	2/7	5 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	13 - 33	B-B13	3/7	5 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	120 - 130	B-J2	2/4	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	410	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	300	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	350	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	230	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	260	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	520	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	110	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	52	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	17	B-B13	1/3	6.6 - 6.7	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	8.5	B-B13	1/4	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
EPH	2262	B-B13	1/4	-	NA	NA	1/4	2000	NA	NA	1/4	460
VPH	170 - 184.5	B-B13	2/4	-	NA	NA	2/4	30	NA	NA	0/4	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	6.9	B-B13	1/4	0.0024 - 0.023	0/4	55.92	0/4	23.51	0/4	1600	NA	NA
Acenaphthene	1.4 - 29	B-J2	2/4	0.0024 - 0.0024	0/4	3681.71	0/4	284.05	0/4	4800	NA	NA
Acenaphthylene	1.2	B-J2	1/3	0.0024 - 0.0024	0/3	3681.71	0/3	284.05	0/3	4800	NA	NA
Anthracene	0.71 - 13	B-J2	2/4	0.0024 - 0.0024	0/4	21896.12	0/4	6777.61	0/4	24000	NA	NA
Benzo(g,h,i)perylene	1.9	B-J2	1/3	0.0024 - 0.0024	0/3	2308.68	0/3	1959.13	0/3	2400	NA	NA
Fluoranthene	0.5 - 120	B-J2	2/4	0.0024 - 0.0024	0/4	2293.61	0/4	6287.36	0/4	3200	NA	NA
Fluorene	2.2 - 7.2	B-J2	2/4	0.0024 - 0.0024	0/4	2643.61	0/4	304.64	0/4	3200	NA	NA
Naphthalene	1.5	B-B13	1/4	0.0024 - 0.023	0/4	55.92	0/4	23.51	0/4	1600	NA	NA
ncPAH	18.9 - 249.5	B-J2	2/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	4.2 - 5	B-B13	2/4	0.0024 - 0.0024	0/4	21896.12	0/4	6777.61	0/4	24000	NA	NA
Pyrene	0.69 - 73	B-J2	2/4	0.0024 - 0.0024	0/4	2308.68	0/4	1959.13	0/4	2400	NA	NA
Other Organics (mg/kg)												
Dibenzofuran	0.58 - 0.73	B-J2	2/4	0.012 - 0.012	0/4	290.53	0/4	29.93	0/4	320	NA	NA
Phenols (mg.kg)												
Pentachlorophenol	0.0092 - 490	B-J2	3/4	0.012 - 0.012	2/4	2.98	2/4	0.077	2/4	8	2/4	11
Tetrachlorophenols	3	B-J2	1/3	0.012 - 0.012	0/3	1833.09	0/3	25.82	0/3	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
VPH = Volatile petroleum hydrocarbon.

Table 4-34

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD
SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.006507 - 0.04868	B-B13	2/4	-	0/4	0.062	0/4	2.32	0/4	0.137	0/4	30
Benzo(a)anthracene	0.16	B-B13	1/4	0.0024 - 0.0025	0/4	0.621	0/4	23.23	0/4	1.370	NA	NA
Benzo(a)pyrene	0.0055 - 0.027	B-B13	2/4	0.0024 - 0.0025	0/4	0.062	0/4	2.32	0/4	0.137	0/4	30
Benzo(b)fluoranthene	0.0047 - 0.027	B-B13	2/4	0.0024 - 0.0025	0/4	0.621	0/4	23.23	0/4	1.370	NA	NA
Benzo(j)fluoranthene	0.0047 - 0.027	B-B13	2/4	0.024 - 0.025	0/4	0.621	0/4	23.23	0/4	1.370	NA	NA
Benzo(k)fluoranthene	0.0047	B-J2	1/3	0.0024 - 0.0025	0/3	6.215	0/3	232.30	0/3	13.699	NA	NA
Chrysene	0.02 - 0.28	B-B13	2/4	0.0024 - 0.0025	0/4	62.148	0/4	2322.99	0/4	136.986	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	10.14 - 2004.729	B-D7	2/2	-	1/2	390	0/2	31384	1/2	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	1.935 - 202.259	B-D7	2/2	-	0/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,7,8-HxCDD	22.791	B-D7	1/2	0.595 - 0.595	0/2	39	0/2	3138	0/2	66.7	NA	NA
1,2,3,6,7,8-HxCDD	98.045	B-D7	1/2	0.4 - 0.4	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,7,8,9-HxCDD	47.108	B-D7	1/2	0.459 - 0.459	0/2	78	0/2	3138	0/2	66.7	NA	NA
1,2,3,7,8,9-HxCDF	9.479	B-D7	1/2	0.482 - 0.482	0/2	39	0/2	3138	0/2	66.7	NA	NA
1,2,3,7,8-PeCDD	9.484	B-D7	1/2	0.495 - 0.495	1/2	3.9	0/2	314	1/2	6.7	NA	NA
1,2,3,7,8-PeCDF	1.17	B-D7	1/2	0.373 - 0.373	0/2	78	0/2	6277	0/2	133.3	NA	NA
2,3,7,8-TCDD TEQ	0.13131 - 51.03	B-D7	2/2	-	1/2	3.9	0/2	314	1/2	6.7	1/2	5
2,3,7,8-TCDF	1.646	B-D7	1/2	0.245 - 0.245	0/2	39	0/2	3138	0/2	66.7	NA	NA
OCDD	102.37 - 14503.071	B-D7	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
OCDF	3.227 - 605.364	B-D7	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
Total HpCDD	18.562 - 3654.248	B-D7	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	1.935 - 202.259	B-D7	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	450.707	B-D7	1/2	0.4 - 0.4	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	3.044 - 413.304	B-D7	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	21.778	B-D7	1/2	0.495 - 0.495	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	121.582	B-D7	1/2	0.377 - 0.377	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	6.83	B-D7	1/2	0.245 - 0.245	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-34

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD
SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C10-C12 Aliphatics	5.8 - 59	B-B13	2/8	5 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	8.8 - 80	B-B13	2/8	5 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	320	B-B13	1/4	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	320	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	280	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	290	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	200	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	210	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	450	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	76	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	39	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	13	B-B13	1/4	6.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	13	B-B13	1/4	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
EPH	1892.6	B-B13	1/4	-	NA	NA	0/4	2000	NA	NA	1/4	460
VPH	472	B-B13	1/4	-	NA	NA	1/4	30	NA	NA	1/4	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	22	B-B13	1/4	0.0024 - 0.0025	0/4	55.92	0/4	23.51	0/4	1600	NA	NA
Acenaphthene	0.017 - 4.8	B-B13	2/4	0.0024 - 0.0025	0/4	3681.71	0/4	284.05	0/4	4800	NA	NA
Acenaphthylene	0.01	B-J2	1/3	0.0024 - 0.0025	0/3	3681.71	0/3	284.05	0/3	4800	NA	NA
Anthracene	1.8	B-B13	1/4	0.0024 - 0.0025	0/4	21896.12	0/4	6777.61	0/4	24000	NA	NA
Fluoranthene	0.095 - 0.82	B-B13	2/4	0.0024 - 0.0025	0/4	2293.61	0/4	6287.36	0/4	3200	NA	NA
Fluorene	0.025 - 6	B-B13	2/4	0.0024 - 0.0025	0/4	2643.61	0/4	304.64	0/4	3200	NA	NA
Naphthalene	1.3	B-B13	1/4	0.0024 - 0.0025	0/4	55.92	0/4	23.51	0/4	1600	NA	NA
ncPAH	0.0024 - 52.22	B-B13	3/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0024 - 14	B-B13	2/4	0.0024 - 0.0025	0/4	21896.12	0/4	6777.61	0/4	24000	NA	NA
Pyrene	0.069 - 1.5	B-B13	2/4	0.0024 - 0.0025	0/4	2308.68	0/4	1959.13	0/4	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.053 - 1.4	B-B13	2/4	0.012 - 0.012	0/4	122.21	1/4	0.45	0/4	160	NA	NA
Benzoic acid	0.018	B-J2	1/3	0.024 - 0.025	0/3	100000.00	0/3	263.04	0/3	320000	NA	NA
Dibenzofuran	1.1	B-B13	1/4	0.012 - 0.013	0/4	290.53	0/4	29.93	0/4	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.19	B-J2	1/3	0.012 - 0.013	0/3	2.98	1/3	0.077	0/3	8	0/3	11
Tetrachlorophenols	0.032	B-J2	1/3	0.012 - 0.013	0/3	1833.09	0/3	25.82	0/3	2400	NA	NA

Table 4-34

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD
SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
bgs	= Below ground surface.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary Remediation Goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalent quotient.
VPH	= Volatile petroleum hydrocarbon.

Table 4-35

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH POLE YARD
SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Stadard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0009	B-J2	1/4	-	0/4	0.062	0/4	2.32	0/4	0.137	0/4	30
Benzo(a)anthracene	0.009	B-J2	1/4	0.0026 - 0.0029	0/4	0.621	0/4	23.23	0/4	1.370	0/4	NA
Dioxins/Furans (ng.kg)												
1,2,3,4,6,7,8-HpCDF	7.567	B-J2	1/1	-	0/1	390	0/1	31384	0/1	666.7	NA	NA
1,2,3,6,7,8-HxCDD	1.396	B-J2	1/1	-	0/1	39	0/1	3138	0/1	66.7	NA	NA
2,3,7,8-TCDD TEQ	0.3457043	B-J2	1/1	-	0/1	3.9	0/1	314	0/1	6.7	0/1	5
OCDD	1288.806	B-J2	1/1	-	0/1	39000	0/1	3138357	0/1	66666.7	NA	NA
OCDF	15.537	B-J2	1/1	-	0/1	39000	0/1	3138357	0/1	66666.7	NA	NA
Total HpCDD	182.569	B-J2	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	7.567	B-J2	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	1.396	B-J2	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	2.926	B-J2	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	1.999	B-J2	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg/kg)												
Acenaphthene	0.0034	B-J2	1/4	0.0026 - 0.0029	0/4	3681.71	0/4	284.05	0/4	4800	0/4	
Fluoranthene	0.037	B-J2	1/4	0.0026 - 0.0029	0/4	2293.61	0/4	6287.36	0/4	3200	0/4	
Naphthalene	0.0017	B-J2	1/4	0.0026 - 0.0029	0/4	55.92	0/4	23.51	0/4	1600	0/4	
ncPAH	0.0037 - 0.0678	B-J2	2/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0027 - 0.0037	B-B13	2/4	0.0026 - 0.0028	0/4	21896.12	0/4	6777.61	0/4	24000	NA	NA
Pyrene	0.023	B-J2	1/4	0.0026 - 0.0029	0/4	2308.68	0/4	1959.13	0/4	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.041 - 0.048	B-D7	2/4	0.013 - 0.014	0/4	122.21	0/4	0.45	0/4	160	NA	NA
2,6-Dinitrotoluene	0.016	B-J2	1/4	0.012 - 0.014	0/4	61.10	0/4	0.20	0/4	80	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.038	B-J2	1/4	0.013 - 0.014	0/4	2.98	0/4	0.077	0/4	8	0/4	11

Key:

B(a)P	= Benzo(a)pyrene.	NA	= Not applicable.
bgs	= Below ground surface.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.	ng/kg	= Nanograms per kilogram.
HpCDD	= Heptachlorodibenzo-p-dioxin.	OCDD	= Octachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.	OCDF	= Octachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.	PeCDF	= Pentachlorodibenzofuran.
HxCDF	= Hexachlorodibenzofuran.	PRG	= Preliminary Remediation Goal.
mg/kg	= Milligrams per kilogram.	TCDD	= Tetrachlorodibenzo-p-dioxin.
MTCA	= Model Toxics Control Act.	TEQ	= Toxicity equivalent quotient.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070550	99070551	99070612	99070613	99070614	99070616	99070617	99070658	99070659
Sample Location		B-N3	B-N3	MW29-S	MW29-S	B-O13	MW35-S	MW35-S	B-O7	B-O7
Sample Depth (Feet bgs)		4-6	14-16	4-6	12-14	24-26	8-10	10-12	2-4	6-8
Sample Date		8/3/99	8/3/99	8/9/99	8/9/99	8/9/99	8/9/99	8/9/99	8/13/99	8/13/99
Semivolatile Organic Compounds (mg/kg)										
2,4-Dichlorophenol	180 [c]	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.0094 U	0.096 U
2,4-Dimethylphenol	1200 [c]	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.0094 U	0.096 U
2,4-Dinitrotoluene	120 [c]	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.0094 U	4.4 JN
2-Methylnaphthalene	56 [c]	0.0022 U	0.0024 U	0.017 J	0.0022 UJ	0.0021 UJ	0.0022 UJ	0.0024 UJ	0.065	360
4-Chloro-3-Methylphenol	NA	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.0094 U	0.096 U
7,12-Dimethylbenz(a)anthracene	NA	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.0019 U	1.7 JN
7H-Dibenzo(c,g)carbazole	NA	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.0019 U	0.16
Acenaphthene	3700 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.0034 JN	280
Acenaphthylene	3700 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.11	2.8
Anthracene	22000 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.34	71
Benzo(a)anthracene	0.62 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.052	**69**
Benzo(a)pyrene	0.062 [c]	0.0022 U	0.0024 U	0.024 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	**0.14**	**20**
Benzo(b)fluoranthene	0.62 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.062 J	**9.2 J**
Benzo(g,h,i)perylene	2300 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.16	3.4
Benzo(j)fluoranthene	1.37 [d]	0.022 U	0.024 U	0.022 U	0.022 U	0.021 U	0.022 U	0.024 U	0.062 J	**9.2 J**
Benzo(k)fluoranthene	6.2 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.062 J	**9.2 J**
Benzoic acid	100000 [c]	0.022 U	0.024 U	0.022 UJ	0.022 UJ	0.021 UJ	0.022 UJ	0.024 UJ	0.069 J	0.19 U
Benzyl alcohol	18000 [c]	0.011 U	0.012 U	0.011 UJ	0.011 UJ	0.01 UJ	0.011 UJ	0.012 UJ	0.0094 U	0.096 U
Chrysene	62 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.15	52
Dibenzo(a,e)pyrene	0.137 [d]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.051	**0.5**
Dibenzo(a,h)acridine	NA	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.0019 U	0.22 JN
Dibenzo(a,h)anthracene	0.062 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.024 JN	**0.92**
Dibenzo(a,h)pyrene	0.0137 [d]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.0067	**0.56**
Dibenzo(a,i)pyrene	0.0137 [d]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	**0.025**	**0.096**
Dibenzo(a,j)acridine	1.37 [d]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.0019 U	0.28
Dibenzofuran	290 [c]	0.011 U	0.012 U	0.0026 J	0.011 U	0.01 U	0.011 U	0.012 U	0.03	6.1
Fluoranthene	2300 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.077	290
Fluorene	2600 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.061	260
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.17	**3.9**
Naphthalene	56 [c]	0.0022 U	0.0024 U	0.025	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.018	**510**
Pentachlorophenol	3 [c]	0.011 UJ	0.012 UJ	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	8.6	**200**
Phenanthrene	22000 [c]	0.0022 U	0.0024 U	0.0022	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.056	600
Pyrene	2300 [c]	0.0022 U	0.0024 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0024 U	0.11	200
Tetrachlorophenols	1800 [c]	0.011 U	0.012 U	0.011 U	0.011 U	0.01 U	0.011 U	0.012 U	0.42	1.7 JN

Key is at the end of the table.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070550	99070551	99070612	99070613	99070614	99070616	99070617	99070658	99070659
Sample Location		B-N3	B-N3	MW29-S	MW29-S	B-O13	MW35-S	MW35-S	B-O7	B-O7
Sample Depth (Feet bgs)		4-6	14-16	4-6	12-14	24-26	8-10	10-12	2-4	6-8
Sample Date		8/3/99	8/3/99	8/9/99	8/9/99	8/9/99	8/9/99	8/9/99	8/13/99	8/13/99
Petroleum Hydrocarbons (mg/kg)										
C10-C12 Aromatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	5 U	5.8 U	6.3 U	5.8 U	320 J
C12-C13 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1000 J
C12-C16 Aliphatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	6.5	660 J
C12-C16 Aromatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	5.8 U	1200 J
C16-C18 Aliphatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	10	440 J
C16-C18 Aromatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	5.8 U	690 J
C18-C21 Aliphatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	21	340 J
C18-C21 Aromatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	11 J	2000 J
C21-C28 Aliphatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	18	170
C21-C28 Aromatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	7.8 J	430 J
C28-C36 Aliphatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	5.8 U	41
C28-C36 Aromatics	NA	5.7 U	6.2 U	5.7 U	5.8 U	NA	5.8 U	6.3 U	11 J	220 J
C8-C10 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	60
Ethylbenzene	230 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.51
m&p-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2
o-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.2
Dioxin/Furans (ng/kg)										
2,3,7,8-TCDD TEQ	3.9 [c]	0.008	NA	0.588	NA	NA	NA	NA	NA	**1157.810**
2,3,7,8-TCDF	3.9 [c]	0.294 U	NA	0.507 U	NA	NA	0.552 U	NA	NA	**224.459**
1,2,3,7,8-PeCDD	NA	0.78 U	NA	0.943 U	NA	NA	1.301 U	NA	NA	3.746
1,2,3,7,8-PeCDF	NA	0.328 U	NA	0.655 U	NA	NA	0.678 U	NA	NA	438.883
2,3,4,7,8-PeCDF	NA	0.332 U	NA	0.662 U	NA	NA	0.686 U	NA	NA	287.555
1,2,3,4,7,8-HxCDF	NA	0.355 U	NA	2.247	NA	NA	0.6 U	NA	NA	762.962 U
1,2,3,6,7,8-HxCDD	NA	0.352 U	NA	0.657 U	NA	NA	0.789 U	NA	NA	3185.148 J
1,2,3,6,7,8-HxCDF	NA	0.266 U	NA	0.624 U	NA	NA	0.45 U	NA	NA	159.301
1,2,3,7,8,9-HxCDD	NA	0.403 U	NA	0.753 U	NA	NA	0.905 U	NA	NA	259.873
1,2,3,7,8,9-HxCDF	NA	0.422 U	NA	0.988 U	NA	NA	0.713 U	NA	NA	349.845
2,3,4,6,7,8-HxCDF	NA	0.312 U	NA	0.729 U	NA	NA	0.526 U	NA	NA	209.229
1,2,3,4,6,7,8-HpCDD	NA	2.548 U	NA	26.309	NA	NA	8.768 U	NA	NA	48270.311 J
1,2,3,4,6,7,8-HpCDF	NA	0.752	NA	4.798	NA	NA	1.336 U	NA	NA	5007.608 J
1,2,3,4,7,8,9-HpCDF	NA	0.503 U	NA	2.068 U	NA	NA	1.223 U	NA	NA	168.565
OCDD	NA	66.051 U	NA	501.587	NA	NA	60.139 U	NA	NA	147386.977 J
OCDF	NA	2.186	NA	25.518	NA	NA	6.784 U	NA	NA	3531.981 J
Total HpCDD	NA	3.458 J	NA	49.121	NA	NA	14.77	NA	NA	94430.55 J
Total HpCDF	NA	0.752	NA	4.798	NA	NA	5.803	NA	NA	5911.772 J
Total HxCDD	NA	0.352 U	NA	0.657 U	NA	NA	0.789 U	NA	NA	12746.176 J
Total HxCDF	NA	0.665	NA	7.097	NA	NA	0.45 U	NA	NA	17777.864 J
Total PeCDD	NA	0.78 U	NA	0.943 U	NA	NA	1.301 U	NA	NA	13.512
Total PeCDF	NA	0.332 U	NA	0.662 U	NA	NA	0.686 U	NA	NA	4893.753
Total TCDD	NA	0.446 U	NA	0.934 U	NA	NA	0.792 U	NA	NA	5.569
Total TCDF	NA	0.294 U	NA	1.472	NA	NA	0.552 U	NA	NA	413.905

Key is at the end of the table.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070660	99070661	99070662	99070663	99070664	99070667	99070668	99070669	99070670
Sample Location		B-O7	B-O7	B-O7	B-O7	B-O7	MW29-S	MW29-S	MW29-S	MW29-S
Sample Depth (Feet bgs)		14-16	16.5-18.5	28-30	34-36	39.5-41.5	2-4	4-6	10-12	16-18
Sample Date		8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99
Semivolatile Organic Compounds (mg/kg)										
2,4-Dichlorophenol	180 [c]	0.0095 U	0.0085 U	0.0087 U	0.0081 U	0.009 U	0.011 U	0.0091 U	0.0099 U	0.009 U
2,4-Dimethylphenol	1200 [c]	0.014	0.0085 U	0.0087 U	0.0081 U	0.009 U	0.011 U	0.0091 U	0.0099 U	0.009 U
2,4-Dinitrotoluene	120 [c]	0.0095 U	0.0085 U	0.0087 U	0.0081 U	0.009 U	0.011 U	0.0091 U	0.0099 U	0.009 U
2-Methylnaphthalene	56 [c]	0.038	0.0041	0.0016 J	0.0016 U	0.0018 U	0.014	0.11	0.002 U	0.0018 U
4-Chloro-3-Methylphenol	NA	0.0095 U	0.0085 U	0.0087 U	0.0081 U	0.009 U	0.011 U	0.0091 U	0.0099 U	0.009 U
7,12-Dimethylbenz(a)anthracene	NA	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U	0.002 U	0.0018 U
7H-Dibenzo(c,g)carbazole	NA	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.014 JN	0.002 U	0.0018 U
Acenaphthene	3700 [c]	0.06	0.0058	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U	0.002 U	0.0018 U
Acenaphthylene	3700 [c]	0.0023	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U	0.002 U	0.0018 U
Anthracene	22000 [c]	0.019	0.0036	0.0017 U	0.0016 U	0.0018	0.0023	0.0036	0.002 U	0.0018 U
Benzo(a)anthracene	0.62 [c]	0.017	0.0036	0.0017 U	0.0016 U	0.002 JN	0.0021 U	0.014	0.002 U	0.0018 U
Benzo(a)pyrene	0.062 [c]	0.0059	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	**0.072**	0.002 U	0.0018 U
Benzo(b)fluoranthene	0.62 [c]	0.005 J	0.0027	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.028 J	0.002 U	0.0018 U
Benzo(g,h,i)perylene	2300 [c]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0023	0.048	0.0046	0.0018 U
Benzo(j)fluoranthene	1.37 [d]	0.005 J	0.017 U	0.017 U	0.016 U	0.018 U	0.021 U	0.028 J	0.02 U	0.018 U
Benzo(k)fluoranthene	6.2 [c]	0.005 J	0.0015 J	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.028 J	0.002 U	0.0018 U
Benzoic acid	100000 [c]	0.019 U	0.017 U	0.017 U	0.016 U	0.018 U	0.021 U	0.018 U	0.02 U	0.018 U
Benzyl alcohol	18000 [c]	0.0095 U	0.0085 U	0.0087 U	0.0081 U	0.009 U	0.0021 J	0.0091 U	0.0099 U	0.009 U
Chrysene	62 [c]	0.013	0.0034	0.0017 U	0.0016 U	0.0018 U	0.0038	0.029 J	0.002 U	0.0018 U
Dibenzo(a,e)pyrene	0.137 [d]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.018	0.002 U	0.0018 U
Dibenzo(a,h)acridine	NA	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U	0.002 U	0.0018 U
Dibenzo(a,h)anthracene	0.062 [c]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.014	0.002 U	0.0018 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	**0.017**	0.002 U	0.0018 U
Dibenzo(a,i)pyrene	0.0137 [d]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.0056	0.002 U	0.0018 U
Dibenzo(a,j)acridine	1.37 [d]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.004 JN	0.002 U	0.0018 U
Dibenzofuran	290 [c]	0.042	0.0051 J	0.0014 J	0.0081 U	0.0014 J	0.0042 J	0.056	0.0099 U	0.009 U
Fluoranthene	2300 [c]	0.071	0.015	0.0043	0.0034	0.0099	0.0036	0.0087 JN	0.002 U	0.0018 U
Fluorene	2600 [c]	0.063	0.0094	0.0028	0.0018	0.0032	0.0021 U	0.0018 U	0.002 U	0.0018 U
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.0019 U	0.0017 U	0.0017 U	0.0016 U	0.0018 U	0.0021 U	0.05	0.002 U	0.0018 U
Naphthalene	56 [c]	0.48	0.029	0.0021 U	0.0018 U	0.0018 U	0.012	0.079	0.002 U	0.0018 U
Pentachlorophenol	3 [c]	0.0095 U	0.8	0.0087 U	0.0081 U	0.007 J	0.055	0.0091 JN	0.035	0.009 U
Phenanthrene	22000 [c]	0.15	0.027	0.0097	0.0065	0.017	0.0068	0.017	0.002 U	0.0018 U
Pyrene	2300 [c]	0.048	0.0079	0.0028	0.0019	0.0052	0.0021 U	0.014 JN	0.002 U	0.0018 U
Tetrachlorophenols	1800 [c]	0.14	0.039	0.0087 U	0.0081 U	0.009 U	0.011 U	0.0091 U	0.0099 U	0.009 U

Key is at the end of the table.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070660	99070661	99070662	99070663	99070664	99070667	99070668	99070669	99070670
Sample Location		B-O7	B-O7	B-O7	B-O7	B-O7	MW29-S	MW29-S	MW29-S	MW29-S
Sample Depth (Feet bgs)		14-16	16.5-18.5	28-30	34-36	39.5-41.5	2-4	4-6	10-12	16-18
Sample Date		8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99	8/13/99
Petroleum Hydrocarbons (mg/kg)										
C10-C12 Aromatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C12-C13 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
C12-C16 Aliphatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C12-C16 Aromatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C16-C18 Aliphatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C16-C18 Aromatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C18-C21 Aliphatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C18-C21 Aromatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C21-C28 Aliphatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C21-C28 Aromatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C28-C36 Aliphatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C28-C36 Aromatics	NA	6.2 U	5.5 U	5.4 U	5.4 U	5.9 U	6.3 U	NA	6.5 U	5.7 U
C8-C10 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
Ethylbenzene	230 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
m&p-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
o-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
Dioxin/Furans (ng/kg)										
2,3,7,8-TCDD TEQ	3.9 [c]	NA	NA	NA	NA	NA	NA	NA	0.057	NA
2,3,7,8-TCDF	3.9 [c]	NA	NA	NA	NA	NA	NA	NA	0.542 U	NA
1,2,3,7,8-PeCDD	NA	NA	NA	NA	NA	NA	NA	NA	0.646 U	NA
1,2,3,7,8-PeCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.485 U	NA
2,3,4,7,8-PeCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.49 U	NA
1,2,3,4,7,8-HxCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.662 U	NA
1,2,3,6,7,8-HxCDD	NA	NA	NA	NA	NA	NA	NA	NA	0.424 U	NA
1,2,3,6,7,8-HxCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.496 U	NA
1,2,3,7,8,9-HxCDD	NA	NA	NA	NA	NA	NA	NA	NA	0.486 U	NA
1,2,3,7,8,9-HxCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.786 U	NA
2,3,4,6,7,8-HxCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.58 U	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	NA	NA	NA	NA	NA	NA	5.657	NA
1,2,3,4,6,7,8-HpCDF	NA	NA	NA	NA	NA	NA	NA	NA	3.279 U	NA
1,2,3,4,7,8,9-HpCDF	NA	NA	NA	NA	NA	NA	NA	NA	4.619 U	NA
OCDD	NA	NA	NA	NA	NA	NA	NA	NA	59.323 U	NA
OCDF	NA	NA	NA	NA	NA	NA	NA	NA	3.011	NA
Total HpCDD	NA	NA	NA	NA	NA	NA	NA	NA	9.225	NA
Total HpCDF	NA	NA	NA	NA	NA	NA	NA	NA	3.279 U	NA
Total HxCDD	NA	NA	NA	NA	NA	NA	NA	NA	0.424 U	NA
Total HxCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.496 U	NA
Total PeCDD	NA	NA	NA	NA	NA	NA	NA	NA	0.646 U	NA
Total PeCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.49 U	NA
Total TCDD	NA	NA	NA	NA	NA	NA	NA	NA	0.359 U	NA
Total TCDF	NA	NA	NA	NA	NA	NA	NA	NA	0.542 U	NA

Key is at the end of the table.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070672	99070673	99070674	99070680	99070681	99070682	99070683	99070684	99070685
Sample Location		MW28-S	MW28-S	MW28-S	MW35-D	MW35-D	MW35-D	MW35-D	MW35-D	MW35-D
Sample Depth (Feet bgs)		2-4	6-8	12-14	2-4	6-8	8-10	12-14	18-20	46-48
Sample Date		8/13/99	8/13/99	8/13/99	8/15/99	8/15/99	8/15/99	8/15/99	8/15/99	8/15/99
Semivolatile Organic Compounds (mg/kg)										
2,4-Dichlorophenol	180 [c]	0.0091 U	0.0025 J	0.0083 U	0.01 U	0.01 U	0.0097 U	0.0094 U	0.0093 U	0.0094 U
2,4-Dimethylphenol	1200 [c]	0.0091 U	0.0097 U	0.0083 U	0.01 U	0.01 U	0.0097 U	0.0094 U	0.0093 U	0.0094 U
2,4-Dinitrotoluene	120 [c]	0.0091 U	0.0097 U	0.0083 U	0.01 U	0.01 U	0.028 JN	0.0094 U	0.0093 U	0.0019 J
2-Methylnaphthalene	56 [c]	0.0031	0.0019 U	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
4-Chloro-3-Methylphenol	NA	0.0091 U	0.0097 U	0.0083 U	0.01 U	0.01 U	0.0097 U	0.0094 U	0.0093 U	0.0023 J
7,12-Dimethylbenz(a)anthracene	NA	0.0018 U	0.0019 U	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
7H-Dibenzo(c,g)carbazole	NA	0.0018 U	0.0019 U	0.0017 U	0.012	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Acenaphthene	3700 [c]	0.56	0.0019 U	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Acenaphthylene	3700 [c]	0.01	0.0019 U	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Anthracene	22000 [c]	0.024	0.0035	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Benzo(a)anthracene	0.62 [c]	0.094	0.0019 U	0.0017 U	0.023	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Benzo(a)pyrene	0.062 [c]	**0.27**	0.0019 U	0.0017 UJ	**0.16**	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Benzo(b)fluoranthene	0.62 [c]	0.13 J	0.0019 U	0.0017 UJ	0.071 J	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Benzo(g,h,i)perylene	2300 [c]	0.12	0.0019 U	0.0017 UJ	0.13	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Benzo(j)fluoranthene	1.37 [d]	0.13 J	0.019 U	0.017 U	0.071 J	0.02 U	0.019 U	0.019 U	0.019 U	0.019 U
Benzo(k)fluoranthene	6.2 [c]	0.13 J	0.0019 U	0.0017 UJ	0.071 J	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Benzoic acid	100000 [c]	0.018 U	0.019 U	0.017 U	0.02 U	0.02 U	0.019 U	0.019 U	0.019 U	0.019 U
Benzyl alcohol	18000 [c]	0.0091 U	0.0097 U	0.0083 U	0.01 U	0.01 U	0.0097 U	0.0094 U	0.0093 U	0.0094 U
Chrysene	62 [c]	0.19	0.0019 U	0.0017 U	0.058	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzo(a,e)pyrene	0.137 [d]	0.027	0.0019 U	0.0017 U	0.11	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzo(a,h)acridine	NA	0.0018 U	0.0019 U	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzo(a,h)anthracene	0.062 [c]	0.031	0.0019 U	0.0017 UJ	0.035	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzo(a,h)pyrene	0.0137 [d]	**0.059 J**	0.0019 U	0.0017 U	**0.087 J**	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzo(a,i)pyrene	0.0137 [d]	**0.027**	0.0019 U	0.0017 U	**0.032**	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzo(a,j)acridine	1.37 [d]	0.0027 JN	0.0019 U	0.0017 U	0.0075	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Dibenzofuran	290 [c]	0.0015 J	0.029	0.0083 U	0.01 U	0.01 U	0.0097 U	0.0094 U	0.0093 U	0.0094 U
Fluoranthene	2300 [c]	0.1	0.022	0.0017 U	0.0047	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Fluorene	2600 [c]	0.0037	0.027	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.14	0.0019 U	0.0017 UJ	0.11	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Naphthalene	56 [c]	0.0068	0.0025	0.0017 U	0.002 U	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Pentachlorophenol	3 [c]	0.012	0.71 J	0.007 J	0.04	0.01 U	0.0097 U	0.0094 U	0.0037 J	0.004 J
Phenanthrene	22000 [c]	0.036	0.064	0.0017 U	0.0026	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U
Pyrene	2300 [c]	0.063	0.018	0.0017 U	0.0079	0.002 U	0.0019 U	0.0019 U	0.0019 U	0.0011 J
Tetrachlorophenols	1800 [c]	0.0091 U	0.056	0.0083 U	0.0026 J	0.01 U	0.0097 U	0.0094 U	0.0093 U	0.0094 U

Key is at the end of the table.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070672	99070673	99070674	99070680	99070681	99070682	99070683	99070684	99070685
Sample Location		MW28-S	MW28-S	MW28-S	MW35-D	MW35-D	MW35-D	MW35-D	MW35-D	MW35-D
Sample Depth (Feet bgs)		2-4	6-8	12-14	2-4	6-8	8-10	12-14	18-20	46-48
Sample Date		8/13/99	8/13/99	8/13/99	8/15/99	8/15/99	8/15/99	8/15/99	8/15/99	8/15/99
Petroleum Hydrocarbons Continued (mg/kg)										
C10-C12 Aromatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C12-C13 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
C12-C16 Aliphatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C12-C16 Aromatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C16-C18 Aliphatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C16-C18 Aromatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C18-C21 Aliphatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C18-C21 Aromatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C21-C28 Aliphatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C21-C28 Aromatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C28-C36 Aliphatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C28-C36 Aromatics	NA	5.7 U	6.2 U	5.2 U	6.4 U	6.5 U	6 U	6 U	5.6 U	5.8 U
C8-C10 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	230 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m&p-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)										
2,3,7,8-TCDD TEQ	3.9 [c]	NA	NA	0.341	NA	NA	NA	1.643	NA	0.098
2,3,7,8-TCDF	3.9 [c]	NA	0.431 U	NA	NA	NA	NA	0.31 U	NA	0.556 U
1,2,3,7,8-PeCDD	NA	NA	0.59 U	NA	NA	NA	NA	0.398 U	NA	0.747 U
1,2,3,7,8-PeCDF	NA	NA	0.452 U	NA	NA	NA	NA	0.356 U	NA	0.786 U
2,3,4,7,8-PeCDF	NA	NA	0.457 U	NA	NA	NA	NA	0.36 U	NA	0.795 U
1,2,3,4,7,8-HxCDF	NA	NA	1.616 U	NA	NA	NA	NA	4.467 U	NA	1.467 U
1,2,3,6,7,8-HxCDD	NA	NA	0.911 U	NA	NA	NA	NA	3.768	NA	0.655 U
1,2,3,6,7,8-HxCDF	NA	NA	0.533 U	NA	NA	NA	NA	0.764 U	NA	1.1 U
1,2,3,7,8,9-HxCDD	NA	NA	1.044 U	NA	NA	NA	NA	0.442 U	NA	0.751 U
1,2,3,7,8,9-HxCDF	NA	NA	0.844 U	NA	NA	NA	NA	1.209 U	NA	1.742 U
2,3,4,6,7,8-HxCDF	NA	NA	0.624 U	NA	NA	NA	NA	0.893 U	NA	1.287 U
1,2,3,4,6,7,8-HpCDD	NA	NA	25.217	NA	NA	NA	NA	101.656	NA	8.673
1,2,3,4,6,7,8-HpCDF	NA	NA	6.167	NA	NA	NA	NA	14.771	NA	1.837 U
1,2,3,4,7,8,9-HpCDF	NA	NA	1.053 U	NA	NA	NA	NA	1.451 U	NA	2.587 U
OCDD	NA	NA	238.992	NA	NA	NA	NA	998.446	NA	112.317
OCDF	NA	NA	30.27	NA	NA	NA	NA	19.572	NA	3.167
Total HpCDD	NA	NA	43.646	NA	NA	NA	NA	186.062	NA	16.12
Total HpCDF	NA	NA	6.167	NA	NA	NA	NA	14.771	NA	14.96
Total HxCDD	NA	NA	1.34	NA	NA	NA	NA	10.92	NA	0.655 U
Total HxCDF	NA	NA	6.479	NA	NA	NA	NA	42.005	NA	1.1 U
Total PeCDD	NA	NA	0.59 U	NA	NA	NA	NA	0.398 U	NA	0.747 U
Total PeCDF	NA	NA	1.782	NA	NA	NA	NA	6.453	NA	0.795 U
Total TCDD	NA	NA	0.476 U	NA	NA	NA	NA	0.332 U	NA	0.372 U
Total TCDF	NA	NA	0.431 U	NA	NA	NA	NA	0.31 U	NA	0.556 U

Key is on the next page.

Table 4-36

SUMMARY OF RESULTS FROM FACILITY SOUTH POLE YARD SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] - PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] - Sample Concentrations above PSLs are in bold type.
[c] - EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] - State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

bgs	= Below ground surface.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identifiedand the numerical result is estimated.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for but was not detected. The associated value is an estimated sample quantitation limit.

Table 4-37

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Stasndard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7H-Dibenzo(c,g)carbazole	0.012 - 0.014	MW29-S	2/7	0.0018 - 0.0022	0/7	0.062	0/7	2.32	0/7	0.137	NA	NA
B(a)P Equivalent	0.0000038 - 1.53602	MW35-D	5/7	-	4/7	0.062	0/7	2.32	4/7	0.137	0/7	30
Benzo(a)anthracene	0.014 - 0.094	MW28-S	4/7	0.0021 - 0.0022	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Benzo(a)pyrene	0.072 - 0.27	MW28-S	4/7	0.0021 - 0.024	4/7	0.062	0/7	2.32	3/7	0.137	0/7	30
Benzo(b)fluoranthene	0.028 - 0.13	MW28-S	4/7	0.0021 - 0.0022	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Benzo(j)fluoranthene	0.028 - 0.13	MW28-S	4/7	0.021 - 0.022	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Benzo(k)fluoranthene	0.028 - 0.13	MW28-S	4/7	0.0021 - 0.0022	0/7	6.215	0/7	232.30	0/7	13.699	NA	NA
Chrysene	0.0038 - 0.19	MW28-S	5/7	0.0022 - 0.0022	0/7	62.148	0/7	2322.99	0/7	136.986	NA	NA
Dibenzo(a,e)pyrene	0.018 - 0.11	MW35-D	4/7	0.0021 - 0.0022	1/7	0.062	0/7	2.32	0/7	0.137	NA	NA
Dibenzo(a,h)anthracene	0.014 - 0.035	MW35-D	4/7	0.0021 - 0.0022	0/7	0.062	0/7	2.32	0/7	0.137	NA	NA
Dibenzo(a,h)pyrene	0.0067 - 0.087	MW35-D	4/7	0.0021 - 0.0022	4/7	0.006	0/7	0.23	3/7	0.014	NA	NA
Dibenzo(a,i)pyrene	0.0056 - 0.032	MW35-D	4/7	0.0021 - 0.0022	3/7	0.006	0/7	0.23	3/7	0.014	NA	NA
Dibenzo(a,j)acridine	0.0027 - 0.0075	MW35-D	3/7	0.0019 - 0.0022	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	0.05 - 0.17	B-O7	4/7	0.0021 - 0.0022	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	26.309	MW29-S	1/2	2.548 - 2.548	0/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	0.752 - 4.798	MW29-S	2/2	-	0/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,7,8-HxCDF	2.247	MW29-S	1/2	0.355 - 0.355	0/2	39	0/2	3138	0/2	66.7	NA	NA
2,3,7,8-TCDD TEQ	0.00774 - 0.58848	MW29-S	2/2	-	0/2	3.9	0/2	314	0/2	6.7	0/2	5
OCDD	501.587	MW29-S	1/2	66.051 - 66.051	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
OCDF	2.186 - 25.518	MW29-S	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
Total HpCDD	3.458 - 49.121	MW29-S	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	0.752 - 4.798	MW29-S	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	0.665 - 7.097	MW29-S	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	1.472	MW29-S	1/2	0.294 - 0.294	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum Hydrocarbons (mg/kg)												
C12-C16 Aliphatics	6.5	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	10	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	21	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	11	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	18	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	7.8	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	11	B-O7	1/6	5.7 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
EPH	85.3	B-O7	1/6	-	NA	NA	0/1	2000	NA	NA	0/1	460

Table 4-37

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Stasndard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0031 - 0.11	MW29-S	5/7	0.002 - 0.0022	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
Acenaphthene	0.0034 - 0.56	MW28-S	2/7	0.0018 - 0.0022	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Acenaphthylene	0.01 - 0.11	B-O7	2/7	0.0018 - 0.0022	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Anthracene	0.0023 - 0.34	B-O7	4/7	0.002 - 0.0022	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Benzo(g,h,i)perylene	0.0023 - 0.16	B-O7	5/7	0.0022 - 0.0022	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Fluoranthene	0.0036 - 0.1	MW28-S	5/7	0.0022 - 0.0022	0/7	2293.61	0/7	6287.36	0/7	3200	NA	NA
Fluorene	0.0037 - 0.061	B-O7	2/7	0.0018 - 0.0022	0/7	2643.61	0/7	304.64	0/7	3200	NA	NA
Naphthalene	0.0068 - 0.079	MW29-S	5/7	0.002 - 0.0022	0/7	55.92	0/7	23.51	0/7	1600	NA	NA
ncPAH	0.041 - 1.0004	B-O7	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0022 - 0.056	B-O7	6/7	0.0022 - 0.0022	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Pyrene	0.0079 - 0.11	B-O7	4/7	0.0021 - 0.0022	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.069	B-O7	1/7	0.018 - 0.022	0/7	100000.00	0/7	263.04	0/7	320000	NA	NA
Benzyl alcohol	0.0021	MW29-S	1/7	0.0091 - 0.011	0/7	18330.93	0/7	28.99	0/7	24000	NA	NA
Dibenzofuran	0.0015 - 0.056	MW29-S	5/7	0.01 - 0.011	0/7	290.53	0/7	29.93	0/7	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.0091 - 8.6	B-O7	5/7	0.011 - 0.011	1/7	2.98	1/7	0.077	1/7	8	0/7	11
Tetrachlorophenols	0.0026 - 0.42	B-O7	2/7	0.0091 - 0.011	0/7	1833.09	0/7	25.82	0/7	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.

Table 4-38

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	1.7	B-O7	1/7	0.0019 - 0.0024	1/7	0.003	1/7	0.12	1/7	0.007	NA	NA
7H-Dibenzo(c,g)carbazole	0.16	B-O7	1/7	0.0019 - 0.0024	1/7	0.062	0/7	2.32	1/7	0.137	NA	NA
B(a)P Equivalent	71.464	B-O7	1/9	-	1/9	0.062	1/9	2.32	1/9	0.137	1/9	30
Benzo(a)anthracene	69	B-O7	1/9	0.0019 - 0.041	1/9	0.621	1/9	23.23	1/9	1.370	NA	NA
Benzo(a)pyrene	20	B-O7	1/9	0.0019 - 0.041	1/9	0.062	1/9	2.32	1/9	0.137	0/9	30
Benzo(b)fluoranthene	9.2	B-O7	1/9	0.0019 - 0.041	1/9	0.621	0/9	23.23	1/9	1.370	NA	NA
Benzo(j)fluoranthene	9.2	B-O7	1/7	0.019 - 0.024	1/7	0.621	0/7	23.23	1/7	1.370	NA	NA
Benzo(k)fluoranthene	9.2	B-O7	1/9	0.0019 - 0.041	1/9	6.215	0/9	232.30	0/9	13.699	NA	NA
Chrysene	52	B-O7	1/9	0.0019 - 0.041	0/9	62.148	0/9	2322.99	0/9	136.986	NA	NA
Dibenzo(a,e)pyrene	0.5	B-O7	1/7	0.0019 - 0.0024	1/7	0.062	0/7	2.32	1/7	0.137	NA	NA
Dibenzo(a,h)acridine	0.22	B-O7	1/7	0.0019 - 0.0024	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Dibenzo(a,h)anthracene	0.92	B-O7	1/9	0.0019 - 0.041	1/9	0.062	0/9	2.32	1/9	0.137	NA	NA
Dibenzo(a,h)pyrene	0.56	B-O7	1/7	0.0019 - 0.0024	1/7	0.006	1/7	0.23	1/7	0.014	NA	NA
Dibenzo(a,i)pyrene	0.096	B-O7	1/7	0.0019 - 0.0024	1/7	0.006	0/7	0.23	1/7	0.014	NA	NA
Dibenzo(a,j)acridine	0.28	B-O7	1/7	0.0019 - 0.0024	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	3.9	B-O7	1/9	0.0019 - 0.041	1/9	0.621	0/9	23.23	1/9	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	5.657 - 48270.31	B-O7	3/4	8.768 - 8.768	1/4	390	1/4	31384	1/4	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	6.167 - 5007.608	B-O7	2/4	1.336 - 3.279	1/4	390	0/4	31384	1/4	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	168.565	B-O7	1/4	1.053 - 4.619	0/4	390	0/4	31384	0/4	666.7	NA	NA
1,2,3,6,7,8-HxCDD	3185.148	B-O7	1/4	0.424 - 0.911	1/4	39	1/4	3138	1/4	66.7	NA	NA
1,2,3,6,7,8-HxCDF	159.301	B-O7	1/4	0.45 - 0.533	1/4	39	0/4	3138	1/4	66.7	NA	NA
1,2,3,7,8,9-HxCDD	259.873	B-O7	1/4	0.486 - 1.044	1/4	78	0/4	3138	1/4	66.7	NA	NA
1,2,3,7,8,9-HxCDF	349.845	B-O7	1/4	0.713 - 0.844	1/4	39	0/4	3138	1/4	66.7	NA	NA
1,2,3,7,8-PeCDD	3.746	B-O7	1/4	0.59 - 1.301	0/4	3.9	0/4	314	0/4	6.7	NA	NA
1,2,3,7,8-PeCDF	438.883	B-O7	1/4	0.452 - 0.678	1/4	78	0/4	6277	1/4	133.3	NA	NA
2,3,4,6,7,8-HxCDF	209.229	B-O7	1/4	0.526 - 0.624	1/4	39	0/4	3138	1/4	66.7	NA	NA
2,3,4,7,8-PeCDF	287.555	B-O7	1/4	0.457 - 0.686	1/4	7.8	0/4	628	1/4	13.3	NA	NA
2,3,7,8-TCDD TEQ	0.0569 - 1157.81	B-O7	3/4	-	1/4	3.9	1/4	314	1/4	6.7	1/4	5
2,3,7,8-TCDF	224.459	B-O7	1/4	0.431 - 0.552	1/4	39	0/4	3138	1/4	66.7	NA	NA
OCDD	238.99 - 147386.98	B-O7	2/4	59.323 - 60.139	1/4	39000	0/4	3138357	1/4	66666.7	NA	NA
OCDF	3.011 - 3531.98	B-O7	3/4	6.784 - 6.784	0/4	39000	0/4	3138357	0/4	66666.7	NA	NA
Total HpCDD	9.225 - 94430.55	B-O7	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	5.803 - 5911.772	B-O7	3/4	3.279 - 3.279	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	1.34 - 12746.176	B-O7	2/4	0.424 - 0.789	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	6.479 - 17777.864	B-O7	2/4	0.45 - 0.496	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	13.512	B-O7	1/4	0.59 - 1.301	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	1.782 - 4893.753	B-O7	2/4	0.49 - 0.686	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	5.569	B-O7	1/4	0.359 - 0.792	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	413.905	B-O7	1/4	0.431 - 0.552	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-38

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C10-C12 Aliphatics	24	B-O7	1/14	5 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	320 - 610	B-O7	2/14	5 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	1000	B-O7	1/7	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	660	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	1200	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	440	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	690	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	340	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	2000	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	170	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	430	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	41	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	220	B-O7	1/7	5.8 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	60	B-O7	1/7	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
EPH	6535	B-O7	1/7	-	NA	NA	1/7	2000	NA	NA	1/7	460
VPH	1670	B-O7	1/7	-	NA	NA	1/7	30	NA	NA	1/7	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.069 - 360	B-O7	2/9	0.0019 - 0.041	1/9	55.92	1/9	23.513	0/9	1600	NA	NA
Acenaphthene	280	B-O7	1/9	0.0019 - 0.041	0/9	3681.71	0/9	284.050	0/9	4800	NA	NA
Acenaphthylene	2.8	B-O7	1/9	0.0019 - 0.041	0/9	3681.71	0/9	284.050	0/9	4800	NA	NA
Anthracene	0.0035 - 71	B-O7	2/9	0.0019 - 0.041	0/9	21896.12	0/9	6777.611	0/9	24000	NA	NA
Benzo(g,h,i)perylene	0.0046 - 3.4	B-O7	2/9	0.0019 - 0.041	0/9	2308.68	0/9	1959.130	0/9	2400	NA	NA
Fluoranthene	0.022 - 290	B-O7	2/9	0.0019 - 0.041	0/9	2293.61	0/9	6287.360	0/9	3200	NA	NA
Fluorene	0.027 - 260	B-O7	2/9	0.0019 - 0.041	0/9	2643.61	0/9	304.642	0/9	3200	NA	NA
Naphthalene	0.0025 - 510	B-O7	4/9	0.0019 - 0.0024	1/9	55.92	1/9	23.513	0/9	1600	NA	NA
ncPAH	0.0046 - 2577.2	B-O7	5/5	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.064 - 600	B-O7	2/9	0.0019 - 0.041	0/9	21896.12	0/9	6777.611	0/9	24000	NA	NA
Pyrene	0.018 - 200	B-O7	2/9	0.0019 - 0.041	0/9	2308.68	0/9	1959.130	0/9	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.028 - 4.4	B-O7	2/9	0.0097 - 0.16	0/9	122.21	1/9	0.454	0/9	160	NA	NA
Dibenzofuran	0.029 - 6.1	B-O7	2/9	0.0097 - 0.041	0/9	290.53	0/9	29.926	0/9	320	NA	NA
Ethylbenzene	0.51	B-O7	1/7	0.5 - 0.5	0/7	230.00	0/7	23.232	0/7	8000	NA	NA
m&p-Xylene	2	B-O7	1/7	0.5 - 0.5	0/7	210.00	0/7	448.666	0/7	160000	NA	NA
o-Xylene	1.2	B-O7	1/7	0.5 - 0.5	0/7	210.00	0/7	448.666	0/7	160000	NA	NA
Phenols (mg/kg)												
2,4-Dichlorophenol	0.0025	MW28-S	1/9	0.0097 - 0.096	0/9	183.31	0/9	1.536	0/9	240	NA	NA
Pentachlorophenol	0.035 - 200	B-O7	3/7	0.0097 - 0.012	1/7	2.98	2/7	0.077	1/7	8	1/7	11
Tetrachlorophenols	0.056 - 1.7	B-O7	2/7	0.0097 - 0.012	0/7	1833.09	0/7	25.825	0/7	2400	NA	NA

Table 4-38

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
bgs	= Below ground surface.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary Remediation Goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalent quotient.
VPH	= Volatile petroleum hydrocarbon.

Table 4-39

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0002 - 0.008663	B-O7	3/13	-	0/13	0.062	0/13	2.32	0/13	0.137	0/13	30
Benzo(a)anthracene	0.002 - 0.017	B-O7	3/13	0.0016 - 0.04	0/13	0.621	0/13	23.23	0/13	1.370	NA	NA
Benzo(a)pyrene	0.0059	B-O7	1/13	0.0016 - 0.04	0/13	0.062	0/13	2.32	0/13	0.137	0/13	30
Benzo(b)fluoranthene	0.0027 - 0.005	B-O7	2/13	0.0016 - 0.04	0/13	0.621	0/13	23.23	0/13	1.370	NA	NA
Benzo(j)fluoranthene	0.005	B-O7	1/10	0.016 - 0.024	0/10	0.621	0/10	23.23	0/10	1.370	NA	NA
Benzo(k)fluoranthene	0.0015 - 0.005	B-O7	2/13	0.0016 - 0.04	0/13	6.215	0/13	232.30	0/13	13.699	NA	NA
Chrysene	0.0034 - 0.013	B-O7	2/13	0.0016 - 0.04	0/13	62.148	0/13	2322.99	0/13	136.986	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	8.673	MW35-D	1/1	-	0/1	390	0/1	31384	0/1	666.7	NA	NA
2,3,7,8-TCDD TEQ	0.0982784	MW35-D	1/1	-	0/1	3.9	0/1	314	0/1	6.7	0/1	5
OCDD	112.317	MW35-D	1/1	-	0/1	39000	0/1	3138357	0/1	66666.7	NA	NA
OCDF	3.167	MW35-D	1/1	-	0/1	39000	0/1	3138357	0/1	66666.7	NA	NA
Total HpCDD	16.12	MW35-D	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	14.96	MW35-D	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0016 - 0.038	B-O7	3/13	0.0016 - 0.04	0/13	55.92	0/13	23.51	0/13	1600	NA	NA
Acenaphthene	0.0058 - 0.06	B-O7	2/13	0.0016 - 0.04	0/13	3681.71	0/13	284.05	0/13	4800	NA	NA
Acenaphthylene	0.0023	B-O7	1/13	0.0016 - 0.04	0/13	3681.71	0/13	284.05	0/13	4800	NA	NA
Anthracene	0.0018 - 0.019	B-O7	3/13	0.0016 - 0.04	0/13	21896.12	0/13	6777.61	0/13	24000	NA	NA
Fluoranthene	0.0034 - 0.071	B-O7	5/13	0.0018 - 0.04	0/13	2293.61	0/13	6287.36	0/13	3200	NA	NA
Fluorene	0.0018 - 0.063	B-O7	5/13	0.0018 - 0.04	0/13	2643.61	0/13	304.64	0/13	3200	NA	NA
Naphthalene	0.029 - 0.48	B-O7	4/13	0.0018 - 0.04	0/13	55.92	0/13	23.51	0/13	1600	NA	NA
ncPAH	0.0011 - 0.9313	B-O7	8/8	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0065 - 0.15	B-O7	5/13	0.0018 - 0.04	0/13	21896.12	0/13	6777.61	0/13	24000	NA	NA
Pyrene	0.0011 - 0.048	B-O7	6/13	0.0018 - 0.04	0/13	2308.68	0/13	1959.13	0/13	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.0019	MW35-D	1/13	0.0081 - 0.16	0/13	122.21	0/13	0.45	0/13	160	NA	NA
Dibenzofuran	0.0014 - 0.042	B-O7	4/13	0.0081 - 0.04	0/13	290.53	0/13	29.93	0/13	320	NA	NA
Phenols (mg/kg)												
2,4-Dimethylphenol	0.014	B-O7	1/13	0.0081 - 0.04	0/13	1222.06	0/13	9.34	0/13	1600	NA	NA
4-Chloro-3-Methylphenol	0.0023	MW35-D	1/13	0.0081 - 0.04	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.0037 - 0.8	B-O7	4/10	0.0081 - 0.012	0/10	2.98	1/10	0.077	0/10	8	0/10	11
Tetrachlorophenols	0.039 - 0.14	B-O7	2/10	0.0081 - 0.012	0/10	1833.09	0/10	25.82	0/10	2400	NA	NA

Table 4-39

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY SOUTH POLE YARD
SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
bgs	= Below ground surface.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDF	= Pentachlorodibenzofuran.
PRG	= Preliminary Remediation Goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TEQ	= Toxicity equivalent quotient.

Table 4-40

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070584	99070585	99070586	99070602	99070603	99070628	99070629	99070630	99070631	99070632
Sample Location		B-R18	B-R18	B-R18	B-Q20	B-Q20	B-R28	B-R28	B-R28	B-R28	B-R28
Sample Depth (feet bgs)		2-4	8-10	14-16	2-4	8-10	2-4	6-8	10-12	20-22	34-36
Sample Date		8/4/99	8/4/99	8/4/99	8/8/99	8/8/99	8/10/99	8/10/99	8/10/99	8/10/99	8/11/99
Semivolatile Organic Compounds (mg/kg)											
2,4-Dinitrotoluene	120 [c]	0.013 U	0.012 U	0.013 U	0.01 U	0.09 JN	0.0097 U	0.009 U	0.011 U	0.0084 U	0.0083 U
2-Methylnaphthalene	56 [c]	0.0053	0.0024 U	0.0026 U	0.004	0.0076 JN	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
3&4-Methylphenol	310 [c]	0.013 U	0.012 U	0.013 U	0.0031 J	0.0095 U	0.0097 U	0.009 U	0.011 U	0.0084 U	0.0083 U
Acenaphthene	3700 [c]	0.0025 U	0.0024 U	0.0026 U	0.0021 U	0.12 J	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Acenaphthylene	3700 [c]	0.013	0.0024 U	0.0026 U	0.0021 U	0.0019 U	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Anthracene	22000 [c]	0.018	0.0024 U	0.0026 U	0.0021 U	0.13	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Benzo(a)anthracene	0.62 [c]	0.0066	0.0024 U	0.0026 U	0.0021 U	0.012 J	0.0039	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Benzo(a)pyrene	0.062 [c]	0.016	0.0024 U	0.0026 U	0.0021 U	0.0057 J	0.027	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Benzo(b)fluoranthene	0.62 [c]	0.009 JK	0.0024 U	0.0026 U	0.0021 U	0.0028 J	0.013 J	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Benzo(j)fluoranthene	1.37 [d]	0.009 JQ	0.024 U	0.026 U	0.021 U	0.0028 J	0.013 J	0.018 U	0.021 U	0.017 U	0.017 U
Benzo(k)fluoranthene	6.2 [c]	0.009 JK	0.0024 U	0.0026 U	0.0021 U	0.0028 J	0.013 J	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Chrysene	62 [c]	0.013	0.0024 U	0.0026 U	0.0021 U	0.016 J	0.0079	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Dibenzo(a,e)pyrene	0.137 [d]	0.0025 U	0.0024 U	0.0026 U	0.0021 U	0.0019 U	0.018	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Dibenzo(a,h)anthracene	0.062 [c]	0.024	0.0024 U	0.0026 U	0.0021 U	0.0019 U	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.0025 U	0.0024 U	0.0026 U	0.0021 U	0.0019 U	**0.028**	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Dibenzofuran	290 [c]	0.003 JQ	0.012 U	0.013 U	0.01 U	0.046 JN	0.0097 U	0.009 U	0.011 U	0.0084 U	0.0083 U
Fluoranthene	2300 [c]	0.014	0.0024 U	0.0026 U	0.0021 U	0.054	0.0015 J	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Fluorene	2600 [c]	0.0041	0.0024 U	0.0026 U	0.0021 U	0.28 J	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Naphthalene	56 [c]	0.0091	0.0024 U	0.0026 U	0.0029	0.014 JN	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Pentachlorophenol	3 [c]	0.14	0.012 U	0.013 U	0.011	0.0095 U	0.0091 J	0.009 U	0.011 U	0.0027 J	0.0083 U
Phenanthrene	22000 [c]	0.012	0.0024 U	0.0026 U	0.0021 U	1.1	0.0019 U	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Phenol	37000 [c]	0.013 U	0.012 U	0.013 U	0.01 U	0.0095 U	0.0097 U	0.009 U	0.011 U	0.0084 U	0.0083 U
Pyrene	2300 [c]	0.013	0.0024 U	0.0026 U	0.0021 U	0.12	0.0019	0.0018 U	0.0021 U	0.0017 U	0.0017 U
Tetrachlorophenols	1800 [c]	0.02	0.012 U	0.013 U	0.01 U	0.0095 U	0.0097 U	0.009 U	0.011 U	0.0084 U	0.0083 U
Petroleum Hydrocarbons (mg/kg)											
C12-C13 Aromatics	NA	5 U	5 U	5 U	5 U	130	5 U	5 U	5 U	5 U	5 U
C12-C16 Aliphatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	65	6.4 U	5.6 U	7.6	7.4	8.7
C12-C16 Aromatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	110	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
C16-C18 Aliphatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	56	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
C16-C18 Aromatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	91	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
C18-C21 Aliphatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	40	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U

Key is at the end of the table.

Table 4-40 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070584	99070585	99070586	99070602	99070603	99070628	99070629	99070630	99070631	99070632
Sample Location		B-R18	B-R18	B-R18	B-Q20	B-Q20	B-R28	B-R28	B-R28	B-R28	B-R28
Sample Depth (feet bgs)		2-4	8-10	14-16	2-4	8-10	2-4	6-8	10-12	20-22	34-36
Sample Date		8/4/99	8/4/99	8/4/99	8/8/99	8/8/99	8/10/99	8/10/99	8/10/99	8/10/99	8/11/99
Petroleum Hydrocarbons Continued (mg/kg)											
C18-C21 Aromatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	240	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
C21-C28 Aliphatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	8.1	6.4 U	5.6 U	6.5 U	7	7.2
C21-C28 Aromatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	14	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
C28-C36 Aliphatics	NA	8.3	6.8 U	6.4 U	6.3 U	6.1 U	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
C28-C36 Aromatics	NA	6.4 U	6.8 U	6.4 U	6.3 U	6.1 U	6.4 U	5.6 U	6.5 U	5.3 U	5.2 U
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9 [c]	NT	NT	NT	NT	NT	1.567	NT	NT	NT	NT
1,2,3,7,8-PeCDD	NA	NT	NT	NT	NT	NT	0.775 U	NT	NT	NT	NT
1,2,3,7,8-PeCDF	NA	NT	NT	NT	NT	NT	0.483 U	NT	NT	NT	NT
2,3,4,7,8-PeCDF	NA	NT	NT	NT	NT	NT	0.488 U	NT	NT	NT	NT
1,2,3,4,7,8-HxCDD	NA	NT	NT	NT	NT	NT	2.051 U	NT	NT	NT	NT
1,2,3,6,7,8-HxCDD	NA	NT	NT	NT	NT	NT	3.236	NT	NT	NT	NT
1,2,3,7,8,9-HxCDD	NA	NT	NT	NT	NT	NT	1.583 U	NT	NT	NT	NT
1,2,3,4,6,7,8-HpCDD	NA	NT	NT	NT	NT	NT	91.782	NT	NT	NT	NT
1,2,3,4,6,7,8-HpCDF	NA	NT	NT	NT	NT	NT	21.879	NT	NT	NT	NT
1,2,3,4,7,8,9-HpCDF	NA	NT	NT	NT	NT	NT	7.294 U	NT	NT	NT	NT
OCDD	NA	NT	NT	NT	NT	NT	948.009	NT	NT	NT	NT
OCDF	NA	NT	NT	NT	NT	NT	124.246	NT	NT	NT	NT
Total HpCDD	NA	NT	NT	NT	NT	NT	155.187	NT	NT	NT	NT
Total HpCDF	NA	NT	NT	NT	NT	NT	21.879	NT	NT	NT	NT
Total HxCDD	NA	NT	NT	NT	NT	NT	8.264	NT	NT	NT	NT
Total HxCDF	NA	NT	NT	NT	NT	NT	42.017	NT	NT	NT	NT
Total PeCDD	NA	NT	NT	NT	NT	NT	0.775 U	NT	NT	NT	NT
Total PeCDF	NA	NT	NT	NT	NT	NT	7.339	NT	NT	NT	NT
Total TCDD	NA	NT	NT	NT	NT	NT	0.591 U	NT	NT	NT	NT
Total TCDF	NA	NT	NT	NT	NT	NT	0.368 U	NT	NT	NT	NT

Key is at the end of the table.

Table 4-40 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070633	99070635	99070636	99070637	99070638	99070639	99070640	99070692	99070693	99070694
Sample Location		B-R28	B-U19	B-U19	B-U19	B-U19	B-U19	B-U19	MW33-D	MW33-D	MW33-D
Sample Depth (feet bgs)		38-40	0-2	2-4	10-12	20-22	26-28	38-40	6-8	10-12	16-18
Sample Date		8/11/99	8/11/99	8/11/99	8/11/99	8/11/99	8/11/99	8/11/99	8/17/99	8/17/99	8/17/99
Semivolatile Organic Compounds (mg/kg)											
2,4-Dinitrotoluene	120 [c]	0.0092 U	0.11 U	0.01 U	0.011 U	0.0086 U	0.0082 U	0.0082 U	0.011 U	0.011 U	0.012 U
2-Methylnaphthalene	56 [c]	0.0031	13	0.14	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
3&4-Methylphenol	310 [c]	0.0092 U	0.11 U	0.01 U	0.011 U	0.0086 U	0.0082 U	0.0082 U	0.011 U	0.011 U	0.012 U
Acenaphthene	3700 [c]	0.0018 U	0.61	0.0078	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Acenaphthylene	3700 [c]	0.0018 U	0.022 U	0.009	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Anthracene	22000 [c]	0.0018 U	0.5	0.014	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Benzo(a)anthracene	0.62 [c]	0.0018 U	0.27	0.014	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Benzo(a)pyrene	0.062 [c]	0.0018 U	**0.39**	0.045	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Benzo(b)fluoranthene	0.62 [c]	0.0018 U	0.22 J	0.02 J	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Benzo(j)fluoranthene	1.37 [d]	0.018 U	0.22 J	0.02 J	0.022 U	0.017 U	0.016 U	0.016 U	0.023 U	0.022 U	0.024 U
Benzo(k)fluoranthene	6.2 [c]	0.0018 U	0.22 J	0.02 J	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Chrysene	62 [c]	0.0018 U	0.57	0.032	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Dibenzo(a,e)pyrene	0.137 [d]	0.0018 U	0.022 U	0.002 U	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Dibenzo(a,h)anthracene	0.062 [c]	0.0018 U	0.022 U	0.002 U	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.0018 U	0.022 U	0.002 U	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Dibenzofuran	290 [c]	0.0092 U	0.31	0.0061 J	0.011 U	0.0086 U	0.0082 U	0.0082 U	0.011 U	0.011 U	0.012 U
Fluoranthene	2300 [c]	0.0018 U	0.41	0.03	0.0052	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Fluorene	2600 [c]	0.0018 U	0.87	0.015	0.0022 U	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Naphthalene	56 [c]	0.0018 U	1.5	0.026	0.0022 U	0.0017 U	0.0011 J	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Pentachlorophenol	3 [c]	0.0092 U	**19**	0.65	0.021	0.0086 U	0.0082 U	0.0082 U	0.011 U	0.011 U	0.012 U
Phenanthrene	22000 [c]	0.0028	3.1	0.044	0.0097	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Phenol	37000 [c]	0.0092 U	0.11 U	0.01 U	0.0032 J	0.0028 J	0.0039 J	0.0082 U	0.011 U	0.0022 J	0.0029 J
Pyrene	2300 [c]	0.0018 U	0.86	0.033	0.0037	0.0017 U	0.0016 U	0.0016 U	0.0023 U	0.0022 U	0.0024 U
Tetrachlorophenols	1800 [c]	0.0092 U	0.11 U	0.01 U	0.011 U	0.0086 U	0.0082 U	0.0082 U	0.011 U	0.011 U	0.012 U
Petroleum Hydrocarbons (mg/kg)											
C12-C13 Aromatics	NA	5 U	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
C12-C16 Aliphatics	NA	5.9 U	35	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C12-C16 Aromatics	NA	5.9 U	16	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C16-C18 Aliphatics	NA	5.9 U	32	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C16-C18 Aromatics	NA	5.9 U	8.8	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C18-C21 Aliphatics	NA	5.9 U	51	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U

Key is at the end of the table.

Table 4-40 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070633	99070635	99070636	99070637	99070638	99070639	99070640	99070692	99070693	99070694
Sample Location		B-R28	B-U19	B-U19	B-U19	B-U19	B-U19	B-U19	MW33-D	MW33-D	MW33-D
Sample Depth (feet bgs)		38-40	0-2	2-4	10-12	20-22	26-28	38-40	6-8	10-12	16-18
Sample Date		8/11/99	8/11/99	8/11/99	8/11/99	8/11/99	8/11/99	8/11/99	8/17/99	8/17/99	8/17/99
Petroleum Hydrocarbons Continued (mg/kg)											
C18-C21 Aromatics	NA	5.9 U	21	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C21-C28 Aliphatics	NA	5.9 U	210	8.6	6.8	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C21-C28 Aromatics	NA	5.9 U	6.9 U	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C28-C36 Aliphatics	NA	5.9 U	150	7.2	10	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
C28-C36 Aromatics	NA	5.9 U	7.2 J	6.6 U	6.3 U	5.3 U	5.8 U	5.3 U	5.7 U	6 U	6.3 U
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9 [c]	NA	NT	**563.044**	NT	NT	NT	NT	NT	0.013	NT
1,2,3,7,8-PeCDD	NA	0.8 U	NT	90.585	NT	NT	NT	NT	NT	0.399 U	NT
1,2,3,7,8-PeCDF	NA	0.402 U	NT	50.352	NT	NT	NT	NT	NT	0.254 U	NT
2,3,4,7,8-PeCDF	NA	0.406 U	NT	55.611	NT	NT	NT	NT	NT	0.257 U	NT
1,2,3,4,7,8-HxCDD	NA	1.01 U	NT	240.521	NT	NT	NT	NT	NT	0.645 U	NT
1,2,3,6,7,8-HxCDD	NA	0.68 U	NT	876.874	NT	NT	NT	NT	NT	0.434 U	NT
1,2,3,7,8,9-HxCDD	NA	0.779 U	NT	487.029	NT	NT	NT	NT	NT	0.498 U	NT
1,2,3,4,6,7,8-HpCDD	NA	4.349 U	NT	20508.917 JL	NT	NT	NT	NT	NT	1.286	NT
1,2,3,4,6,7,8-HpCDF	NA	1.57 U	NT	5479.953 JL	NT	NT	NT	NT	NT	0.333 U	NT
1,2,3,4,7,8,9-HpCDF	NA	2.211 U	NT	256.404	NT	NT	NT	NT	NT	0.469 U	NT
OCDD	NA	38.054 U	NT	152318.542 JL	NT	NT	NT	NT	NT	13.641 U	NT
OCDF	NA	4.062 U	NT	27545.982 JL	NT	NT	NT	NT	NT	0.561 U	NT
Total HpCDD	NA	0.836 U	NT	34050.209	NT	NT	NT	NT	NT	1.286	NT
Total HpCDF	NA	1.57 U	NT	5736.357	NT	NT	NT	NT	NT	0.333 U	NT
Total HxCDD	NA	0.68 U	NT	4677.115	NT	NT	NT	NT	NT	0.434 U	NT
Total HxCDF	NA	0.637 U	NT	6955.349	NT	NT	NT	NT	NT	0.337 U	NT
Total PeCDD	NA	0.8 U	NT	291.329	NT	NT	NT	NT	NT	0.399 U	NT
Total PeCDF	NA	0.406 U	NT	1717.912	NT	NT	NT	NT	NT	0.257 U	NT
Total TCDD	NA	0.355 U	NT	14.144	NT	NT	NT	NT	NT	0.512 U	NT
Total TCDF	NA	0.31 U	NT	100.282	NT	NT	NT	NT	NT	0.356 U	NT

Key is at the end of the table.

Table 4-40 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070695	99070696	99070697	99080013	99080014	99080015
Sample Location		MW33-D	MW33-D	MW33-D	MW33-S	MW33-S	MW33-S
Sample Depth (feet bgs)		28-30	38-40	44-46	2-4	10-12	20-22
Sample Date		8/17/99	8/17/99	8/17/99	8/19/99	8/19/99	8/19/99
Semivolatile Organic Compounds (mg/kg)							
2,4-Dinitrotoluene	120 [c]	0.01 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
2-Methylnaphthalene	56 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
3&4-Methylphenol	310 [c]	0.01 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Acenaphthene	3700 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Acenaphthylene	3700 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Anthracene	22000 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Benzo(a)anthracene	0.62 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Benzo(a)pyrene	0.062 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Benzo(b)fluoranthene	0.62 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Benzo(j)fluoranthene	1.37 [d]	0.02 U	0.024 U	0.024 U	0.025 U	0.022 U	0.021 U
Benzo(k)fluoranthene	6.2 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Chrysene	62 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Dibenzo(a,e)pyrene	0.137 [d]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Dibenzo(a,h)anthracene	0.062 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Dibenzofuran	290 [c]	0.01 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Fluoranthene	2300 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Fluorene	2600 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Naphthalene	56 [c]	0.002 U	0.0024 U	0.0015 J	0.002 J	0.0022 U	0.0021 U
Pentachlorophenol	3 [c]	0.01 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Phenanthrene	22000 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Phenol	37000 [c]	0.01 U	0.012 U	0.012 U	0.0022 J	0.002 J	0.0023 J
Pyrene	2300 [c]	0.002 U	0.0024 U	0.0024 U	0.0025 U	0.0022 U	0.0021 U
Tetrachlorophenols	1800 [c]	0.01 U	0.012 U	0.012 U	0.012 U	0.011 U	0.011 U
Petroleum Hydrocarbons (mg/kg)							
C12-C13 Aromatics	NA	8.3	5 U	5 U	5 U	5 U	5 U
C12-C16 Aliphatics	NA	5.3 U	6.2 U	6.3 U	13	5.9 U	6
C12-C16 Aromatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U
C16-C18 Aliphatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U
C16-C18 Aromatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U
C18-C21 Aliphatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U

Key is at the end of the table.

Table 4-40 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070695	99070696	99070697	99080013	99080014	99080015
Sample Location		MW33-D	MW33-D	MW33-D	MW33-S	MW33-S	MW33-S
Sample Depth (feet bgs)		28-30	38-40	44-46	2-4	10-12	20-22
Sample Date		8/17/99	8/17/99	8/17/99	8/19/99	8/19/99	8/19/99
Petroleum Hydrocarbons Continued (mg/kg)							
C18-C21 Aromatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U
C21-C28 Aliphatics	NA	5.3 U	6.2 U	7.2	6.7	5.9 U	6.3
C21-C28 Aromatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U
C28-C36 Aliphatics	NA	5.3 U	9.2	9.1	6.3 U	5.9 U	5.6 U
C28-C36 Aromatics	NA	5.3 U	6.2 U	6.3 U	6.3 U	5.9 U	5.6 U
Dioxin/Furans (ng/kg)							
2,3,7,8-TCDD TEQ	3.9 [c]	NT	NT	NA	NT	NT	NA
1,2,3,7,8-PeCDD	NA	NT	NT	0.348 U	NT	NT	0.245 U
1,2,3,7,8-PeCDF	NA	NT	NT	0.189 U	NT	NT	0.178 U
2,3,4,7,8-PeCDF	NA	NT	NT	0.191 U	NT	NT	0.18 U
1,2,3,4,7,8-HxCDD	NA	NT	NT	0.484 U	NT	NT	0.442 U
1,2,3,6,7,8-HxCDD	NA	NT	NT	0.326 U	NT	NT	0.297 U
1,2,3,7,8,9-HxCDD	NA	NT	NT	0.373 U	NT	NT	0.341 U
1,2,3,4,6,7,8-HpCDD	NA	NT	NT	0.347 U	NT	NT	0.327 U
1,2,3,4,6,7,8-HpCDF	NA	NT	NT	0.305 U	NT	NT	0.252 U
1,2,3,4,7,8,9-HpCDF	NA	NT	NT	0.429 U	NT	NT	0.355 U
OCDD	NA	NT	NT	5.628 U	NT	NT	4.268 U
OCDF	NA	NT	NT	0.441 U	NT	NT	0.33 U
Total HpCDD	NA	NT	NT	0.347 U	NT	NT	0.327 U
Total HpCDF	NA	NT	NT	0.305 U	NT	NT	0.252 U
Total HxCDD	NA	NT	NT	0.326 U	NT	NT	0.297 U
Total HxCDF	NA	NT	NT	0.193 U	NT	NT	0.226 U
Total PeCDD	NA	NT	NT	0.348 U	NT	NT	0.245 U
Total PeCDF	NA	NT	NT	0.191 U	NT	NT	0.18 U
Total TCDD	NA	NT	NT	0.309 U	NT	NT	0.221 U
Total TCDF	NA	NT	NT	0.316 U	NT	NT	0.236 U

Key is on next page.

Table 4-40

SUMMARY OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] - PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] - Sample Concentrations above PSLs are in bold type.
[c] - EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] - State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

bgs	= Below ground surface.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JK	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
JL	= The analyte was positively identified. The associated numerical result is an estimate, biased low.
JN	= The analyte was tentatively identifiedand the numerical result is estimated.
JQ	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
NT	= Not tested.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-41

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.042563 - 0.46377	B-U19	5/8	-	3/8	0.062	0/8	2.32	2/8	0.137	0/8	30
Benzo(a)anthracene	0.0039 - 0.27	B-U19	4/7	0.0021 - 0.375	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Benzo(a)pyrene	0.016 - 0.39	B-U19	5/7	0.0021 - 0.0025	2/7	0.062	0/7	2.32	1/7	0.137	0/7	30
Benzo(b)fluoranthene	0.009 - 0.22	B-U19	5/7	0.0021 - 0.0025	0/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Benzo(j)fluoranthene	0.009 - 0.22	B-U19	4/6	0.021 - 0.025	0/6	0.621	0/6	23.23	0/6	1.370	NA	NA
Benzo(k)fluoranthene	0.009 - 0.22	B-U19	5/7	0.0021 - 0.0025	0/7	6.215	0/7	232.30	0/7	13.699	NA	NA
Chrysene	0.0079 - 0.57	B-U19	5/7	0.0021 - 0.0025	0/7	62.148	0/7	2322.99	0/7	136.986	NA	NA
Dibenzo(a,e)pyrene	0.018	B-R28	1/6	0.002 - 0.022	0/6	0.062	0/6	2.32	0/6	0.137	NA	NA
Dibenzo(a,h)anthracene	0.024	B-R18	1/7	0.0019 - 0.375	0/7	0.062	0/7	2.32	0/7	0.137	NA	NA
Dibenzo(a,h)pyrene	0.028	B-R28	1/6	0.002 - 0.022	1/6	0.006	0/6	0.23	1/6	0.014	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	91.782 - 20508.917	B-U19	2/2	-	1/2	390	0/2	31384	1/2	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	21.879 - 5479.953	B-U19	2/2	-	1/2	390	0/2	31384	1/2	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	256.404	B-U19	1/2	7.294 - 7.294	0/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,7,8-HxCDD	240.521	B-U19	1/2	2.051 - 2.051	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,6,7,8-HxCDD	3.236 - 876.874	B-U19	2/2	-	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,7,8,9-HxCDD	487.029	B-U19	1/2	1.583 - 1.583	1/2	78	0/2	3138	1/2	66.7	NA	NA
1,2,3,7,8-PeCDD	90.585	B-U19	1/2	0.775 - 0.775	1/2	3.9	0/2	314	1/2	6.7	NA	NA
1,2,3,7,8-PeCDF	50.352	B-U19	1/2	0.483 - 0.483	0/2	78	0/2	6277	0/2	133.3	NA	NA
2,3,4,7,8-PeCDF	55.611	B-U19	1/2	0.488 - 0.488	1/2	7.8	0/2	628	1/2	13.3	NA	NA
2,3,7,8-TCDD TEQ	1.567 - 563.045	B-U19	2/2	-	1/2	3.9	1/2	314	1/2	6.7	1/2	5
2,3,7,8-TCDF	12.552	B-U19	1/2	0.368 - 0.368	0/2	39	0/2	3138	0/2	66.7	NA	NA
OCDD	948.009 - 152318.542	B-U19	2/2	-	1/2	39000	0/2	3138357	1/2	66666.7	NA	NA
OCDF	124.246 - 27545.982	B-U19	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
Total HpCDD	155.187 - 34050.209	B-U19	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	21.879 - 5736.357	B-U19	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	8.264 - 4677.115	B-U19	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	42.017 - 6955.349	B-U19	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	291.329	B-U19	1/2	0.775 - 0.775	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	7.339 - 1717.912	B-U19	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDD	14.144	B-U19	1/2	0.591 - 0.591	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	100.282	B-U19	1/2	0.368 - 0.368	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-41

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C12-C13 Aromatics	10	B-U19	1/6	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	13 - 35	B-U19	2/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	16	B-U19	1/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	32	B-U19	1/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	8.8	B-U19	1/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	51	B-U19	1/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	21	B-U19	1/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	6.7 - 210	B-U19	3/6	6.3 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	7.2 - 150	B-U19	3/6	6.3 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	7.2	B-U19	1/6	6.3 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
EPH	8.3 - 531	B-U19	4/6	-	NA	NA	0/6	2000	NA	NA	1/6	460
VPH	10	B-U19	1/6	-	NA	NA	0/6	30	NA	NA	0/6	200
ncPAHs (mg/kg)												
2-Chloronaphthalene	0.016	SI-OS04	1/8	0.0039 - 0.044	0/8	3852.60	0/8	121.61	0/8	6400	NA	NA
2-Methylnaphthalene	0.004 - 13	B-U19	4/8	0.0019 - 0.375	0/8	55.92	0/8	23.51	0/8	1600	NA	NA
Acenaphthene	0.0078 - 0.61	B-U19	3/8	0.0019 - 0.0025	0/8	3681.71	0/8	284.05	0/8	4800	NA	NA
Acenaphthylene	0.009 - 0.013	B-R18	2/8	0.0019 - 0.375	0/8	3681.71	0/8	284.05	0/8	4800	NA	NA
Anthracene	0.014 - 0.5	B-U19	3/8	0.0019 - 0.375	0/8	21896.12	0/8	6777.61	0/8	24000	NA	NA
Benzo(g,h,i)perylene	0.0505	SI-OS04	1/8	0.0019 - 0.022	0/8	2308.68	0/8	1959.13	0/8	2400	NA	NA
Fluoranthene	0.0015 - 0.41	B-U19	3/8	0.0021 - 0.0025	0/8	2293.61	0/8	6287.36	0/8	3200	NA	NA
Fluorene	0.0041 - 0.87	B-U19	3/8	0.0019 - 0.375	0/8	2643.61	0/8	304.64	0/8	3200	NA	NA
Naphthalene	0.002 - 1.5	B-U19	5/8	0.0019 - 0.375	0/8	55.92	0/8	23.51	0/8	1600	NA	NA
ncPAH	0.002 - 20.85	B-U19	7/8	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.012 - 3.1	B-U19	3/8	0.0019 - 0.375	0/8	21896.12	0/8	6777.61	0/8	24000	NA	NA
Pyrene	0.0019 - 0.86	B-U19	5/8	0.0021 - 0.0025	0/8	2308.68	0/8	1959.13	0/8	2400	NA	NA
Retene	0.0627	SI-OS04	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Other Organics (mg/kg)												
Dibenzofuran	0.003 - 0.31	B-U19	3/7	0.0097 - 0.375	0/7	290.53	0/7	29.93	0/7	320	NA	NA
Hexachlorobenzene	0.0369	SI-OS04	1/7	0.0097 - 0.11	0/7	0.30	0/7	0.88	0/7	1	0/7	31
Phenols (mg/kg)												
3&4-Methylphenol	0.0031	B-Q20	1/6	0.0097 - 0.11	0/6	305.52	0/6	1.06	0/6	400	NA	NA
Pentachlorophenol	0.0091 - 19	B-U19	5/7	0.012 - 0.375	1/7	2.98	3/7	0.077	1/7	8	1/7	11
Phenol	0.0022	MW33-S	1/7	0.0097 - 0.375	0/7	36661.86	0/7	80.64	0/7	48000	NA	NA
Tetrachlorophenols	0.02	B-R18	1/6	0.0097 - 0.11	0/6	1833.09	0/6	25.82	0/6	2400	NA	NA

Key:

B(a)P	= Benzo(a)pyrene.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
bgs	= Below ground surface.	ng/kg	= Nanograms per kilogram.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.	OCDD	= Octachlorodibenzo-p-dioxin.
EPH	= Extractable petroleum hydrocarbon.	OCDF	= Octachlorodibenzofuran.
HpCDD	= Heptachlorodibenzo-p-dioxin.	PeCDD	= Pentachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.	PeCDF	= Pentachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.	PRG	= Preliminary Remediation Goal.
HxCDF	= Hexachlorodibenzofuran.	TCDD	= Tetrachlorodibenzo-p-dioxin.
mg/kg	= Milligrams per kilogram.	TCDF	= Tetrachlorodibenzofuran.
MTCA	= Model Toxics Control Act.	TEQ	= Toxicity equivalent quotient.
NA	= Not applicable.	VPH	= Volatile petroleum hydrocarbon.

Table 4-42

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.007504 - 1.283	GP11	4/15	-	3/15	0.062	0/15	2.32	3/15	0.137	0/15	30
Benzo(a)anthracene	0.012 - 1.5	GP11	3/15	0.0018 - 0.184	1/15	0.621	0/15	23.23	1/15	1.370	NA	NA
Benzo(a)pyrene	0.0057 - 1	GP11	4/15	0.0018 - 0.046	3/15	0.062	0/15	2.32	3/15	0.137	0/15	30
Benzo(b)fluoranthene	0.0028 - 0.81	GP11	4/15	0.0018 - 0.046	1/15	0.621	0/15	23.23	0/15	1.370	NA	NA
Benzo(j)fluoranthene	0.0028	B-Q20	1/8	0.018 - 0.024	0/8	0.621	0/8	23.23	0/8	1.370	NA	NA
Benzo(k)fluoranthene	0.0028 - 0.75	GP11	4/15	0.0018 - 0.046	0/15	6.215	0/15	232.30	0/15	13.699	NA	NA
Chrysene	0.016 - 1.5	GP11	4/15	0.0018 - 0.046	0/15	62.148	0/15	2322.99	0/15	136.986	NA	NA
Dibenzo(a,h)anthracene	0.0193	OS49	1/15	0.0018 - 0.41	0/15	0.062	0/15	2.32	0/15	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.06 - 0.43	GP11	3/15	0.0018 - 0.046	0/15	0.621	0/15	23.23	0/15	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	1.286	MW33-D	1/1	-	0/1	390	0/1	31384	0/1	666.7	NA	NA
2,3,7,8-TCDD TEQ	0.01286	MW33-D	1/1	-	0/1	3.89857	0/1	314	0/1	6.7	0/1	5
Total HpCDD	1.286	MW33-D	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum Hydrocarbons (mg/kg)												
C10-C12 Aliphatics	15	B-Q20	1/16	5 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	23	B-Q20	1/16	5 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	130	B-Q20	1/8	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	7.6 - 65	B-Q20	2/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	110	B-Q20	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	56	B-Q20	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	91	B-Q20	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	40	B-Q20	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	240	B-Q20	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	6.8 - 8.1	B-Q20	2/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	14	B-Q20	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	10	B-U19	1/8	5.6 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
EPH	7.6 - 624.1	B-Q20	3/8	-	NA	NA	0/8	2000	NA	NA	1/8	460
VPH	168	B-Q20	1/8	-	NA	NA	1/8	30	NA	NA	0/8	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0076 - 41	GP11	6/15	0.0018 - 0.046	0/15	55.92	2/15	23.51	0/15	1600	NA	NA
Acenaphthene	0.047 - 5.3	GP11	5/15	0.0018 - 0.184	0/15	3681.71	0/15	284.05	0/15	4800	NA	NA
Anthracene	0.13 - 2.7	GP11	4/15	0.0018 - 0.046	0/15	21896.12	0/15	6777.61	0/15	24000	NA	NA
Benzo(g,h,i)perylene	0.0553 - 0.48	GP11	3/15	0.0018 - 0.046	0/15	2308.68	0/15	1959.13	0/15	2400	NA	NA
Fluoranthene	0.0052 - 6	GP11	6/15	0.0018 - 0.046	0/15	2293.61	0/15	6287.36	0/15	3200	NA	NA
Fluorene	0.13 - 6.5	GP11	5/15	0.0018 - 0.046	0/15	2643.61	0/15	304.64	0/15	3200	NA	NA
Naphthalene	0.014 - 11	GP11	6/15	0.0018 - 0.046	0/15	55.92	0/15	23.51	0/15	1600	NA	NA
ncPAH	0.0186 - 100.08	GP11	8/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0097 - 21	GP11	6/15	0.0018 - 0.046	0/15	21896.12	0/15	6777.61	0/15	24000	NA	NA
Pyrene	0.0037 - 6.1	GP11	6/15	0.0018 - 0.046	0/15	2308.68	0/15	1959.13	0/15	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.09	B-Q20	1/15	0.009 - 1.6	0/15	122.21	0/15	0.45	0/15	160	NA	NA
Carbazole	0.76	GP11	1/7	0.04 - 0.184	0/7	24.32	NA	NA	0/7	50	NA	NA
Dibenzofuran	0.046 - 2.6	GP11	4/15	0.009 - 0.046	0/15	290.53	0/15	29.93	0/15	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.021 - 39	GP11	5/14	0.009 - 0.19	3/14	2.98	4/14	0.077	2/14	8	2/14	11
Phenol	0.002 - 0.0032	B-U19	3/15	0.009 - 0.41	0/15	36661.86	0/15	80.64	0/15	48000	NA	NA

Table 4-42

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.	NA	= Not applicable.
bgs	= Below ground surface.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.	ng/kg	= Nanograms per kilogram.
EPH	= Extractable petroleum hydrocarbon.	PRG	= Preliminary Remediation Goal.
HpCDD	= Heptachlorodibenzo-p-dioxin.	TCDD	= Tetrachlorodibenzo-p-dioxin.
mg/kg	= Milligrams per kilogram.	TEQ	= Toxicity equivalent quotient.
MTCA	= Model Toxics Control Act.	VPH	= Volatile petroleum hydrocarbon.

Table 4-43

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WOOD STORAGE AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum Hydrocarbons (mg/kg)												
C12-C13 Aromatics	8.3	MW33-D	1/12	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	6 - 8.7	B-R28	3/12	5.3 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	6.3 - 7.2	B-R28	4/12	5.3 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	9.1 - 9.2	MW33-D	2/12	5.2 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
EPH	9.2 - 16.3	MW33-D	5/12	-	NA	NA	0/12	2000	NA	NA	0/12	460
VPH	8.3	MW33-D	1/12	-	NA	NA	0/12	30	NA	NA	0/12	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0031	B-R28	1/26	0.0016 - 0.201	0/26	55.92	0/26	23.51	0/26	1600	NA	NA
Anthracene	0.0086	MW02-D	1/26	0.0016 - 0.201	0/26	21896.12	0/26	6777.61	0/26	24000	NA	NA
Fluoranthene	0.0068	MW02-D	1/26	0.0016 - 0.201	0/26	2293.61	0/26	6287.36	0/26	3200	NA	NA
Fluorene	0.0142	MW02-D	1/26	0.0016 - 0.201	0/26	2643.61	0/26	304.64	0/26	3200	NA	NA
Naphthalene	0.0011 - 0.085	MW17-D	4/26	0.0016 - 0.201	0/26	55.92	0/26	23.51	0/26	1600	NA	NA
ncPAH	0.0011 - 0.085	MW17-D	6/26	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0028 - 0.0184	MW02-D	2/26	0.0016 - 0.201	0/26	21896.12	0/26	6777.61	0/26	24000	NA	NA
Pyrene	0.0114	MW02-D	1/26	0.0016 - 0.201	0/26	2308.68	0/26	1959.13	0/26	2400	NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.0697	MW02-D	1/24	0.016 - 2.01	0/24	100000.00	0/24	263.04	0/24	320000	NA	NA
Benzyl alcohol	0.0302	MW02-D	1/24	0.0082 - 0.201	0/24	18330.93	0/24	28.99	0/24	24000	NA	NA
Carbazole	0.0099	MW02-D	1/12	0.036 - 0.201	0/12	24.32	NA	NA	0/12	50	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.0027	B-R28	1/20	0.0082 - 1	0/20	2.98	0/20	0.077	0/20	8	0/20	11
Phenol	0.0023 - 0.0039	B-U19	4/24	0.0082 - 0.201	0/24	36661.86	0/24	80.64	0/24	48000	NA	NA

Key:

bgs	= Below ground surface.	NA	= Not applicable.
EPH	= Extractable petroleum hydrocarbon.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
mg/kg	= Milligrams per kilogram.	PRG	= Preliminary Remediation Goal.
MTCA	= Model Toxics Control Act.	VPH	= Volatile petroleum hydrocarbon.

Table 4-44

SUMMARY OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070568	99070569	99070570	99070571	99070572	99070574	99070641	99070642	99070643	99070644	99070645
Sample Location		B-F16	B-F16	B-F16	B-J20	B-J20	B-J20	B-B16	B-B16	B-B16	B-B16	B-B16
Sample Depth (feet bgs)		2-4	8-10	14-16	2-4	8-10	14-16	4-6	8-10	16-18	22-24	30-32
Sample Date		8/4/99	8/4/99	8/4/99	8/4/99	8/4/99	8/4/99	8/12/99	8/12/99	8/12/99	8/12/99	8/12/99
Semivolatile Organic Compounds (mg/kg)												
2-Methylnaphthalene	56 [c]	0.0021 U	0.0024 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0021 JN	0.0017 U
Acenaphthene	3700 [c]	0.0021 U	0.0024 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016	0.0017 U
Acenaphthylene	3700 [c]	0.0021 U	0.0024 U	0.0022 U	0.0017 JQ	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Anthracene	22000 [c]	0.0021 U	0.0024 U	0.0022 U	0.067	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Benzo(a)anthracene	0.62 [c]	0.0021 U	0.0024 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Benzo(a)pyrene	0.062 [c]	0.0021 U	0.0024 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Benzo(b)fluoranthene	0.62 [c]	0.0021 U	0.0024 U	0.0022 U	0.0048	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Benzo(k)fluoranthene	6.2 [c]	0.0021 U	0.0024 U	0.0022 U	0.0015 JQ	0.0022 U	0.0022 U	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Dibenzofuran	290 [c]	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0097 U	0.01 U	0.0095 U	0.0011 J	0.0083 U
Fluoranthene	2300 [c]	0.0021 U	0.0024 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0047	0.002 U	0.0019 U	0.0031	0.0017 U
Fluorene	2600 [c]	0.0021 U	0.0024 U	0.0022 U	0.0021 U	0.0022 U	0.0022 U	0.0018 J	0.002 U	0.0019 U	0.0019	0.0017 U
Naphthalene	56 [c]	0.011 U	0.0024 U	0.0022 U	0.0021 U	0.0022	0.006	0.0019 U	0.002 U	0.0019 U	0.0016 U	0.0017 U
Pentachlorophenol	3 [c]	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0084 J	0.51	0.043	0.0081 U	0.0083 U
Phenanthrene	22000 [c]	0.003	0.0024 U	0.0022 U	0.013	0.0022 U	0.0022 U	0.0053	0.002 U	0.0019 U	0.0041	0.0017 U
Phenol	37000 [c]	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0097 U	0.01 U	0.0095 U	0.0081 U	0.0083 U
Pyrene	2300 [c]	0.0021 U	0.0024 U	0.0022 U	0.0052	0.0022 U	0.0022 U	0.0033	0.002 U	0.0019 U	0.0023	0.0017 U
Tetrachlorophenols	1800 [c]	0.011 U	0.012 U	0.011 U	0.01 U	0.011 U	0.011 U	0.0097 U	0.055	0.0095 U	0.0081 U	0.0083 U
Petroleum Hydrocarbons (mg/kg)												
C12-C16 Aliphatics	NA	5.4 U	6.3 U	5.5 U	5.2 U	5.8 U	5.7 U	5.9 U	6.1 U	6.2 U	5.2 U	5.3 U
C21-C28 Aliphatics	NA	5.4 U	6.3 U	5.5 U	5.2 U	5.8 U	5.7 U	5.9 U	6.1 U	6.2 U	5.2 U	5.3 U
C28-C36 Aliphatics	NA	5.4 U	6.3 U	5.5 U	11	5.8 U	5.7 U	5.9 U	6.1 U	6.2 U	5.2 U	5.3 U
C28-C36 Aromatics	NA	5.4 U	6.3 U	5.5 U	7.6 J	5.8 U	5.7 U	5.9 U	6.1 U	6.2 U	5.2 U	5.3 U
Dioxin/Furans (ng/kg)												
2,3,7,8-TCDD TEQ	3.9 [c]	2.620	NT	NT	**6.492**	0.0003	NT	NT	1.171	NT	NT	NT
1,2,3,7,8-PeCDD	NA	1.115 U	NT	NT	1.2	0.805 U	NT	NT	2.574 U	NT	NT	NT
1,2,3,4,7,8-HxCDD	NA	1.266 U	NT	NT	3.045	0.713 U	NT	NT	3.877 U	NT	NT	NT
1,2,3,6,7,8-HxCDD	NA	5.643	NT	NT	15.73 U	0.48 U	NT	NT	6.17 U	NT	NT	NT
1,2,3,7,8,9-HxCDD	NA	0.977 U	NT	NT	5.427 U	0.55 U	NT	NT	5.696	NT	NT	NT
1,2,3,4,6,7,8-HpCDD	NA	169.833	NT	NT	409.258	3.696 U	NT	NT	220.059 U	NT	NT	NT
1,2,3,4,6,7,8-HpCDF	NA	18.248	NT	NT	48.678	0.424 U	NT	NT	48.35	NT	NT	NT
OCDD	NA	1665.504	NT	NT	3870.284	122.889 U	NT	NT	959.037	NT	NT	NT
OCDF	NA	87.471	NT	NT	206.905	2.813	NT	NT	222.145	NT	NT	NT
Total TCDF	NA	0.484 U	NT	NT	0.486 U	0.417 U	NT	NT	2.301	NT	NT	NT
Total PeCDD	NA	1.115 U	NT	NT	1.2	0.805 U	NT	NT	2.574 U	NT	NT	NT
Total PeCDF	NA	0.784 U	NT	NT	19.698	0.298 U	NT	NT	16.977	NT	NT	NT
Total HxCDD	NA	20.998	NT	NT	46.671	0.48 U	NT	NT	26.185 J	NT	NT	NT
Total HxCDF	NA	31.542	NT	NT	82.351	0.542 U	NT	NT	65.938 J	NT	NT	NT
Total HpCDD	NA	299.361	NT	NT	742.744	0.925 U	NT	NT	347.223	NT	NT	NT
Total HpCDF	NA	18.248	NT	NT	48.678	0.424 U	NT	NT	48.35	NT	NT	NT

Key is at the end of the table.

Table 4-44

SUMMARY OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [ab]	99070646	99070698	99080010	99080011	99080012
Sample Location		B-B16	MW30-D	MW30-D	MW30-D	MW30-D
Sample Depth (feet bgs)		38-40	3-5	7-9	16-18	32-34
Sample Date		8/12/99	8/19/99	8/19/99	8/19/99	8/19/99
Semivolatile Organic Compounds (mg/kg)						
2-Methylnaphthalene	56 [c]	0.0017 U	0.002 U	0.0022 U	0.002 U	0.002 U
Acenaphthene	3700 [c]	0.0064	0.002 U	0.0022 U	0.002 U	0.002 U
Acenaphthylene	3700 [c]	0.0017 U	0.002 U	0.0022 U	0.002 U	0.002 U
Anthracene	22000 [c]	0.0048	0.002 U	0.0022 U	0.002 U	0.002 U
Benzo(a)anthracene	0.62 [c]	0.0046	0.002 U	0.0022 U	0.002 U	0.002 U
Benzo(a)pyrene	0.062 [c]	0.0021	0.002 U	0.0022 U	0.002 U	0.002 U
Benzo(b)fluoranthene	0.62 [c]	0.0036	0.002 U	0.0022 U	0.002 U	0.002 U
Benzo(k)fluoranthene	6.2 [c]	0.0014 J	0.002 U	0.0022 U	0.002 U	0.002 U
Dibenzofuran	290 [c]	0.006 J	0.01 U	0.011 U	0.0099 U	0.01 U
Fluoranthene	2300 [c]	0.022	0.002 U	0.0022 U	0.002 U	0.002 U
Fluorene	2600 [c]	0.012	0.002 U	0.0022 U	0.002 U	0.002 U
Naphthalene	56 [c]	0.0017 U	0.002 U	0.0022 U	0.002 U	0.002 U
Pentachlorophenol	3 [c]	0.05	0.01 U	0.011 U	0.0099 U	0.01 U
Phenanthrene	22000 [c]	0.041	0.002 U	0.0022 U	0.002 U	0.002 U
Phenol	37000 [c]	0.0086 U	0.0016 J	0.011 U	0.0024 J	0.01 U
Pyrene	2300 [c]	0.013	0.002 U	0.0022 U	0.002 U	0.002 U
Tetrachlorophenols	1800 [c]	0.0086 U	0.01 U	0.011 U	0.0099 U	0.01 U
Petroleum Hydrocarbons (mg/kg)						
C12-C16 Aliphatics	NA	5.2 U	5.4 U	5.9	5.7	NT
C21-C28 Aliphatics	NA	5.2 U	5.6	6.2	5.6	NT
C28-C36 Aliphatics	NA	5.2 U	6.1	5.9 J	5.2 U	NT
C28-C36 Aromatics	NA	5.2 U	5.4 U	5.8 U	5.2 U	NT
Dioxin/Furans (ng/kg)						
2,3,7,8-TCDD TEQ	3.9 [c]	NT	NT	NT	0.007	NT
1,2,3,7,8-PeCDD	NA	NT	NT	NT	0.282 U	NT
1,2,3,4,7,8-HxCDD	NA	NT	NT	NT	0.316 U	NT
1,2,3,6,7,8-HxCDD	NA	NT	NT	NT	0.213 U	NT
1,2,3,7,8,9-HxCDD	NA	NT	NT	NT	0.244 U	NT
1,2,3,4,6,7,8-HpCDD	NA	NT	NT	NT	0.727	NT
1,2,3,4,6,7,8-HpCDF	NA	NT	NT	NT	0.162 U	NT
OCDD	NA	NT	NT	NT	6.299 U	NT
OCDF	NA	NT	NT	NT	0.232 U	NT
Total TCDF	NA	NT	NT	NT	0.173 U	NT
Total PeCDD	NA	NT	NT	NT	0.282 U	NT
Total PeCDF	NA	NT	NT	NT	0.149 U	NT
Total HxCDD	NA	NT	NT	NT	0.213 U	NT
Total HxCDF	NA	NT	NT	NT	0.193 U	NT
Total HpCDD	NA	NT	NT	NT	0.727	NT
Total HpCDF	NA	NT	NT	NT	0.162 U	NT

Key is on the next page.

Table 4-44

SUMMARY OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] - PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] - Sample Concentrations above PSLs are in bold type.
[c] - EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] - State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

bgs	= Below ground surface.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identifiedand the numerical result is estimated.
JQ	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
NT	= Not tested.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for but was not detected. The associated value is the sample quantitation limit.

Table 4-45

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.000495 - 10.29	GP37	5/11	-	3/11	0.062	2/11	2.32	3/11	0.137	0/11	30
Benzo(a)anthracene	3.3 - 19	GP37	2/11	0.0019 - 0.338	2/11	0.621	0/11	23.23	2/11	1.370	NA	NA
Benzo(a)pyrene	0.0367 - 7.2	GP37	4/11	0.0019 - 0.338	3/11	0.062	1/11	2.32	2/11	0.137	0/11	30
Benzo(b)fluoranthene	0.0048 - 9	GP37	4/11	0.0019 - 0.338	2/11	0.621	0/11	23.23	2/11	1.370	NA	NA
Benzo(k)fluoranthene	0.0015 - 8.3	GP37	4/11	0.0019 - 0.338	1/11	6.215	0/11	232.30	0/11	13.699	NA	NA
Chrysene	0.0399 - 17	GP37	3/11	0.0019 - 0.338	0/11	62.148	0/11	2322.99	0/11	136.986	NA	NA
Dibenzo(a,h)anthracene	0.28	GP46	1/11	0.0019 - 0.46	1/11	0.062	0/11	2.32	1/11	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.0348 - 1.9	GP37	4/11	0.0019 - 0.845	1/11	0.621	0/11	23.23	1/11	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	169.833 - 409.258	B-J20	2/2	-	1/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	18.248 - 48.678	B-J20	2/2	-	0/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,7,8-HxCDD	3.045	B-J20	1/2	1.266 - 1.266	0/2	39	0/2	3138	0/2	66.7	NA	NA
1,2,3,6,7,8-HxCDD	5.643	B-F16	1/2	15.73 - 15.73	0/2	39	0/2	3138	0/2	66.7	NA	NA
1,2,3,7,8-PeCDD	1.2	B-J20	1/2	1.115 - 1.115	0/2	3.9	0/2	314	0/2	6.7	NA	NA
2,3,7,8-TCDD TEQ	2.620 - 6.492	B-J20	2/2	-	1/2	3.9	0/2	314	0/2	6.7	1/2	5
OCDD	1665.504 - 3870.284	B-J20	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
OCDF	87.471 - 206.905	B-J20	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
Total HpCDD	299.361 - 742.744	B-J20	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	18.248 - 48.678	B-J20	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	20.998 - 46.671	B-J20	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	31.542 - 82.351	B-J20	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	1.2	B-J20	1/2	1.115 - 1.115	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	19.698	B-J20	1/2	0.784 - 0.784	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C21-C28 Aliphatics	5.6	MW30-D	1/4	5.2 - 5.9	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	6.1 - 11	B-J20	2/4	5.4 - 5.9	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	7.6	B-J20	1/4	5.4 - 5.9	NA	NA	NA	NA	NA	NA	NA	NA
EPH	11.7 - 18.6	B-J20	2/4	-	NA	NA	0/4	2000	NA	NA	0/4	460

Table 4-45

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.056 - 14	GP37	3/11	0.0019 - 0.338	0/11	55.92	0/11	23.51	0/11	1600	NA	NA
Acenaphthene	4.9 - 36	GP37	2/11	0.0019 - 0.338	0/11	3681.71	0/11	284.05	0/11	4800	NA	NA
Acenaphthylene	0.0017 - 0.89	GP37	3/11	0.0019 - 0.338	0/11	3681.71	0/11	284.05	0/11	4800	NA	NA
Anthracene	0.067 - 15	GP37	3/11	0.0019 - 0.338	0/11	21896.12	0/11	6777.61	0/11	24000	NA	NA
Benzo(g,h,i)perylene	0.0882 - 1.6	GP37	4/11	0.0019 - 0.338	0/11	2308.68	0/11	1959.13	0/11	2400	NA	NA
Fluoranthene	0.0047 - 93	GP37	3/11	0.002 - 0.338	0/11	2293.61	0/11	6287.36	0/11	3200	NA	NA
Fluorene	0.0018 - 37	GP37	3/11	0.002 - 0.338	0/11	2643.61	0/11	304.64	0/11	3200	NA	NA
Naphthalene	0.67 - 25	GP37	2/11	0.0019 - 0.338	0/11	55.92	1/11	23.51	0/11	1600	NA	NA
ncPAH	0.003 - 416.49	GP37	8/11	-	NA	NA	NA	NA	NA		NA	NA
Phenanthrene	0.003 - 130	GP37	5/11	0.002 - 0.338	0/11	21896.12	0/11	6777.61	0/11	24000	NA	NA
Pyrene	0.0033 - 64	GP37	6/11	0.002 - 0.338	0/11	2308.68	0/11	1959.13	0/11	2400	NA	NA
Other Organics (mg/kg)												
1,2,4-Trichlorobenzene	0.0021	B-F16	1/11	0.0097 - 0.46	0/11	646.18	0/11	16.25	0/11	800	NA	NA
Benzoic acid	0.0506	SI-OS03	1/11	0.019 - 9.1	0/11	100000.00	0/11	263.04	0/11	320000	NA	NA
Carbazole	0.73 - 5.2	GP37	2/7	0.037 - 0.338	0/7	24.32	NA	NA	0/7	50	NA	NA
Dibenzofuran	3.3 - 23	GP37	2/11	0.0097 - 0.338	0/11	290.53	0/11	29.93	0/11	320	NA	NA
Phenols (mg/kg)												
1,3,5-Tribromophenol	0.062 - 0.069	SI-OS01	2/3	0.338 - 0.338	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.0084 - 2.2	GP37	3/11	0.01 - 0.338	0/11	2.98	1/11	0.077	0/11	8	0/11	11
Phenol	0.0016	MW30-D	1/11	0.0097 - 0.46	0/11	36661.86	0/11	80.64	0/11	48000	NA	NA

Key:

B(a)P	= Benzo(a)pyrene.	NA	= Not applicable.
bgs	= Below ground surface.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.	ng/kg	= Nanograms per kilogram.
EPH	= Extractable petroleum hydrocarbon.	OCDD	= Octachlorodibenzo-p-dioxin.
HpCDD	= Heptachlorodibenzo-p-dioxin.	OCDF	= Octachlorodibenzofuran.
HpCDF	= Heptachlorodibenzofuran.	PeCDD	= Pentachlorodibenzo-p-dioxin.
HxCDD	= Hexachlorodibenzo-p-dioxin.	PeCDF	= Pentachlorodibenzofuran.
HxCDF	= Hexachlorodibenzofuran.	PRG	= Preliminary Remediation Goal.
mg/kg	= Milligrams per kilogram.	TCDD	= Tetrachlorodibenzo-p-dioxin.
MTCA	= Model Toxics Control Act.	TEQ	= Toxicity equivalent quotient.

Table 4-46

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding PRGs	PRG	Frequency Exceeding MTCA Migration to Groundwater	MTCA Migration to Groundwater	Frequency Exceeding MTCA Direct Contact	MTCA Direct Contact	Frequency Exceeding MTCA ECO	MTCA ECO
cPAHs (mg/kg)												
B(a)P Equivalent	0.5751 - 0.7539	MW15-S	2/7	-	2/7	0.062	0/7	2.32	2/7	0.137	0/7	30
Benzo(a)anthracene	1.4 - 1.8	MW15-S	2/7	0.002 - 0.206	2/7	0.621	0/7	23.23	2/7	1.370	NA	NA
Benzo(a)pyrene	0.39 - 0.5	MW15-S	2/7	0.002 - 0.206	2/7	0.062	0/7	2.32	2/7	0.137	0/7	30
Benzo(b)fluoranthene	0.38 - 0.66	MW15-S	2/7	0.002 - 0.206	1/7	0.621	0/7	23.23	0/7	1.370	NA	NA
Benzo(k)fluoranthene	0.57 - 0.61	MW15-S	2/7	0.002 - 0.206	0/7	6.215	0/7	232.30	0/7	13.699	NA	NA
Chrysene	1.4 - 1.8	MW15-S	2/7	0.002 - 0.206	0/7	62.148	0/7	2322.99	0/7	136.986	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDF	48.35	B-B16	1/2	0.424 - 0.424	0/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,7,8,9-HxCDD	5.696	B-B16	1/2	0.55 - 0.55	0/2	78	0/2	3138	0/2	66.7	NA	NA
2,3,7,8-TCDD TEQ	0.000281 - 1.171	B-B16	2/2	-	0/2	3.9	0/2	314	0/2	6.7	0/2	5
OCDD	959.037	B-B16	1/2	122.889 - 122.889	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
OCDF	2.813 - 222.145	B-B16	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
Total HpCDD	347.223	B-B16	1/2	0.925 - 0.925	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	48.35	B-B16	1/2	0.424 - 0.424	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	26.185	B-B16	1/2	0.48 - 0.48	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	65.938	B-B16	1/2	0.542 - 0.542	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	16.977	B-B16	1/2	0.298 - 0.298	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	2.301	B-B16	1/2	0.417 - 0.417	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C12-C16 Aliphatics	5.9	MW30-D	1/4	5.8 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	6.2	MW30-D	1/4	5.8 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	5.9	MW30-D	1/4	5.8 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
EPH	18	MW30-D	1/4	-	NA	NA	0/4	2000	NA	NA	0/4	460
TPH-Gas	6000 - 7900	MW15-S	2/2	-	NA	NA	2/2	30	NA	NA	2/2	200
ncPAH (mg/kg)												
2-Methylnaphthalene	43 - 82	MW15-S	2/7	0.002 - 0.206	1/7	55.92	2/7	23.51	0/7	1600	NA	NA
Acenaphthene	11 - 16	MW15-S	2/7	0.002 - 0.206	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Acenaphthylene	0.41 - 0.61	MW15-S	2/7	0.002 - 0.206	0/7	3681.71	0/7	284.05	0/7	4800	NA	NA
Anthracene	2.7 - 3.6	MW15-S	2/7	0.002 - 0.206	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Fluoranthene	7.6 - 10	MW15-S	2/7	0.002 - 0.206	0/7	2293.61	0/7	6287.36	0/7	3200	NA	NA
Fluorene	8.7 - 12	MW15-S	2/7	0.002 - 0.206	0/7	2643.61	0/7	304.64	0/7	3200	NA	NA
Naphthalene	0.0022 - 310	MW15-S	3/7	0.002 - 0.206	2/7	55.92	2/7	23.51	0/7	1600	NA	NA
ncPAH	0.0022 - 462.71	MW15-S	4/7	-	NA	NA	NA	NA	NA		NA	NA
Phenanthrene	0.0173 - 20	MW15-S	3/7	0.002 - 0.0024	0/7	21896.12	0/7	6777.61	0/7	24000	NA	NA
Pyrene	6.6 - 8.5	MW15-S	2/7	0.002 - 0.206	0/7	2308.68	0/7	1959.13	0/7	2400	NA	NA
Other Organics (mg/kg)												
Carbazole	0.89 - 1.2	MW15-S	2/3	0.206 - 0.206	0/3	24.32	NA	NA	0/3	50	NA	NA
Dibenzofuran	6.9 - 10	MW15-S	2/7	0.01 - 0.206	0/7	290.53	0/7	29.93	0/7	320	NA	NA
Ethylbenzene	35 - 46	MW15-S	2/6	0.5 - 0.5	0/6	230.00	2/6	23.23	0/6	8000	NA	NA
m&p-Xylene	110 - 140	MW15-S	2/6	0.5 - 0.5	0/6	210.00	0/6	448.67	0/6	160000	NA	NA
o-Xylene	58 - 70	MW15-S	2/6	0.5 - 0.5	0/6	210.00	0/6	448.67	0/6	160000	NA	NA
Toluene	6 - 7.1	MW15-S	2/6	0.5 - 0.5	0/6	520.00	0/6	34.04	0/6	16000	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.134 - 12	MW15-S	4/7	0.011 - 0.012	2/7	2.98	4/7	0.077	1/7	8	1/7	11
Phenol	0.497	OS43	1/7	0.01 - 0.41	0/7	36661.86	0/7	80.64	0/7	48000	NA	NA
Tetrachlorophenols	0.055	B-B16	1/4	0.011 - 0.012	0/4	1833.09	0/4	25.82	0/4	2400	NA	NA

Table 4-46

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.	NA	= Not applicable.
bgs	= Below ground surface.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.	ng/kg	= Nanograms per kilogram.
EPH	= Extractable petroleum hydrocarbon.	OCDD	= Octachlorodibenzo-p-dioxin.
HpCDD	= Heptachlorodibenzo-p-dioxin.	OCDF	= Octachlorodibenzofuran.
HpCDF	= Heptachlorodibenzofuran.	PeCDF	= Pentachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.	PRG	= Preliminary Remediation Goal.
HxCDF	= Hexachlorodibenzofuran.	TCDD	= Tetrachlorodibenzo-p-dioxin.
mg/kg	= Milligrams per kilogram.	TCDF	= Tetrachlorodibenzofuran.
MTCA	= Model Toxics Control Act.	TEQ	= Toxicity equivalent quotient.

Table 4-47

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY TREATED POLE AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY RMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.002938	B-B16	1/9	-	0/9	0.062	0/9	2.32	0/9	0.137	0/9	30
Benzo(a)anthracene	0.0046	B-B16	1/9	0.0016 - 0.036	0/9	0.621	0/9	23.23	0/9	1.370	NA	NA
Benzo(a)pyrene	0.0021	B-B16	1/9	0.0016 - 0.036	0/9	0.062	0/9	2.32	0/9	0.137	0/9	30
Benzo(b)fluoranthene	0.0036	B-B16	1/9	0.0016 - 0.036	0/9	0.621	0/9	23.23	0/9	1.370	NA	NA
Benzo(k)fluoranthene	0.0014	B-B16	1/9	0.0016 - 0.036	0/9	6.215	0/9	232.30	0/9	13.699	NA	NA
Chrysene	0.004	B-B16	1/9	0.0016 - 0.036	0/9	62.148	0/9	2322.99	0/9	136.986	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	0.727	MW30-D	1/1	-	0/1	390	0/1	31384	0/1	666.7	NA	NA
2,3,7,8-TCDD TEQ	0.00727	MW30-D	1/1	-	0/1	3.9	0/1	314	0/1	6.7	0/1	5
Total HpCDD	0.727	MW30-D	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C12-C16 Aliphatics	5.7	B-J20	1/7	5.2 - 6.2	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	5.6	MW30-D	1/7	5.2 - 6.2	NA	NA	NA	NA	NA	NA	NA	NA
EPH	11.3	MW30-D	1/7	-	NA	NA	0/7	2000	NA	NA	0/7	460
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0021	B-B16	1/9	0.0017 - 0.036	0/9	55.92	0/9	23.51	0/9	1600	NA	NA
Acenaphthene	0.0016 - 0.0064	B-B16	2/9	0.0017 - 0.036	0/9	3681.71	0/9	284.05	0/9	4800	NA	NA
Anthracene	0.0048	B-B16	1/9	0.0016 - 0.036	0/9	21896.12	0/9	6777.61	0/9	24000	NA	NA
Fluoranthene	0.0031 - 0.022	B-B16	2/9	0.0017 - 0.036	0/9	2293.61	0/9	6287.36	0/9	3200	NA	NA
Fluorene	0.0019 - 0.012	B-B16	2/9	0.0017 - 0.036	0/9	2643.61	0/9	304.64	0/9	3200	NA	NA
Naphthalene	0.006	B-J20	1/9	0.0016 - 0.036	0/9	55.92	0/9	23.51	0/9	1600	NA	NA
ncPAH	0.006 - 0.0992	B-B16	3/9	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0041 - 0.041	B-B16	2/9	0.0017 - 0.036	0/9	21896.12	0/9	6777.61	0/9	24000	NA	NA
Pyrene	0.0023 - 0.013	B-B16	2/9	0.0017 - 0.036	0/9	2308.68	0/9	1959.13	0/9	2400	NA	NA
Other Organics (mg/kg)												
Dibenzofuran	0.0011 - 0.006	B-B16	2/9	0.0083 - 0.036	0/9	290.53	0/9	29.93	0/9	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.043 - 0.05	B-B16	2/9	0.0081 - 0.14	0/9	2.98	0/9	0.077	0/9	8	0/9	11
Phenol	0.0024	MW30-D	1/9	0.0081 - 0.036	0/9	36661.86	0/9	80.64	0/9	48000	NA	NA

Key:

B(a)P	= Benzo(a)pyrene.	NA	= Not applicable.
bgs	= Below ground surface.	ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.	ng/kg	= Nanograms per kilogram.
EPH	= Extractable petroleum hydrocarbon.	PRG	= Preliminary Remediation Goal.
HpCDD	= Heptachlorodibenzo-p-dioxin.	TCDD	= Tetrachlorodibenzo-p-dioxin.
mg/kg	= Milligrams per kilogram.	TEQ	= Toxicity equivalent quotient.
MTCA	= Model Toxics Control Act.		

Table 4-48

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070575	99070576	99070577	99070580	99070581	99070582	99070599	99070600	99070601	99070606
Sample Location		B-L25	B-L25	B-L25	B-Q26	B-Q26	B-Q26	B-L17	B-L17	B-L17	B-Q27
Sample Depth (feet bgs)		4-6	6-8	14-16	2-4	8-10	14-16	8-10	10-12	14-16	8-10
Sample Date		8/4/99	8/4/99	8/4/99	8/4/99	8/4/99	8/4/99	8/8/99	8/8/99	8/8/99	8/8/99
Semivolatile Organic Compounds (mg/kg)											
2,4-Dinitrotoluene	120 [c]	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.0097 U	0.0091 U	0.0089 U
2,6-Dinitrotoluene	61 [c]	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.0097 U	0.0091 J	0.0089 U
2-Methylnaphthalene	56 [c]	0.002 U	0.0022 U	0.0035	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
3&4-Methylphenol	310 [c]	0.01 U	0.011 U	0.011 U	0.011 U	0.004 JQ	0.01 U	0.011 U	0.0097 U	0.0091 U	0.0089 U
4-Chloro-3-Methylphenol	NA	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.0097 U	0.0091 U	0.0089 U
7,12-Dimethylbenz(a)anthracene	NA	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
7H-Dibenzo(c,g)carbazole	NA	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Acenaphthene	3700 [c]	0.002 U	0.0022 U	0.0081	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Acenaphthylene	3700 [c]	0.002 U	0.0022 U	0.0022 U	0.0097	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Anthracene	22000 [c]	0.002 U	0.0022 U	0.0022	0.015	0.032	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Benzo(a)anthracene	0.62 [c]	0.002 U	0.0022 U	0.0022 U	0.0043	0.0069	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Benzo(a)pyrene	0.062 [c]	0.002 U	0.0022 UJK	0.0022 UJK	0.013	0.033	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Benzo(b)fluoranthene	0.62 [c]	0.002 U	0.0022 UJK	0.0022 UJK	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Benzo(g,h,i)perylene	2300 [c]	0.002 U	0.0022 UJK	0.0022 UJK	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Benzo(j)fluoranthene	1.37 [d]	0.02 U	0.022 UJK	0.022 U	0.0097 JQ	0.0054 JQ	0.021 U	0.022 U	0.019 U	0.018 U	0.018 U
Benzo(k)fluoranthene	6.2 [c]	0.002 U	0.0022 UJK	0.0022 UJK	0.0022 U	0.04	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Carbazole	24 [c]	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	62 [c]	0.002 U	0.0022 U	0.0022 U	0.012	0.047	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,e)pyrene	0.137 [d]	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,h)acridine	NA	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,h)anthracene	0.062 [c]	0.002 U	0.0022 UJK	0.0022 UJK	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,i)pyrene	0.0137 [d]	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,j)acridine	1.37 [d]	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzo(a,l)pyrene	NA	0.002 U	0.0022 UJK	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Dibenzofuran	290 [c]	0.01 U	0.011 U	0.0081 JQ	0.011 U	0.011 U	0.01 U	0.011 U	0.0097 U	0.0091 U	0.0089 U
Fluoranthene	2300 [c]	0.002 U	0.0022 U	0.0022 U	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Fluorene	2600 [c]	0.002 U	0.0022 U	0.0072	0.0079	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.002 U	0.0022 UJK	0.0022 UJK	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Naphthalene	56 [c]	0.0018 JQ	0.0054	0.023	0.0022 U	0.0022 U	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Pentachlorophenol	3 [c]	0.01 U	0.011 U	0.039	1.7 J	**4.6**	0.01 U	0.42	0.017	0.0091 U	0.0089 U
Phenanthrene	22000 [c]	0.002 U	0.0022 U	0.0059	0.0043	0.061	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Phenol	37000 [c]	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.0097 U	0.0091 U	0.0089 U
Pyrene	2300 [c]	0.002 U	0.0022 U	0.0022 U	0.019	0.054	0.0021 U	0.0022 U	0.0019 U	0.0018 U	0.0018 U
Tetrachlorophenols	1800 [c]	0.01 U	0.011 U	0.018	0.12	0.011 U	0.01 U	0.026	0.0025 J	0.0091 U	0.0089 U
Petroleum Hydrocarbons (mg/kg)											
C10-C12 Aliphatics	NA	5.4 U	5.6 U	5.9 U	6.4 U	5.7 U	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C10-C12 Aromatics	NA	5.4 U	5.6 U	5.9 U	6.4 U	5.7 U	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C12-C13 Aromatics	NA	5 U	5 U	5 U	22	5 U	5 U	5 U	5 U	5 U	5 U
C12-C16 Aliphatics	NA	5.4 U	5.6 U	5.9 U	15	120	5.4 U	6.3 U	6.3 U	16	5.7 U
C12-C16 Aromatics	NA	5.4 U	5.6 U	5.9 U	6.4 U	9	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C16-C18 Aliphatics	NA	5.4 U	5.6 U	5.9 U	23	140	5.4 U	6.3 U	6.3 U	32	5.7 U
C16-C18 Aromatics	NA	5.4 U	5.6 U	5.9 U	6.4 U	15	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C18-C21 Aliphatics	NA	5.4 U	5.6 U	5.9 U	34	100	5.4 U	6.3 U	6.3 U	36	5.7 U

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070575	99070576	99070577	99070580	99070581	99070582	99070599	99070600	99070601	99070606
Sample Location		B-L25	B-L25	B-L25	B-Q26	B-Q26	B-Q26	B-L17	B-L17	B-L17	B-Q27
Sample Depth (feet bgs)		4-6	6-8	14-16	2-4	8-10	14-16	8-10	10-12	14-16	8-10
Sample Date		8/4/99	8/4/99	8/4/99	8/4/99	8/4/99	8/4/99	8/8/99	8/8/99	8/8/99	8/8/99
Petroleum Hydrocarbons Continued (mg/kg)											
C18-C21 Aromatics	NA	5.4 U	5.6 U	5.9 U	20	66	5.4 U	6.3 U	6.3 U	37	5.7 U
C21-C28 Aliphatics	NA	5.4 U	13	18	22	47	5.4 U	6.3 U	6.3 U	21	5.7 U
C21-C28 Aromatics	NA	5.4 U	5.6 U	5.9 U	8.5	14	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C28-C36 Aliphatics	NA	5.4 U	11	15	6.4 U	6.7	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C28-C36 Aromatics	NA	5.4 U	5.6 U	5.9 U	7.9 J	9.9	5.4 U	6.3 U	6.3 U	5.6 U	5.7 U
C5-C6 Aliphatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
C6-C8 Aliphatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
C8-C10 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	230 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m&p-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	520 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD TEQ	3.9 [c]	0.200	NT	NT	NT	**577.875**	NT	0.033	NT	NT	0.014
2,3,7,8-TCDF	NA	0.543 U	NT	NT	NT	38.614	NT	0.244 U	NT	NT	0.333 U
1,2,3,7,8-PeCDD	NA	1.047 U	NT	NT	NT	1.602 U	NT	0.38 U	NT	NT	0.598 U
1,2,3,7,8-PeCDF	NA	0.582 U	NT	NT	NT	196.031	NT	0.484 U	NT	NT	0.596 U
2,3,4,7,8-PeCDF	NA	0.589 U	NT	NT	NT	226.045	NT	0.49 U	NT	NT	0.603 U
1,2,3,4,7,8-HxCDF	NA	0.586 U	NT	NT	NT	1621.359 U	NT	4.891 U	NT	NT	3.371 U
1,2,3,6,7,8-HxCDD	NA	0.86 U	NT	NT	NT	866.642	NT	0.735 U	NT	NT	0.882 U
1,2,3,6,7,8-HxCDF	NA	0.439 U	NT	NT	NT	149.554	NT	3.668 U	NT	NT	2.528 U
1,2,3,7,8,9-HxCDD	NA	0.986 U	NT	NT	NT	46.329	NT	0.842 U	NT	NT	1.012 U
2,3,4,6,7,8-HxCDF	NA	0.696 U	NT	NT	NT	202.067	NT	4.289 U	NT	NT	2.956 U
1,2,3,4,6,7,8-HpCDD	NA	17.667	NT	NT	NT	25368.32	NT	16.353 U	NT	NT	11.541 U
1,2,3,4,6,7,8-HpCDF	NA	2.222 U	NT	NT	NT	4697.314	NT	1.596	NT	NT	15.82 U
1,2,3,4,7,8,9-HpCDF	NA	0.826 U	NT	NT	NT	300.032	NT	1.926 U	NT	NT	22.28 U
OCDD	NA	235.02	NT	NT	NT	203956.546	NT	168.32	NT	NT	114.584
OCDF	NA	3.327 U	NT	NT	NT	6781.249	NT	6.985	NT	NT	26.395
Total TCDD	NA	0.717 U	NT	NT	NT	0.869 U	NT	0.334 U	NT	NT	0.459 U
Total TCDF	NA	0.543 U	NT	NT	NT	215.911	NT	0.244 U	NT	NT	0.333 U
Total PeCDD	NA	1.047 U	NT	NT	NT	1.602 U	NT	0.38 U	NT	NT	0.598 U
Total PeCDF	NA	0.589 U	NT	NT	NT	2995.951	NT	0.49 U	NT	NT	0.603 U
Total HxCDD	NA	0.86 U	NT	NT	NT	2118.772	NT	0.735 U	NT	NT	0.882 U
Total HxCDF	NA	3.617 JH	NT	NT	NT	11884.854 JH	NT	3.668 U	NT	NT	2.528 U
Total HpCDD	NA	17.907	NT	NT	NT	40949.66	NT	16.353 U	NT	NT	19.465
Total HpCDF	NA	0.587 U	NT	NT	NT	4697.314	NT	1.596	NT	NT	15.82 U

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070607	99070608	99070609	99070610	99070623	99070624	99070625	99070626	99070675	99070676	99070677
Sample Location		B-Q27	MW32-S	MW32-S	MW32-S	B-L30	B-L30	B-L30	B-L30	B-M20	B-M20	B-M20
Sample Depth (feet bgs)		12-14	8-10	10-12	14-16	6-8	15-17	12-19	35-37	2-4	7-9	11-13
Sample Date		8/8/99	8/8/99	8/8/99	8/8/99	8/9/99	8/10/99	8/10/99	8/10/99	8/13/99	8/13/99	8/13/99
Semivolatile Organic Compounds (mg/kg)												
2,4-Dinitrotoluene	120 [c]	0.0087 U	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	1.1 U	0.0095 U	0.0097 U
2,6-Dinitrotoluene	61 [c]	0.0087 U	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	1.1 U	0.0095 U	0.0097 U
2-Methylnaphthalene	56 [c]	0.0017 U	0.0021 UJ	0.0023 UJ	0.0026 UJ	0.0021 U	0.0017 U	0.0016 U	0.002 U	2.9	4.9	22
3&4-Methylphenol	310 [c]	0.0087 U	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	1.1 U	0.0095 U	0.0097 U
4-Chloro-3-Methylphenol	NA	0.0012 J	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	1.1 U	0.0095 U	0.0097 U
7,12-Dimethylbenz(a)anthracene	NA	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	0.22 U	0.057 JN	0.047 JN
7H-Dibenzo(c,g)carbazole	NA	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	0.22 U	0.0019 U	0.0019 U
Acenaphthene	3700 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	8.6	5.2	10
Acenaphthylene	3700 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	7.5	0.1	0.15 JN
Anthracene	22000 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.0086	13	0.88	4.2
Benzo(a)anthracene	0.62 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**29**	**1.6**	**2**
Benzo(a)pyrene	0.062 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**52**	**0.7**	**0.73**
Benzo(b)fluoranthene	0.62 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**40 J**	0.32 J	0.39 J
Benzo(g,h,i)perylene	2300 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	51	0.16	0.11
Benzo(j)fluoranthene	1.37 [d]	0.017 U	0.021 U	0.023 U	0.026 U	0.021 U	0.017 U	0.016 U	0.02 U	**40 J**	0.32 J	0.39 J
Benzo(k)fluoranthene	6.2 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**40 J**	0.32 J	0.39 J
Carbazole	24 [c]	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	1.2 J	NA
Chrysene	62 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	38 J	1.4	1.6
Dibenzo(a,e)pyrene	0.137 [d]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**15**	0.028	0.011
Dibenzo(a,h)acridine	NA	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	0.22 U	0.0019 U	0.0047 JN
Dibenzo(a,h)anthracene	0.062 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**7.6**	0.037	0.029
Dibenzo(a,h)pyrene	0.0137 [d]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**7.3**	**0.02**	0.0097
Dibenzo(a,i)pyrene	0.0137 [d]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	0.22 U	0.0044	0.0031
Dibenzo(a,j)acridine	1.37 [d]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	1.6 JN	0.011 JN	0.0019 U
Dibenzo(a,l)pyrene	NA	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	0.22 U	0.0019 U	0.0019 U
Dibenzofuran	290 [c]	0.0087 U	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	5.2	0.91	4.8
Fluoranthene	2300 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.011	74	6	11
Fluorene	2600 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.006	9.8	4.2	8.4
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	**46**	0.18	0.13
Naphthalene	56 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.002 U	3.7	0.29	19
Pentachlorophenol	3 [c]	0.0087 U	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	**200**	**3.3**	**6.3**
Phenanthrene	22000 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.06	23	7.5	25
Phenol	37000 [c]	0.003 J	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	1.1 U	0.0095 U	0.0097 U
Pyrene	2300 [c]	0.0017 U	0.0021 U	0.0023 U	0.0026 U	0.0021 U	0.0017 U	0.0016 U	0.0092	62	5.4	6.8
Tetrachlorophenols	1800 [c]	0.0087 U	0.01 U	0.011 U	0.013 U	0.01 U	0.0083 U	0.0082 U	0.01 U	16	0.0095 U	0.0097 U
Petroleum Hydrocarbons (mg/kg)												
C10-C12 Aliphatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	5.6 U	6.6 U	11	6.2
C10-C12 Aromatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	5.6 U	11	12	12
C12-C13 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	15	29 J	5 U
C12-C16 Aliphatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	15	350 J	220	73
C12-C16 Aromatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	5.6 U	120	150	70
C16-C18 Aliphatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	7.8	450 J	140	38
C16-C18 Aromatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	5.6 U	110	100 J	37
C18-C21 Aliphatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	8.4	640 J	120	27

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070607	99070608	99070609	99070610	99070623	99070624	99070625	99070626	99070675	99070676	99070677
Sample Location		B-Q27	MW32-S	MW32-S	MW32-S	B-L30	B-L30	B-L30	B-L30	B-M20	B-M20	B-M20
Sample Depth (feet bgs)		12-14	8-10	10-12	14-16	6-8	15-17	12-19	35-37	2-4	7-9	11-13
Sample Date		8/8/99	8/8/99	8/8/99	8/8/99	8/9/99	8/10/99	8/10/99	8/10/99	8/13/99	8/13/99	8/13/99
Petroleum Hydrocarbons Continued (mg/kg)												
C18-C21 Aromatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	5.6 U	860 J	330 J	91 J
C21-C28 Aliphatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	13	810 J	67	10
C21-C28 Aromatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	5.6 U	570 J	57 J	13 J
C28-C36 Aliphatics	NA	5.6 U	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	7.1	550 J	5.9 U	6 U
C28-C36 Aromatics	NA	7.5	5.6 U	6.2 U	6.8 U	6.6 U	5.4 U	5.3 U	6.6 J	750 J	25 J	7 J
C5-C6 Aliphatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
C6-C8 Aliphatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
C8-C10 Aromatics	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	230 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m&p-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	520 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)												
2,3,7,8-TCDD TEQ	3.9 [c]	NT	NA	NT	NA	NT	NA	NT	NT	NT	**908.347**	NT
2,3,7,8-TCDF	NA	NT	0.692 U	NT	0.247 U	NT	0.246 U	NT	NT	NT	24.637	NT
1,2,3,7,8-PeCDD	NA	NT	1.195 U	NT	0.429 U	NT	0.492 U	NT	NT	NT	2.485 U	NT
1,2,3,7,8-PeCDF	NA	NT	1.006 U	NT	0.256 U	NT	0.25 U	NT	NT	NT	142.414	NT
2,3,4,7,8-PeCDF	NA	NT	1.017 U	NT	0.258 U	NT	0.252 U	NT	NT	NT	139.966	NT
1,2,3,4,7,8-HxCDF	NA	NT	4.214 U	NT	0.305 U	NT	0.314 U	NT	NT	NT	945.011	NT
1,2,3,6,7,8-HxCDD	NA	NT	2.797 U	NT	0.4 U	NT	0.393 U	NT	NT	NT	1047.583	NT
1,2,3,6,7,8-HxCDF	NA	NT	3.161 U	NT	0.228 U	NT	0.236 U	NT	NT	NT	128.421	NT
1,2,3,7,8,9-HxCDD	NA	NT	3.206 U	NT	0.459 U	NT	0.451 U	NT	NT	NT	88.411	NT
2,3,4,6,7,8-HxCDF	NA	NT	3.696 U	NT	0.267 U	NT	0.276 U	NT	NT	NT	156.219	NT
1,2,3,4,6,7,8-HpCDD	NA	NT	23.489 U	NT	1.001 U	NT	3.724 U	NT	NT	NT	47245.8	NT
1,2,3,4,6,7,8-HpCDF	NA	NT	5.196 U	NT	0.278 U	NT	0.991 U	NT	NT	NT	6677.9	NT
1,2,3,4,7,8,9-HpCDF	NA	NT	2.291 U	NT	0.391 U	NT	1.395 U	NT	NT	NT	217.522	NT
OCDD	NA	NT	189.567 U	NT	12.64 U	NT	51.843 U	NT	NT	NT	497696	NT
OCDF	NA	NT	22.895 U	NT	1.244 U	NT	2.764 U	NT	NT	NT	10336	NT
Total TCDD	NA	NT	0.909 U	NT	0.345 U	NT	0.322 U	NT	NT	NT	0.348 U	NT
Total TCDF	NA	NT	0.692 U	NT	0.247 U	NT	0.246 U	NT	NT	NT	69.137	NT
Total PeCDD	NA	NT	1.195 U	NT	0.429 U	NT	0.492 U	NT	NT	NT	5.548	NT
Total PeCDF	NA	NT	1.017 U	NT	0.258 U	NT	0.252 U	NT	NT	NT	1923.785	NT
Total HxCDD	NA	NT	2.797 U	NT	0.4 U	NT	0.693	NT	NT	NT	3009.581	NT
Total HxCDF	NA	NT	3.161 U	NT	0.228 U	NT	0.632	NT	NT	NT	8296.023	NT
Total HpCDD	NA	NT	16.441	NT	0.692 U	NT	2.823 U	NT	NT	NT	88903.4	NT
Total HpCDF	NA	NT	1.627 U	NT	0.967	NT	0.991 U	NT	NT	NT	6677.9	NT

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070678	99070679	99070686	99070687	99070688	99070689	99070690	99070691	99080016	99080017	99080018
Sample Location		B-M20	B-M20	MW34-D	MW34-D	MW34-D	MW34-D	MW34-D	MW34-D	MW31-S	MW31-S	MW31-S
Sample Depth (feet bgs)		20-22	30-32	16-18	24-26	30-32	32-34	38-40	46-48	0-2	4-6	8-10
Sample Date		8/13/99	8/13/99	8/16/99	8/16/99	8/16/99	8/16/99	8/16/99	8/16/99	8/19/99	8/19/99	8/19/99
Semivolatile Organic Compounds (mg/kg)												
2,4-Dinitrotoluene	120 [c]	0.083 U	0.0091 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	1.3 U	0.012 U	2.3 JN
2,6-Dinitrotoluene	61 [c]	0.083 U	0.0091 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	1.3 U	0.012 U	0.11 U
2-Methylnaphthalene	310 [c]	1.1	0.12	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.42	21	180 J
3&4-Methylphenol	310 [c]	0.083 U	0.0091 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	1.3 U	0.12 U	0.11 U
4-Chloro-3-Methylphenol	NA	0.083 U	0.0091 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	1.3 U	0.12 U	0.11 UJ
7,12-Dimethylbenz(a)anthracene	NA	0.017 U	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	0.056 JN	0.24 JN
7H-Dibenzo(c,g)carbazole	NA	0.017 U	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	0.0066 JN	0.023 U
Acenaphthene	3700 [c]	14	0.56	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	16	100 J
Acenaphthylene	3700 [c]	0.57	0.023	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	1	0.11	1.3 J
Anthracene	22000 [c]	6.4	0.46	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	2.1	6.4	35 J
Benzo(a)anthracene	0.62 [c]	**11**	0.32	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**7.7**	**4.6**	**19 J**
Benzo(a)pyrene	0.062 [c]	**3.9**	**0.17**	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**20**	**1.8**	**8.1 J**
Benzo(b)fluoranthene	0.62 [c]	**1.9 J**	0.12 J	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**8 J**	**0.76 J**	**4.5 J**
Benzo(g,h,i)perylene	2300 [c]	0.79	0.031	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	3.6	0.22	1.2 J
Benzo(j)fluoranthene	1.37 [d]	**1.9 J**	0.12 J	0.02 U	0.02 U	0.021 U	0.021 U	0.023 U	0.024 U	**8 J**	0.76 J	**4.5 J**
Benzo(k)fluoranthene	6.2 [c]	1.9 J	0.12 J	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**8 J**	0.76 J	4.5 J
Carbazole	24 [c]	1 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	62 [c]	11	0.33	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	26	4	16 J
Dibenzo(a,e)pyrene	0.137 [d]	**0.29**	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**0.32**	0.047	0.12 J
Dibenzo(a,h)acridine	NA	0.063 JN	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	0.0025 U	0.023 U
Dibenzo(a,h)anthracene	0.062 [c]	0.017 U	0.01	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**1.3**	**0.13**	**0.64 J**
Dibenzo(a,h)pyrene	0.0137 [d]	**0.16**	0.0022	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**0.29**	**0.043**	**0.11 J**
Dibenzo(a,i)pyrene	0.0137 [d]	**0.023**	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	**0.027**	**0.073 J**
Dibenzo(a,j)acridine	1.37 [d]	0.066 JN	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.29 JN	0.014 JN	0.11 J
Dibenzo(a,l)pyrene	NA	0.018	0.0018 U	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	0.0025 U	0.023 U
Dibenzofuran	290 [c]	1.1	0.13	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	0.24 J	12	67 J
Fluoranthene	2300 [c]	49	1.6	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	24	14	58 J
Fluorene	2600 [c]	5.1	0.43	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	0.26 U	15	80 J
Indeno(1,2,3-cd)pyrene	0.62 [c]	**1**	0.045	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	**4.3**	0.38	**1.9 J**
Naphthalene	56 [c]	0.71	0.051	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0011 J	0.0024 U	0.66	17	**410 J**
Pentachlorophenol	3 [c]	**48**	1.1	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	**520**	**20**	**49**
Phenanthrene	22000 [c]	17	1.1	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	1.4	24	130 J
Phenol	37000 [c]	0.083 U	0.0091 U	0.0018 J	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	1.3 U	0.12 U	0.11 U
Pyrene	2300 [c]	47	1.2	0.002 U	0.002 U	0.0021 U	0.0021 U	0.0023 U	0.0024 U	30	11	40 J
Tetrachlorophenols	1800 [c]	0.76 JN	0.0091 U	0.0099 U	0.01 U	0.011 U	0.01 U	0.011 U	0.012 U	19	0.75 JN	1.6 JN
Petroleum Hydrocarbons (mg/kg)												
C10-C12 Aliphatics	NA	27	NA	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	11	8	43
C10-C12 Aromatics	NA	20	NA	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	7.1 U	45	550
C12-C13 Aromatics	NA	180 J	NA	5 U	5 U	5 U	5 U	5 U	5 U	52 J	190 J	1200 J
C12-C16 Aliphatics	NA	820 J	NA	8	10	7.6	7.5	5.9 U	6.3 U	630 J	150	580
C12-C16 Aromatics	NA	250 J	NA	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	64	230	1000
C16-C18 Aliphatics	NA	430 J	NA	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	710 J	91	270
C16-C18 Aromatics	NA	210	NA	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	120	130	480
C18-C21 Aliphatics	NA	310 J	NA	5.4	5.4	5.5	5.3 U	5.9 U	6.3 U	890 J	81	220

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99070678	99070679	99070686	99070687	99070688	99070689	99070690	99070691	99080016	99080017	99080018
Sample Location		B-M20	B-M20	MW34-D	MW34-D	MW34-D	MW34-D	MW34-D	MW34-D	MW31-S	MW31-S	MW31-S
Sample Depth (feet bgs)		20-22	30-32	16-18	24-26	30-32	32-34	38-40	46-48	0-2	4-6	8-10
Sample Date		8/13/99	8/13/99	8/16/99	8/16/99	8/16/99	8/16/99	8/16/99	8/16/99	8/19/99	8/19/99	8/19/99
Petroleum Hydrocarbons Continued (mg/kg)												
C18-C21 Aromatics	NA	870 J	NT	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	1400 J	330	1100
C21-C28 Aliphatics	NA	150	NT	9.5	9.2	9.6	7.9	5.9 U	6.3 U	540 J	43	120
C21-C28 Aromatics	NA	260 J	NT	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	410 J	61	240
C28-C36 Aliphatics	NA	22	NT	8.1 J	6.1 J	7.1 J	5.6 J	5.9 U	6.3 U	95	6.5 U	5.7 U
C28-C36 Aromatics	NA	130 J	NT	5.3 U	5.2 U	5.2 U	5.3 U	5.9 U	6.3 U	260 J	35	120
C5-C6 Aliphatics	NA	5 U	NT	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5.3
C6-C8 Aliphatics	NA	5 U	NT	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	9.1
C8-C10 Aromatics	NA	5 U	NT	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8.3	140 J
Ethylbenzene	230 [c]	0.5 U	NT	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.2
m&p-Xylene	210 [c]	0.5 U	NT	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.8
o-Xylene	210 [c]	0.5 U	NT	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.9
Toluene	520 [c]	0.5 U	NT	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2
Dioxin/Furans (ng/kg)												
2,3,7,8-TCDD TEQ	3.9 [c]	**564.468**	NT	NA	NT	NT	NT	NT	NA	NT	NT	**326.143**
2,3,7,8-TCDF	NA	30.809	NT	0.405 U	NT	NT	NT	NT	0.364 U	NT	NT	16.887
1,2,3,7,8-PeCDD	NA	2.971	NT	0.436 U	NT	NT	NT	NT	0.3 U	NT	NT	1.685 U
1,2,3,7,8-PeCDF	NA	233.106	NT	0.261 U	NT	NT	NT	NT	0.21 U	NT	NT	102.479
2,3,4,7,8-PeCDF	NA	235.367	NT	0.264 U	NT	NT	NT	NT	0.212 U	NT	NT	92.351
1,2,3,4,7,8-HxCDF	NA	1643.551 U	NT	0.277 U	NT	NT	NT	NT	0.346 U	NT	NT	675.71 U
1,2,3,6,7,8-HxCDD	NA	1148.128	NT	0.268 U	NT	NT	NT	NT	0.316 U	NT	NT	778.458
1,2,3,6,7,8-HxCDF	NA	206.1	NT	0.208 U	NT	NT	NT	NT	0.259 U	NT	NT	98.171
1,2,3,7,8,9-HxCDD	NA	70.551	NT	0.307 U	NT	NT	NT	NT	0.362 U	NT	NT	52.449 U
2,3,4,6,7,8-HxCDF	NA	170.601	NT	0.243 U	NT	NT	NT	NT	0.303 U	NT	NT	74.936 U
1,2,3,4,6,7,8-HpCDD	NA	21886	NT	0.572 U	NT	NT	NT	NT	0.414 U	NT	NT	14237
1,2,3,4,6,7,8-HpCDF	NA	2559.2	NT	0.388 U	NT	NT	NT	NT	0.307 U	NT	NT	2526.222
1,2,3,4,7,8,9-HpCDF	NA	454.25	NT	0.546 U	NT	NT	NT	NT	0.433 U	NT	NT	167.883
OCDD	NA	201242	NT	4.939 U	NT	NT	NT	NT	5.306 U	NT	NT	158172
OCDF	NA	4207.5	NT	0.439 U	NT	NT	NT	NT	0.316 U	NT	NT	3641.007
Total TCDD	NA	0.214 U	NT	0.503 U	NT	NT	NT	NT	0.519 U	NT	NT	0.497 U
Total TCDF	NA	116.441	NT	0.405 U	NT	NT	NT	NT	0.364 U	NT	NT	83.698
Total PeCDD	NA	12.771	NT	0.436 U	NT	NT	NT	NT	0.3 U	NT	NT	1.727
Total PeCDF	NA	3512.689	NT	0.264 U	NT	NT	NT	NT	0.212 U	NT	NT	1176.867
Total HxCDD	NA	3380.629	NT	0.268 U	NT	NT	NT	NT	0.316 U	NT	NT	2488.653
Total HxCDF	NA	5764.325	NT	0.208 U	NT	NT	NT	NT	0.259 U	NT	NT	6764.691
Total HpCDD	NA	38212.5	NT	0.716 U	NT	NT	NT	NT	0.414 U	NT	NT	26533
Total HpCDF	NA	2559.2	NT	0.388 U	NT	NT	NT	NT	0.307 U	NT	NT	2694.105

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99080019	99080020	99080021	99080029	99080030	99080031
Sample Location		MW31-S	MW36-S	MW36-S	B-L19	B-L19	B-L19
Sample Depth (feet bgs)		12-14	3-5	10-12	1-3	5-7	17-19
Sample Date		8/19/99	8/19/99	8/19/99	8/20/99	8/20/99	8/20/99
Semivolatile Organic Compounds (mg/kg)							
2,4-Dinitrotoluene	120 [c]	0.011 U	0.012 U	0.12	0.012 U	0.011 U	0.01 U
2,6-Dinitrotoluene	61 [c]	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U
2-Methylnaphthalene	56 [c]	0.17	0.039	8.2 J	0.0033	0.0021 U	0.0021 U
3&4-Methylphenol	310 [c]	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U
4-Chloro-3-Methylphenol	NA	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U
7,12-Dimethylbenz(a)anthracene	NA	0.0022 U	0.0024 U	0.0049 U	0.0024 U	0.0021 U	0.0021 U
7H-Dibenzo(c,g)carbazole	NA	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U
Acenaphthene	3700 [c]	0.094	0.35	2.8 J	0.0024 U	0.0021 U	0.0021 U
Acenaphthylene	3700 [c]	0.0027	0.0076	0.067	0.0022 J	0.0021 U	0.0021 U
Anthracene	22000 [c]	0.0022 U	0.34	0.89	0.0024 U	0.0021 U	0.0021 U
Benzo(a)anthracene	0.62 [c]	0.016	0.19	0.4	0.0024 U	0.0021 U	0.0021 U
Benzo(a)pyrene	0.062 [c]	0.0078	**0.092 J**	**0.14 J**	0.0029 J	0.0021 U	0.0021 U
Benzo(b)fluoranthene	0.62 [c]	0.0045 J	0.052 J	0.072 J	0.0024 U	0.0021 U	0.0021 U
Benzo(g,h,i)perylene	2300 [c]	0.0022 U	0.02	0.022	0.0045	0.0021 U	0.0021 U
Benzo(j)fluoranthene	1.37 [d]	0.0045 J	0.052 J	0.072 J	0.024 U	0.021 U	0.021 U
Benzo(k)fluoranthene	6.2 [c]	0.0045 J	0.052 J	0.072 J	0.0024 U	0.0021 U	0.0021 U
Carbazole	24 [c]	NA	NA	NA	NA	NA	1 U
Chrysene	62 [c]	0.02	0.23	0.37	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,e)pyrene	0.137 [d]	0.0022 U	0.0024 U	0.003	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,h)acridine	NA	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,h)anthracene	0.062 [c]	0.0022 U	0.0024 U	0.0089 J	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,h)pyrene	0.0137 [d]	0.0022 U	0.0024 U	0.0023	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,i)pyrene	0.0137 [d]	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,j)acridine	1.37 [d]	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U
Dibenzo(a,l)pyrene	NA	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U
Dibenzofuran	290 [c]	0.069	0.094	1	0.012 U	0.011 U	0.01 U
Fluoranthene	2300 [c]	0.053	0.95	2.1 J	0.0024 U	0.0021 U	0.0021 U
Fluorene	2600 [c]	0.088	0.28	2.3 J	0.0024 U	0.0021 U	0.0021 U
Indeno(1,2,3-cd)pyrene	0.62 [c]	0.0022 U	0.015	0.029	0.0038	0.0021 U	0.0021 U
Naphthalene	56 [c]	0.46	0.03	7.5 J	0.0026	0.0021 U	0.0021 U
Pentachlorophenol	3 [c]	0.74	0.14	**3.2 J**	0.027	0.011 U	0.01 U
Phenanthrene	22000 [c]	0.12	0.72	5.1 J	0.0022 J	0.0021 U	0.0021 U
Phenol	37000 [c]	0.0022 J	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U
Pyrene	2300 [c]	0.034	0.8	1.6 J	0.0024	0.0021 U	0.0021 U
Tetrachlorophenols	1800 [c]	0.059	0.013	0.066	0.012 U	0.011 U	0.01 U
Petroleum Hydrocarbons (mg/kg)							
C10-C12 Aliphatics	NA	6 U	6.2 U	24	6.3 U	5.6 U	5.3 U
C10-C12 Aromatics	NA	6 U	6.2 U	76	6.3 U	5.6 U	5.3 U
C12-C13 Aromatics	NA	5 U	5 U	290 J	5 U	5 U	5 U
C12-C16 Aliphatics	NA	7	11	230	15	5.6 U	5.3
C12-C16 Aromatics	NA	6 U	6.2 U	290 J	6.3 U	5.6 U	5.3 U
C16-C18 Aliphatics	NA	6 U	6.2 U	120	6.3 U	5.6 U	5.3 U
C16-C18 Aromatics	NA	6 U	6.2 U	140	6.3 U	5.6 U	5.3 U
C18-C21 Aliphatics	NA	6 U	6.2 U	100	6.3 U	5.6 U	5.3 U

Key is at the end of the table.

Table 4-48 (CONTINUED)

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	Preliminary Screening Levels [ab]	99080019	99080020	99080021	99080029	99080030	99080031
Sample Location		MW31-S	MW36-S	MW36-S	B-L19	B-L19	B-L19
Sample Depth (feet bgs)		12-14	3-5	10-12	1-3	5-7	17-19
Sample Date		8/19/99	8/19/99	8/19/99	8/20/99	8/20/99	8/20/99
Petroleum Hydrocarbons Continued (mg/kg)							
C18-C21 Aromatics	NA	6 U	6.2 U	350 J	6.3 U	5.6 U	5.3 U
C21-C28 Aliphatics	NA	6 U	6.2 U	56	6.3 U	5.6 U	5.3 U
C21-C28 Aromatics	NA	6 U	6.2 U	50 J	6.4 J	5.6 U	5.3 U
C28-C36 Aliphatics	NA	6 U	6.2 U	6 U	6.3 U	5.6 U	5.3 U
C28-C36 Aromatics	NA	6 U	6.2 U	21 J	6.3 U	5.6 U	5.3 U
C5-C6 Aliphatics	NA	5 U	5 U	5 U	5 U	5 U	5 U
C6-C8 Aliphatics	NA	5 U	5 U	5 U	5 U	5 U	5 U
C8-C10 Aromatics	NA	5 U	5 U	44	5 U	5 U	5 U
Ethylbenzene	230 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m&p-Xylene	210 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	210 [c]	0.5 U	0.5 U	0.54	0.5 U	0.5 U	0.5 U
Toluene	520 [c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)							
2,3,7,8-TCDD TEQ	3.9 [c]	NT	NT	NT	NT	NT	0.031
2,3,7,8-TCDF	NA	NT	NT	NT	NT	NT	0.45 U
1,2,3,7,8-PeCDD	NA	NT	NT	NT	NT	NT	0.796 U
1,2,3,7,8-PeCDF	NA	NT	NT	NT	NT	NT	0.553 U
2,3,4,7,8-PeCDF	NA	NT	NT	NT	NT	NT	0.559 U
1,2,3,4,7,8-HxCDF	NA	NT	NT	NT	NT	NT	0.571 U
1,2,3,6,7,8-HxCDD	NA	NT	NT	NT	NT	NT	0.568 U
1,2,3,6,7,8-HxCDF	NA	NT	NT	NT	NT	NT	0.428 U
1,2,3,7,8,9-HxCDD	NA	NT	NT	NT	NT	NT	0.651 U
2,3,4,6,7,8-HxCDF	NA	NT	NT	NT	NT	NT	0.678 U
1,2,3,4,6,7,8-HpCDD	NA	NT	NT	NT	NT	NT	2.85
1,2,3,4,6,7,8-HpCDF	NA	NT	NT	NT	NT	NT	0.447 U
1,2,3,4,7,8,9-HpCDF	NA	NT	NT	NT	NT	NT	0.629 U
OCDD	NA	NT	NT	NT	NT	NT	22.973
OCDF	NA	NT	NT	NT	NT	NT	2.244
Total TCDD	NA	NT	NT	NT	NT	NT	0.877 U
Total TCDF	NA	NT	NT	NT	NT	NT	0.45 U
Total PeCDD	NA	NT	NT	NT	NT	NT	0.796 U
Total PeCDF	NA	NT	NT	NT	NT	NT	0.559 U
Total HxCDD	NA	NT	NT	NT	NT	NT	0.568 U
Total HxCDF	NA	NT	NT	NT	NT	NT	0.428 U
Total HpCDD	NA	NT	NT	NT	NT	NT	2.85
Total HpCDF	NA	NT	NT	NT	NT	NT	0.447 U

Key is on the next page.

Table 4-48

SUMMARY OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] - PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] - Sample Concentrations above PSLs are in bold type.
[c] - EPA Region 9 risk-based concentration derived from EPA Region 9 "Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] - State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) Update February 1996. Values are based on revised MTCA (February 2001).

Key:

bgs = Below ground surface.
EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
JH = The analyte was positively identified. The associated numerical result is an estimate, biased high.
JN = The analyte was tentatively identifiedand the numerical result is estimated.
JQ = The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
mg/kg = Milligrams per kilogram.
ng/kg = Nanograms per kilogram.
NA = Not applicable.
NT = Not tested.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for but was not detected. The associated value is an estimated sample quantitation limit.
UJK = The material was analyzed for but was not detected. The associated value is an estimated sample quantitation limit, biased unknown.

Table 4-49

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	0.056	MW31-S	1/8	0.002 - 0.26	1/8	0.003	0/8	0.12	1/8	0.007	NA	NA
7H-Dibenzo(c,g)carbazole	0.0066	MW31-S	1/8	0.002 - 0.26	0/8	0.062	0/8	2.32	0/8	0.137	NA	NA
B(a)P Equivalent	0.00127 - 163.698	B-M20	9/15	-	4/15	0.062	3/15	2.32	3/15	0.137	1/15	30
Benzo(a)anthracene	0.0043 - 29	B-M20	5/15	0.002 - 0.391	3/15	0.621	1/15	23.23	3/15	1.370	NA	NA
Benzo(a)pyrene	0.0029 - 52	B-M20	6/15	0.002 - 0.391	4/15	0.062	2/15	2.32	3/15	0.137	1/15	30
Benzo(b)fluoranthene	0.0061 - 40	B-M20	6/15	0.002 - 0.391	3/15	0.621	1/15	23.23	2/15	1.370	NA	NA
Benzo(j)fluoranthene	0.0097 - 40	B-M20	5/8	0.02 - 0.024	3/8	0.621	1/8	23.23	2/8	1.370	NA	NA
Benzo(k)fluoranthene	0.052 - 40	B-M20	4/15	0.002 - 0.391	2/15	6.215	0/15	232.30	1/15	13.699	NA	NA
Chrysene	0.012 - 38	B-M20	5/15	0.002 - 0.391	0/15	62.148	0/15	2322.99	0/15	136.986	NA	NA
Dibenzo(a,e)pyrene	0.047 - 15	B-M20	3/8	0.002 - 0.0024	2/8	0.062	1/8	2.32	2/8	0.137	NA	NA
Dibenzo(a,h)anthracene	0.13 - 7.6	B-M20	3/15	0.002 - 0.391	3/15	0.062	1/15	2.32	2/15	0.137	NA	NA
Dibenzo(a,h)pyrene	0.043 - 7.3	B-M20	3/8	0.002 - 0.0024	3/8	0.006	2/8	0.23	3/8	0.014	NA	NA
Dibenzo(a,i)pyrene	0.027	MW31-S	1/8	0.002 - 0.26	1/8	0.006	0/8	0.23	1/8	0.014	NA	NA
Dibenzo(a,j)acridine	0.014 - 1.6	B-M20	3/8	0.002 - 0.0024	1/8	0.621	0/8	23.23	1/8	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	0.0038 - 46	B-M20	7/15	0.002 - 0.156	2/15	0.621	1/15	23.23	2/15	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	17.667 - 0.064	GP61	2/2	-	1/2	390	1/2	31384	1/2	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	23000	GP61	1/2	2.222 - 2.222	1/2	390	0/2	31384	1/2	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	2900	GP61	1/2	0.826 - 0.826	1/2	390	0/2	31384	1/2	666.7	NA	NA
1,2,3,4,7,8-HxCDF	2400	GP61	1/2	0.586 - 0.586	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,6,7,8-HxCDD	2300	GP61	1/2	0.86 - 0.86	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,6,7,8-HxCDF	760	GP61	1/2	0.439 - 0.439	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,7,8,9-HxCDD	120	GP61	1/2	0.986 - 0.986	1/2	78	0/2	3138	1/2	66.7	NA	NA
1,2,3,7,8,9-HxCDF	98	GP61	1/2	0.514 - 0.514	1/2	39	0/2	3138	1/2	66.7	NA	NA
1,2,3,7,8-PeCDF	320	GP61	1/2	0.582 - 0.582	1/2	78	0/2	6277	1/2	133.3	NA	NA
2,3,4,6,7,8-HxCDF	180	GP61	1/2	0.696 - 0.696	1/2	39	0/2	3138	1/2	66.7	NA	NA
2,3,4,7,8-PeCDF	270	GP61	1/2	0.589 - 0.589	1/2	7.8	0/2	628	1/2	13.3	NA	NA
2,3,7,8-TCDD TEQ	0.200 - 1706.6	GP61	2/2	-	1/2	3.9	1/2	314	1/2	6.7	1/2	5
2,3,7,8-TCDF	49	GP61	1/2	0.543 - 0.543	1/2	39	0/2	3138	0/2	66.7	NA	NA
OCDD	235.02 - 560000	GP61	2/2	-	1/2	39000	0/2	3138357	1/2	66666.7	NA	NA
OCDF	99000	GP61	1/2	3.327 - 3.327	1/2	39000	0/2	3138357	1/2	66666.7	NA	NA
Total HpCDD	17.907 - 90000	GP61	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	140000	GP61	1/2	0.587 - 0.587	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	4400	GP61	1/2	0.86 - 0.86	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	3.617 - 54000	GP61	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	4300	GP61	1/2	0.589 - 0.589	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	62	GP61	1/2	0.543 - 0.543	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-49

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum (mg/kg)												
C10-C12 Aliphatics	8 - 11	MW31-S	2/16	5 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	11 - 86	MW31-S	4/16	5 - 7.1	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	15 - 190	MW31-S	4/8	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	11 - 630	MW31-S	6/8	5.4 - 5.6	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	64 - 230	MW31-S	3/8	5.4 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	23 - 710	MW31-S	4/8	5.4 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	110 - 130	MW31-S	3/8	5.4 - 6.4	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	34 - 890	MW31-S	4/8	5.4 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	20 - 1400	MW31-S	4/8	5.4 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	22 - 810	B-M20	4/8	5.4 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	6.4 - 570	B-M20	5/8	5.4 - 6.2	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	95 - 550	B-M20	2/8	5.4 - 6.5	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	7.9 - 750	B-M20	4/8	5.4 - 6.3	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	8.3	MW31-S	1/8	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
EPH	11 - 5221	B-M20	6/8	-	NA	NA	2/8	2000	NA	NA	4/8	460
VPH	15 - 284.3	MW31-S	4/8	-	NA	NA	2/8	30	NA	NA	1/8	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0033 - 21	MW31-S	5/15	0.002 - 0.391	0/15	55.92	0/15	23.51	0/15	1600	NA	NA
Acenaphthene	0.35 - 16	MW31-S	3/15	0.002 - 0.391	0/15	3681.71	0/15	284.05	0/15	4800	NA	NA
Acenaphthylene	0.0022 - 7.5	B-M20	6/15	0.002 - 0.391	0/15	3681.71	0/15	284.05	0/15	4800	NA	NA
Anthracene	0.0061 - 13	B-M20	6/15	0.002 - 0.391	0/15	21896.12	0/15	6777.61	0/15	24000	NA	NA
Benzo(g,h,i)perylene	0.0045 - 51	B-M20	7/15	0.002 - 0.156	0/15	2308.68	0/15	1959.13	0/15	2400	NA	NA
Fluoranthene	0.0071 - 74	B-M20	6/15	0.002 - 0.391	0/15	2293.61	0/15	6287.36	0/15	3200	NA	NA
Fluorene	0.0079 - 15	MW31-S	4/15	0.002 - 0.391	0/15	2643.61	0/15	304.64	0/15	3200	NA	NA
Naphthalene	0.0018 - 17	MW31-S	7/15	0.0021 - 0.391	0/15	55.92	0/15	23.51	0/15	1600	NA	NA
ncPAH	0.0018 - 255.5	B-M20	12/15	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0022 - 24	MW31-S	10/15	0.002 - 0.391	0/15	21896.12	0/15	6777.61	0/15	24000	NA	NA
Pyrene	0.0024 - 62	B-M20	8/15	0.002 - 0.391	0/15	2308.68	0/15	1959.13	0/15	2400	NA	NA
Retene	0.039	SI-OS05	1/1	-	0/1		0/1		0/1		NA	NA
Other Organics (mg/kg)												
Benzoic acid	0.0768	SI-OS05	1/12	0.02 - 2.6	0/12	100000.00	0/12	263.04	0/12	320000	NA	NA
Dibenzofuran	0.094 - 12	MW31-S	4/12	0.01 - 0.391	0/12	290.53	0/12	29.93	0/12	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.027 - 520	MW31-S	9/15	0.01 - 0.391	4/15	2.98	7/15	0.077	4/15	8	3/15	11
Tetrachlorophenols	0.013 - 19	MW31-S	5/8	0.01 - 0.012	0/8	1833.09	0/8	25.82	0/8	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
VPH = Volatile petroleum hydrocarbon.

Table 4-50

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
7,12-Dimethylbenz(a)anthracene	0.047 - 0.24	MW31-S	3/12	0.0018 - 0.0049	3/12	0.003	1/12	0.12	3/12	0.007	NA	NA
B(a)P Equivalent	0.0000065 - 18.552	MW31-S	13/29	-	8/29	0.062	6/29	2.32	8/29	0.137	0/29	30
Benzo(a)anthracene	0.0069 - 19	MW31-S	12/29	0.0018 - 0.042	7/29	0.621	0/29	23.23	7/29	1.370	NA	NA
Benzo(a)pyrene	0.033 - 8.1	MW31-S	10/29	0.0018 - 0.043	8/29	0.062	4/29	2.32	8/29	0.137	0/29	30
Benzo(b)fluoranthene	0.072 - 4.5	MW31-S	9/29	0.0018 - 0.043	5/29	0.621	0/29	23.23	5/29	1.370	NA	NA
Benzo(j)fluoranthene	0.0054 - 4.5	MW31-S	5/12	0.018 - 0.023	1/12	0.621	0/12	23.23	1/12	1.370	NA	NA
Benzo(k)fluoranthene	0.04 - 4.5	MW31-S	9/29	0.0018 - 0.043	0/29	6.215	0/29	232.30	0/29	13.699	NA	NA
Chrysene	0.0065 - 16	MW31-S	13/29	0.0018 - 0.042	0/29	62.148	0/29	2322.99	0/29	136.986	NA	NA
Dibenzo(a,e)pyrene	0.003 - 0.12	MW31-S	4/12	0.0018 - 0.0023	1/12	0.062	0/12	2.32	0/12	0.137	NA	NA
Dibenzo(a,h)acridine	0.0047	B-M20	1/12	0.0018 - 0.023	0/12	0.621	0/12	23.23	0/12	1.370	NA	NA
Dibenzo(a,h)anthracene	0.0089 - 0.64	MW31-S	7/29	0.0018 - 0.41	4/29	0.062	0/29	2.32	4/29	0.137	NA	NA
Dibenzo(a,h)pyrene	0.0023 - 0.11	MW31-S	4/12	0.0018 - 0.0023	3/12	0.006	0/12	0.23	2/12	0.014	NA	NA
Dibenzo(a,i)pyrene	0.0031 - 0.073	MW31-S	3/12	0.0018 - 0.0023	1/12	0.006	0/12	0.23	1/12	0.014	NA	NA
Dibenzo(a,j)acridine	0.011 - 0.11	MW31-S	2/12	0.0018 - 0.0023	0/12	0.621	0/12	23.23	0/12	1.370	NA	NA
Indeno(1,2,3-cd)pyrene	0.029 - 1.9	MW31-S	8/29	0.0018 - 0.043	3/29	0.621	0/29	23.23	1/29	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	14237 - 47245.8	B-M20	3/6	11.541 - 23.489	3/6	390	1/6	31384	3/6	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	1.596 - 6677.9	B-M20	4/6	5.196 - 15.82	3/6	390	0/6	31384	3/6	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	167.883 - 300.032	B-Q26	3/6	1.926 - 22.28	0/6	390	0/6	31384	0/6	666.7	NA	NA
1,2,3,4,7,8-HxCDF	945.011	B-M20	1/6	3.371 - 1621.359	1/6	39	0/6	3138	1/6	66.7	NA	NA
1,2,3,6,7,8-HxCDD	778.458 - 1047.583	B-M20	3/6	0.735 - 2.797	3/6	39	0/6	3138	3/6	66.7	NA	NA
1,2,3,6,7,8-HxCDF	98.171 - 149.554	B-Q26	3/6	2.528 - 3.668	3/6	39	0/6	3138	3/6	66.7	NA	NA
1,2,3,7,8,9-HxCDD	46.329 - 88.411	B-M20	2/6	0.842 - 52.449	1/6	78	0/6	3138	1/6	66.7	NA	NA
1,2,3,7,8-PeCDF	102.479 - 196.031	B-Q26	3/6	0.484 - 1.006	3/6	78	0/6	6277	2/6	133.3	NA	NA
2,3,4,6,7,8-HxCDF	156.219 - 202.067	B-Q26	2/6	2.956 - 74.936	2/6	39	0/6	3138	2/6	66.7	NA	NA
2,3,4,7,8-PeCDF	92.351 - 226.045	B-Q26	3/6	0.49 - 1.017	3/6	7.8	0/6	628	3/6	13.3	NA	NA
2,3,7,8-TCDD TEQ	0.0141 - 908.347	B-M20	5/6	-	3/6	3.9	3/6	314	3/6	6.7	3/6	5
2,3,7,8-TCDF	16.887 - 38.614	B-Q26	3/6	0.244 - 0.692	0/6	39	0/6	3138	0/6	66.7	NA	NA
OCDD	114.584 - 497696	B-M20	5/6	189.567 - 189.567	3/6	39000	0/6	3138357	3/6	66666.7	NA	NA
OCDF	6.985 - 10336	B-M20	5/6	22.895 - 22.895	0/6	39000	0/6	3138357	0/6	66666.7	NA	NA
Total HpCDD	16.441 - 88903.4	B-M20	5/6	16.353 - 16.353	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	1.596 - 6677.9	B-M20	4/6	1.627 - 15.82	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	2118.772 - 3009.581	B-M20	3/6	0.735 - 2.797	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	11884.854	B-Q26	3/6	2.528 - 3.668	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	1.727 - 5.548	B-M20	2/6	0.38 - 1.602	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	1176.867 - 2995.951	B-Q26	3/6	0.49 - 1.017	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	69.137 - 215.911	B-Q26	3/6	0.244 - 0.692	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C10-C12 Aliphatics	6.2 - 43	MW31-S	5/25	2.8 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	11 - 1100	MW31-S	7/25	2.8 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	29 - 1200	MW31-S	3/12	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	11 - 580	MW31-S	6/13	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	9 - 1000	MW31-S	5/13	2.8 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-50

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
C16-C18 Aliphatics	38 - 270	MW31-S	5/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	15 - 480	MW31-S	5/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	8.8	GP61	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	27 - 220	MW31-S	5/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	66 - 1100	MW31-S	5/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	10 - 120	MW31-S	6/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	13 - 240	MW31-S	5/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	30	GP61	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	6.7 - 11	B-L25	2/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	7 - 120	MW31-S	5/12	5.6 - 6.6	NA	NA	NA	NA	NA	NA	NA	NA
C5-C6 Aliphatics	5.3	MW31-S	1/12	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C6-C8 Aliphatics	9.1	MW31-S	1/12	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	44 - 140	MW31-S	2/12	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
EPH	24 - 4723	MW31-S	7/13	-	NA	NA	1/13	2000	NA	NA	3/13	460
TPH-Diesel	32 - 3730	GP35	2/3	28 - 28	NA	NA	1/3	2000	NA	NA	1/3	460
VPH	40 - 2454.4	MW31-S	3/12	-	NA	NA	3/12	30	NA	NA	2/12	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.064 - 180	MW31-S	12/29	0.0018 - 0.042	5/29	55.92	5/29	23.51	0/29	1600	NA	NA
Acenaphthene	0.039 - 100	MW31-S	12/29	0.0018 - 0.042	0/29	3681.71	0/29	284.05	0/29	4800	NA	NA
Acenaphthylene	0.067 - 1.3	MW31-S	4/29	0.0018 - 0.45	0/29	3681.71	0/29	284.05	0/29	4800	NA	NA
Anthracene	0.032 - 35	MW31-S	12/29	0.0018 - 0.042	0/29	21896.12	0/29	6777.61	0/29	24000	NA	NA
Benzo(g,h,i)perylene	0.022 - 1.2	MW31-S	7/29	0.0018 - 0.41	0/29	2308.68	0/29	1959.13	0/29	2400	NA	NA
Fluoranthene	0.007 - 58	MW31-S	14/29	0.0018 - 0.042	0/29	2293.61	0/29	6287.36	0/29	3200	NA	NA
Fluorene	0.041 - 80	MW31-S	12/29	0.0018 - 0.042	0/29	2643.61	0/29	304.64	0/29	3200	NA	NA
Naphthalene	0.0054 - 410	MW31-S	12/29	0.0018 - 0.042	4/29	55.92	5/29	23.51	0/29	1600	NA	NA
ncPAH	0.0054 - 1035.5	MW31-S	17/29	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.013 - 130	MW31-S	16/29	0.0018 - 0.042	0/29	21896.12	0/29	6777.61	0/29	24000	NA	NA
Pyrene	0.0065 - 40	MW31-S	15/29	0.0018 - 0.042	0/29	2308.68	0/29	1959.13	0/29	2400	NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.12 - 2.3	MW31-S	2/25	0.0089 - 1.8	0/25	122.21	1/25	0.45	0/25	160	NA	NA
Carbazole	0.23 - 2.7	GP06	5/13	0.037 - 0.042	0/13	24.32	NA	NA	0/13	50	NA	NA
Dibenzofuran	0.046 - 67	MW31-S	11/25	0.0089 - 0.042	0/25	290.53	1/25	29.93	0/25	320	NA	NA
Ethylbenzene	1.2	MW31-S	1/12	0.5 - 0.5	0/12	230.00	0/12	23.23	0/12	8000	NA	NA
m&p-Xylene	3.8	MW31-S	1/12	0.5 - 0.5	0/12	210.00	0/12	448.67	0/12	160000	NA	NA
o-Xylene	0.54 - 1.9	MW31-S	2/12	0.5 - 0.5	0/12	210.00	0/12	448.67	0/12	160000	NA	NA
Toluene	2	MW31-S	1/12	0.5 - 0.5	0/12	520.00	0/12	34.04	0/12	16000	NA	NA
Phenols (mg/kg)												
3&4-Methylphenol	0.004	B-Q26	1/16	0.0089 - 0.11	0/16	305.52	0/16	1.06	0/16	400	NA	NA
Pentachlorophenol	0.017 - 60	GP06	16/28	0.0089 - 0.6	9/28	2.98	14/28	0.077	3/28	8	3/28	11
Phenol	0.012	GP58	1/29	0.0089 - 0.45	0/29	36661.86	0/29	80.64	0/29	48000	NA	NA
Tetrachlorophenols	0.0025 - 1.6	MW31-S	4/12	0.0089 - 0.011	0/12	1833.09	0/12	25.82	0/12	2400	NA	NA

Table 4-50

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
bgs	= Below ground surface.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.

Table 4-51

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Methd B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.000036 - 17.62	MW21-S	22/47	-	14/47	0.062	8/47	2.32	13/47	0.137	0/47	30
Benzo(a)anthracene	0.0063 - 32	MW21-S	18/47	0.0016 - 0.047	8/47	0.621	1/47	23.23	8/47	1.370	NA	NA
Benzo(a)pyrene	0.0078 - 13	MW21-S	17/47	0.0016 - 0.047	14/47	0.062	7/47	2.32	11/47	0.137	0/47	30
Benzo(b)fluoranthene	0.0045 - 12	MW21-S	19/47	0.0016 - 0.047	9/47	0.621	0/47	23.23	8/47	1.370	NA	NA
Benzo(j)fluoranthene	0.0045 - 1.9	B-M20	3/18	0.016 - 0.026	1/18	0.621	0/18	23.23	1/18	1.370	NA	NA
Benzo(k)fluoranthene	0.0045 - 18	MW21-S	17/47	0.0016 - 0.047	1/47	6.215	0/47	232.30	1/47	13.699	NA	NA
Chrysene	0.0061 - 40	MW21-S	21/47	0.0016 - 0.047	0/47	62.148	0/47	2322.99	0/47	136.986	NA	NA
Dibenzo(a,e)pyrene	0.29	B-M20	1/18	0.0016 - 0.0026	1/18	0.062	0/18	2.32	1/18	0.137	NA	NA
Dibenzo(a,h)acridine	0.063	B-M20	1/18	0.0016 - 0.0026	0/18	0.621	0/18	23.23	0/18	1.370	NA	NA
Dibenzo(a,h)anthracene	0.01 - 1	GP05	5/47	0.0016 - 4	4/47	0.062	0/47	2.32	3/47	0.137	NA	NA
Dibenzo(a,h)pyrene	0.0022 - 0.16	B-M20	2/18	0.0016 - 0.0026	1/18	0.006	0/18	0.23	1/18	0.014	NA	NA
Dibenzo(a,i)pyrene	0.023	B-M20	1/18	0.0016 - 0.0026	1/18	0.006	0/18	0.23	1/18	0.014	NA	NA
Dibenzo(a,j)acridine	0.066	B-M20	1/18	0.0016 - 0.0026	0/18	0.621	0/18	23.23	0/18	1.370	NA	NA
Dibenzo(a,l)pyrene	0.018	B-M20	1/17	0.0016 - 0.0026	1/17	0.006	0/17	0.23	1/17	0.014	NA	NA
Indeno(1,2,3-cd)pyrene	0.0059 - 1.8	GP05	12/47	0.0016 - 4	6/47	0.621	0/47	23.23	2/47	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	2.85 - 21886	B-M20	2/6	0.414 - 3.724	1/6	390	0/6	31384	1/6	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	2559.2	B-M20	1/6	0.278 - 0.991	1/6	390	0/6	31384	1/6	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	454.25	B-M20	1/6	0.391 - 1.395	1/6	390	0/6	31384	0/6	666.7	NA	NA
1,2,3,6,7,8-HxCDD	1148.128	B-M20	1/6	0.268 - 0.568	1/6	39	0/6	3138	1/6	66.7	NA	NA
1,2,3,6,7,8-HxCDF	206.1	B-M20	1/6	0.208 - 0.428	1/6	39	0/6	3138	1/6	66.7	NA	NA
1,2,3,7,8,9-HxCDD	70.551	B-M20	1/6	0.307 - 0.651	0/6	78	0/6	3138	1/6	66.7	NA	NA
1,2,3,7,8-PeCDD	2.971	B-M20	1/6	0.3 - 0.796	0/6	3.9	0/6	314	0/6	6.7	NA	NA
1,2,3,7,8-PeCDF	233.106	B-M20	1/6	0.21 - 0.553	1/6	78	0/6	6277	1/6	133.3	NA	NA
2,3,4,6,7,8-HxCDF	170.601	B-M20	1/6	0.243 - 0.678	1/6	39	0/6	3138	1/6	66.7	NA	NA
2,3,4,7,8-PeCDF	235.367	B-M20	1/6	0.212 - 0.559	1/6	7.8	0/6	628	1/6	13.3	NA	NA
2,3,7,8-TCDD TEQ	0.03102 - 564.468	B-M20	2/6	-	1/6	3.9	1/6	314	1/6	6.7	1/6	5
2,3,7,8-TCDF	30.809	B-M20	1/6	0.246 - 0.45	0/6	39	0/6	3138	0/6	66.7	NA	NA
OCDD	22.973 - 201242	B-M20	2/6	4.939 - 51.843	1/6	39000	0/6	3138357	1/6	66666.7	NA	NA
OCDF	2.244 - 4207.5	B-M20	2/6	0.316 - 2.764	0/6	39000	0/6	3138357	0/6	66666.7	NA	NA
Total HpCDD	2.85 - 38212.5	B-M20	2/6	0.414 - 2.823	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	0.967 - 2559.2	B-M20	2/6	0.307 - 0.991	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	0.693 - 3380.629	B-M20	2/6	0.268 - 0.568	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	0.632 - 5764.325	B-M20	2/6	0.208 - 0.428	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	12.771	B-M20	1/6	0.3 - 0.796	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	3512.689	B-M20	1/6	0.212 - 0.559	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	116.441	B-M20	1/6	0.246 - 0.45	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-51

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Methd B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Petroleum (mg/kg)												
C10-C12 Aliphatics	27 - 100	GP60	2/35	5 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	20 - 66	B-M20	3/35	5 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C12-C13 Aromatics	180	B-M20	1/17	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	5.3 - 820	B-M20	10/18	5.3 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	250 - 580	GP60	2/18	5.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aliphatics	7.8 - 430	B-M20	3/17	5.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C18 Aromatics	210	B-M20	1/17	5.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	510	GP60	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	870	GP60	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aliphatics	5.4 - 310	B-M20	6/17	5.3 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C18-C21 Aromatics	37 - 870	B-M20	2/17	5.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aliphatics	7.9 - 150	B-M20	8/17	5.3 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C28 Aromatics	260	B-M20	1/17	5.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	110	GP60	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	61	GP60	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aliphatics	5.6 - 22	B-M20	7/17	5.3 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C28-C36 Aromatics	6.6 - 130	B-M20	3/17	5.2 - 6.8	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aliphatics	8.6	GP60	1/18	5 - 5	NA	NA	NA	NA	NA	NA	NA	NA
EPH	5.3 - 3499	B-M20	12/18	-	NA	NA	2/18	2000	NA	NA	4/18	460
TPH-Diesel	20000	MW21-S	1/1	-	NA	NA	1/1	2000	NA	NA	1/1	460
VPH	246	B-M20	1/17	-	NA	NA	1/17	30	NA	NA	1/17	200
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0035 - 550	MW21-S	24/47	0.0016 - 0.04	7/47	55.92	7/47	23.51	0/47	1600	NA	NA
Acenaphthene	0.0081 - 220	MW21-S	23/47	0.0016 - 0.04	0/47	3681.71	0/47	284.05	0/47	4800	NA	NA
Acenaphthylene	0.0027 - 3.5	GP05	9/47	0.0016 - 4	0/47	3681.71	0/47	284.05	0/47	4800	NA	NA
Anthracene	0.0022 - 73	MW21-S	21/47	0.0016 - 0.047	0/47	21896.12	0/47	6777.61	0/47	24000	NA	NA
Benzo(g,h,i)perylene	0.0064 - 1.5	MW21-S	12/47	0.0016 - 4	0/47	2308.68	0/47	1959.13	0/47	2400	NA	NA
Fluoranthene	0.011 - 150	MW21-S	23/47	0.0016 - 0.047	0/47	2293.61	0/47	6287.36	0/47	3200	NA	NA
Fluorene	0.0059 - 190	MW21-S	23/47	0.0016 - 0.047	0/47	2643.61	0/47	304.64	0/47	3200	NA	NA
Naphthalene	0.0011 - 550	MW21-S	24/47	0.0016 - 0.04	7/47	55.92	7/47	23.51	0/47	1600	NA	NA
ncPAH	0.0011 - 2153	MW21-S	30/47	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0059 - 310	MW21-S	26/47	0.0016 - 0.047	0/47	21896.12	0/47	6777.61	0/47	24000	NA	NA
Pyrene	0.0092 - 110	MW21-S	24/47	0.0016 - 0.047	0/47	2308.68	0/47	1959.13	0/47	2400	NA	NA
Other Organics (mg/kg)												
2,6-Dinitrotoluene	0.0091	B-L17	1/36	0.0082 - 16	0/36	61.10	0/36	0.20	0/36	80	NA	NA
Carbazole	0.12 - 14	GP05	9/18	0.036 - 0.047	0/18	24.32	NA	NA	0/18	50	NA	NA
Dibenzofuran	0.0081 - 140	MW21-S	13/36	0.0082 - 0.047	0/36	290.53	5/36	29.93	0/36	320	NA	NA

Table 4-51

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY NORTH TREATMENT AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Methd B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Phenols (mg/kg)												
2,4-Dimethylphenol	0.0058	GP58	1/47	0.0082 - 4	0/47	1222.06	0/47	9.34	0/47	1600	NA	NA
3&4-Methylphenol	0.021	GP58	1/29	0.0082 - 2.9	0/29	305.52	0/29	1.06	0/29	400	NA	NA
4-Chloro-3-Methylphenol	0.0012	B-Q27	1/47	0.0082 - 4	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.0096 - 110	GP05	24/47	0.0082 - 2.8	12/47	2.98	22/47	0.077	7/47	8	7/47	11
Phenol	0.0018 - 0.027	GP58	4/47	0.0082 - 4	0/47	36661.86	0/47	80.64	0/47	48000	NA	NA
Tetrachlorophenols	0.018 - 0.76	B-M20	3/18	0.0082 - 0.013	0/18	1833.09	0/18	25.82	0/18	2400	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
TPH-D = Total petroleum hydrocarbon as diesel.
VPH = Volatile petroleum hydrocarbon.

Table 4-52

SUMMARY OF RESULTS FROM FACILITY WEST TREATMENT AREA SUBSURFACE SOIL SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

No samples were collected from this area during the remedial investigation.

Table 4-53

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WEST TREATMENT AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.02317 - 155.5	HSA08	6/8	-	5/8	0.062	3/8	2.32	4/8	0.137	1/8	30
Benzo(a)anthracene	0.0088 - 270	HSA08	6/8	0.0053 - 0.0056	3/8	0.621	2/8	23.23	3/8	1.370	NA	NA
Benzo(a)pyrene	0.019 - 110	HSA08	6/8	0.0053 - 0.0056	5/8	0.062	3/8	2.32	4/8	0.137	1/8	30
Benzo(b)fluoranthene	0.021 - 140	HSA08	6/8	0.0053 - 0.0056	3/8	0.621	2/8	23.23	3/8	1.370	NA	NA
Benzo(k)fluoranthene	0.0073 - 55	HSA08	6/8	0.0053 - 0.0056	2/8	6.215	0/8	232.30	1/8	13.699	NA	NA
Chrysene	0.019 - 950	HSA08	6/8	0.0053 - 0.0056	1/8	62.148	0/8	2322.99	1/8	136.986	NA	NA
Dibenzo(a,h)anthracene	0.068	HSA06	1/8	0.0052 - 0.64	1/8	0.062	0/8	2.32	0/8	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.011 - 30	HSA08	6/8	0.0053 - 0.0056	3/8	0.621	1/8	23.23	2/8	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	46000 - 55000	HSA09	2/2	-	2/2	390	2/2	31384	2/2	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	3000 - 4800	HSA06	2/2	-	2/2	390	0/2	31384	2/2	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	150 - 400	HSA06	2/2	-	1/2	390	0/2	31384	0/2	666.7	NA	NA
1,2,3,4,7,8-HxCDD	140 - 150	HSA06	2/2	-	2/2	39	0/2	3138	2/2	66.7	NA	NA
1,2,3,4,7,8-HxCDF	340 - 350	HSA06	2/2	-	2/2	39	0/2	3138	2/2	66.7	NA	NA
1,2,3,6,7,8-HxCDD	3400 - 3800	HSA09	2/2	-	2/2	39	2/2	3138	2/2	66.7	NA	NA
1,2,3,6,7,8-HxCDF	100 - 190	HSA06	2/2	-	2/2	39	0/2	3138	2/2	66.7	NA	NA
1,2,3,7,8,9-HxCDD	520 - 1100	HSA09	2/2	-	2/2	78	0/2	3138	2/2	66.7	NA	NA
1,2,3,7,8-PeCDF	130 - 170	HSA09	2/2	-	2/2	78	0/2	6277	1/2	133.3	NA	NA
2,3,4,6,7,8-HxCDF	110 - 200	HSA06	2/2	-	2/2	39	0/2	3138	2/2	66.7	NA	NA
2,3,4,7,8-PeCDF	160	HSA09	1/2	91 - 91	1/2	7.8	0/2	628	1/2	13.3	NA	NA
2,3,7,8-TCDD TEQ	104.52 - 1267.2	HSA09	2/2	-	2/2	3.9	2/2	314	2/2	6.7	2/2	5
2,3,7,8-TCDF	45 - 80	HSA09	2/2	-	2/2	39	0/2	3138	1/2	66.7	NA	NA
OCDD	300000 - 400000	HSA06	2/2	-	2/2	39000	0/2	3138357	2/2	66666.7	NA	NA
OCDF	2000 - 12000	HSA06	2/2	-	0/2	39000	0/2	3138357	0/2	66666.7	NA	NA
Total HpCDD	077000 - 97000	HSA09	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	10000 - 21000	HSA06	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	10000 - 14000	HSA09	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	08500 - 12000	HSA06	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDD	280	HSA06	1/2	27 - 27	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	2300 - 3000	HSA09	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	72 - 170	HSA09	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C10-C12 Aliphatics	71	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	190	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	750	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	1300	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	780	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	2300	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	200	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	580	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
C8-C10 Aliphatics	4.6	HSA09	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
EPH	6175.6	HSA09	1/1	-	NA	NA	1/1	2000	NA	NA	1/1	460

Table 4-53

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WEST TREATMENT AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
ncPAHs (mg/kg)												
1-Methylnaphthalene	0.0174	SI-OS09	1/2	0.406 - 0.406	0/2	55.92	0/2	23.51	0/2	1600	NA	NA
2-Chloronaphthalene	1.5	HSA08	1/8	0.0052 - 0.52	0/8	3852.60	0/8	121.61	0/8	6400	NA	NA
2-Methylnaphthalene	0.0206 - 930	HSA08	4/8	0.0052 - 0.406	2/8	55.92	2/8	23.51	0/8	1600	NA	NA
Acenaphthene	0.166 - 1400	HSA08	4/8	0.0052 - 0.406	0/8	3681.71	1/8	284.05	0/8	4800	NA	NA
Acenaphthylene	0.15 - 16	HSA08	3/8	0.0052 - 0.406	0/8	3681.71	0/8	284.05	0/8	4800	NA	NA
Anthracene	0.0067 - 1100	HSA08	6/8	0.0053 - 0.0056	0/8	21896.12	0/8	6777.61	0/8	24000	NA	NA
Benzo(g,h,i)perylene	0.016 - 25	HSA08	6/8	0.0053 - 0.0056	0/8	2308.68	0/8	1959.13	0/8	2400	NA	NA
Fluoranthene	0.0067 - 950	HSA08	6/8	0.0053 - 0.0056	0/8	2293.61	0/8	6287.36	0/8	3200	NA	NA
Fluorene	0.008 - 910	HSA08	5/8	0.0052 - 0.406	0/8	2643.61	1/8	304.64	0/8	3200	NA	NA
Naphthalene	0.35 - 2900	HSA08	3/8	0.0052 - 0.406	2/8	55.92	2/8	23.51	1/8	1600	NA	NA
ncPAH	0.0155 - 11852.5	HSA08	7/8	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0057 - 2800	HSA08	7/8	0.0056 - 0.0056	0/8	21896.12	0/8	6777.61	0/8	24000	NA	NA
Pyrene	0.011 - 820	HSA08	6/8	0.0053 - 0.0056	0/8	2308.68	0/8	1959.13	0/8	2400	NA	NA
Other Organics (mg/kg)												
Carbazole	0.149	SI-OS09	1/2	0.406 - 0.406	0/2	24.32	NA	NA	0/2	50	NA	NA
Dibenzofuran	0.069	SI-OS09	1/2	0.406 - 0.406	0/2	290.53	0/2	29.93	0/2	320	NA	NA
Phenols (mg/kg)												
2-Nitrophenol	0.71	HSA08	1/8	0.026 - 2.6	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	0.68	HSA09	1/8	0.026 - 3.2	0/8	488.82	0/8	11.70	0/8	640	NA	NA
Pentachlorophenol	0.066 - 76	HSA06	4/6	0.028 - 0.404	2/6	2.98	3/6	0.077	2/6	8	2/6	11

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.

Table 4-54

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WEST TREATMENT AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.000069 - 64.063	HSA07	12/14	-	8/14	0.062	7/14	2.32	8/14	0.137	2/14	30
Benzo(a)anthracene	0.0065 - 62	HSA09	11/14	0.039 - 0.046	8/14	0.621	2/14	23.23	8/14	1.370	NA	NA
Benzo(a)pyrene	0.0083 - 52	HSA07	10/14	0.0054 - 0.046	8/14	0.062	7/14	2.32	8/14	0.137	2/14	30
Benzo(b)fluoranthene	0.0083 - 65	HSA07	10/14	0.0054 - 0.046	8/14	0.621	2/14	23.23	8/14	1.370	NA	NA
Benzo(k)fluoranthene	0.026 - 22	HSA07	9/14	0.0054 - 0.046	2/14	6.215	0/14	232.30	1/14	13.699	NA	NA
Chrysene	0.0092 - 43	HSA07	12/14	0.039 - 0.046	0/14	62.148	0/14	2322.99	0/14	136.986	NA	NA
Dibenzo(a,h)anthracene	0.078 - 1.5	MW22-S	3/14	0.0054 - 0.6	3/14	0.062	0/14	2.32	2/14	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.013 - 18	HSA09	9/14	0.0054 - 0.046	7/14	0.621	0/14	23.23	5/14	1.370	NA	NA
Petroleum (mg/kg)												
C10-C12 Aromatics	44	GP56	1/2	2.6 - 2.6	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	18 - 23	GP62	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	57 - 120	GP56	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	17 - 24	GP62	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	290 - 800	GP62	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	23 - 31	GP56	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	120 - 210	GP62	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
EPH	640 - 1137	GP62	2/2	-	NA	NA	0/2	2000	NA	NA	2/2	460
TPH-Diesel	1300	MW22-S	1/1	-	NA	NA	0/1	2000	NA	NA	1/1	460
ncPAHs (mg/kg)												
2-Chloronaphthalene	0.98	GP56	1/14	0.0054 - 0.6	0/14	3852.60	0/14	121.61	0/14	6400	NA	NA
2-Methylnaphthalene	0.058 - 230	HSA09	10/14	0.0054 - 0.053	1/14	55.92	3/14	23.51	0/14	1600	NA	NA
Acenaphthene	0.016 - 200	HSA09	10/14	0.039 - 0.053	0/14	3681.71	0/14	284.05	0/14	4800	NA	NA
Acenaphthylene	0.0089 - 3.3	HSA09	9/14	0.0054 - 0.6	0/14	3681.71	0/14	284.05	0/14	4800	NA	NA
Anthracene	0.0097 - 73	HSA09	10/14	0.0063 - 0.046	0/14	21896.12	0/14	6777.61	0/14	24000	NA	NA
Benzo(g,h,i)perylene	0.01 - 15	HSA09	9/14	0.0054 - 0.046	0/14	2308.68	0/14	1959.13	0/14	2400	NA	NA
Fluoranthene	0.025 - 230	HSA09	12/14	0.039 - 0.046	0/14	2293.61	0/14	6287.36	0/14	3200	NA	NA
Fluorene	0.019 - 130	HSA09	11/14	0.039 - 0.046	0/14	2643.61	0/14	304.64	0/14	3200	NA	NA
Naphthalene	0.0059 - 700	HSA09	12/14	0.039 - 0.046	3/14	55.92	3/14	23.51	0/14	1600	NA	NA
ncPAH	0.173 - 2211.3	HSA09	13/14	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.074 - 420	HSA09	11/14	0.039 - 0.046	0/14	21896.12	0/14	6777.61	0/14	24000	NA	NA
Pyrene	0.026 - 210	HSA09	12/14	0.039 - 0.046	0/14	2308.68	0/14	1959.13	0/14	2400	NA	NA
Other Organics (mg/kg)												
Carbazole	5.8	MW22-S	1/4	0.039 - 0.046	0/4	24.32	NA	NA	0/4	50	NA	NA
Dibenzofuran	22	MW22-S	1/4	0.039 - 0.046	0/4	290.53	0/4	29.93	0/4	320	NA	NA
Phenols (mg/kg)												
2-Nitrophenol	0.014 - 0.1	GP56	2/14	0.027 - 3	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.022 - 25	HSA09	7/12	0.16 - 3	2/12	2.98	6/12	0.077	1/12	8	1/12	11
Phenol	0.013 - 0.022	GP56	2/14	0.027 - 3	0/14	36661.86	0/14	80.64	0/14	48000	NA	NA

Table 4-54

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY WEST TREATMENT AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
bgs	= Below ground surface.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbon.
mg/kg	= Milligrams per kilogram.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Non-carcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary Remediation Goal.
TPH-D	= Total petroleum hydrocarbon as diesel.

Table 4-55

STATISTICAL ANALYSIS OF RESULTS FROM WEST TREATMENT AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0000075 - 146.62	MW22-S	31/42	-	22/42	0.062	12/42	2.32	16/42	0.137	5/42	30
Benzo(a)anthracene	0.0061 - 260	GP57	27/42	0.0051 - 0.263	12/42	0.621	6/42	23.23	12/42	1.370	NA	NA
Benzo(a)pyrene	0.0056 - 100	MW22-S	26/42	0.005 - 0.045	18/42	0.062	12/42	2.32	13/42	0.137	4/42	30
Benzo(b)fluoranthene	0.0076 - 160	GP57	28/42	0.005 - 0.045	12/42	0.621	5/42	23.23	12/42	1.370	NA	NA
Benzo(k)fluoranthene	0.011 - 80	GP57	24/42	0.005 - 0.045	7/42	6.215	0/42	232.30	5/42	13.699	NA	NA
Chrysene	0.0075 - 220	GP57	31/42	0.0051 - 0.045	3/42	62.148	0/42	2322.99	2/42	136.986	NA	NA
Dibenzo(a,h)anthracene	0.54 - 17	MW22-S	3/42	0.005 - 3.7	3/42	0.062	2/42	2.32	3/42	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.011 - 51	GP57	21/42	0.005 - 3.7	10/42	0.621	2/42	23.23	9/42	1.370	NA	NA
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	0.000074 - 0.15	GP63	4/4	-	3/4	390	1/4	31384	3/4	666.7	NA	NA
1,2,3,4,6,7,8-HpCDF	0.000009 - 0.019	GP63	4/4	-	2/4	390	0/4	31384	2/4	666.7	NA	NA
1,2,3,4,7,8,9-HpCDF	0.0013	GP63	1/4	0.71 - 42	1/4	390	0/4	31384	1/4	666.7	NA	NA
1,2,3,4,7,8-HxCDD	0.000099	GP63	1/4	0.41 - 17	1/4	39	0/4	3138	1/4	66.7	NA	NA
1,2,3,4,7,8-HxCDF	0.000078 - 0.0029	GP63	2/4	0.6 - 6.6	2/4	39	0/4	3138	2/4	66.7	NA	NA
1,2,3,6,7,8-HxCDD	0.0000047 - 0.009	GP63	3/4	15 - 15	2/4	39	1/4	3138	2/4	66.7	NA	NA
1,2,3,6,7,8-HxCDF	0.0008	GP63	1/4	0.27 - 27	1/4	39	0/4	3138	1/4	66.7	NA	NA
1,2,3,7,8,9-HxCDD	0.000074 - 0.00069	GP63	2/4	0.94 - 11	1/4	78	0/4	3138	2/4	66.7	NA	NA
1,2,3,7,8,9-HxCDF	0.00015	GP63	1/4	0.1 - 8.1	1/4	39	0/4	3138	1/4	66.7	NA	NA
1,2,3,7,8-PeCDF	0.00079	GP63	1/4	0.36 - 23	1/4	78	0/4	6277	1/4	133.3	NA	NA
2,3,4,6,7,8-HxCDF	0.00051	GP63	1/4	0.33 - 33	1/4	39	0/4	3138	1/4	66.7	NA	NA
2,3,4,7,8-PeCDF	0.00074	GP63	1/4	0.37 - 22	1/4	7.8	1/4	628	1/4	13.3	NA	NA
2,3,7,8-TCDD TEQ	0.000001404 - 0.003611	GP63	4/4	-	3/4	3.9	1/4	314	3/4	6.7	3/4	5
2,3,7,8-TCDF	0.00029	GP63	1/4	0.17 - 8.6	1/4	39	0/4	3138	1/4	66.7	NA	NA
OCDD	0.001 - 0.53	GP63	4/4	-	2/4	38986	0/4	3138357	2/4	66666.7	NA	NA
OCDF	0.000039 - 0.016	GP63	4/4	-	0/4	38986	0/4	3138357	0/4	66666.7	NA	NA
Total HpCDD	0.00013 - 0.25	GP63	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HpCDF	0.000036 - 0.081	GP63	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDD	0.00001 - 0.024	GP63	4/4	-	NA	NA	NA	NA	NA	NA	NA	NA
Total HxCDF	0.000014 - 0.053	GP63	3/4	33 - 33	NA	NA	NA	NA	NA	NA	NA	NA
Total PeCDF	0.0000026 - 0.014	GP63	3/4	2.7 - 2.7	NA	NA	NA	NA	NA	NA	NA	NA
Total TCDF	0.00072	GP63	1/4	0.31 - 8.6	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum (mg/kg)												
C10-C12 Aliphatics	3.5 - 40	GP57	2/3	2.8 - 2.8	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	57 - 3500	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	11 - 370	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	93 - 5200	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	13 - 390	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	220 - 12000	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	31 - 400	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	75 - 4700	GP57	3/3	-	NA	NA	NA	NA	NA	NA	NA	NA
EPH	500 - 26600	GP57	3/3	-	NA	NA	2/3	2000	NA	NA	3/3	460
TPH-Diesel	40 - 16000	MW22-S	6/6	-	NA	NA	4/6	2000	NA	NA	4/6	460

Table 4-55

STATISTICAL ANALYSIS OF RESULTS FROM WEST TREATMENT AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
ncPAHs (mg/kg)												
2-Chloronaphthalene	0.46 - 1.3	GP57	2/42	0.005 - 4.1	0/42	3852.60	0/42	121.61	0/42	6400	NA	NA
2-Methylnaphthalene	0.0061 - 820	GP57	31/42	0.0058 - 0.263	10/42	55.92	12/42	23.51	0/42	1600	NA	NA
Acenaphthene	0.0061 - 930	GP57	31/42	0.0058 - 0.18	0/42	3681.71	2/42	284.05	0/42	4800	NA	NA
Acenaphthylene	0.0069 - 16	GP57	17/42	0.005 - 3.7	0/42	3681.71	0/42	284.05	0/42	4800	NA	NA
Anthracene	0.0064 - 270	GP57	33/42	0.0051 - 0.045	0/42	21896.12	0/42	6777.61	0/42	24000	NA	NA
Benzo(g,h,i)perylene	0.0098 - 42	GP57	21/42	0.005 - 3.7	0/42	2308.68	0/42	1959.13	0/42	2400	NA	NA
Fluoranthene	0.0075 - 910	GP57	36/42	0.037 - 0.044	0/42	2293.61	0/42	6287.36	0/42	3200	NA	NA
Fluorene	0.0061 - 460	MW22-S	29/42	0.0058 - 0.6	0/42	2643.61	1/42	304.64	0/42	3200	NA	NA
Naphthalene	0.0069 - 2200	GP57	38/44	0.037 - 0.263	11/44	55.92	12/44	23.51	2/44	1600	NA	NA
ncPAH	0.0479 - 7849.3	GP57	41/41	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0092 - 1800	GP57	35/42	0.0063 - 0.044	0/42	21896.12	0/42	6777.61	0/42	24000	NA	NA
Pyrene	0.0075 - 860	GP57	36/42	0.037 - 0.044	0/42	2308.68	0/42	1959.13	0/42	2400	NA	NA
Other Organics (mg/kg)												
4-Methyl-2-Pentanone	0.0059	MW05-D	1/2	0.0214 - 0.0214	0/2	786.53	0/2	12.86	0/2	6400	NA	NA
Carbazole	1.7 - 59	MW22-S	4/15	0.035 - 3.7	1/15	24.32	NA	NA	1/15	50	NA	NA
Dibenzofuran	0.0101 - 300	MW22-S	7/15	0.037 - 0.18	1/15	290.53	2/15	29.93	0/15	320	NA	NA
Phenols (mg/kg)												
2,4,6-Trichlorophenol	0.0087	HSA09	1/42	0.025 - 4.1	0/42	44.22	0/42	0.39	0/42	90.91	NA	NA
2-Nitrophenol	0.96	GP57	1/42	0.025 - 4.1	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.0055 - 140	GP63	18/35	0.025 - 16	6/35	2.98	12/35	0.077	5/35	8.33	5/35	11
Phenol	0.0086 - 0.015	GP57	2/42	0.025 - 4.1	0/42	36661.86	0/42	80.64	0/42	48000	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDF = Pentachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalent quotient.
TPH-D = Total petroleum hydrocarbon as diesel.

Table 4-56

SUMMARY OF RESULTS FROM FACILITY EAST TREATMENT AREA SUBSURFACE SOIL SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

No samples were collected from this area during the remedial investigation.

Table 4-57

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY EAST TREATMENT AREA SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0071 - 59.196	HA01	13/17	-	9/17	0.062	4/17	2.32	9/17	0.137	1/17	30
Benzo(a)anthracene	0.063 - 36	HA01	11/17	0.041 - 0.413	7/17	0.621	1/17	23.23	5/17	1.370	NA	NA
Benzo(a)pyrene	0.0315 - 41	HA01	10/17	0.041 - 0.408	9/17	0.062	4/17	2.32	9/17	0.137	1/17	30
Benzo(b)fluoranthene	0.064 - 36	HA01	10/17	0.041 - 0.408	6/17	0.621	1/17	23.23	5/17	1.370	NA	NA
Benzo(k)fluoranthene	0.042 - 25	HA01	10/17	0.041 - 0.408	2/17	6.215	0/17	232.30	2/17	13.699	NA	NA
Chrysene	0.0826 - 46	HA01	12/17	0.041 - 0.408	0/17	62.148	0/17	2322.99	0/17	136.986	NA	NA
Dibenzo(a,h)anthracene	0.0246 - 8.6	HA01	7/17	0.041 - 0.91	4/17	0.062	1/17	2.32	4/17	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.0827 - 21	HA01	9/17	0.041 - 1.0325	4/17	0.621	0/17	23.23	4/17	1.370	NA	NA
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.054 - 70	SP-06	14/17	0.082 - 0.408	2/17	55.92	3/17	23.51	0/17	1600	NA	NA
Acenaphthene	0.34 - 75	HA01	8/17	0.041 - 0.91	0/17	3681.71	0/17	284.05	0/17	4800	NA	NA
Acenaphthylene	2.4	HA01	1/17	0.041 - 0.91	0/17	3681.71	0/17	284.05	0/17	4800	NA	NA
Anthracene	0.0414 - 62	SP-09	8/17	0.041 - 0.91	0/17	21896.12	0/17	6777.61	0/17	24000	NA	NA
Benzo(g,h,i)perylene	0.0706 - 25	HA01	8/17	0.041 - 0.91	0/17	2308.68	0/17	1959.13	0/17	2400	NA	NA
Fluoranthene	0.056 - 120	HA01	13/17	0.042 - 0.408	0/17	2293.61	0/17	6287.36	0/17	3200	NA	NA
Fluorene	0.27 - 40	HA01	10/17	0.041 - 0.413	0/17	2643.61	0/17	304.64	0/17	3200	NA	NA
Naphthalene	0.043 - 39	SP-06	10/17	0.042 - 0.91	0/17	55.92	1/17	23.51	0/17	1600	NA	NA
ncPAH	0.19 - 502.7	HA01	15/17	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0448 - 95	HA01	12/17	0.082 - 0.41	0/17	21896.12	0/17	6777.61	0/17	24000	NA	NA
Pyrene	0.0837 - 110	HA01	13/17	0.042 - 0.408	0/17	2308.68	0/17	1959.13	0/17	2400	NA	NA
Retene	0.0251	SI-OS07	1/2	0.408 - 0.408	0/2		0/2		0/2		NA	NA
Other Organics (mg/kg)												
2,4-Dinitrotoluene	0.26	SP-01	1/17	0.041 - 3.7	0/17	122.21	0/17	0.45	0/17	160	NA	NA
3,3'-Dichlorobenzidine	0.38	SP-08	1/17	0.16 - 3.7	0/17	1.08	1/17	0.03	0/17	2	NA	NA
Carbazole	1.1 - 3.5	SP-06	4/17	0.041 - 0.413	0/17	24.32	0/17		0/17	50	NA	NA
Dibenzofuran	0.25 - 18	HA01	8/17	0.041 - 0.91	0/17	290.53	0/17	29.93	0/17	320	NA	NA
N-nitrosodiphenylamine	0.36 - 23	SP-09	5/17	0.041 - 0.91	0/17	99.26	4/17	1.24	0/17	204	NA	NA
Phenols (mg/kg)												
2,4,5-Trichlorophenol	0.36	SP-09	1/17	0.041 - 0.91	0/17	6110.31	0/17	368.00	0/17	8000	NA	NA
2,4-Dinitrophenol	0.36	SP-09	1/17	0.16 - 8.01	0/17	122.21	1/17	0.13	0/17	160	NA	NA
4,6-Dinitro-2-methylphenol	1.3	SP-09	1/17	0.16 - 3.7	0/17		0/17		0/17		NA	NA
Pentachlorophenol	0.73 - 480	SP-08	16/17	0.41 - 0.41	12/17	2.98	16/17	0.077	10/17	8	10/17	11

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
PRG = Preliminary Remediation Goal.

Table 4-58

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY EAST TREATMENT AREA SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.00654 - 45.44	SPX-3-BP	13/18	-	10/18	0.062	6/18	2.32	10/18	0.137	1/18	30
Benzo(a)anthracene	0.058 - 66	SPX-3-BP	11/18	0.04 - 0.78	7/18	0.621	2/18	23.23	6/18	1.370	NA	NA
Benzo(a)pyrene	0.044 - 33	SPX-3-BP	12/18	0.043 - 0.78	10/18	0.062	4/18	2.32	9/18	0.137	1/18	30
Benzo(b)fluoranthene	0.047 - 35	SPX-3-BP	11/18	0.043 - 0.78	6/18	0.621	1/18	23.23	6/18	1.370	NA	NA
Benzo(k)fluoranthene	0.096 - 19	SPX-3-BP	8/18	0.04 - 0.82	2/18	6.215	0/18	232.30	1/18	13.699	NA	NA
Chrysene	0.14 - 240	SPX-3-BP	11/18	0.04 - 0.78	1/18	62.148	0/18	2322.99	1/18	136.986	NA	NA
Dibenzo(a,h)anthracene	0.81 - 1.5	GP09	3/18	0.04 - 0.82	3/18	0.062	0/18	2.32	3/18	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.13 - 11	SPX-3-BP	7/18	0.04 - 0.78	5/18	0.621	0/18	23.23	3/18	1.370	NA	NA
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.068 - 210	GP09	16/18	0.043 - 0.78	3/18	55.92	4/18	23.51	0/18	1600	NA	NA
Acenaphthene	0.1 - 130	SPX-3-BP	12/18	0.04 - 0.78	0/18	3681.71	0/18	284.05	0/18	4800	NA	NA
Acenaphthylene	0.039	HA02	1/18	0.043 - 0.88	0/18	3681.71	0/18	284.05	0/18	4800	NA	NA
Anthracene	0.085 - 350	SPX-3-BP	11/18	0.04 - 0.78	0/18	21896.12	0/18	6777.61	0/18	24000	NA	NA
Benzo(g,h,i)perylene	0.077 - 8.7	SPX-3-BP	5/18	0.043 - 0.82	0/18	2308.68	0/18	1959.13	0/18	2400	NA	NA
Fluoranthene	0.29 - 210	SPX-3-BP	12/18	0.04 - 0.78	0/18	2293.61	0/18	6287.36	0/18	3200	NA	NA
Fluorene	0.13 - 120	SPX-3-BP	12/18	0.04 - 0.78	0/18	2643.61	0/18	304.64	0/18	3200	NA	NA
Naphthalene	0.054 - 180	SPX-3-BP	14/18	0.043 - 0.82	3/18	55.92	3/18	23.51	0/18	1600	NA	NA
ncPAH	0.145 - 1748.7	SPX-3-BP	16/18	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.077 - 420	SPX-3-BP	13/18	0.04 - 0.78	0/18	21896.12	0/18	6777.61	0/18	24000	NA	NA
Pyrene	0.046 - 180	SPX-3-BP	14/18	0.043 - 0.78	0/18	2308.68	0/18	1959.13	0/18	2400	NA	NA
Other Organics (mg/kg)												
4-Chlorophenyl-phenylether	0.13	SP-03	1/18	0.04 - 0.88	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	0.13 - 65	SPX-3-BP	8/18	0.04 - 0.78	1/18	24.32	0/18		1/18	50	NA	NA
Dibenzofuran	0.14 - 62	SPX-3-BP	10/18	0.04 - 0.82	0/18	290.53	3/18	29.93	0/18	320	NA	NA
N-nitrosodiphenylamine	0.51 - 6.2	SP-08	2/18	0.04 - 0.88	0/18	99.26	1/18	1.24	0/18	204	NA	NA
Phenols (mg/kg)												
2,4,6-Trichlorophenol	0.089	SP-03	1/18	0.04 - 0.88	0/18	44.22	0/18	0.39	0/18	91	NA	NA
Pentachlorophenol	0.24 - 300	SPX-3-BP	16/18	0.18 - 3.1	13/18	2.98	16/18	0.077	10/18	8	9/18	11

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
PRG = Preliminary Remediation Goal.

Table 4-59

STATISTICAL ANALYSIS OF RESULTS FROM FACILITY EAST TREATMENT AREA SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.00043 - 76.23	XC1-05	21/37	-	16/37	0.062	14/37	2.32	16/37	0.137	4/37	30
Benzo(a)anthracene	0.034 - 85	XC1-05	20/37	0.035 - 0.4	15/37	0.621	4/37	23.23	14/37	1.370	NA	NA
Benzo(a)pyrene	0.046 - 57	XC1-05	17/37	0.035 - 0.4	16/37	0.062	14/37	2.32	16/37	0.137	3/37	30
Benzo(b)fluoranthene	0.042 - 79	XC1-05	18/37	0.035 - 0.4	15/37	0.621	4/37	23.23	14/37	1.370	NA	NA
Benzo(k)fluoranthene	0.035 - 19	XC1-07	18/37	0.035 - 0.8	7/37	6.215	0/37	232.30	3/37	13.699	NA	NA
Chrysene	0.035 - 80	XC1-05	20/37	0.035 - 0.4	1/37	62.148	0/37	2322.99	0/37	136.986	NA	NA
Dibenzo(a,h)anthracene	0.049 - 1.2	SP-09	13/37	0.035 - 0.8	12/37	0.062	0/37	2.32	11/37	0.137	NA	NA
Indeno(1,2,3-cd)pyrene	0.089 - 15	XC1-05	16/37	0.035 - 0.4	14/37	0.621	0/37	23.23	9/37	1.370	NA	NA
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.069 - 120	XC1-05	20/37	0.035 - 0.079	3/37	55.92	7/37	23.51	0/37	1600	NA	NA
Acenaphthene	0.064 - 130	XC1-05	18/37	0.035 - 0.4	0/37	3681.71	0/37	284.05	0/37	4800	NA	NA
Acenaphthylene	0.038 - 0.047	XC1-01	2/37	0.035 - 0.8	0/37	3681.71	0/37	284.05	0/37	4800	NA	NA
Anthracene	0.35 - 660	XC1-05	18/37	0.035 - 0.4	0/37	21896.12	0/37	6777.61	0/37	24000	NA	NA
Benzo(g,h,i)perylene	0.063 - 11	XC1-05	16/37	0.035 - 0.4	0/37	2308.68	0/37	1959.13	0/37	2400	NA	NA
Fluoranthene	0.051 - 530	XC1-05	24/37	0.035 - 0.042	0/37	2293.61	0/37	6287.36	0/37	3200	NA	NA
Fluorene	0.063 - 100	XC1-05	18/37	0.035 - 0.4	0/37	2643.61	0/37	304.64	0/37	3200	NA	NA
Naphthalene	0.037 - 270	XC1-07	22/37	0.037 - 0.079	3/37	55.92	7/37	23.51	0/37	1600	NA	NA
ncPAH	0.038 - 2338.2	XC1-05	26/37	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.033 - 700	XC1-05	20/37	0.037 - 0.042	0/37	21896.12	0/37	6777.61	0/37	24000	NA	NA
Pyrene	0.048 - 150	XC1-07	24/37	0.035 - 0.042	0/37	2308.68	0/37	1959.13	0/37	2400	NA	NA
Other Organics (mg/kg)												
2-Nitroaniline	0.035	XC1-01	1/37	0.035 - 0.8	0/37	3.49	0/37	0.08	0/37	5	NA	NA
3,3'-Dichlorobenzidine	0.034	XC1-01	1/37	0.14 - 3.2	0/37	1.08	0/37	0.03	0/37	2	NA	NA
3-Nitroaniline	0.24	XC2-01	1/37	0.14 - 3.2	0/37	3.49	0/37	1.79	0/37	240	NA	NA
4-Chloroaniline	10	XC2-04	1/37	0.035 - 0.8	0/37	244.41	1/37	0.78	0/37	320	NA	NA
4-Chlorophenyl-phenylether	0.037	SP-02	1/37	0.035 - 0.8	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	0.43	XC1-03	1/37	0.14 - 3.2	0/37	3.49	0/37		0/37	240	NA	NA
Benzoic acid	0.18	XC2-02	1/37	0.71 - 16	0/37	100000.00	0/37	263.04	0/37	320000	NA	NA
Carbazole	0.32 - 5.4	XC1-03	13/37	0.035 - 0.4	0/37	24.32	0/37		0/37	50	NA	NA
Dibenzofuran	0.089 - 64	XC1-05	17/37	0.035 - 0.4	0/37	290.53	3/37	29.93	0/37	320	NA	NA
Hexachloroethane	0.19	XC2-01	1/37	0.035 - 0.8	0/37	34.74	0/37	2.30	0/37	71	NA	NA
n-Nitroso-di-n-propylamine	0.43 - 0.53	SP-03	2/37	0.035 - 0.8	2/37	0.07	2/37	0.00	2/37	0	NA	NA
N-nitrosodiphenylamine	0.95 - 6.4	SP-10	2/37	0.035 - 0.8	0/37	99.26	1/37	1.24	0/37	204	NA	NA
Nitrobenzene	0.037	SP-02	1/37	0.035 - 0.8	0/37	19.64	0/37	0.05	0/37	40	NA	NA
Phenols (mg/kg)												
4-Nitrophenol	0.34	XC1-07	1/37	0.14 - 3.2	0/37	488.82	0/37	11.70	0/37	640	NA	NA
Pentachlorophenol	0.054 - 810	XC1-05	28/37	0.14 - 0.16	18/37	2.98	27/37	0.077	15/37	8	13/37	11

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
PRG = Preliminary Remediation Goal.

Table 4-60

SUMMARY OF RESULTS FROM SOUTH SLOPE SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number		99070538	99070539	99070540	99070541	99070542	99070543	99070544	99070545
Sample Location	Preliminary	MWLSC04	MWLSC04	MWLSC01	MWLSC01	MWLSC01	MWLSC03	MWLSC03	MWLSC02
Sample Depth (feet bgs)	Screening	4-6	12-14	10-12	18-20	34-36	28-30	32-34	10-12
Sample Date	Levels	8/2/99	8/2/99	8/6/99	8/6/99	8/6/99	8/7/99	8/7/99	8/7/99
SVOCs (mg/kg)									
2-Methylnaphthalene	56[b]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0043	0.0024 U	0.0024 U	0.0021 UJ
Acenaphthylene	3700	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0023 U	0.0028	0.0024 U	0.0021 U
Anthracene	22,000[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Benzo(a)pyrene	0.062[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0057 JN	0.0024 U	0.0024 U	0.0021 U
Benzo(b)fluoranthene	0.62[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.003	0.0024 U	0.0024 U	0.0021 U
Chrysene	62[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Fluoranthene	2,300[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Fluorene	2,600[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0027	0.0031	0.0027	0.0021 U
Naphthalene	56[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0023 U	0.0024 U	0.0024 U	0.0021 U
Phenanthrene	22,000[b]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0085	0.0024 U	0.0024 U	0.0021 U
Pyrene	2300[a]	0.0021 U	0.002 U	0.0021 U	0.0024 U	0.0018 J	0.0024 U	0.0024 U	0.0021 U
TOC	NA	NT	NT	NT	2100	NT	NT	1300	NT
Petroleum Hydrocarbons (mg/kg)									
m&p-Xylene	210[a]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)									
2,3,7,8-TCDD TEQ	3.9[a]	NT	NT	NT	0.0426	NT	NT	NA	NT
1,2,3,4,6,7,8-HpCDD	NA	NT	NT	NT	4.262	NT	NT	0.791 U	NT
OCDD	NA	NT	NT	NT	50.241 U	NT	NT	13.933 U	NT
OCDF	NA	NT	NT	NT	6.37 U	NT	NT	0.883 U	NT
Total HpCDD	NA	NT	NT	NT	4.262	NT	NT	0.791 U	NT

Key is at the end of the table.

Table 4-60 (CONTINUED)

SUMMARY OF RESULTS FROM SOUTH SLOPE SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte		99070546	99070547	99070587	99070588	99070589	99070590	99070591	99070592	99070593
Sample Location	Preliminary	MWLSC02	MWLSC02	B-AA2	B-AA4	B-AA4	B-AA4	B-AA6	B-AA6	B-BB5
Sample Depth (feet bgs)	Screening	22-24	30-32	6-8	36-38	6-8	18-20	6-8	18-20	4-6
Sample Date	Levels	8/7/99	8/7/99	8/5/99	8/5/99	8/5/99	8/5/99	8/5/99	8/5/99	8/6/99
SVOCs (mg/kg)										
2-Methylnaphthalene	56[b]	0.0022 UJ	0.0026 UJ	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0021 U	0.0022 U
Acenaphthylene	3700	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0021 U	0.0022 U
Anthracene	2,2000[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0023	0.0022 U
Benzo(a)pyrene	0.062[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0021 U	0.0022 U
Benzo(b)fluoranthene	0.62[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0021 U	0.0022 U
Chrysene	62[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0023	0.0022 U
Fluoranthene	2,300[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0051	0.0022 U
Fluorene	2,600[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0021 U	0.0022 U
Naphthalene	56[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0021 U	0.0022 U
Phenanthrene	22,000[b]	0.0022 U	0.0029	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0066	0.0022 U
Pyrene	2300[a]	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0025 U	0.0022 U	0.0025 U	0.0041	0.0022 U
TOC	NA	NT	NT	2800	NT	2000	1600	1300	NT	NT
Petroleum Hydrocarbons (mg/kg)										
m&p-Xylene	210[a]	0.5 U	0.63	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)										
2,3,7,8-TCDD TEQ	3.9[a]	NT	NT	0.154	0.0219	NA	NA	NA	NT	NA
1,2,3,4,6,7,8-HpCDD	NA	NT	NT	14.097	23.42 U	0.82 U	1.23 U	0.933 U	NT	0.809 U
OCDD	NA	NT	NT	118.923	210.196	4.108 U	18.627 U	11.254 U	NT	14.481 U
OCDF	NA	NT	NT	6.876	9.07	0.976 U	0.648 U	1.018 U	NT	0.914 U
Total HpCDD	NA	NT	NT	14.097	27.597	0.82 U	0.956 U	0.933 U	NT	0.809 U

Key is at the end of the table.

Table 4-60 (CONTINUED)

SUMMARY OF RESULTS FROM SOUTH SLOPE SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte		99070594	99070595	99070596	99070597
Sample Location	Preliminary	B-BB5	B-BB5	B-BB3	B-BB3
Sample Depth (feet bgs)	Screening	16-18	18-20	2-4	18-20
Sample Date	Levels	8/6/99	8/6/99	8/6/99	8/6/99
SVOCs (mg/kg)					
2-Methylnaphthalene	56[b]	NT	0.0021 U	0.0025 U	0.0023 U
Acenaphthylene	3700	NT	0.0021 U	0.0025 U	0.0023 U
Anthracene	2,2000[a]	NT	0.0021 U	0.0025 U	0.0023 U
Benzo(a)pyrene	0.062[a]	NT	0.0021 U	0.0025 U	0.0023 U
Benzo(b)fluoranthene	0.62[a]	NT	0.0021 U	0.0025 U	0.0023 U
Chrysene	62[a]	NT	0.0021 U	0.0025 U	0.0023 U
Fluoranthene	2,300[a]	NT	0.0021 U	0.0025 U	0.0023 U
Fluorene	2,600[a]	NT	0.0021 U	0.0025 U	0.0023 U
Naphthalene	56[a]	NT	0.0021 U	0.0025 U	0.002 J
Phenanthrene	22,000[b]	NT	0.0021 U	0.0025 U	0.0023 U
Pyrene	2300[a]	NT	0.0021 U	0.0025 U	0.0023 U
TOC	NA	NT	NT	NT	NT
Petroleum Hydrocarbons (mg/kg)					
m&p-Xylene	210[a]	0.5 U	0.5 U	0.5 U	0.5 U
Dioxin/Furans (ng/kg)					
2,3,7,8-TCDD TEQ	3.9[a]	NA	NA	NT	NT
1,2,3,4,6,7,8-HpCDD	NA	0.609 U	0.673 U	NT	NT
OCDD	NA	12.531 U	10.462 U	NT	NT
OCDF	NA	0.816 U	0.64 U	NT	NT
Total HpCDD	NA	0.609 U	0.673 U	NT	NT

Key is on the next page.

[a] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[b] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Note: PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

Table 4-60 (CONTINUED)

SUMMARY OF RESULTS FROM SOUTH SLOPE SUBSURFACE SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

bgs	= Below ground surface.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identified and the numerical result is estimated.
mg/kg	= Milligrams per kilogram.
NA	= Not applicable.
NT	= Not tested.
ng/kg	= Nanograms per kilogram.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PSLs	= Preliminary screening levels.
SVOCs	= Semivolatile organic compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic carbon.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-61

STATISTICAL ANALYSIS OF RESULTS FROM SOUTH SLOPE SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

No analytes detected.

Key:

bgs = Below ground surface.

Table 4-62

STATISTICAL ANALYSIS OF RESULTS FROM SOUTH SLOPE SUBSURFACE (6 TO <12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
Dioxins/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	14.097	B-AA2	1/3	0.82 - 0.933	0/3	390	0/3	31384	0/3	666.7	NA	NA
2,3,7,8-TCDD TEQ	0.1535499	B-AA2	1/3	-	0/3	3.9	0/3	314	0/3	6.7	0/3	5
OCDD	118.923	B-AA2	1/3	4.108 - 11.254	0/3	39000	0/3	3138357	0/3	666666.7	NA	NA
OCDF	6.876	B-AA2	1/3	0.976 - 1.018	0/3	39000	0/3	3138357	0/3	66666.7	NA	NA
Total HpCDD	14.097	B-AA2	1/3	0.82 - 0.933	NA	NA	NA	NA	NA	NA	NA	NA

Key:

bgs = Below ground surface.
HpCDD = Heptachlorodibenzo-p-dioxin.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.

Table 4-63

STATISTICAL ANALYSIS OF RESULTS FROM SOUTH SLOPE SUBSURFACE (>12 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.0000023 - 0.006	MWLSC01	2/13	-	0/13	0.062	0/13	2.32	0/13	0.137	0/13	30
Benzo(a)pyrene	0.0057	MWLSC01	1/13	0.002 - 0.0026	0/13	0.062	0/13	2.32	0/13	0.137	0/13	30
Benzo(b)fluoranthene	0.003	MWLSC01	1/13	0.002 - 0.0026	0/13	0.621	0/13	23.23	0/13	1.370	NA	NA
Chrysene	0.0023	MWLSC01	1/13	0.002 - 0.0026	0/13	62.148	0/13	2322.99	0/13	136.986	NA	NA
Dioxin/Furans (ng/kg)												
1,2,3,4,6,7,8-HpCDD	4.262	MWLSC01	1/6	0.609 - 23.42	0/6	390	0/6	31384	0/6	666.7	NA	NA
2,3,7,8-TCDD TEQ	0.0219 - 0.0426	MWLSC01	2/6	-	0/6	3.9	0/6	314	0/6	6.7	0/6	5
OCDD	210.196	B-AA4	1/6	10.462 - 50.241	0/6	39000	0/6	3138357	0/6	66666.7	NA	NA
OCDF	9.07	B-AA4	1/6	0.64 - 6.37	0/6	39000	0/6	3138357	0/6	66666.7	NA	NA
Total HpCDD	4.262 - 27.597	B-AA4	2/6	0.609 - 0.956	NA	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.0043	MWLSC01	1/13	0.002 - 0.0026	0/13	55.92	0/13	23.51	0/13	1600	NA	NA
Acenaphthylene	0.0028	MWLSC03	1/13	0.002 - 0.0026	0/13	3681.71	0/13	284.05	0/13	4800	NA	NA
Anthracene	0.0023	MWLSC01	1/13	0.002 - 0.0026	0/13	21896.12	0/13	6777.61	0/13	24000	NA	NA
Fluoranthene	0.0051	B-AA6	1/13	0.002 - 0.0026	0/13	2293.61	0/13	6287.36	0/13	3200	NA	NA
Fluorene	0.0027 - 0.0031	MWLSC03	3/13	0.002 - 0.0026	0/13	2643.61	0/13	304.64	0/13	3200	NA	NA
Naphthalene	0.002	MWLSC04	1/13	0.002 - 0.0026	0/13	55.92	0/13	23.51	0/13	1600	NA	NA
ncPAH	0.002 - 0.0181	B-AA6	6/6	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0029 - 0.0085	MWLSC01	3/13	0.002 - 0.0025	0/13	21896.12	0/13	6777.61	0/13	24000	NA	NA
Pyrene	0.0018 - 0.0041	B-AA6	2/13	0.002 - 0.0026	0/13	2308.68	0/13	1959.13	0/13	2400	NA	NA
Other Organics (mg/kg)												
m&p-Xylene	0.63	MWLSC02	1/13	0.5 - 0.5	0/13	210.00	0/13	448.67	0/13	160000	NA	NA
VPH	0.63	MWLSC02	1/1	-	NA	NA	0/1	30.00	NA	NA	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
HpCDD = Heptachlorodibenzo-p-dioxin.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDD = Octochlorodibenzo-p-dioxin.
OCDF = Octochlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.

Table 4-64

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK TRENCH SAMPLES THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Sample Number	PSLs[a]	99070647	99070648	99070649
Sample Location		TT01-B	TT01-SW	TT01-BW
Sample Depth (feet bgs)		6-6	4-4	2.5-2.5
Sample Date		8/5/99	8/5/99	8/5/99
SVOCs (mg/kg)				
2-Methylnaphthalene	56[b]	0.002 U	0.041	0.0019 U
Acenaphthylene	3700[b]	0.002	0.0021 U	0.0019 U
Anthracene	22000[b]	0.0022	0.006	0.0019 U
Benzo(a)anthracene	0.62[b]	0.002 U	0.0033	0.0019 U
Benzo(a)pyrene	0.062[b]	0.0026	0.0074	0.0019 U
Benzo(b)fluoranthene	0.62[b]	0.002 U	0.0034 J	0.0019 U
Benzo(g,h,i)perylene	2300[b]	0.0048	0.0078	0.0019 U
Benzo(j)fluoranthene	1.37[c]	0.02 U	0.0034 J	0.019 U
Benzo(k)fluoranthene	6.2[b]	0.002 U	0.0034 J	0.0019 U
Chrysene	62[b]	0.0024	0.0054	0.0019 U
Dibenzofuran	290[b]	0.0099 U	0.011	0.0095 U
Fluoranthene	2300[b]	0.002 U	0.0037	0.0019 U
Fluorene	2600[b]	0.0018 J	0.0021 U	0.0019 U
Indeno(1,2,3-cd)pyrene	0.62[b]	0.004	0.0058	0.0019 U
Naphthalene	56[b]	0.002 U	0.029	0.0019 U
Pentachlorophenol	3[b]	0.0093 J	0.01 U	0.0095 U
Phenanthrene	22000[c]	0.002 U	0.021	0.0019 U
Pyrene	2300[b]	0.002 U	0.006	0.0019 U
TOC	NA	NT	NT	2000
Dioxin/Furans (ng/kg)				
2,3,7,8-TCDD TEQ	3.9[b]	NT	NT	0.0008421
OCDF	NA	NT	NT	8.421
Total HpCDD	NA	NT	NT	6.755

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[c] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

bgs = Below ground surface.
EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
J = The analyte was positively identified. The associated numerical result is an estimate.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
NT = Not tested.
OCDF = Octachlorodibenzofuran.
PSLs = Preliminary screening levels.
SVOCs = Semivolatile organic compounds.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalency quotient.
TOC = Total organic carbon.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-65

STATISTICAL ANALYSIS OF RESULTS FROM LITTLE SQUALICUM CREEK SUBSURFACE (0.5 TO <6 FEET BGS) SOIL SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Groundwater Protection Standard	MTCA Method B Groundwater Protection Standard	Frequency Exceeding MTCA Method B Direct Contact Standard	MTCA Method B Direct Contact Standard	Frequency Exceeding MTCA Terrestrial Ecological Standard	MTCA Terrestrial Ecological Standard
cPAHs (mg/kg)												
B(a)P Equivalent	0.00300 - 0.00903	TT01-SW	2/3	-	0/3	0.062	0/3	2.32	0/3	0.137	0/3	30
Benzo(a)anthracene	0.0033	TT01-SW	1/3	0.0019 - 0.002	0/3	0.621	0/3	23.23	0/3	1.370	NA	NA
Benzo(a)pyrene	0.0026 - 0.0074	TT01-SW	2/3	0.0019 - 0.0019	0/3	0.062	0/3	2.32	0/3	0.137	0/3	30
Benzo(b)fluoranthene	0.0034	TT01-SW	1/3	0.0019 - 0.002	0/3	0.621	0/3	23.23	0/3	1.370	NA	NA
Benzo(j)fluoranthene	0.0034	TT01-SW	1/3	0.019 - 0.02	0/3	0.621	0/3	23.23	0/3	1.370	NA	NA
Benzo(k)fluoranthene	0.0034	TT01-SW	1/3	0.0019 - 0.002	0/3	6.215	0/3	232.30	0/3	13.699	NA	NA
Chrysene	0.0024 - 0.0054	TT01-SW	2/3	0.0019 - 0.0019	0/3	62.148	0/3	2322.99	0/3	136.986	NA	NA
Indeno(1,2,3-cd)pyrene	0.004 - 0.0058	TT01-SW	2/3	0.0019 - 0.0019	0/3	0.621	0/3	23.23	0/3	1.370	NA	NA
Dioxins/Furans (ng/kg)												
2,3,7,8-TCDD TEQ	0.0008421	TT01-BW	1/1	-	0/1	3.9	0/1	314	0/1	6.7	0/1	5
OCDF	8.421	TT01-BW	1/1	-	0/1	39000	0/1	3138357	0/1	66666.7	NA	NA
Total HpCDD	6.755	TT01-BW	1/1	-	NA	NA	NA	NA	NA	NA	NA	NA
ncPAHs (mg/kg)												
2-Methylnaphthalene	0.041	TT01-SW	1/3	0.0019 - 0.002	0/3	55.92	0/3	23.51	0/3	1600	NA	NA
Acenaphthylene	0.002	TT01-B	1/3	0.0019 - 0.0021	0/3	3681.71	0/3	284.05	0/3	4800	NA	NA
Anthracene	0.0022 - 0.006	TT01-SW	2/3	0.0019 - 0.0019	0/3	21896.12	0/3	6777.61	0/3	24000	NA	NA
Benzo(g,h,i)perylene	0.0048 - 0.0078	TT01-SW	2/3	0.0019 - 0.0019	0/3	2308.68	0/3	1959.13	0/3	2400	NA	NA
Fluoranthene	0.0037	TT01-SW	1/3	0.0019 - 0.002	0/3	2293.61	0/3	6287.36	0/3	3200	NA	NA
Fluorene	0.0018	TT01-B	1/3	0.0019 - 0.0021	0/3	2643.61	0/3	304.64	0/3	3200	NA	NA
Naphthalene	0.029	TT01-SW	1/3	0.0019 - 0.002	0/3	55.92	0/3	23.51	0/3	1600	NA	NA
ncPAH	0.0108 - 0.1145	TT01-SW	2/2	-	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.021	TT01-SW	1/3	0.0019 - 0.002	0/3	21896.12	0/3	6777.61	0/3	24000	NA	NA
Pyrene	0.006	TT01-SW	1/3	0.0019 - 0.002	0/3	2308.68	0/3	1959.13	0/3	2400	NA	NA
Other Organics (mg/kg)												
Dibenzofuran	0.011	TT01-SW	1/3	0.0095 - 0.0099	0/3	290.53	0/3	29.93	0/3	320	NA	NA
Phenols (mg/kg)												
Pentachlorophenol	0.0093	TT01-B	1/3	0.0095 - 0.01	0/3	2.98	0/3	0.077	0/3	8	0/3	11

Key:

B(a)P = Benzo(a)pyrene.
bgs = Below ground surface.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
HpCDD = Heptachlorodibenzo-p-dioxin.
mg/kg = Milligrams per kilogram.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
ng/kg = Nanograms per kilogram.
OCDF = Octachlorodibenzofuran.
PRG = Preliminary Remediation Goal.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalent quotient.

Table 4-66

SOIL SAMPLE RESULTS VERSUS SPLP RESULTS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Analyte	Location	Sample Date	Depth Top	Depth Bottom	Soil Result	SPLP Result
Semivolatile Organic Compounds						**(mg/kg)**	**(µg/L)**
99070549	Anthracene	B-N3	8/3/99	0	0.5	79	1 U
99070549	Phenanthrene	B-N3	8/3/99	0	0.5	11	1 U
99070549	Pentachlorophenol	B-N3	8/3/99	0	0.5	18	10 U
99070549	Fluorene	B-N3	8/3/99	0	0.5	12	1 U
99070549	Pyrene	B-N3	8/3/99	0	0.5	7.5	1 U
99070549	Dibenzofuran	B-N3	8/3/99	0	0.5	3.7	1 U
99070549	Acenaphthene	B-N3	8/3/99	0	0.5	0.21	1 U
99070549	Acenaphthylene	B-N3	8/3/99	0	0.5	1.2	1 U
99070549	Benzo(a)anthracene	B-N3	8/3/99	0	0.5	5.9	1 U
99070549	Chrysene	B-N3	8/3/99	0	0.5	43	1 U
99070549	Benzo(b)fluoranthene	B-N3	8/3/99	0	0.5	5 J	1 U
99070549	Benzo(k)fluoranthene	B-N3	8/3/99	0	0.5	5 J	1 U
99070549	Benzo(a)pyrene	B-N3	8/3/99	0	0.5	8	1 U
99070549	Indeno(1,2,3-cd)pyrene	B-N3	8/3/99	0	0.5	3.3	1 U
99070549	Benzo(g,h,i)perylene	B-N3	8/3/99	0	0.5	3.9	1 U
99070549	Fluoranthene	B-N3	8/3/99	0	0.5	5.4	1 U
99070549	Tetrachlorophenols	B-N3	8/3/99	0	0.5	1.8	1 U
99070549	7,12-Dimethylbenz(a)anthracene	B-N3	8/3/99	0	0.5	0.51 JN	1 U
99070549	Benzo(j)fluoranthene	B-N3	8/3/99	0	0.5	5 J	1 U
99070549	Dibenzo(a,h)acridine	B-N3	8/3/99	0	0.5	0.22 JN	1 U
99070549	Dibenzo(a,j)acridine	B-N3	8/3/99	0	0.5	0.19 JN	1 U
99070549	Dibenzo(a,e)pyrene	B-N3	8/3/99	0	0.5	0.84	1 U
99070549	Dibenzo(a,h)pyrene	B-N3	8/3/99	0	0.5	0.56	1 U
99070549	Dibenzo(a,i)pyrene	B-N3	8/3/99	0	0.5	0.19	1 U
99070549	Dibenzo(a,h)anthracene	B-N3	8/3/99	0	0.5	0.95	1 U
99070549	2-Methylnaphthalene	B-N3	8/3/99	0	0.5	2.6	1 U
99070549	Naphthalene	B-N3	8/3/99	0	0.5	2.1	1 U
99070553	Dibenzo(a,j)acridine	B-J2	8/3/99	2	4	0.16 JN	1 U
99070553	Dibenzo(a,e)pyrene	B-J2	8/3/99	2	4	0.6 J	1 U
99070553	Dibenzo(a,h)pyrene	B-J2	8/3/99	2	4	0.12 J	1 U
99070553	7H-Dibenzo(c,g)carbazole	B-J2	8/3/99	2	4	0.058 JN	1 U
99070553	Indeno(1,2,3-cd)pyrene	B-J2	8/3/99	2	4	1.7 J	1 U
99070553	Anthracene	B-J2	8/3/99	2	4	13 J	1 U
99070553	Fluoranthene	B-J2	8/3/99	2	4	120 J	14
99070553	Pyrene	B-J2	8/3/99	2	4	73 J	8.9
99070553	Pentachlorophenol	B-J2	8/3/99	2	4	490	1400
99070553	Benzo(a)anthracene	B-J2	8/3/99	2	4	22 J	1 U
99070553	Chrysene	B-J2	8/3/99	2	4	23 J	1
99070553	Benzo(b)fluoranthene	B-J2	8/3/99	2	4	6.2 J	1 U
99070553	Benzo(k)fluoranthene	B-J2	8/3/99	2	4	6.2 J	1 U
99070553	Benzo(a)pyrene	B-J2	8/3/99	2	4	8.4 J	1 U
99070553	Acenaphthylene	B-J2	8/3/99	2	4	1.2 J	2.3
99070553	Acenaphthene	B-J2	8/3/99	2	4	29 J	56
99070553	Phenanthrene	B-J2	8/3/99	2	4	4.2 J	2
99070553	Dibenzofuran	B-J2	8/3/99	2	4	0.73 J	2.8
99070553	Fluorene	B-J2	8/3/99	2	4	7.2 J	13
99070553	Benzo(g,h,i)perylene	B-J2	8/3/99	2	4	1.9 J	1 U
99070553	Dibenzo(a,h)anthracene	B-J2	8/3/99	2	4	0.79 J	1 U
99070553	Tetrachlorophenols	B-J2	8/3/99	2	4	3	NA
99070553	Benzo(j)fluoranthene	B-J2	8/3/99	2	4	6.2 J	1 U
99070553	7,12-Dimethylbenz(a)anthracene	B-J2	8/3/99	2	4	0.54 JN	1 U
99070558	Phenanthrene	B-F3	8/3/99	10	12	0.0024 JN	1 U
99070558	1,2,4-Trichlorobenzene	B-F3	8/3/99	10	12	0.0021 J	1 U
99070562	2,4-Dinitrotoluene	B-D7	8/3/99	6	8	0.053 JN	1 U
99070564	Naphthalene	B-B13	8/4/99	4	6	1.5 J	10 J

Key is at the end of the table.

Table 4-66 (CONTINUED)

SOIL SAMPLE RESULTS VERSUS SPLP RESULTS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Analyte	Location	Sample Date	Depth Top	Depth Bottom	Soil Result	SPLP Result
Semivolatile Organic Compounds						**(mg/kg)**	**(µg/L)**
99070564	2-Methylnaphthalene	B-B13	8/4/99	4	6	6.9 J	37 J
99070564	Acenaphthene	B-B13	8/4/99	4	6	1.4 J	8.9 J
99070564	Chrysene	B-B13	8/4/99	4	6	0.16 J	1 U
99070564	Benzo(j)fluoranthene	B-B13	8/4/99	4	6	0.0099 J	1 U
99070564	Phenanthrene	B-B13	8/4/99	4	6	5 J	11 J
99070564	Dibenzofuran	B-B13	8/4/99	4	6	0.58 J	2.4 J
99070564	Fluorene	B-B13	8/4/99	4	6	2.2 J	8.1 J
99070564	Pentachlorophenol	B-B13	8/4/99	4	6	96 J	960 J
99070564	Anthracene	B-B13	8/4/99	4	6	0.71 J	1.4 J
99070564	Fluoranthene	B-B13	8/4/99	4	6	0.5 J	1 U
99070564	Pyrene	B-B13	8/4/99	4	6	0.69 J	1 U
99070564	Benzo(a)anthracene	B-B13	8/4/99	4	6	0.11 J	1 U
99070564	Carbazole	B-B13	8/4/99	4	6	NA	1.7 J
99070571	Phenanthrene	B-J20	8/4/99	2	4	0.013	1 UJ
99070571	Acenaphthylene	B-J20	8/4/99	2	4	0.0017 JQ	1 UJ
99070571	Anthracene	B-J20	8/4/99	2	4	0.067	1 UJ
99070571	Benzo(k)fluoranthene	B-J20	8/4/99	2	4	0.0015 JQ	1 UJ
99070571	Pyrene	B-J20	8/4/99	2	4	0.0052	1 UJ
99070571	Benzo(b)fluoranthene	B-J20	8/4/99	2	4	0.0048	1 UJ
99070572	Naphthalene	B-J20	8/4/99	8	10	0.0022	1 U
99070575	Naphthalene	B-L25	8/4/99	0	0.5	0.0018 JQ	1 U
99070612	Naphthalene	MW29-S	8/9/99	12	14	0.025	1 U
99070612	2-Methylnaphthalene	MW29-S	8/9/99	12	14	0.017 J	1 U
99070612	Phenanthrene	MW29-S	8/9/99	12	14	0.0022	1 U
99070612	Dibenzofuran	MW29-S	8/9/99	12	14	0.0026 J	1 U
99070622	Phenanthrene	B-L30	8/9/99	0	0.5	0.11	1 U
99070622	Chrysene	B-L30	8/9/99	0	0.5	0.9	1 U
99070622	Benzo(a)anthracene	B-L30	8/9/99	0	0.5	0.24	1 U
99070622	Pyrene	B-L30	8/9/99	0	0.5	0.41	1 U
99070622	Fluoranthene	B-L30	8/9/99	0	0.5	0.33	1 U
99070622	Benzo(j)fluoranthene	B-L30	8/9/99	0	0.5	0.36 J	1 U
99070622	Tetrachlorophenols	B-L30	8/9/99	0	0.5	0.062 J	NA
99070622	Benzo(a)pyrene	B-L30	8/9/99	0	0.5	0.29	1 U
99070622	Benzo(k)fluoranthene	B-L30	8/9/99	0	0.5	0.36 J	1 U
99070622	Benzo(b)fluoranthene	B-L30	8/9/99	0	0.5	0.36 J	1 U
99070622	2-Methylnaphthalene	B-L30	8/9/99	0	0.5	0.031	1 U
99070622	Naphthalene	B-L30	8/9/99	0	0.5	0.033	1 U
99070622	Anthracene	B-L30	8/9/99	0	0.5	0.22	1 U
99070622	Pentachlorophenol	B-L30	8/9/99	0	0.5	1.8	10 U
99070622	Acenaphthylene	B-L30	8/9/99	0	0.5	0.092	1 U
99070622	Fluorene	B-L30	8/9/99	0	0.5	0.04	1 U
99070622	Dibenzofuran	B-L30	8/9/99	0	0.5	0.017 J	1 U
99070627	Benzo(k)fluoranthene	B-R28	8/10/99	0	0.5	0.081 J	1 U
99070627	Benzo(a)pyrene	B-R28	8/10/99	0	0.5	0.16 JN	1 U
99070627	Benzo(b)fluoranthene	B-R28	8/10/99	0	0.5	0.081 J	1 U
99070627	3&4-Methylphenol	B-R28	8/10/99	0	0.5	0.082 J	NA
99070627	Tetrachlorophenols	B-R28	8/10/99	0	0.5	0.31 J	NA
99070627	Fluoranthene	B-R28	8/10/99	0	0.5	0.1	1 U
99070627	Fluorene	B-R28	8/10/99	0	0.5	0.057	1 U
99070627	Anthracene	B-R28	8/10/99	0	0.5	0.26	1 U
99070627	Phenanthrene	B-R28	8/10/99	0	0.5	0.12	1 U
99070627	Benzo(j)fluoranthene	B-R28	8/10/99	0	0.5	0.081 J	1 U
99070627	Pentachlorophenol	B-R28	8/10/99	0	0.5	5.2	10 U
99070627	2-Methylnaphthalene	B-R28	8/10/99	0	0.5	0.035	1 U
99070627	Chrysene	B-R28	8/10/99	0	0.5	0.14	1 U

Key is at the end of the table.

Table 4-66 (CONTINUED)

SOIL SAMPLE RESULTS VERSUS SPLP RESULTS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Analyte	Location	Sample Date	Depth Top	Depth Bottom	Soil Result	SPLP Result
Semivolatile Organic Compounds						**(mg/kg)**	**(µg/L)**
99070627	Benzo(a)anthracene	B-R28	8/10/99	0	0.5	0.061	1 U
99070627	Naphthalene	B-R28	8/10/99	0	0.5	0.028	1 U
99070627	Pyrene	B-R28	8/10/99	0	0.5	0.15	1 U
99070627	Acenaphthylene	B-R28	8/10/99	0	0.5	0.031	1 U
99070627	Dibenzofuran	B-R28	8/10/99	0	0.5	0.021 J	1 U
99070657	Acenaphthylene	B-B16	8/12/99	0	0	0.015	1 U
99070657	Dibenzofuran	B-B16	8/12/99	0	0	0.0087	1 U
99070657	Benzoic acid	B-B16	8/12/99	0	0	0.057 J	10 UJ
99070657	2,4-Dichlorophenol	B-B16	8/12/99	0	0	0.012	1 U
99070657	2-Methylnaphthalene	B-B16	8/12/99	0	0	0.054	1 U
99070657	Fluorene	B-B16	8/12/99	0	0	0.023	1 U
99070657	Benzo(b)fluoranthene	B-B16	8/12/99	0	0	0.065 J	1 U
99070657	Naphthalene	B-B16	8/12/99	0	0	0.012	1 U
99070657	Indeno(1,2,3-cd)pyrene	B-B16	8/12/99	0	0	0.036	1 U
99070657	Dibenzo(a,h)anthracene	B-B16	8/12/99	0	0	0.0085	1 U
99070657	Benzo(g,h,i)perylene	B-B16	8/12/99	0	0	0.03	1 U
99070657	Tetrachlorophenols	B-B16	8/12/99	0	0	0.035	NA
99070657	Benzo(j)fluoranthene	B-B16	8/12/99	0	0	0.065 J	1 U
99070657	Dibenzo(a,j)acridine	B-B16	8/12/99	0	0	0.0035 JN	1 U
99070657	Dibenzo(a,e)pyrene	B-B16	8/12/99	0	0	0.006	1 U
99070657	Dibenzo(a,h)pyrene	B-B16	8/12/99	0	0	0.004	1 U
99070657	Fluoranthene	B-B16	8/12/99	0	0	0.11	1 U
99070657	Pentachlorophenol	B-B16	8/12/99	0	0	1.4	10 UJ
99070657	Phenanthrene	B-B16	8/12/99	0	0	0.043	1 U
99070657	Benzo(a)pyrene	B-B16	8/12/99	0	0	0.12	1 U
99070657	Benzo(k)fluoranthene	B-B16	8/12/99	0	0	0.065 J	1 U
99070657	Pyrene	B-B16	8/12/99	0	0	0.091	1 UJ
99070657	Benzo(a)anthracene	B-B16	8/12/99	0	0	0.079	1 U
99070657	Chrysene	B-B16	8/12/99	0	0	0.14 J	1 U
99070657	Anthracene	B-B16	8/12/99	0	0	0.037	1 U
99070657	Benzyl alcohol	B-B16	8/12/99	0	0	0.002 J	1 U
99070666	Anthracene	B-O7	8/13/99	0	0	0.064	1 U
99070666	Phenanthrene	B-O7	8/13/99	0	0	0.016	1 U
99070666	Pentachlorophenol	B-O7	8/13/99	0	0	0.28	10 UJ
99070666	Fluorene	B-O7	8/13/99	0	0	0.0085	1 U
99070666	Pyrene	B-O7	8/13/99	0	0	0.03	1 UJ
99070666	Dibenzofuran	B-O7	8/13/99	0	0	0.0039 J	1 U
99070666	Acenaphthylene	B-O7	8/13/99	0	0	0.0044	1 U
99070666	Dibenzo(a,h)anthracene	B-O7	8/13/99	0	0	0.0041	1 U
99070666	Benzo(j)fluoranthene	B-O7	8/13/99	0	0	0.027 J	1 U
99070666	Tetrachlorophenols	B-O7	8/13/99	0	0	0.012	NA
99070666	Fluoranthene	B-O7	8/13/99	0	0	0.029	1 U
99070666	Benzo(a)pyrene	B-O7	8/13/99	0	0	0.046	1 U
99070666	Benzo(k)fluoranthene	B-O7	8/13/99	0	0	0.027 J	1 U
99070666	Benzo(b)fluoranthene	B-O7	8/13/99	0	0	0.027 J	1 U
99070666	Chrysene	B-O7	8/13/99	0	0	0.079	1 U
99070666	Benzo(a)anthracene	B-O7	8/13/99	0	0	0.015	1 U
99070666	Indeno(1,2,3-cd)pyrene	B-O7	8/13/99	0	0	0.017	1 U
99070666	Benzo(g,h,i)perylene	B-O7	8/13/99	0	0	0.018	1 U
99070666	2-Methylnaphthalene	B-O7	8/13/99	0	0	0.0067	1 U
99070666	Benzoic acid	B-O7	8/13/99	0	0	0.017 J	10 UJ
99070666	Benzyl alcohol	B-O7	8/13/99	0	0	0.0017 J	1 U
99070669	Pentachlorophenol	MW29-S	8/13/99	10	12	0.035	10 UJ
99070669	Benzo(g,h,i)perylene	MW29-S	8/13/99	10	12	0.0046	1 U
99070673	Pentachlorophenol	MW28-S	8/13/99	6	8	0.71 J	12 J

Key is at the end of the table.

Table 4-66 (CONTINUED)

SOIL SAMPLE RESULTS VERSUS SPLP RESULTS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Analyte	Location	Sample Date	Depth Top	Depth Bottom	Soil Result	SPLP Result
Semivolatile Organic Compounds						**(mg/kg)**	**(µg/L)**
99070673	Phenanthrene	MW28-S	8/13/99	6	8	0.064	2.5
99070673	Pyrene	MW28-S	8/13/99	7	9	0.018	1 U
99070673	Fluoranthene	MW28-S	8/13/99	7	9	0.022	1 U
99070673	Anthracene	MW28-S	8/13/99	7	9	0.0035	1 U
99070673	Fluorene	MW28-S	8/13/99	7	9	0.027	1 U
99070673	Tetrachlorophenols	MW28-S	8/13/99	7	9	0.056	NA
99070673	Dibenzofuran	MW28-S	8/13/99	7	9	0.029	1 U
99070673	2,4-Dichlorophenol	MW28-S	8/13/99	7	9	0.0025 J	10 U
99070673	Naphthalene	MW28-S	8/13/99	7	9	0.0025	1 U
99070676	Dibenzofuran	B-M20	8/13/99	7	9	0.91	7.7 J
99070676	Acenaphthylene	B-M20	8/13/99	7	9	0.1	1 UJ
99070676	Acenaphthene	B-M20	8/13/99	7	9	5.2	15 J
99070676	Anthracene	B-M20	8/13/99	7	9	0.88	1.6 J
99070676	Fluorene	B-M20	8/13/99	7	9	4.2	11 J
99070676	Pentachlorophenol	B-M20	8/13/99	7	9	3.3	10 UJ
99070676	2-Methylnaphthalene	B-M20	8/13/99	7	9	4.9	17 J
99070676	Naphthalene	B-M20	8/13/99	7	9	0.29	1.6 J
99070676	Phenanthrene	B-M20	8/13/99	7	9	7.5	11 J
99070676	Dibenzo(a,h)pyrene	B-M20	8/13/99	7	9	0.02	1 UJ
99070676	Indeno(1,2,3-cd)pyrene	B-M20	8/13/99	7	9	0.18	1 UJ
99070676	Fluoranthene	B-M20	8/13/99	7	9	6	1.4 J
99070676	Pyrene	B-M20	8/13/99	7	9	5.4	1 UJ
99070676	Benzo(a)anthracene	B-M20	8/13/99	7	9	1.6	1 UJ
99070676	Chrysene	B-M20	8/13/99	7	9	1.4	1 UJ
99070676	Benzo(b)fluoranthene	B-M20	8/13/99	7	9	0.32 J	1 UJ
99070676	Benzo(a)pyrene	B-M20	8/13/99	7	9	0.7	1 UJ
99070676	Dibenzo(a,i)pyrene	B-M20	8/13/99	7	9	0.0044	1 UJ
99070676	Dibenzo(a,h)anthracene	B-M20	8/13/99	7	9	0.037	1 UJ
99070676	Benzo(g,h,i)perylene	B-M20	8/13/99	7	9	0.16	1 UJ
99070676	7,12-Dimethylbenz(a)anthracene	B-M20	8/13/99	7	9	0.057 JN	1 UJ
99070676	Benzo(j)fluoranthene	B-M20	8/13/99	7	9	0.32 J	1 UJ
99070676	Dibenzo(a,j)acridine	B-M20	8/13/99	7	9	0.011 JN	1 UJ
99070676	Dibenzo(a,e)pyrene	B-M20	8/13/99	7	9	0.028	1 UJ
99070676	Carbazole	B-M20	8/13/99	7	9	NA	1.2 J
99070676	Benzo(k)fluoranthene	B-M20	8/13/99	7	9	0.32 J	1 UJ
99070678	Dibenzo(a,e)pyrene	B-M20	8/14/99	20	22	0.29	1 UJ
99070678	Dibenzo(a,h)pyrene	B-M20	8/14/99	20	22	0.16	1 UJ
99070678	Dibenzo(a,i)pyrene	B-M20	8/14/99	20	22	0.023	1 UJ
99070678	Dibenzo(a,l)pyrene	B-M20	8/14/99	20	22	0.018	1 UJ
99070678	Benzo(j)fluoranthene	B-M20	8/14/99	20	22	1.9 J	1 UJ
99070678	Dibenzo(a,h)acridine	B-M20	8/14/99	20	22	0.063 JN	1 UJ
99070678	Tetrachlorophenols	B-M20	8/14/99	20	22	0.76 JN	NA
99070678	Benzo(g,h,i)perylene	B-M20	8/14/99	20	22	0.79	1 UJ
99070678	Dibenzo(a,j)acridine	B-M20	8/14/99	20	22	0.066 JN	1 UJ
99070678	Acenaphthene	B-M20	8/14/99	20	22	14	1 UJ
99070678	Acenaphthylene	B-M20	8/14/99	20	22	0.57	1 UJ
99070678	2-Methylnaphthalene	B-M20	8/14/99	20	22	1.1	1 UJ
99070678	Naphthalene	B-M20	8/14/99	20	22	0.71	1 UJ
99070678	Fluorene	B-M20	8/14/99	20	22	5.1	1 UJ
99070678	Dibenzofuran	B-M20	8/14/99	20	22	1.1	1 UJ
99070678	Pentachlorophenol	B-M20	8/14/99	20	22	48	10 UJ
99070678	Indeno(1,2,3-cd)pyrene	B-M20	8/14/99	20	22	1	1 UJ
99070678	Benzo(a)pyrene	B-M20	8/14/99	20	22	3.9	1 UJ
99070678	Benzo(b)fluoranthene	B-M20	8/14/99	20	22	1.9 J	1 UJ
99070678	Chrysene	B-M20	8/14/99	20	22	11	1 UJ

Key is at the end of the table.

Table 4-66 (CONTINUED)

SOIL SAMPLE RESULTS VERSUS SPLP RESULTS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Analyte	Location	Sample Date	Depth Top	Depth Bottom	Soil Result	SPLP Result
Semivolatile Organic Compounds						(mg/kg)	(µg/L)
99070678	Benzo(a)anthracene	B-M20	8/14/99	20	22	11	1 UJ
99070678	Pyrene	B-M20	8/14/99	20	22	47	1 UJ
99070678	Fluoranthene	B-M20	8/14/99	20	22	49	1 UJ
99070678	Anthracene	B-M20	8/14/99	20	22	6.4	1 UJ
99070678	Phenanthrene	B-M20	8/14/99	20	22	17	1 UJ
99070678	Benzo(k)fluoranthene	B-M20	8/14/99	20	22	1.9 J	1 UJ
99070685	4-Chloro-3-Methylphenol	MW35-D	8/15/99	46	48	0.0023 J	1 UJ
99070685	Pyrene	MW35-D	8/15/99	46	48	0.0011 J	1 UJ
99070685	2,4-Dinitrotoluene	MW35-D	8/15/99	46	48	0.0019 J	1 UJ
99070685	Pentachlorophenol	MW35-D	8/15/99	46	48	0.004 J	1 UJ
99080015	Acenaphthylene	MW33-S	8/19/99	20	22	0.0021 U	2.3
99080015	Anthracene	MW33-S	8/19/99	20	22	0.0021 U	7.2
99080015	Dibenzofuran	MW33-S	8/19/99	20	22	0.011 U	7.2
99080015	2-Methylnaphthalene	MW33-S	8/19/99	20	22	0.0021 U	8.3
99080015	Pyrene	MW33-S	8/19/99	20	22	0.0021 U	10 J
99080015	Fluoranthene	MW33-S	8/19/99	20	22	0.0021 U	12
99080015	Naphthalene	MW33-S	8/19/99	20	22	0.0021 U	17
99080015	Fluorene	MW33-S	8/19/99	20	22	0.0021 U	23
99080015	Phenanthrene	MW33-S	8/19/99	20	22	0.0021 U	25
99080015	Acenaphthene	MW33-S	8/19/99	20	22	0.0021 U	59 J
99080015	Pentachlorophenol	MW33-S	8/19/99	20	22	0.011 U	190 J
99080015	Phenol	MW33-S	8/19/99	20	22	0.0023 J	1 U
99080022	Benzo(j)fluoranthene	MW29-S	8/20/99	0	0	0.003 J	1 U
99080022	Tetrachlorophenols	MW29-S	8/20/99	0	0	0.0073 J	NA
99080022	Naphthalene	MW29-S	8/20/99	0	0	0.0071	1 U
99080022	2-Methylnaphthalene	MW29-S	8/20/99	0	0	0.0079	1 U
99080022	Benzoic acid	MW29-S	8/20/99	0	0	0.022 J	10 UJ
99080022	Benzo(b)fluoranthene	MW29-S	8/20/99	0	0	0.003 J	1 U
99080022	Fluoranthene	MW29-S	8/20/99	0	0	0.011	1 U
99080022	Pyrene	MW29-S	8/20/99	0	0	0.0095	1 U
99080022	Benzo(a)anthracene	MW29-S	8/20/99	0	0	0.0054	1 U
99080022	Chrysene	MW29-S	8/20/99	0	0	0.037	1 U
99080022	Indeno(1,2,3-cd)pyrene	MW29-S	8/20/99	0	0	0.0028	1 U
99080022	Benzo(k)fluoranthene	MW29-S	8/20/99	0	0	0.003 J	1 U
99080022	Benzo(a)pyrene	MW29-S	8/20/99	0	0	0.0034 J	1 U
99080022	Benzo(g,h,i)perylene	MW29-S	8/20/99	0	0	0.0032	1 U
99080022	Acenaphthene	MW29-S	8/20/99	0	0	0.002	1 U
99080022	Fluorene	MW29-S	8/20/99	0	0	0.0038	1 U
99080022	Dibenzofuran	MW29-S	8/20/99	0	0	0.0018 J	1 U
99080022	Pentachlorophenol	MW29-S	8/20/99	0	0	0.22	10 UJ
99080022	Phenanthrene	MW29-S	8/20/99	0	0	0.0067	1 U
99080022	Anthracene	MW29-S	8/20/99	0	0	0.0052	1 U
99080028	Fluorene	MW33-S	8/20/99	0	0	0.012	1 U
99080028	Pentachlorophenol	MW33-S	8/20/99	0	0	0.14	10 UJ
99080028	Phenanthrene	MW33-S	8/20/99	0	0	0.039	1 U
99080028	Dibenzofuran	MW33-S	8/20/99	0	0	0.012	1 U
99080028	Acenaphthylene	MW33-S	8/20/99	0	0	0.061	1 U
99080028	Anthracene	MW33-S	8/20/99	0	0	0.066	1 U
99080028	Tetrachlorophenols	MW33-S	8/20/99	0	0	0.01 J	NA
99080028	Acenaphthene	MW33-S	8/20/99	0	0	0.0048	1 U
99080028	Indeno(1,2,3-cd)pyrene	MW33-S	8/20/99	0	0	0.15	1 U
99080028	Dibenzo(a,h)pyrene	MW33-S	8/20/99	0	0	0.054	1 U
99080028	Dibenzo(a,e)pyrene	MW33-S	8/20/99	0	0	0.078	1 U
99080028	Benzo(j)fluoranthene	MW33-S	8/20/99	0	0	0.029 J	1 U
99080028	Dibenzo(a,h)anthracene	MW33-S	8/20/99	0	0	0.023 J	1 U

Key is at the end of the table.

Table 4-66 (CONTINUED)

SOIL SAMPLE RESULTS VERSUS SPLP RESULTS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Analyte	Location	Sample Date	Depth Top	Depth Bottom	Soil Result	SPLP Result
Semivolatile Organic Compounds						**(mg/kg)**	**(µg/L)**
99080028	Benzo(g,h,i)perylene	MW33-S	8/20/99	0	0	0.19	1 U
99080028	Benzo(a)pyrene	MW33-S	8/20/99	0	0	0.16 J	1 U
99080028	Benzo(k)fluoranthene	MW33-S	8/20/99	0	0	0.029 J	1 U
99080028	Benzo(b)fluoranthene	MW33-S	8/20/99	0	0	0.029 J	1 U
99080028	Chrysene	MW33-S	8/20/99	0	0	0.09	1 U
99080028	Benzo(a)anthracene	MW33-S	8/20/99	0	0	0.032	1 U
99080028	Pyrene	MW33-S	8/20/99	0	0	0.05	1 U
99080028	Fluoranthene	MW33-S	8/20/99	0	0	0.065	1 U
99080028	Phenol	MW33-S	8/20/99	0	0	0.006 J	1 U
99080028	2-Methylnaphthalene	MW33-S	8/20/99	0	0	0.022	1 U
99080028	Naphthalene	MW33-S	8/20/99	0	0	0.04	1 U
99080028	2,4-Dichlorophenol	MW33-S	8/20/99	0	0	0.0052 J	10 UJ
99080028	Benzoic acid	MW33-S	8/20/99	0	0	0.037 J	10 UJ
99080028	Benzyl alcohol	MW33-S	8/20/99	0	0	0.045	1 U

Key:

EPA = United States Environmental Protection Agency.
ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
mg/kg = Milligrams per kilogram.
µg/L = Micrograms per liter.
NA = Not analyzed.
SPLP = Synthetic Percipitation Leaching Procedure.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is an estimated sample quantitation limit.

Table 4-67

STATISTICAL ANALYSIS OF SPLP SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte (µg/L)	Range of Detected Concentration	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding PRGs	PRG	Frequency Exceeding MTCA B	MTCA B	Frequency Exceeding MCL	MCLs
2-Methylnaphthalene	8.3 - 37	B-B13	3/24	1 - 1	3/24	6.20	0/24	160.0	NA	NA
Acenaphthene	8.9 - 59	MW33-S	4/24	1 - 1	0/24	365.00	0/24	480.0	NA	NA
Acenaphthylene	2.3	B-J2	2/23	1 - 1	0/23	365.00	0/23	480.0	NA	NA
Anthracene	1.4 - 7.2	MW33-S	3/24	1 - 1	0/24	1825.00	0/24	2400.0	NA	NA
Carbazole	1.2 - 1.7	B-B13	2/25	1 - 1	0/25	3.36	0/25	4.4	NA	NA
Chrysene	1	B-N3	1/24	1 - 1	0/24	9.21	0/24	12.0	NA	NA
Dibenzofuran	2.4 - 7.7	B-M20	4/23	1 - 1	0/23	24.33	0/23	32.0	NA	NA
Fluoranthene	1.4 - 14	B-J2	3/23	1 - 1	0/23	1460.00	0/23	640.0	NA	NA
Fluorene	8.1 - 23	MW33-S	4/23	1 - 1	0/23	243.33	0/23	320.0	NA	NA
Naphthalene	1.6 - 17	MW33-S	3/24	1 - 1	2/24	6.20	0/24	160.0	NA	NA
Pentachlorophenol	12 - 1400	B-J2	4/24	10 - 10	4/24	0.56	4/24	0.73	4/24	1
Phenanthrene	2 - 25	MW33-S	5/22	1 - 1	0/22	1825.00	0/22	2400.0	NA	NA
Pyrene	8.9 - 10	MW33-S	2/24	1 - 1	0/24	182.50	0/24	240.0	NA	NA

Key:

MCL = Maximum contaminant level.
µg/L = Micrograms per liter.
MTCA = Model Toxics Control Act.
NA = Not applicable.
PRG = Preliminary remediation goal.
SPLP = Synthetic precipitate leaching procedure.

Table 4-68

HISTORICAL SUMMARY OF POSITIVE RESULTS FROM BACKGROUND MONITORING WELL, MW06-D
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Preliminary Screening Levels[ab]	95372644	95512175	96164174	96302373	96434085	97074076	97090552	98010523	99244016	99244017	99384015	99504048	99514008	00094082
Sample Location		MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D	MW06-D
Sample Date		9/1/99	12/18/95	4/17/96	7/24/96	10/24/96	2/12/97	9/30/97	1/26/98	6/9/99	6/9/99	9/13/99	12/10/99	12/14/99	3/1/00
Volatile Organic Compounds (µg/L)															
1,1,1-Trichloroethane	NA	NA	4.5	NA	NA	2.1	2.4	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	0.046[c]	NA	**0.55 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.12[c]	NA	**0.31 J**	NA	**1.4 J**	**1.3**	**1.6**	NA	NA	NA	NA	NA	NA	NA	NA
m&p-Xylene	1400[c]	NA	0.87 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	720[c]	NA	0.24 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1400[c]	NA	0.87 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (µg/L)															
1,3-Dichlorobenzene	5.5[c]	0.04 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	6.2[c]	NA	NA	NA	NA	NA	NA	NA	0.061	NA	NA	NA	NA	0.0066	0.034
Acenaphthene	370[c]	NA	NA	NA	NA	NA	NA	NA	0.027	0.044	NA	NA	NA	NA	NA
Anthracene	1800[c]	NA	NA	NA	NA	NA	NA	NA	0.023	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.092[c]	NA	NA	NA	NA	NA	NA	NA	0.014 J	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.0092[c]	NA	NA	NA	NA	NA	NA	NA	0.0076	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.092[c]	NA	NA	NA	NA	NA	NA	NA	0.015	NA	NA	NA	NA	NA	NA
Benzoic acid	150000[c]	NA	NA	1.8 J	NA	NA	NA	0.02 J	NA	NA	NA	NA	NA	NA	NA
Benzyl alcohol	11000[c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.041
Chrysene	9.2[c]	NA	NA	NA	NA	NA	NA	NA	0.017 J	NA	NA	NA	NA	NA	NA
Fluoranthene	1500[c]	0.026 J	NA	0.018 J	NA	NA	NA	NA	0.058	0.0099	NA	0.0047	0.0034 J	NA	0.0048
Fluorene	240[c]	NA	NA	NA	NA	NA	NA	NA	NA	0.018	NA	NA	NA	NA	0.0095
Naphthalene	6.2[c]	NA	NA	NA	NA	NA	NA	NA	0.065	NA	NA	0.0071	0.0067	NA	0.14
Pentachlorophenol	0.56[c]	NA	NA	NA	NA	NA	NA	NA	0.39	NA	NA	NA	NA	NA	0.084
Phenanthrene	1800[c]	0.033 J	NA	0.017 J	NA	NA	NA	NA	0.17	0.026	NA	0.014	NA	NA	0.022
Pyrene	180[c]	0.045 J	NA	0.13 J	NA	NA	NA	NA	0.052	0.02	NA	0.0028 J	0.0072	NA	0.0062
Fuels (µg/L)															
C10-C12 Aliphatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	24	NA	NA	NA	NA	NA
C10-C12 Aromatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	36	NA	NA	NA	NA	NA
C12-C16 Aliphatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	24	NA	NA	NA	NA	NA
C12-C16 Aromatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	24	NA	NA	NA	NA	NA
C16-C21 Aromatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NA	NA	NA	NA	NA
C21-C34 Aromatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NA	NA	NA	NA	NA
C8-C10 Aromatics	NA	NA	NA	NA	NA	NA	NA	NA	NA	36	NA	NA	NA	NA	NA

Key is at the end of the table.

Table 4-68

HISTORICAL SUMMARY OF POSITIVE RESULTS FROM BACKGROUND MONITORING WELL, MW06-D
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample ID	Preliminary Screening Levels[ab]	95372644	95512175	96164174	96302373	96434085	97074076	97090552	98010523	99244016	99244017	99384015	99504048	99514008	00094082
Sample Location		**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**	**MW06-D**
Sample Date		**9/1/99**	**12/18/95**	**4/17/96**	**7/24/96**	**10/24/96**	**2/12/97**	**9/30/97**	**1/26/98**	**6/9/99**	**6/9/99**	**9/13/99**	**12/10/99**	**12/14/99**	**3/1/00**
Dioxin/Furans (pg/L)															
2,3,7,8-TCDD TEQ	0.45[c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.002	NA	0.004	0.0004
OCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20.546	NA	35.081	4.587
Water Quality Parameters (mg/L)															
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	91	NA	83.8	87	81.8	85
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.72	NA	9.8	9.78	13.2	8.43
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.085	NA	0.067	0.054	0.057	0.0549
Hardness	NA	NA	NA	NA	NA	NA	NA	NA	NA	112.04	113.16	109	113	115	106
Nitrate+Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.68	NA	5.43	5.08	5.15	3.22
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	24	NA	20.8	19.6	19.4	21.9
TDS	NA	NA	NA	NA	NA	NA	NA	NA	NA	168	NA	184	177	171	168
TSS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.41	NA

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample Concentrations above PSLs are in bold.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

Key:

ID = Identification.
J = The analyte was positively identified. The associated numerical result is an estimate.
mg/L = Milligrams per liter.
µg/L = Micrograms per liter.
NA = Not applicable.
OCDD = Octachlorodibenzo-p-dioxin.
pg/L = Picograms per liter.
PSLs = Preliminary screening levels.
SVOCs = Semivolatile Organic Compounds.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TDS = Total dissolved solids.
TEQ = Toxicity equivalency quotient.
TSS = Total suspended solids.

Table 4-69

SUMMARY OF GROUNDWATER WELLS SAMPLED FROM 1995 THROUGH 2000
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Analyses	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S
09/95	VOCs, SVOCs, Metals	X	X	X	X	X					
12/95	VOCs, SVOCs, Metals	X	X	X	X	X					
04/96	VOCs, SVOCs, Metals	X	X	X	X	X	X	X	X	X	
07/96	VOCs, SVOCs, Metals	X	X	X	X	X	X	X	X	X	
02/97	VOCs, SVOCs, Metals	X	X	X	X	X	X	X	X	X	X
04/97	VOCs, SVOCs, Metals, WTPH-D, WTPH-G										
09/97	VOCs, SVOCs, Metals	X	X	X	X	X	X	X	X	X	X
01/98	SVOCs		X	X	X	X	X	X	X	X	X
04/98	SVOCs	X	X	X	X	X	X	X	X	X	X
07/98	SVOCs	X	X	X	X	X	X	X	X	X	
06/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH		X	X	X	X	DRY	X	X	X	FP
09/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	X	X	X	FP	X	X	X	FP
12/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	X	X	X	FP	X	X	X	FP
02/00	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	X	X	X	FP	X	X	X	FP

Key is at the end of the table.

Table 4-69

SUMMARY OF GROUNDWATER WELLS SAMPLED FROM 1995 THROUGH 2000
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Analyses	MW14-S	MW15-S	MW16-S	MW17-D	MW18-D	MW19-S	MW20-D	MW21S	MW22-S	MW23-D
09/95	VOCs, SVOCs, Metals										
12/95	VOCs, SVOCs, Metals										
04/96	VOCs, SVOCs, Metals										
07/96	VOCs, SVOCs, Metals										
02/97	VOCs, SVOCs, Metals	X	X	X							
04/97	VOCs, SVOCs, Metals, WTPH-D, WTPH-G		X		X	X	X	X		X	X
09/97	VOCs, SVOCs, Metals	X	X	X	X	X	X	X		X	X
01/98	SVOCs	X			X	X	X	X		X	X
04/98	SVOCs	X	X		X	X	X	X		X	X
07/98	SVOCs		X		X	X	X	X		X	X
06/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	DRY	X	X	X	X	DRY	X	X
09/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	DRY	X	DRY	X	X	X	X	DRY	X	X
12/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	DRY	X	DRY	X	X	X	X	DRY	X	X
02/00	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	DRY	X	DRY	X		X	X	DRY	X	X

Table 4-69

SUMMARY OF GROUNDWATER WELLS SAMPLED FROM 1995 THROUGH 2000
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Analyses	MW24-D	MW25-D	MW26-S	MW28-S	MW29-S	MW30-D	MW31-S	MW32-S	MW33-S	MW33-D
09/95	VOCs, SVOCs, Metals										
12/95	VOCs, SVOCs, Metals										
04/96	VOCs, SVOCs, Metals										
07/96	VOCs, SVOCs, Metals										
02/97	VOCs, SVOCs, Metals										
04/97	VOCs, SVOCs, Metals, WTPH-D, WTPH-G	X	X	X							
09/97	VOCs, SVOCs, Metals	X	X	X							
01/98	SVOCs	X	X	X							
04/98	SVOCs	X	X	X							
07/98	SVOCs	X	X	X							
06/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	FP							
09/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	FP	DRY	DRY	X	X	X	DRY	X
12/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	FP	X	X	X	X	X	DRY	X
02/00	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	FP	X	DRY	X	X	X	DRY	X

Key is at the end of the table.

Table 4-69

SUMMARY OF GROUNDWATER WELLS SAMPLED FROM 1995 THROUGH 2000
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Analyses	MW34-D	MW35-D	MW35-S	MW36-S	GP05	GP22	GP23	MWLSC01	MWLSC02	MWLSC03
09/95	VOCs, SVOCs, Metals										
12/95	VOCs, SVOCs, Metals										
04/96	VOCs, SVOCs, Metals										
07/96	VOCs, SVOCs, Metals										
02/97	VOCs, SVOCs, Metals					X	X	X			
04/97	VOCs, SVOCs, Metals, WTPH-D, WTPH-G										
09/97	VOCs, SVOCs, Metals										
01/98	SVOCs										
04/98	SVOCs										
07/98	SVOCs										
06/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH										
09/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	X	X				X	X	X
12/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	X	X				X	X	X
02/00	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	X	X	X	X				X	X	X

Key is at the end of the table.

Table 4-69

SUMMARY OF GROUNDWATER WELLS SAMPLED FROM 1995 THROUGH 2000
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Date	Analyses	MWLSC04	Ershigs 1d	Ershigs 1s	Ershigs 2s	Ershigs 3s	Ershigs 4s	Ershigs 4d	TC-5	TC-6
09/95	VOCs, SVOCs, Metals									
12/95	VOCs, SVOCs, Metals									
04/96	VOCs, SVOCs, Metals									
07/96	VOCs, SVOCs, Metals									
02/97	VOCs, SVOCs, Metals									
04/97	VOCs, SVOCs, Metals, WTPH-D, WTPH-G		X	X		X	X	X	X	X
09/97	VOCs, SVOCs, Metals									
01/98	SVOCs									
04/98	SVOCs									
07/98	SVOCs									
06/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH		X	X	DRY	X	X	X		
09/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	DRY	X	X	DRY	X	DRY	X	X	X
12/99	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	DRY	X	X	DRY	X	X	X		
02/00	VOCs, SVOCs, Metals, Water Quality, Dioxins, EPH, VPH	DRY	X	X	DRY	X	X	X		

Key:

	= Well did not exist or could not be accessed.
DRY	= Insufficient water to sample.
EPH	= Extractable petroleum hydrocarbon.
FP	= Well contained free product (light non-aqueous phase liquid [LNAPL]).
SVOCs	= Semivolatile organic compounds.
VOCs	= Volatile organic compounds.
VPH	= Volatile petroleum hydrocarbon.
WTPH-D	= Washington total petroleum hydrocarbon as diesel.
WTPH-G	= Washington total petroleum hydrocarbon as gasoline.
X	= Sample collected.

Table 4-70

1995 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D
cPAHs					
Benzo(a)pyrene				P,B	
B(a)P Equivalent				P,B	
Other Organics					
1,1-Dichloroethene	P,B				P,B
1,2-Dichloroethane	P,B	P,B		P	P

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
PSL = Preliminary screening level.
P = Above EPA, Region 9, preliminary remediation goal (PRG).

Table 4-71

STATISTICAL ANALYSIS OF 1995 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.04	MW05-D	1/10	-	1/10	0.0092	1/10	0.0120	NA	NA
Benzo(a)pyrene	0.04	MW05-D	1/10	0.22-0.44	1/10	0.0092	1/10	0.0120	0/10	0.2
ncPAHs (ug/l)										
1-Methylnaphthalene	0.026 - 0.027	MW02-D	2/5	0.22-0.22	0/5	6.2029	0/5	160	NA	NA
2-Methylnaphthalene	0.018 - 0.028	MW01-D	3/10	0.22-0.44	0/10	6.2029	0/10	160	NA	NA
Acenaphthene	0.029 - 0.2	MW05-D	3/10	0.22-0.44	0/10	365	0/10	480	NA	NA
Acenaphthylene	0.2	MW05-D	1/10	0.22-0.44	0/10	365	0/10	480	NA	NA
Anthracene	0.033 - 0.7	MW05-D	5/10	0.22-0.44	0/10	1825	0/10	2400	NA	NA
Fluoranthene	0.026 - 0.28	MW05-D	3/10	0.22-0.44	0/10	1459.9979	0/10	640	NA	NA
Fluorene	0.24	MW05-D	1/10	0.22-0.44	0/10	243.3333	0/10	320	NA	NA
Naphthalene	0.087	MW02-D	1/15	0.22-1	0/15	6.2029	0/15	160	NA	NA
ncPAH	0.03 - 2.128	MW05-D	7/10	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.016 - 0.2	MW05-D	6/10	0.22-0.22	0/10	1825	0/10	2400	NA	NA
Pyrene	0.045 - 0.29	MW05-D	3/10	0.22-0.44	0/10	182.5	0/10	240	NA	NA
Other Organics (ug/l)										
1,1-Dichloroethene	0.55 - 0.72	MW01-D	2/10	1-1	2/10	0.0456	2/10	0.0729	0/10	7
1,2-Dichloroethane	0.26 - 0.62	MW01-D	5/10	1-1	5/10	0.1231	2/10	0.4808	0/10	5
1,3-Dichlorobenzene	0.04 - 0.057	MW03-D	3/15	0.22-1	0/15	5.4750	0/15	7.2	NA	NA
4-Methyl-2-Pentanone	0.74 - 1.4	MW01-D	3/10	2-2	0/10	157.8378	0/10	640	NA	NA
Dibenzofuran	0.013 - 0.018	MW02-D	2/10	0.22-0.44	0/10	24.3333	0/10	32	NA	NA
m&p-Xylene	0.82 - 0.93	MW01-D	4/10	0.86-2	0/10	1431.3725	0/10	16000	0/10	10000
Toluene	0.23 - 0.41	MW01-D	4/10	1-1	0/10	723.4234	0/10	1600	0/10	1000
Total Xylenes	0.82 - 0.93	MW01-D	5/10	2-2	0/10	1431.3725	0/10	16000	0/10	10000
Phenols (ug/l)										
2,4,6-Trichlorophenol	0.073 - 0.15	MW02-D	2/10	0.22-0.44	0/10	6.1120	0/10	7.9545	NA	NA
Phenol	0.29	MW01-D	1/10	0.22-0.44	0/10	21899.5204	0/10	9600	NA	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
MCL = Maximum contaminant level.
µg/L = Micrograms per liter.
MTCA = Model Toxics Control Act.
NA = Not applicable.
ncPAHs = Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG = Preliminary remediation goal.

Table 4-72

STATISTICAL ANALYSIS OF 1996 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.029	MW05-D	1/17	-	1/17	0.0092	1/17	0.0120	NA	NA
Benzo(a)pyrene	0.029	MW05-D	1/17	0.13-1.4	1/17	0.0092	1/17	0.0120	0/17	0.2
ncPAHs (ug/l)										
1-Methylnaphthalene	0.57	MW01-D	1/17	0.0084-1.4	0/17	6.2029	0/17	160	NA	NA
2-Methylnaphthalene	0.65	MW01-D	1/17	0.0092-1.4	0/17	6.2029	0/17	160	NA	NA
Acenaphthene	1.2	MW05-D	2/17	0.009-1.4	0/17	365	0/17	480	NA	NA
Acenaphthylene	0.17 - 0.38	MW05-D	4/17	0.13-1.4	0/17	365	0/17	480	NA	NA
Anthracene	0.038 - 0.78	MW05-D	7/17	0.13-1.4	0/17	1825	0/17	2400	NA	NA
Fluoranthene	0.011 - 0.14	MW05-D	3/17	0.13-1.4	0/17	1459.9979	0/17	640	NA	NA
Fluorene	0.32	MW01-D	1/17	0.13-1.4	0/17	243.3333	0/17	320	NA	NA
ncPAH	0.064 - 3.19	MW01-D	8/17	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.015 - 1.2	MW06-D	5/17	0.13-1.4	0/17	1825	0/17	2400	NA	NA
Pyrene	0.026 - 0.14	MW05-D	3/17	0.13-1.4	0/17	182.5	0/17	240	NA	NA
Other Organics (ug/l)										
1,1-Dichloroethene	1.1	MW02-D	1/17	1-1	1/17	0.0456	1/17	0.0729	0/17	7
1,2-Dichloroethane	0.95 - 3	MW05-D	9/17	1-1	9/17	0.1231	9/17	0.4808	0/17	5
4-Methyl-2-Pentanone	2.4 - 4	MW05-D	2/17	2-4	0/17	157.8378	0/17	640	NA	NA
Benzoic acid	1.8	MW06-D	1/17	1.3-13.8	0/17	145979	0/17	64000	NA	NA
Chloromethane	0.3 - 0.35	MW05-D	2/17	1-1	0/17	1.5109	0/17	3.3654	NA	NA
m&p-Xylene	0.65 - 0.66	MW05-D	2/17	2-2	0/17	1431.3725	0/17	16000	0/17	10000
o-Xylene	0.12 - 0.16	MW02-D	2/17	1-1	0/17	1431.3725	0/17	16000	0/17	10000
Toluene	0.22 - 0.94	MW02-D	2/17	1-1	0/17	723.4234	0/17	1600	0/17	1000
Total Xylenes	0.65 - 0.66	MW05-D	2/11	3-3	0/11	1431.3725	0/11	16000	0/11	10000
Phenols (ug/l)										
2,4-Dimethylphenol	0.073	MW02-D	1/17	0.13-1.4	0/17	729.9995	0/17	320	NA	NA
Pentachlorophenol	0.55 - 5.4	MW05-D	8/17	0.66-6.9	7/17	0.5603	5/17	0.7292	5/17	1

Table 4-72

STATISTICAL ANALYSIS OF 1996 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary remediation goal.

Table 4-73

STATISTICAL SUMMARY OF 1996 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.000027 - 8.4171	MW07-S	3/13	-	2/13	0.0092	2/13	0.0120	NA	NA
Benzo(a)anthracene	4.8	MW07-S	1/13	0.12-12.5	1/13	0.0921	1/13	0.1199	NA	NA
Benzo(a)pyrene	3 - 7.3	MW07-S	2/13	0.13-2.5	2/13	0.0092	2/13	0.0120	2/13	0.2
Benzo(b)fluoranthene	5 - 10.5	MW07-S	2/13	0.12-1.4	2/13	0.0921	2/13	0.1199	NA	NA
Benzo(k)fluoranthene	1.6 - 5	MW07-S	2/13	0.12-1.4	2/13	0.9210	2/13	1.1986	NA	NA
Chrysene	0.027 - 17.1	MW07-S	3/13	0.12-1.4	1/13	9.2098	1/13	11.9863	NA	NA
Indeno(1,2,3-cd)pyrene	1.4	MW07-S	1/13	0.26-25	1/13	0.0921	1/13	0.1199	NA	NA
ncPAHs (ug/l)										
1-Methylnaphthalene	239 - 1890	MW07-S	3/13	0.016-1.4	3/13	6.20	3/13	160	NA	NA
2-Methylnaphthalene	310 - 3200	MW07-S	3/13	0.023-1.4	3/13	6.20	3/13	160	NA	NA
Acenaphthene	0.02 - 80.6	MW07-S	3/13	0.12-12.5	0/13	365	0/13	480	NA	NA
Acenaphthylene	12.8	MW07-S	1/13	0.12-12.5	0/13	365	0/13	480	NA	NA
Anthracene	0.03 - 86.8	MW07-S	6/13	0.13-1.4	0/13	1825	0/13	2400	NA	NA
Benzo(g,h,i)perylene	1.4 - 3	MW07-S	2/13	0.12-1.4	0/13	182.5	0/13	240	NA	NA
Fluoranthene	0.029 - 62.2	MW07-S	5/13	0.13-1.4	0/13	1460	0/13	640	NA	NA
Fluorene	0.013 - 310	MW07-S	4/13	0.12-1.4	1/13	243	0/13	320	NA	NA
Naphthalene	0.2 - 134	MW07-S	4/13	0.031-1.4	3/13	6.20	0/13	160	NA	NA
ncPAH	0.045 - 6627.6	MW07-S	7/13		NA	NA	NA	NA	NA	NA
Phenanthrene	0.015 - 855	MW07-S	6/13	0.13-1.4	0/13	1825	0/13	2400	NA	NA
Pyrene	0.03 - 86.6	MW07-S	5/13	0.13-1.4	0/13	182.5	0/13	240	NA	NA

Table 4-73

STATISTICAL SUMMARY OF 1996 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
Other Organics (ug/l)										
1,2,4-Trimethylbenzene	23.8 - 30.2	MW07-S	3/13	1-1	3/13	12.33	0/13	400	NA	NA
1,2-Dichloroethane	0.88 - 2.8	MW10-S	5/13	1-2	5/13	0.1231	5/13	0.4808	0/13	5
1,3,5-Trimethylbenzene	4.4 - 6.4	MW07-S	3/13	1-1	0/13	12.33	0/13	400	NA	NA
4-Methyl-2-Pentanone	0.38	MW07-S	1/13	2-4	0/13	157.84	0/13	640	NA	NA
Benzene	0.17	MW07-S	1/13	1-1	0/13	0.3539	0/13	0.7955	0/13	5
Benzoic acid	1.7 - 1.8	MW09-S	2/13	1.3-125	0/13	145979	0/13	64000	NA	NA
Carbazole	0.02 - 11.1	MW07-S	3/13	0.12-12.5	2/13	3.36	2/13	4.375	NA	NA
Chloromethane	0.37	MW10-S	1/13	1-1	0/13	1.51	0/13	3.3654	NA	NA
Dibenzofuran	6.6	MW07-S	1/13	0.12-12.5	0/13	24.33	0/13	32	NA	NA
Ethylbenzene	0.23 - 2.8	MW07-S	4/13	1-1	0/13	1339.87	0/13	800	0/13	700
Isophorone	0.043	MW10-S	1/13	0.12-12.5	0/13	70.77	0/13	92.11	NA	NA
Isopropylbenzene	0.86 - 1.2	MW07-S	3/13	1-1	0/13	658.20	0/13	800	NA	NA
m&p-Xylene	0.16 - 9	MW07-S	6/13	2-2	0/13	1431.37	0/13	16000	0/13	10000
n-Butylbenzene	1.9	MW07-S	1/13	1-1	0/13	60.83	0/13	80	NA	NA
N-nitrosodiphenylamine	436	MW07-S	1/13	0.13-2.5	1/13	13.72	1/13	17.86	NA	NA
n-Propylbenzene	1.4 - 1.6	MW07-S	3/13	1-1	0/13	60.83	0/13	80	NA	NA
o-Xylene	9 - 9.9	MW07-S	3/13	1-1	0/13	1431.37	0/13	16000	0/13	10000
p-Isopropyltoluene	0.86	MW07-S	1/13	1-1	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	0.47	MW07-S	1/13	1-1	0/13	60.83	0/13	80	NA	NA
Toluene	0.6 - 1	MW09-S	3/13	1-1	0/13	723.42	0/13	1600	0/13	1000
Total Xylenes	1.1 - 14.8	MW07-S	3/9	3-3	0/9	1431	0/9	16000	0/9	10000
Phenols (ug/l)										
2,4,5-Trichlorophenol	2.4 - 7.1	MW07-S	2/13	0.12-25	0/13	3650	0/13	1600	NA	NA
2,4,6-Trichlorophenol	0.17 - 1.3	MW07-S	2/13	0.12-25	0/13	6.112	0/13	7.955	NA	NA
2,4-Dichlorophenol	0.48	MW07-S	1/13	0.13-12.5	0/13	109.49999	0/13	48	NA	NA
4-Methylphenol	0.6	MW07-S	1/13	0.12-12.5	0/13	182.49997	0/13	80	NA	NA
Pentachlorophenol	7.9 - 13700	MW07-S	6/13	0.66-7	6/13	0.5603	6/13	0.7292	6/13	1

Table 4-73

STATISTICAL SUMMARY OF 1996 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary remediation goal.

Table 4-74

1996 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP AND SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D	MW07-S	MW08-S	MW09-S	MW10-S
cPAHs									
Benzo(a)anthracene						P,B			
Benzo(a)pyrene				P,B		P,B,M			
Benzo(b)fluoranthene						P,B			
Benzo(k)fluoranthene						P,B			
Chrysene						P,B			
Indeno(1,2,3-cd)pyrene						P,B			
B(a)P Equivalents				P,B		P,B			
ncPAHs									
Flourene						P			
1-Methylnapthalene						P,B			
2-Methylnapthalene						P,B			
Naphthalene						P			
Phenols									
Pentachlorphenol	P,B,M	P		P,B,M		P,B,M			P,B,M
Other Organics									
Carbazole						P,B			
1,1-Dichloroethene		P,B							
1,2-Dichloroethane		P,B	P,B	P,B	P,B	P,B	P,B	P,B	P,B
N-nitrosodiphenylamine						P,B			
1,2,4-Trimethylbenzene						P			

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.

Table 4-75

STATISTICAL ANALYSIS OF 1997 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency ExceEding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.0007575 - 0.17305	MW17-D	13/29	-	9/29	0.0092	8/29	0.0120	NA	NA
Benzo(a)anthracene	0.0075 - 0.47	MW17-D	10/29	0.0063-0.83	1/29	0.0921	1/29	0.1199	NA	NA
Benzo(a)pyrene	0.0075 - 0.093	MW17-D	8/29	0.00625-0.4	6/29	0.0092	4/29	0.0120	0/29	0.2
Benzo(b)fluoranthene	0.01 - 0.37	MW05-D	12/29	0.0063-0.13	2/29	0.0921	2/29	0.1199	NA	NA
Benzo(k)fluoranthene	0.0075 - 0.13	MW17-D	8/29	0.00625-0.35	0/29	0.9210	0/29	1.1986	NA	NA
Chrysene	0.0075 - 0.45	MW17-D	10/29	0.0063-0.49	0/29	9.2098	0/29	11.9863	NA	NA
Dibenzo(a,h)anthracene	0.013	MW17-D	1/29	0.00625-0.58	1/29	0.0092	1/29	0.0120	NA	NA
Indeno(1,2,3-cd)pyrene	0.0075 - 0.033	MW17-D	7/29	0.00625-0.26	0/29	0.0921	0/29	0.1199	NA	NA
Petroleum (ug/l)										
TPH-Diesel	2700 - 6000	MW17-D	2/10	500-500	NA	NA	2/10	500	NA	NA
ncPAHs (ug/l)										
2-Methylnaphthalene	0.045 - 0.85	TC-5	13/29	0.043-0.13	0/29	6.20	0/29	160	NA	NA
Acenaphthene	0.0675 - 1.9	MW05-D	9/29	0.028-0.13	0/29	365	0/29	480	NA	NA
Acenaphthylene	0.0075 - 0.28	MW05-D	7/29	0.0063-0.13	0/29	365	0/29	480	NA	NA
Anthracene	0.0125 - 0.62	MW05-D	19/29	0.0063-0.13	0/29	1825	0/29	2400	NA	NA
Benzo(g,h,i)perylene	0.0075 - 0.02	MW17-D	6/29	0.00625-2.4	0/29	182.5	0/29	240	NA	NA
Fluoranthene	0.0075 - 2.9	MW17-D	14/29	0.0063-0.13	0/29	1460.00	0/29	640	NA	NA
Fluorene	0.02 - 2.7	MW05-D	14/29	0.01-0.13	0/29	243.33	0/29	320	NA	NA
Naphthalene	0.021 - 0.67	MW23-D	13/29	0.033-0.13	0/29	6.203	0/29	160	NA	NA
ncPAH	0.0075 - 10.8575	MW17-D	23/29	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.029 - 4.4	MW17-D	18/29	0.03-0.38	0/29	1825	0/29	2400	NA	NA
Pyrene	0.02 - 2.1	MW17-D	12/29	0.0075-0.56	0/29	182.5	0/29	240	NA	NA
Other Organics (ug/l)										
1,2-Dichloroethane	0.94 - 1.6	MW06-D	4/6	1-1	4/6	0.123	4/6	0.4808	0/6	5
2,4-Dinitrotoluene	0.092	MW24-D	1/29	0.068-1.3	0/29	73.000	0/29	32	NA	NA
2,6-Dinitrotoluene	0.092	MW24-D	1/29	0.076-1.3	0/29	36.500	0/29	16	NA	NA
Benzoic acid	0.02 - 1.2	MW17-D	7/29	0.27-5	0/29	145979	0/29	64000	NA	NA
Dibenzofuran	0.26 - 1.3	MW05-D	3/29	0.058-0.25	0/29	24.333	0/29	32	NA	NA
N-Nitrosodiphenylamine	0.05	MW02-D	1/29	0.063-0.66	0/29	13.721	0/29	17.86	NA	NA
Phenols (ug/l)										
Pentachlorophenol	0.19 - 17	MW23-D	14/27	0.069-1	8/27	0.5603	8/27	0.7292	6/27	1

Table 4-75

STATISTICAL ANALYSIS OF 1997 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary remediation goal.
TPH-D	= Total petroleum hydrocarbons as diesel.

Table 4-76

STATISTICAL ANALYSIS OF 1997 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.0087 - 96	MW14-S	14/28	-	13/28	0.0092	13/28	0.0120	NA	NA
Benzo(a)anthracene	0.12 - 950	MW14-S	13/27	0.0063-1000	13/27	0.0921	13/27	0.1199	NA	NA
Benzo(a)pyrene	0.38 - 24	MW14-S	11/27	0.0063-1000	11/27	0.0092	11/27	0.0120	11/27	0.2
Benzo(b)fluoranthene	0.63 - 25	MW14-S	10/27	0.0063-1000	10/27	0.0921	10/27	0.1199	NA	NA
Benzo(k)fluoranthene	0.24 - 30	MW14-S	9/27	0.0063-1000	5/27	0.9210	4/27	1.1986	NA	NA
Chrysene	0.26 - 1000	MW14-S	13/28	0.0063-1000	4/28	9.2098	3/28	11.9863	NA	NA
Dibenzo(a,h)anthracene	0.081 - 2.6	MW14-S	4/27	0.0063-1000	4/27	0.0092	4/27	0.0120	NA	NA
Indeno(1,2,3-cd)pyrene	0.23 - 5.1	MW14-S	4/27	0.0063-1000	4/27	0.0921	4/27	0.1199	NA	NA
Petroleum (ug/l)										
TPH-Diesel	4600 - 42000	MW22-S	4/4	-	NA	NA	4/4	500	NA	NA
TPH-Gas	45	MW15-S	1/1	-	NA	NA	0/1	800	NA	NA
ncPAHs (ug/l)										
1-Methylnaphthalene	691	MW07-S	1/4	0.12-0.14	1/4	6.203	1/4	160	NA	NA
2-Chloronaphthalene	3.1 - 7.3	MW22-S	2/28	0.081-1000	0/28	486.67	0/28	640	NA	NA
2-Methylnaphthalene	0.03 - 26000	MW14-S	21/28	0.038-0.49	16/28	6.203	14/28	160	NA	NA
Acenaphthene	0.076 - 5700	MW14-S	18/28	0.02-1000	3/28	365	1/28	480	NA	NA
Acenaphthylene	0.07 - 14	MW22-S	10/28	0.0063-1000	0/28	365	0/28	480	NA	NA
Anthracene	0.0075 - 2000	MW14-S	20/28	0.0063-1000	1/28	1825	0/28	2400	NA	NA
Benzo(g,h,i)perylene	0.31 - 4.4	MW14-S	5/28	0.0063-1000	0/28	182.5	0/28	240	NA	NA
Fluoranthene	0.0075 - 4700	MW14-S	18/28	0.067-1000	1/28	1459.9979	1/28	640	NA	NA
Fluorene	0.028 - 5300	MW14-S	19/28	0.013-1000	2/28	243.33	2/28	320	NA	NA
Naphthalene	0.022 - 26000	MW14-S	17/28	0.033-1000	15/28	6.203	12/28	160	NA	NA
ncPAH	0.0075 - 87500	MW14-S	26/28	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.037 - 14000	MW14-S	23/28	0.03-0.14	1/28	1825	1/28	2400	NA	NA
Pyrene	0.023 - 3800	MW14-S	17/28	0.01-1000	2/28	182.5	1/28	240	NA	NA

Table 4-76

STATISTICAL ANALYSIS OF 1997 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
Other Organics (ug/l)										
1,2,4-Trimethylbenzene	2.3	MW07-S	1/4	1-1	0/4	12.33	0/4	400	NA	NA
1,2-Dichloroethane	1.4 - 2.5	MW08-S	4/4	-	4/4	0.1231	4/4	0.4808	0/4	5
1,3,5-Trimethylbenzene	15.3	MW07-S	1/4	1-1	1/4	12.33	0/4	400	NA	NA
Benzene	29	MW15-S	1/5	1-1	1/5	0.3539	1/5	0.7955	1/5	5
Benzoic acid	0.067 - 9	MW26-S	3/28	0.27-5000	0/28	145978.69	0/28	64000	NA	NA
Carbazole	8.7 - 280	MW22-S	8/17	0.12-42	8/17	3.3616	8/17	4.375	NA	NA
Dibenzofuran	0.052 - 4300	MW14-S	16/27	0.059-1000	10/27	24.33	10/27	32	NA	NA
Ethylbenzene	1.4 - 850	MW15-S	2/5	1-1	0/5	1339.8734	1/5	800	1/5	700
m&p-Xylene	2.8 - 2700	MW15-S	2/5	2-2	1/5	1431.3725	0/5	16000	0/5	10000
n-Butylbenzene	0.95	MW07-S	1/4	1-1	0/4	60.83	0/4	80	NA	NA
N-Nitrosodiphenylamine	5 - 2100	MW14-S	2/28	0.063-1000	1/28	13.72	1/28	17.86	NA	NA
n-Propylbenzene	1.1	MW07-S	1/4	1-1	0/4	60.83	0/4	80	NA	NA
o-Xylene	5.6 - 1500	MW15-S	2/5	1-1	1/5	1431.37	0/5	16000	0/5	10000
Toluene	260	MW15-S	1/5	1-1	0/5	723.42	0/5	1600	0/5	1000
Phenols (ug/l)										
2-Chlorophenol	0.28 - 2.1	MW15-S	2/28	0.065-1000	0/28	30.42	0/28	40	NA	NA
2,4,5-Trichlorophenol	0.77 - 8.3	MW15-S	4/28	0.077-1000	0/28	3650	0/28	1600	NA	NA
2,4,6-Trichlorophenol	1.1 - 2.6	MW15-S	4/28	0.077-1000	0/28	6.11	0/28	7.955	NA	NA
2,4-Dichlorophenol	0.54 - 5.6	MW15-S	3/28	0.045-1000	0/28	109.50	0/28	48	NA	NA
2,4-Dimethylphenol	7.7 - 57	MW15-S	3/28	0.073-1000	0/28	730.00	0/28	320	NA	NA
2-Methylphenol	5.2	MW16-S	1/28	0.045-1000	0/28	1825	0/28	800	NA	NA
2-Nitrophenol	0.56	MW22-S	1/28	0.051-1000	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.63 - 110	MW16-S	2/11	0.063-1000	0/11	182.50	1/11	80	NA	NA
4-Methylphenol	11 - 28	GP05	3/17	0.12-4	0/17	182.50	0/17	80	NA	NA
Pentachlorophenol	0.078 - 82000	MW14-S	22/26	0.11-0.68	21/26	0.56	21/26	0.7292	21/26	1
Phenol	0.33 - 14	MW15-S	3/28	0.081-1000	0/28	21900	0/28	9600	NA	NA

Table 4-76

STATISTICAL ANALYSIS OF 1997 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary remediation goal.
TPH-D	= Total petroleum hydrocarbons as diesel.
TPH-G	= Total petroleum hydrocarbons as gasoline.

Table 4-77

1997 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Mill Number	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D	MW17-D	MW18-D	MW20-D	MW23-D	MW24-D	MW25-D	TC-5	TC-6
cPAHs													
Benzo(a)anthracene						P,B							
Benzo(a)pyrene						P,B			P,B	P,B		P,B	P
Benzo(b)fluoranthene				P,B		P,B							
Dibenzo(a,h)anthracene						P,B							
B(a)P Equivalents				P,B		P,B			P,B	P,B	P,B	P,B	P,B
Phenols													
Pentachlorphenol	P,B			P,B,M		P,B,M	P,B,M		P,B,M	P,B	P,B,M		
Other Organics													
1,2-Dichloroethane			P,B	P,B	P,B								
Petroleum Hydrocarbons													
TPH-D						B							

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.
TPH-D = Total petroleum hydrocarbon as diesel

Table 4-78

1997 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21S	MW22-S	MW26-S	GP05	GP22	GP23
cPAHs															
Benzo(a)anthracene						P,B	P,B	P,B	P,B		P,B	P,B	P,B	P,B	P,B
Benzo(a)pyrene						P,B,M	P,B,M		P,B,M		P,B,M	P,B,M	P,B,M	P,B,M	P,B,M
Benzo(b)fluoranthene						P,B	P,B	P,B	P,B		P,B	P,B	P,B		
Benzo(k)fluoranthene						P,B			P		P,B		P,B		
Chrysene						P,B					P		P,B		
Dibenzo(a,h)anthracene						P,B			P,B		P,B				
Indeno(1,2,3-cd)pyrene						P,B	P,B		P,B		P,B				
B(a)P Equivalents						P,B	P,B	P,B	P,B		P,B	P,B	P,B	P,B	P,B
ncPAHs															
Acenaphthene						P,B					P				
Anthracene						P									
Fluoranthene						P,B									
Fluorene						P,B									
1-Methylnapthalene	P,B														
2-Methylnaphthalene	P,B				P,B	P,B	P,B	P,B			P,B	P,B	P,B	P	
Naphthalene	P				P	P,B	P,B	P,B			P,B	P,B	P,B	P,B	P
Phenanthrene						P,B									
Pyrene						P,B									
Phenols															
3&4-Methylphenol								B							
Pentachlorphenol	P,B,M		P,B,M	P,B,M	P,B,M	P,B,M	P,B,M	P,B,M	P,B,M		P,B,M	P,B,M	P,B,M	P,B,M	P,B,M
Other Organics															
1,2-Dichloroethane	P,B	P,B	P,B	P,B											
Benzene							P,B,M								
Carbazole					P,B	P,B	P,B	P,B			P,B	P,B	P,B		
Dibenzofuran						P,B	P,B	P,B			P,B	P,B	P,B	P,B	
Ethyl Benzene							B,M								
N-nitrosodiphenylamine						P,B									
1,3,5-Trimethylbenzene	P														
m&p-Xylenes							P,M								
o-Xylene							P,M								
TPH-D							B		B		B	B			

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.
TPH-D = Total petroleum hydrocarbon as diesel

Table 4-79

STATISTICAL ANALYSIS OF 1998 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.0076 - 0.41548	MW24-D	6/34	-	5/34	0.0092	4/34	0.0120	NA	NA
Benzo(a)anthracene	0.014 - 0.75	MW24-D	5/34	0.0047-0.1	3/34	0.0921	3/34	0.1199	NA	NA
Benzo(a)pyrene	0.0076 - 0.28	MW24-D	4/34	0.0047-0.1	3/34	0.0092	3/34	0.0120	2/34	0.2
Benzo(b)fluoranthene	0.015 - 0.58	MW24-D	5/34	0.0047-0.1	4/34	0.0921	4/34	0.1199	NA	NA
Benzo(k)fluoranthene	0.067 - 0.27	MW23-D	3/34	0.0047-0.1	0/34	0.9210	0/34	1.1986	NA	NA
Chrysene	0.017 - 0.83	MW23-D	4/34	0.0047-0.1	0/34	9.2098	0/34	11.9863	NA	NA
ncPAHs (ug/l)										
2-Methylnaphthalene	0.0066 - 11	MW23-D	16/34	0.046-0.1	1/34	6.2029	0/34	160	NA	NA
Acenaphthene	0.0069 - 3.5	MW23-D	13/34	0.0047-0.1	0/34	365	0/34	480	NA	NA
Acenaphthylene	0.0058 - 0.21	MW05-D	6/34	0.0047-0.1	0/34	365	0/34	480	NA	NA
Anthracene	0.023 - 1.6	MW23-D	18/34	0.046-0.1	0/34	1825	0/34	2400	NA	NA
Fluoranthene	0.0058 - 3.3	MW23-D	16/34	0.046-0.1	0/34	1460.00	0/34	640	NA	NA
Fluorene	0.0059 - 3.6	MW23-D	11/34	0.0047-0.1	0/34	243.33	0/34	320	NA	NA
Naphthalene	0.014 - 7.2	MW23-D	14/34	0.046-0.1	1/34	6.2029	0/34	160	NA	NA
ncPAH	0.057 - 41	MW23-D	19/34	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.014 - 8.4	MW23-D	18/34	0.046-0.1	0/34	1825	0/34	2400	NA	NA
Pyrene	0.0088 - 2.4	MW23-D	12/34	0.0047-0.1	0/34	182.5	0/34	240	NA	NA
Other Organics (ug/l)										
Dibenzofuran	0.2 - 2.3	MW23-D	3/11	0.47-0.52	0/11	24.33	0/11	32	NA	NA
N-nitrosodiphenylamine	0.21 - 0.27	MW25-D	2/11	0.47-0.52	0/11	13.72	0/11	17.86	NA	NA
Phenols (ug/l)										
Pentachlorophenol	0.089 - 17	MW17-D	16/33	0.46-0.57	7/33	0.5603	7/33	0.7292	5/33	1

Table 4-79

STATISTICAL ANALYSIS OF 1998 GROUNDWATER RESULTS FROM DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary remediation goal.

Table 4-80

STATISTICAL ANALYSIS OF 1998 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.0056 - 1577.1	MW26-S	21/29	-	20/29	0.0092	20/29	0.0120	NA	NA
Benzo(a)anthracene	0.056 - 2400	MW26-S	21/29	0.0049-0.1	20/29	0.0921	19/29	0.1199	NA	NA
Benzo(a)pyrene	0.45 - 1100	MW26-S	19/29	0.0049-0.52	19/29	0.0092	19/29	0.0120	19/29	0.2
Benzo(b)fluoranthene	0.74 - 2100	MW26-S	19/29	0.0049-0.52	19/29	0.0921	19/29	0.1199	NA	NA
Benzo(k)fluoranthene	0.32 - 540	MW26-S	18/29	0.0049-5	13/29	0.9210	13/29	1.1986	NA	NA
Chrysene	0.38 - 2700	MW26-S	20/29	0.0049-0.1	11/29	9.2098	10/29	11.9863	NA	NA
Dibenzo(a,h)anthracene	0.64 - 9	MW07-S	3/27	0.0049-9.3	3/27	0.0092	3/27	0.0120	NA	NA
Indeno(1,2,3-cd)pyrene	0.45 - 190	MW26-S	14/27	0.0049-5	14/27	0.0921	14/27	0.1199	NA	NA
ncPAHs (ug/l)										
2-Chloronaphthalene	1.5 - 1400	MW13-S	3/27	0.0049-9.3	1/27	486.67	1/27	640	NA	NA
2-Methylnaphthalene	0.011 - 46000	MW26-S	20/28	0.0049-0.1	17/28	6.203	16/28	160	NA	NA
Acenaphthene	0.0049 - 17000	MW26-S	21/29	0.0049-0.1	10/29	365	8/29	480	NA	NA
Acenaphthylene	0.12 - 170	MW26-S	12/28	0.0049-9.3	0/28	365	0/28	480	NA	NA
Anthracene	0.016 - 5400	MW26-S	24/29	0.046-0.1	3/29	1825	2/29	2400	NA	NA
Benzo(g,h,i)perylene	0.7 - 180	MW26-S	12/27	0.0049-5	0/27	182.5	0/27	240	NA	NA
Fluoranthene	0.011 - 11000	MW26-S	22/29	0.0049-1.2	3/29	1460	5/29	640	NA	NA
Fluorene	0.0059 - 14000	MW26-S	22/29	0.046-0.1	9/29	243.3	7/29	320	NA	NA
Naphthalene	0.017 - 43000	MW26-S	22/29	0.046-0.1	18/29	6.203	16/29	160	NA	NA
ncPAH	0.058 - 170050	MW26-S	25/29	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.02 - 25000	MW26-S	24/29	0.047-0.1	4/29	1825	4/29	2400	NA	NA
Pyrene	0.0049 - 8300	MW26-S	24/29	0.047-0.1	6/29	182.5	6/29	240	NA	NA
Other Organics (ug/l)										
2,6-Dinitrotoluene	0.1	MW08-S	1/10	0.47-47	0/10	36.4999987	0/10	16	NA	NA
Dibenzofuran	0.21 - 8500	MW26-S	7/10	0.47-0.5	4/10	24.33	4/10	32	NA	NA
Phenols (ug/l)										
2,4,5-Trichlorophenol	0.27	MW19-S	1/10	0.47-47	0/10	3650	0/10	1600	NA	NA
2,4,6-Trichlorophenol	0.29 - 3.8	MW15-S	3/10	0.47-47	0/10	6.11	0/10	7.955	NA	NA
2,4-Dinitrophenol	8	MW22-S	1/10	0.47-47	0/10	73.00	0/10	32	NA	NA
Pentachlorophenol	0.15 - 120000	MW13-S	24/29	0.049-0.5	23/29	0.5603	23/29	0.7292	23/29	1

Table 4-80

STATISTICAL ANALYSIS OF 1998 GROUNDWATER RESULTS FROM SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
PRG	= Preliminary remediation goal.

Table 4-81

1998 SUMMARY OF GROUNDWATER PSL EXCEEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D	MW17-D	MW18-D	MW20-D	MW23-D	MW24-D	MW25-D
cPAHs											
Benzo(a)anthracene				P,B					P,B	P,B	
Benzo(a)pyrene				P,B					P,B,M	P,B,M	
Benzo(b)fluoranthene				P,B					P,B	P,B	
B(a)P Equivalents				P,B	P				P,B	P,B	
ncPAHs											
2-Methylnaphthalene									P		
Naphthalene									P		
Phenols											
Pentachlorphenol				P,B,M		P,B,M			P,B,M	P,B,M	P,B

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.

Table 4-82

1998 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21S	MW22-S	MW26-S
cPAHs												
Benzo(a)anthracene	P,B				P,B	P,B	P,B		P,B		P,B	P,B
Benzo(a)pyrene	P,B,M				P,B,M	P,B,M	P,B,M		P,B,M		P,B,M	P,B,M
Benzo(b)fluoranthene	P,B				P,B	P,B	P,B		P,B		P,B	P,B
Benzo(k)fluoranthene	P,B				P,B	P,B			P,B		P,B	P,B
Chrysene	P,B				P,B	P,B					P,B	P,B
Dibenzo(a,h)anthracene	P,B					P,B			P,B			
Indeno(1,2,3-cd)pyrene	P,B				P,B	P,B			P,B		P,B	P,B
B(a)P Equivalents	P,B				P,B	P,B	P,B		P,B		P,B	P,B
ncPAHs												
Acenaphthene	P,B				P,B	P,B					P,B	P,B
Anthracene	P				P,B							P,B
2-Chloronaphthalene					P,B							
Flouranthene	B				P,B							P,B
Fluorene	P,B				P,B	P,B					P	P,B
2-Methylnaphthalene	P,B				P,B	P,B	P,B		P		P,B	P,B
Naphthalene	P,B				P,B	P,B	P,B		P,B		P,B	P,B
Phenanthrene	P,B				P,B							P,B
Pyrene	P,B				P,B	P,B						P,B
Phenols												
Pentachlorphenol	P,B,M			P,B,M	P,B,M	P,B,M	P,B,M		P,B,M		P,B,M	P,B,M
Other Organics												
Dibenzofuran					P,B	P,B					P,B	P,B

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.

Table 4-83

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99244000	99244001	99244011	99244012	99244016	99244017	99244020	99244021	99244024	99244025	99254000	99254001
Sample Location		**MW24-D**	**MW24-D**	**MW18-D**	**MW18-D**	**MW06-D**	**MW06-D**	**MW25-D**	**MW25-D**	**MW02-D**	**MW02-D**	**MW23-D**	**MW23-D**
Sample Date		**6/7/99**	**6/7/99**	**6/9/99**	**6/9/99**	**6/9/99**	**6/9/99**	**6/9/99**	**6/9/99**	**6/10/99**	**6/10/99**	**6/14/99**	**6/14/99**
Volatile Organic Compounds (µg/L)													
m&p-Xylene	140 [c]	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Semivolatile Organic Compounds (µg/L)													
2,4-Dinitrotoluene	73 [c]	0.5 U	NA	0.12 JQ	NA	0.47 U	NA	0.48 U	NA	0.48 U	NA	0.49 U	NA
Acenaphthene	370 [c]	0.005 U	NA	0.012	NA	0.044	NA	0.022	NA	0.0081	NA	0.0049 U	NA
Acenaphthylene	370 [c]	0.028	NA	0.0048 U	NA	0.0047 U	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Anthracene	1800 [c]	0.15	NA	0.027	NA	0.0047 U	NA	0.05	NA	0.02	NA	0.077	NA
Dibenzofuran	24 [c]	0.5 U	NA	0.48 U	NA	0.47 U	NA	0.48 U	NA	0.48 U	NA	0.49 U	NA
Fluoranthene	1500 [c]	0.005 U	NA	0.0048 U	NA	0.0099	NA	0.0048 U	NA	0.013	NA	0.0049 U	NA
Fluorene	240 [c]	0.005 U	NA	0.011	NA	0.018	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Naphthalene	6.2 [c]	0.005 U	NA	0.1	NA	0.0047 U	NA	0.048	NA	0.092	NA	0.035	NA
Pentachlorophenol	0.56 [c]	0.5 U	NA	0.48 U	NA	0.47 U	NA	**4.3**	NA	0.48 U	NA	0.49 UJK	NA
Phenanthrene	1800 [c]	0.061	NA	0.019	NA	0.026	NA	0.02	NA	0.023	NA	0.0049 U	NA
Pyrene	180 [c]	0.005 U	NA	0.015	NA	0.02	NA	0.029	NA	0.0048 U	NA	0.0049 U	NA
Petroleum Hydrocarbons (µg/L)													
C10-C12 Aliphatics	NA	25 U	NA	24	NA	24	NA	24 U	NA	24 U	NA	24 U	NA
C10-C12 Aromatics	NA	36	NA	24	NA	36	NA	34	NA	38	NA	24 U	NA
C12-C16 Aliphatics	NA	25 U	NA	24	NA	24	NA	24 U	NA	24 U	NA	24 U	NA
C12-C16 Aromatics	NA	25 U	NA	24	NA	24	NA	24 U	NA	24 U	NA	24 U	NA
C16-C21 Aliphatics	NA	53 U	NA	38	NA	79 U	NA	24 U	NA	29 U	NA	24 U	NA
C16-C21 Aromatics	NA	50 U	NA	48	NA	47	NA	47 U	NA	48 U	NA	47 U	NA
C21-C34 Aliphatics	NA	130 U	NA	61	NA	220 U	NA	47 U	NA	76 U	NA	47 U	NA
C21-C34 Aromatics	NA	50 U	NA	48	NA	47	NA	47 U	NA	48 U	NA	47 U	NA
C8-C10 Aliphatics	NA	30 U	NA	30 U	NA	30 U	NA	30 U	NA	30 U	NA	24 U	NA
C8-C10 Aromatics	NA	25 U	NA	25 U	NA	36	NA	25 U	NA	25 U	NA	25 U	NA
Dioxin/Furans (pg/L)													
2,3,7,8-TCDD TEQ	0.45 [c]	0.179	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	17.87	NA	4.57 U	NA	4.611 U	NA	3.823 U	NA	12.805 U	NA	8.434 U	NA
Total TCDD	NA	4.307 U	NA	3.181 U	NA	2.101 U	NA	1.945 U	NA	1.639	NA	2.481 U	NA
Water Quality Parameters (mg/L)													
Alkalinity	NA	312	NA	215	NA	91	NA	346	NA	341	NA	251	NA
Bromide	NA	0.2 U	NA	0.232	NA	0.2 U	NA	0.2 U	NA	0.233	NA	0.228	NA
Chloride	NA	15.9	NA	17.2	NA	9.72	NA	34.1	NA	27.7	NA	21.9	NA
COD	NA	11	NA	5 U	NA	5 U	NA	5 U	NA		NA	11	NA
Fluoride	NA	0.15	NA	0.088	NA	0.085	NA	0.153	NA	0.098	NA	0.09	NA
Hardness	NA	324.86	325.33	234.64	234.31	112.04	113.16	357.28	361.64	351.23	341.64	283.75	285.57
Nitrate+Nitrite	NA	0.484	NA	1.06	NA	3.68	NA	0.122	NA	0.02 U	NA	0.532	NA
Sulfate	NA	19.8	NA	26.6	NA	24	NA	28.3	NA	28.1	NA	45.1	NA
TDS	NA	380	NA	278	NA	168	NA	440	NA	438	NA	360	NA
TOC	NA	3.23	NA	1.82	NA	1 U	NA	3	NA	3.19	NA	3.63	NA

Key is at the end of the table.

Table 4-83

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99254003	99254004	99254005	99254006	99254007	99254008	99254009	99254010	99254011	99254012	99254018	99254019
Sample Location		MW17-D	MW17-D	MW03-D	MW03-D	MW05-D	MW05-D	MW20-D	MW20-D	Ershigs-4D	Ershigs-4D	Ershigs-1D	Ershigs-1D
Sample Date		6/14/99	6/14/99	6/14/99	6/14/99	6/14/99	6/14/99	6/14/99	6/14/99	6/15/99	6/15/99	6/15/99	6/15/99
Volatile Organic Compounds (µg/L)													
m&p-Xylene	140 [c]	10 U	NA	10 U	NA	0.12	NA	10 U	NA	10 U	NA	10 U	NA
Semivolatile Organic Compounds (µg/L)													
2,4-Dinitrotoluene	73 [c]	0.47 U	NA	0.47 U	NA	0.5 U	NA	0.47 U	NA	NA	NA	0.48 U	NA
Acenaphthene	370 [c]	0.027	NA	0.0099	NA	1.1	NA	0.0047	NA	NA	NA	0.0048	NA
Acenaphthylene	370 [c]	0.0047 U	NA	0.0047 U	NA	0.13 U	NA	0.0047 U	NA	NA	NA	0.0048 U	NA
Anthracene	1800 [c]	0.029	NA	0.0047 U	NA	0.29 U	NA	0.0047 U	NA	NA	NA	0.0048 U	NA
Dibenzofuran	24 [c]	0.47 U	NA	0.47 U	NA	0.33 JQ	NA	0.47 U	NA	NA	NA	0.48 U	NA
Fluoranthene	1500 [c]	0.0047 U	NA	0.0047 U	NA	0.04 U	NA	0.0047 U	NA	NA	NA	0.0048 U	NA
Fluorene	240 [c]	0.0047 U	NA	0.0075	NA	0.28	NA	0.0047	NA	NA	NA	0.0048	NA
Naphthalene	6.2 [c]	0.035	NA	0.0047 U	NA	0.005 U	NA	0.0047 U	NA	2 U	NA	0.042 U	NA
Pentachlorophenol	0.56 [c]	0.47 UJK	NA	0.47 U	NA	**0.81**	NA	0.47 U	NA	NA	NA	0.48 U	NA
Phenanthrene	1800 [c]	0.0047 U	NA	0.015	NA	0.027	NA	0.0047	NA	NA	NA	0.031	NA
Pyrene	180 [c]	0.026	NA	0.014	NA	0.005	NA	0.038	NA	NA	NA	0.0048	NA
Petroleum Hydrocarbons (µg/L)													
C10-C12 Aliphatics	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA
C10-C12 Aromatics	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA
C12-C16 Aliphatics	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA
C12-C16 Aromatics	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA	24 U	NA
C16-C21 Aliphatics	NA	24 U	NA	24 UJK	NA	24 UJK	NA	24 U	NA	24 U	NA	24 U	NA
C16-C21 Aromatics	NA	47 U	NA	48 U	NA	48 U	NA	48 U	NA	47 U	NA	48 U	NA
C21-C34 Aliphatics	NA	47 U	NA	48 U	NA	48 U	NA	48 U	NA	47 U	NA	48 U	NA
C21-C34 Aromatics	NA	47 U	NA	48 U	NA	48 U	NA	48 U	NA	47 U	NA	48 U	NA
C8-C10 Aliphatics	NA	24 U	NA	30 U	NA	30 U	NA	24 U	NA	24 U	NA	24 U	NA
C8-C10 Aromatics	NA	25 U	NA	94	NA	25 U	NA	25 U	NA	73 U	NA	25 U	NA
Dioxin/Furans (pg/L)													
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	8.569 U	NA	5.794 U	NA	6.235 U	NA	4.64 U	NA	6.731 U	NA	4.982 U	NA
Total TCDD	NA	2.824 U	NA	3.07 U	NA	3.679 U	NA	2.312 U	NA	2.389 U	NA	2.51 U	NA
Water Quality Parameters (mg/L)													
Alkalinity	NA	211	NA	172	NA	290	NA	178	NA	133	NA	121	NA
Bromide	NA	0.2 U	NA	0.237	NA	0.247	NA	0.2 U	NA	0.2 U	NA	0.217	NA
Chloride	NA	13.7	NA	16.4	NA	12.9	NA	13.4	NA	16.3	NA	23.7	NA
COD	NA	5 U	NA	13	NA	26	NA	17	NA	5 U	NA	6	NA
Fluoride	NA	0.093	NA	0.066	NA	0.101	NA	0.09	NA	0.057	NA	0.075	NA
Hardness	NA	244.05	245.5	208.79	245.5	307.64	245.5	206.18	245.5	154.74	245.5	134.6	245.5
Nitrate+Nitrite	NA	2.3	NA	1.62	NA	0.584	NA	3.14	NA	2.98	NA	2.29	NA
Sulfate	NA	21.3	NA	33.7	NA	25.2	NA	20.7	NA	21.4	NA	25	NA
TDS	NA	296	NA	274	NA	394	NA	252	NA	214	NA	218	NA
TOC	NA	1.39	NA	1 U	NA	8.44	NA	1 U	NA	1 U	NA	1 U	NA

Key is on the next page.

Table 4-83

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
JQ	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJK	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit, biased unknown.

Table 4-84

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99244002	99244003	99244004	99244005	99244007	99244008	99244009	99244010	99244014	99244015
Sample Location		MW10-S	MW10-S	MW14-S	MW14-S	MW22-S	MW22-S	MW19-S	MW19-S	MW15-S	MW15-S
Sample Date		6/8/99	6/8/99	6/8/99	6/8/99	6/9/99	6/9/99	6/9/99	6/9/99	6/9/99	6/9/99
Volatile Organic Compounds (µg/L)											
1,1-Dichloroethane	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
1,1-Dichloroethene	0.046 [c]	0.02 U	NA	0.02 U	NA	1 U	NA	0.012 J	NA	1 U	NA
Benzene	0.41 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	18	NA
cis-1,2-Dichloroethene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
Ethylbenzene	1300 [c]	5 U	NA	1.1 JQ	NA	11	NA	5 U	NA	930	NA
Isopropylbenzene	660 [c]	1 U	NA	3.4	NA	9	NA	1 U	NA	251	NA
m&p-Xylene	1400 [c]	10 U	NA	5.7 JQ	NA	10	NA	10 U	NA	**2700**	NA
n-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1.6	NA	1 U	NA	**89.1**	NA
n-Propylbenzene	61 [c]	1 U	NA	1.6	NA	0.67 J	NA	1 U	NA	**255**	NA
o-Xylene	1400 [c]	5 U	NA	10	NA	9.3	NA	5 U	NA	**1600**	NA
p-Isopropyltoluene	NA	1 U	NA	1 U	NA	1.2	NA	1 U	NA	64.4	NA
sec-Butylbenzene	61 [c]	1 U	NA	2.7	NA	1.3	NA	1 U	NA	**79.3**	NA
tert-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1.4	NA
Tetrachloroethene	1.1 [c]	0.05 U	NA	1	NA	2 U	NA	0.05 U	NA	2 U	NA
Toluene	720 [c]	5 U	NA	5 U	NA	1.6 JQ	NA	5 U	NA	**240**	NA
Semivolatile Organic Compounds (µg/L)											
1,2,4-Trimethylbenzene	12 [c]	1 U	NA	**43.7**	NA	**25**	NA	1 U	NA	**2390**	NA
1,3,5-Trimethylbenzene	12 [c]	1 U	NA	**16.2**	NA	8.1	NA	1 U	NA	**570**	NA
1,4-Dichlorobenzene	NA	0.49 U	NA	0.49 U	NA	0.5 U	NA	0.51 U	NA	0.5 U	NA
2,4-Dinitrotoluene	73 [c]	0.49 U	NA	0.49 U	NA	0.5 U	NA	0.15 JQ	NA	0.5 U	NA
2-Methylnaphthalene	6.2 [c]	NA	NA	NA	NA	340	NA	NA	NA	550	NA
2-Methylphenol	1800 [c]	0.49 U	NA	0.49 U	NA	0.53	NA	0.51 U	NA	0.5 U	NA
4-Bromophenyl-phenylether	NA	0.49 U	NA	0.49 U	NA	0.5	NA	0.51 U	NA	0.5 U	NA
Acenaphthene	370 [c]	0.0049 U	NA	73	NA	**380**	NA	0.13	NA	54	NA
Acenaphthylene	370 [c]	0.0049 U	NA	1.3 JL	NA	5.2	NA	0.0051 U	NA	2.1	NA
Anthracene	1800 [c]	0.011	NA	3.3 JL	NA	30	NA	0.052	NA	8.9	NA
Benzo(a)anthracene	0.092 [c]	0.0049 U	NA	**0.28 JL**	NA	**0.19**	NA	0.0051 U	NA	0.5 U	NA
Benzo(a)pyrene	0.0092 [c]	0.0049 U	NA	**0.64 JL**	NA	0.05 U	NA	0.0051 U	NA	0.5 U	NA
Benzo(b)fluoranthene	0.092 [c]	0.0049 U	NA	0.05 JL	NA	0.05 U	NA	0.0051 U	NA	0.5 U	NA
Chrysene	9.2 [c]	0.0049 U	NA	0.27 JL	NA	0.21	NA	0.0051 U	NA	0.5 U	NA
Dibenzofuran	24 c	0.49 U	NA	**35**	NA	**150**	NA	0.51 U	NA	**31**	NA
Fluoranthene	1500 [c]	0.0049 U	NA	3.1 JL	NA	8	NA	0.03	NA	1.3	NA
Fluorene	240 [c]	0.0049 U	NA	33	NA	150	NA	0.061	NA	21	NA
Naphthalene	6.2 [c]	0.028	NA	**310**	NA	**3600**	NA	0.47	NA	**5300**	NA
Pentachlorophenol	0.56 [c]	**3**	NA	**330**	NA	**180**	NA	**30**	NA	**2200**	NA
Phenanthrene	1800 [c]	0.032	NA	19	NA	140	NA	0.053	NA	16	NA
Pyrene	180 [c]	0.0049 U	NA	2 JL	NA	6.3	NA	0.049	NA	0.35 JQ	NA
Tetrachlorophenols	1100 [c]	NA	NA	19	NA	0.5 U	NA	0.51 U	NA	270	NA

Key is at the end of the table.

Table 4-84

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99244002	99244003	99244004	99244005	99244007	99244008	99244009	99244010	99244014	99244015
Sample Location		MW10-S	MW10-S	MW14-S	MW14-S	MW22-S	MW22-S	MW19-S	MW19-S	MW15-S	MW15-S
Sample Date		6/8/99	6/8/99	6/8/99	6/8/99	6/9/99	6/9/99	6/9/99	6/9/99	6/9/99	6/9/99
Petroleum Hydrocarbons (µg/L)											
C10-C12 Aliphatics	NA	25 U	NA	350	NA	1000	NA	25	NA	9300	NA
C10-C12 Aromatics	NA	38	NA	250	NA	2300	NA	25	NA	980	NA
C12-C16 Aliphatics	NA	25 U	NA	290	NA	170	NA	25	NA	1200	NA
C12-C16 Aromatics	NA	25 U	NA	640	NA	1600	NA	25	NA	350	NA
C16-C21 Aliphatics	NA	56 U	NA	36	NA	25	NA	25	NA	130 U	NA
C16-C21 Aromatics	NA	50 U	NA	630	NA	1300	NA	49	NA	1800	NA
C21-C34 Aliphatics	NA	140 U	NA	59	NA	50	NA	57	NA	120 U	NA
C21-C34 Aromatics	NA	50 U	NA	50	NA	130	NA	49	NA	49 U	NA
C6-C8 Aliphatics	NA	10 UJK	NA	10 UJK	NA	10 UJK	NA	10 UJK	NA	100 JL	NA
C8-C10 Aliphatics	NA	30 U	NA	29 JQ	NA	44	NA	30 U	NA	5500	NA
C8-C10 Aromatics	NA	25 U	NA	430	NA	560	NA	21 JQ	NA	16000	NA
Dioxin/Furans (pg/L)											
2,3,7,8-TCDD TEQ	0.45 [c]	0.148	NA	**19.001**	NA	NA	NA	0.180	NA	**0.737**	NA
1,2,3,4,7,8-HxCDF	NA	1.879 U	NA	16.7	NA	3.591 UJ	NA	6.681 U	NA	6.023 U	NA
1,2,3,6,7,8-HxCDD	NA	4.187 U	NA	62.07	NA	9.916 UJ	NA	5.631 U	NA	4.549 U	NA
1,2,3,4,6,7,8-HpCDD	NA	14.78	NA	1063.845	NA	11.593 UJ	NA	18.054	NA	65.888	NA
1,2,3,4,6,7,8-HpCDF	NA	2.289 U	NA	80.728 U	NA	6.199 UJ	NA	6.74 U	NA	8.506 U	NA
OCDD	NA	63.629 U	NA	4729.406	NA	26.736 UJ	NA	169.76 U	NA	783.913	NA
OCDF	NA	8.805 U	NA	123.189	NA	19.322 UJ	NA	14.012 U	NA	8.991 U	NA
Total TCDD	NA	1.392 U	NA	1.555 U	NA	3.339 UJ	NA	6.327 U	NA	5.77	NA
Total TCDF	NA	1.336 U	NA	7.097	NA	3.219 UJ	NA	6.163 U	NA	4.504	NA
Water Quality Parameters (mg/L)											
Alkalinity	NA	283	NA	172	NA	309	NA	287	NA	207	NA
Biochemical Oxygen Demand	NA	20 U	NA	20 U	NA	20 U	NA	20 U	NA	17.9	NA
Bromide	NA	0.265	NA	0.2 U	NA	0.2 U	NA	0.25	NA	0.2 U	NA
Chloride	NA	8.28	NA	7.55	NA	7.01	NA	8.52	NA	12.5	NA
COD	NA	17	NA	5 U	NA	54	NA	5 U	NA	82	NA
Fluoride	NA	0.091	NA	0.068	NA	0.206	NA	0.109	NA	0.105	NA
Hardness	NA	312.91	310.71	179.45	181.37	306.94	302.45	309.43	306.83	215.63	215.45
Nitrate+Nitrite	NA	0.03	NA	0.352	NA	0.302	NA	0.02 U	NA	NA	NA
Sulfate	NA	57.7	NA	24.3	NA	6.26	NA	24	NA	7.22	NA
TDS	NA	378	NA	240	NA	390	NA	342	NA	336	NA
TOC	NA	5.63	NA	6.21	NA	19.7	NA	6.1	NA	36.2	NA
TSS	NA	2.1 U	NA	2.1 U	NA	2.1 U	NA	5.32	NA	5.66	NA

Key is at the end of the table.

Table 4-84

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99244018	99244019	99244022	99244023	99254013	99254014	99254016	99254017	99254020	99254021
Sample Location		MW08-S	MW08-S	MW09-S	MW09-S	Ershigs-4S	Ershigs-4S	Ershigs-1S	Ershigs-1S	Ershigs-3S	Ershigs-3S
Sample Date		6/9/99	6/9/99	6/10/99	6/10/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99
Volatile Organic Compounds (µg/L)											
1,1-Dichloroethane	NA	1 U	NA	1 U	NA	2.1	NA	1 U	NA	1 U	NA
1,1-Dichloroethene	0.046 [c]	0.02 U	NA	0.02 U	NA	**0.14**	NA	0.02 U	NA	0.02 U	NA
Benzene	0.41 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
cis-1,2-Dichloroethene	61 [c]	1 U	NA	1 U	NA	0.86 J	NA	1 U	NA	1 U	NA
Ethylbenzene	1300 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Isopropylbenzene	660 [c]	1 U	NA	1 U	NA	2 U	NA	2 U	NA	2 U	NA
m&p-Xylene	1400 [c]	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
n-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
n-Propylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
o-Xylene	1400 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
p-Isopropyltoluene	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
sec-Butylbenzene	61 [c]	1 U	NA	1 U	NA	2 U	NA	2 U	NA	2 U	NA
tert-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
Tetrachloroethene	1.1 [c]	0.05 U	NA	0.05 U	NA	0.14	NA	0.02 U	NA	0.02 U	NA
Toluene	720 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Semivolatile Organic Compounds (µg/L)											
1,2,4-Trimethylbenzene	12 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
1,3,5-Trimethylbenzene	12 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
1,4-Dichlorobenzene	NA	0.51 U	NA	0.5 U	NA	1.7	NA	0.47 U	NA	0.48 U	NA
2,4-Dinitrotoluene	73 [c]	0.51 U	NA	0.5 U	NA	0.47 U	NA	0.47 U	NA	0.48 U	NA
2-Methylnaphthalene	6.2 [c]	0.51 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	1800 [c]	0.51 U	NA	0.5 U	NA	0.47 U	NA	0.47 U	NA	0.48 U	NA
4-Bromophenyl-phenylether	NA	0.51 U	NA	0.5 U	NA	0.47 U	NA	0.47 U	NA	0.48 U	NA
Acenaphthene	370 [c]	0.026	NA	0.005 U	NA	0.0047	NA	0.0047	NA	0.0048	NA
Acenaphthylene	370 [c]	0.0051 U	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Anthracene	1800 [c]	0.02	NA	0.008	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Benzo(a)anthracene	0.092 [c]	0.0051 U	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Benzo(a)pyrene	0.0092 [c]	0.0051 U	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Benzo(b)fluoranthene	0.092 [c]	0.0051 U	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Chrysene	9.2 [c]	0.0051 U	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Dibenzofuran	24 c	0.51 U	NA	0.5 U	NA	0.47 U	NA	0.47 U	NA	0.48 U	NA
Fluoranthene	1500 [c]	0.014	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA
Fluorene	240 [c]	0.0051 U	NA	0.005 U	NA	0.0047	NA	0.0047	NA	0.0048	NA
Naphthalene	6.2 [c]	1.8	NA	0.051	NA	0.0047 U	NA	0.033 U	NA	0.038 U	NA
Pentachlorophenol	0.56 [c]	0.51 U	NA	0.5 U	NA	0.47 U	NA	0.47 U	NA	0.48 U	NA
Phenanthrene	1800 [c]	0.025	NA	0.022	NA	0.025	NA	0.028	NA	0.054	NA
Pyrene	180 [c]	0.029	NA	0.005 U	NA	0.0047	NA	0.0047	NA	0.0048	NA
Tetrachlorophenols	1100 [c]	0.51 U	NA	0.5 U	NA	0.47 U	NA	0.47 U	NA	0.48 U	NA

Key is at the end of the table.

Table 4-84

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99244018	99244019	99244022	99244023	99254013	99254014	99254016	99254017	99254020	99254021
Sample Location		MW08-S	MW08-S	MW09-S	MW09-S	Ershigs-4S	Ershigs-4S	Ershigs-1S	Ershigs-1S	Ershigs-3S	Ershigs-3S
Sample Date		6/9/99	6/9/99	6/10/99	6/10/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99
Petroleum Hydrocarbons (µg/L)											
C10-C12 Aliphatics	NA	25 U	NA	26 U	NA	NA	NA	24 U	NA	24 U	NA
C10-C12 Aromatics	NA	25 U	NA	34	NA	NA	NA	24 U	NA	24 U	NA
C12-C16 Aliphatics	NA	25 U	NA	26 U	NA	NA	NA	24 U	NA	24 U	NA
C12-C16 Aromatics	NA	25 U	NA	26 U	NA	NA	NA	24 U	NA	24 U	NA
C16-C21 Aliphatics	NA	53 U	NA	52 U	NA	NA	NA	24 U	NA	24 U	NA
C16-C21 Aromatics	NA	50 U	NA	51 U	NA	NA	NA	48 U	NA	49 U	NA
C21-C34 Aliphatics	NA	120 U	NA	130 U	NA	NA	NA	48 U	NA	49 U	NA
C21-C34 Aromatics	NA	50 U	NA	51 U	NA	NA	NA	48 U	NA	49 U	NA
C6-C8 Aliphatics	NA	10 UJK	NA	10 U	NA	10 UJK	NA	10 UJK	NA	10 UJK	NA
C8-C10 Aliphatics	NA	30 U	NA	30 U	NA	30 U	NA	24 U	NA	24 U	NA
C8-C10 Aromatics	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
Dioxin/Furans (pg/L)											
2,3,7,8-TCDD TEQ	0.45 [c]	**4.189**	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HxCDF	NA	7.436 U	NA	2.239 U	NA	4.644 U	NA	3.582 U	NA	10.877 U	NA
1,2,3,6,7,8-HxCDD	NA	10.846 U	NA	3.74 U	NA	2.866 U	NA	4.066 U	NA	12.967 U	NA
1,2,3,4,6,7,8-HpCDD	NA	339.357	NA	31.933 U	NA	4.365 U	NA	5.458 U	NA	22.25 U	NA
1,2,3,4,6,7,8-HpCDF	NA	49.923	NA	2.181 U	NA	3.712 U	NA	3.348 U	NA	23.615 U	NA
OCDD	NA	2963.054	NA	150.056 U	NA	44.143 U	NA	26.158 U	NA	24.72 U	NA
OCDF	NA	101.475 U	NA	10.328 U	NA	8.194 U	NA	8.223 U	NA	19.438 U	NA
Total TCDD	NA	1.93 U	NA	2.257 U	NA	1.996 U	NA	2.585 U	NA	6.933 U	NA
Total TCDF	NA	5.904	NA	2.245 U	NA	1.856 U	NA	4.059 U	NA	8.992 U	NA
Water Quality Parameters (mg/L)											
Alkalinity	NA	186	NA	228	NA	239	NA	231	NA	140	NA
Biochemical Oxygen Demand	NA	20 U	NA	20 U	NA	4.21	NA	2.4 U	NA	2.4 U	NA
Bromide	NA	0.2 U	NA	0.2 U	NA	0.219	NA	0.25	NA	0.24	NA
Chloride	NA	3.87	NA	4.45	NA	22.5	NA	4.76	NA	26.1	NA
COD	NA	5 U	NA	5 U	NA	20	NA	28	NA	14	NA
Fluoride	NA	0.15	NA	0.079	NA	0.241	NA	0.285	NA	0.092	NA
Hardness	NA	204.53	201.62	227.22	230.38	243.21	244.97	243.23	244.33	192.41	199.21
Nitrate+Nitrite	NA	0.02 U	NA	0.062	NA	1.16	NA	0.192	NA	2.14	NA
Sulfate	NA	31	NA	5.68	NA	42.6	NA	21.3	NA	31.4	NA
TDS	NA	242	NA	288	NA	354	NA	290	NA	260	NA
TOC	NA	3.62	NA	4.07	NA	5.17	NA	8.74	NA	2.74	NA
TSS	NA	10.9	NA	4.3	NA	2.5 U	NA	11.3	NA	2.4 U	NA

Key is on the next page.

Table 4-84

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(JUNE 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JL	= The analyte was positively identified. The associated numerical result is an estimate, biased low.
JQ	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
mg/L	= Milligrams per liter.
µg/L	= Micrograms per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJK	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit, biased unknown.

Table 4-85

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(SEPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384000	99384001	99384002	99384003	99384004	99384005	99384007	99384008	99384009	99384010	99384011	99384012
Sample Location		MW25-D	MW25-D	MW20-D	MW20-D	MW34-D	MW34-D	MW18-D	MW18-D	MW24-D	MW24-D	MW30-D	MW30-D
Sample Date		9/12/99	9/12/99	9/12/99	9/12/99	9/12/99	9/12/99	9/13/99	9/13/99	9/13/99	9/13/99	9/13/99	9/13/99
Semivolatile Organic Compounds (µg/L)													
1-Nitropyrene	NA	0.0048 U	NA	0.0049 U	NA	0.0049 U	NA	0.0049 U	NA	0.0047 U	NA	0.0047 U	NA
2-Methylnaphthalene	6.2 [c]	0.0057	NA	0.0058	NA	0.0049	NA	0.0049 U	NA	0.017	NA	0.0085	NA
Acenaphthene	370 [c]	0.0048 U	NA	0.0049 U	NA	0.0049 U	NA	0.0049 U	NA	0.0047 U	NA	0.0047 U	NA
Acenaphthylene	370 [c]	0.0048 U	NA	0.0049 U	NA	0.0049 U	NA	0.0049 U	NA	0.015	NA	0.0047 U	NA
Anthracene	1800 [c]	0.06	NA	0.027	NA	0.011	NA	0.033	NA	0.097	NA	0.0047 U	NA
Benzo(a)anthracene	0.092 [c]	0.0048 U	NA	0.0049 U	NA	0.0049 U	NA	0.0049 U	NA	0.0047 U	NA	0.0047 U	NA
Benzo(g,h,i)perylene	180 [c]	0.0048 U	NA	0.032	NA	0.0049 U	NA	0.0049 U	NA	0.0047 U	NA	0.0047 U	NA
Benzoic acid	150000 [c]	0.048 U	NA	0.049 U	NA	0.049 U	NA	0.049 U	NA	0.047 U	NA	0.047 U	NA
Benzyl alcohol	11000 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Chrysene	9.2 [c]	0.0048 U	NA	0.0049 U	NA	0.0049 U	NA	0.0049 U	NA	0.0047 U	NA	0.0047 U	NA
Dibenzofuran	24 [c]	0.024 U	NA	0.0034 J	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	0.009	NA	0.015	NA	0.0092	NA	0.0087	NA	0.0071	NA	0.0099	NA
Fluorene	240 [c]	0.0048 U	NA	0.0049 U	NA	0.0049 U	NA	0.0049 U	NA	0.0047 U	NA	0.0047 U	NA
Isophorone	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Naphthalene	6.2 [c]	0.009	NA	0.0083	NA	0.011	NA	0.0073	NA	0.0094	NA	0.008	NA
Pentachlorophenol	0.56 [c]	0.51	NA	0.027	NA	0.024 U	NA	0.024 U	NA	0.095	NA	0.024 U	NA
Phenanthrene	1800 [c]	0.022	NA	0.028	NA	0.016	NA	0.021	NA	0.016	NA	0.021	NA
Phenol	22000 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Pyrene	180 [c]	0.01	NA	0.038	NA	0.0063	NA	0.0083	NA	0.0061	NA	0.016	NA
Tetrachlorophenols	1100 [c]	1.3	NA	0.011 J	NA	0.024 U	NA	0.019 J	NA	0.033 J	NA	0.024 U	NA
Dioxin/Furans (pg/L)													
2,3,7,8-TCDD TEQ	0.45 [c]	0.002	NA	0.001	NA	0.001	NA	NA	NA	0.001	NA	0.0007	NA
1,2,3,4,6,7,8-HpCDD	NA	4.669 U	NA	1.592 U	NA	1.715 U	NA	1.493 U	NA	1.815 U	NA	1.569 U	NA
OCDD	NA	17.724	NA	14.266	NA	14.403	NA	14.045 U	NA	11.874	NA	7.202	NA
OCDF	NA	4.978 U	NA	3.198 U	NA	3.063 U	NA	3.128 U	NA	3.933 U	NA	3.895 U	NA
Water Quality Parameters (mg/L)													
Alkalinity	NA	341	NA	196	NA	232	NA	221	NA	310	NA	85.3	NA
Biochemical Oxygen Demand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	31.3	NA	12.3	NA	15.6	NA	16.6	NA	14.4	NA	13	NA
COD	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Fluoride	NA	0.126	NA	0.081	NA	0.116	NA	0.087	NA	0.111	NA	0.069	NA
Hardness	NA	346	NA	216	NA	222	NA	230	NA	310	NA	107	NA
Nitrate+Nitrite	NA	0.11	NA	3.15	NA	1.14	NA	0.929	NA	0.497	NA	3.4	NA
Sulfate	NA	24.7	NA	18	NA	39.9	NA	23.4	NA	20.1	NA	22.2	NA
Sulfide	NA	0.01 UJ	NA	0.01 UJ	NA	0.01 UJ	NA	0.01 UJ	NA	0.01 UJ	NA	0.01 UJ	NA
TDS	NA	440	NA	268	NA	342	NA	320	NA	384	NA	173	NA
TOC	NA	2.76	NA	1.04	NA	1.11	NA	1.54	NA	3.14	NA	1 U	NA
TSS	NA	2.3 U	NA	2.2 U	NA	2.1 U	NA	2.1 U	NA	2.2 U	NA	2.1 U	NA

Key is at the end of the table.

Table 4-85

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(SEPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384013	99384014	99384015	99384016	99384017	99384018	99384019	99384020	99384021	99384022	99384023	99384024
Sample Location		MW17-D	MW17-D	MW06-D	MW06-D	MW33-D	MW33-D	MW35-D	MW35-D	MW02-D	MW02-D	TC-6	TC-6
Sample Date		9/13/99	9/13/99	9/13/99	9/13/99	9/13/99	9/13/99	9/13/99	9/13/99	9/14/99	9/14/99	9/14/99	9/14/99
Semivolatile Organic Compounds (µg/L)													
1-Nitropyrene	NA	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
2-Methylnaphthalene	6.2 [c]	0.0074	NA	0.0047 U	NA	0.0047	NA	0.016	NA	0.0071	NA	0.0049 U	NA
Acenaphthene	370 [c]	0.005 U	NA	0.0047 U	NA	0.0099	NA	0.0048 U	NA	0.0062	NA	0.0087	NA
Acenaphthylene	370 [c]	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Anthracene	1800 [c]	0.034	NA	0.0047 U	NA	0.0061	NA	0.009	NA	0.017	NA	0.0049 U	NA
Benzo(a)anthracene	0.092 [c]	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Benzo(g,h,i)perylene	180 [c]	0.005 U	NA	0.0047 U	NA	0.022	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Benzoic acid	150000 [c]	0.05 U	NA	0.047 U	NA	0.047 U	NA	0.048 U	NA	0.048 U	NA	0.049 U	NA
Benzyl alcohol	11000 [c]	0.025 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 UJ	NA	0.024 U	NA
Chrysene	9.2 [c]	0.005 U	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Dibenzofuran	24 [c]	0.0045 J	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	0.011	NA	0.0047	NA	0.0094	NA	0.0086	NA	0.013	NA	0.0083	NA
Fluorene	240 [c]	0.005	NA	0.0047 U	NA	0.0047 U	NA	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA
Isophorone	NA	0.025 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Naphthalene	6.2 [c]	0.017	NA	0.0071	NA	0.022	NA	0.0071	NA	0.01	NA	0.014	NA
Pentachlorophenol	0.56 [c]	0.082	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Phenanthrene	1800 [c]	0.024	NA	0.014	NA	0.021	NA	0.023	NA	0.014	NA	0.017	NA
Phenol	22000 [c]	0.025 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Pyrene	180 [c]	0.011	NA	0.0028 J	NA	0.015	NA	0.0052	NA	0.01	NA	0.012	NA
Tetrachlorophenols	1100 [c]	0.055 J	NA	0.024 UJ	NA	0.024 UJ	NA	0.024 UJ	NA	0.024 U	NA	0.024 UJ	NA
Dioxin/Furans (pg/L)													
2,3,7,8-TCDD TEQ	0.45 [c]	0.033	NA	0.002	NA	NA	NA	0.0008	NA	0.0008	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	2.95	NA	1.534 U	NA	3.585 U	NA	1.419 U	NA	3.446 U	NA	2.803 U	NA
OCDD	NA	34.549	NA	20.546	NA	4.38 U	NA	8.525	NA	17.165 U	NA	3.686 U	NA
OCDF	NA	3.802 U	NA	3.283 U	NA	5.348 U	NA	3.699 U	NA	7.891	NA	7.393 U	NA
Water Quality Parameters (mg/L)													
Alkalinity	NA	234	NA	83.8	NA	199	NA	111	NA	331	NA	110	NA
Biochemical Oxygen Demand	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.3 U	NA	2.3 U	NA
Chloride	NA	14.9	NA	9.8	NA	6.7	NA	12.8	NA	23.3	NA	20	NA
COD	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Fluoride	NA	0.086	NA	0.067	NA	0.126	NA	0.073	NA	0.093	NA	0.061	NA
Hardness	NA	245	NA	109	NA	195	NA	127	NA	326	NA	123	NA
Nitrate+Nitrite	NA	1.85	NA	5.43	NA	1.17	NA	2.6	NA	0.187	NA	1.9	NA
Sulfate	NA	20.5	NA	20.8	NA	24	NA	19.8	NA	23.5	NA	21.3	NA
Sulfide	NA	0.1 U	NA	0.1 U	NA	0.1 U	NA	0.1 U	NA	0.1 U	NA	0.1 U	NA
TDS	NA	316	NA	184	NA	260	NA	201	NA	412	NA	196	NA
TOC	NA	1.43	NA	1 U	NA	1 U	NA	1.28	NA	1.39	NA	1 U	NA
TSS	NA	2.2 U	NA	2.1 U	NA	2.4 U	NA	2.1 U	NA	2.1 U	NA	2 U	NA

Key is at the end of the table.

Table 4-85

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(SEPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384025	99384026	99384027	99384028	99384029	99384030	99384031	99384032	99384033	99384034	99384036	99384037
Sample Location		MW30-D	MW24-D	MW06-D	MW17-D	MW18-D	MW33-D	MW20-D	MW25-D	MW34-D	MW35-D	MW03-D	MW03-D
Sample Date		9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99	9/14/99
Semivolatile Organic Compounds (µg/L)													
1-Nitropyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
2-Methylnaphthalene	6.2 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Acenaphthene	370 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Acenaphthylene	370 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Anthracene	1800 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Benzo(a)anthracene	0.092 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Benzo(g,h,i)perylene	180 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Benzoic acid	150000 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.048 R	NA
Benzyl alcohol	11000 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.024 R	NA
Chrysene	9.2 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Dibenzofuran	24 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.024 R	NA
Fluoranthene	1500 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Fluorene	240 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.024 R	NA
Naphthalene	6.2 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Pentachlorophenol	0.56 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.024 R	NA
Phenanthrene	1800 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Phenol	22000 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.024 R	NA
Pyrene	180 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0048 R	NA
Tetrachlorophenols	1100 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.024 R	NA
Dioxin/Furans (pg/L)													
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.002	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.768 U	NA
OCDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.131	NA
OCDF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.404 U	NA
Water Quality Parameters (mg/L)													
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	172	NA
Biochemical Oxygen Demand	NA	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.81	2.3 U	2.3 U		NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16.4	NA
COD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.067	NA
Hardness	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200	NA
Nitrate+Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.02	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33.7	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	NA
TDS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	253	NA
TOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA
TSS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1 U	NA

Key is at the end of the table.

Table 4-85

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(SEPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384038	99384039	99384042	99384043	99384044	99384045	99384047	99384048	99384350	99384351	99384352	99384353
Sample Location		MW01-D	MW01-D	Ershigs-4D	Ershigs-4D	MW01-D	MW03-D	MW05-D	MW05-D	MWLSC02	MWLSC02	MW23-D	MW23-D
Sample Date		9/14/99	9/14/99	9/15/99	9/15/99	9/15/99	9/15/99	9/15/99	9/15/99	9/16/99	9/16/99	9/15/99	9/15/99
Semivolatile Organic Compounds (µg/L)													
1-Nitropyrene	NA	0.0048 U	NA	0.005 U	NA	NA	NA	0.0048 U	NA	0.0048 U	NA	0.0048 U	NA
2-Methylnaphthalene	6.2 [c]	0.0063	NA	0.0075	NA	NA	NA	0.0067	NA	0.0076	NA	0.0091	NA
Acenaphthene	370 [c]	0.013	NA	0.005 U	NA	NA	NA	0.0048 U	NA	0.0048 U	NA	0.0048	NA
Acenaphthylene	370 [c]	0.0048 U	NA	0.005 U	NA	NA	NA	0.096	NA	0.0048 U	NA	0.0048 U	NA
Anthracene	1800 [c]	0.042	NA	0.0085	NA	NA	NA	0.32	NA	0.021 JN	NA	0.036	NA
Benzo(a)anthracene	0.092 [c]	0.0048 U	NA	0.005 U	NA	NA	NA	0.0067	NA	0.0048 U	NA	0.0048 U	NA
Benzo(g,h,i)perylene	180 [c]	0.0048 U	NA	0.005 U	NA	NA	NA	0.0048 U	NA	0.0048 U	NA	0.0048 U	NA
Benzoic acid	150000 [c]	0.048 U	NA	0.05 R	NA	NA	NA	0.048 U	NA	0.048 U	NA	0.049	NA
Benzyl alcohol	11000 [c]	0.024 UJ	NA	0.025 R	NA	NA	NA	0.024 UJ	NA	0.024 U	NA	0.024 U	NA
Chrysene	9.2 [c]	0.0048 U	NA	0.005 U	NA	NA	NA	0.0067	NA	0.0048 U	NA	0.0048 U	NA
Dibenzofuran	24 [c]	0.024 U	NA	0.025 U	NA	NA	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	0.0048 U	NA	0.008	NA	NA	NA	0.068	NA	0.0048 U	NA	0.0096	NA
Fluorene	240 [c]	0.0048 U	NA	0.005 U	NA	NA	NA	0.0048 U	NA	0.0048 U	NA	0.0048 U	NA
Isophorone	NA	0.024 U	NA	0.025 U	NA	NA	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Naphthalene	6.2 [c]	0.013	NA	0.0075	NA	NA	NA	0.0082	NA	0.013	NA	0.015	NA
Pentachlorophenol	0.56 [c]	0.024 U	NA	0.025 R	NA	NA	NA	**2.1**	NA	0.024 U	NA	0.024 U	NA
Phenanthrene	1800 [c]	0.017	NA	0.021	NA	NA	NA	0.04	NA	0.012	NA	0.028	NA
Phenol	22000 [c]	0.024 U	NA	0.025 R	NA	NA	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Pyrene	180 [c]	0.015	NA	0.0035 J	NA	NA	NA	0.027	NA	0.0048 U	NA	0.0087	NA
Tetrachlorophenols	1100 [c]	0.037 J	NA	0.025 R	NA	NA	NA	0.68 J	NA	0.024 U	NA	0.0067 J	NA
Dioxin/Furans (pg/L)													
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005	NA
1,2,3,4,6,7,8-HpCDD	NA	1.907 U	NA	4.361 U	NA	NA	NA	5.244 U	NA	3.562 U	NA	4.956 U	NA
OCDD	NA	4.898 U	NA	9.318 U	NA	NA	NA	8.709 U	NA	26.327 U	NA	53.1	NA
OCDF	NA	8.711 U	NA	8.937 U	NA	NA	NA	12.802 U	NA	11.235 U	NA	11.712 U	NA
Water Quality Parameters (mg/L)													
Alkalinity	NA	476	NA	134	NA	NA	NA	296	NA	165	NA	252	NA
Biochemical Oxygen Demand	NA		NA	2.3 U	NA	2.3 U	2.3 U	2.3 U	NA	2.3 U	NA	2.3 U	NA
Chloride	NA	10.4	NA	15.7	NA	NA	NA	12.7	NA	12.5	NA	20.1	NA
COD	NA	5 U	NA	5 U	NA	NA	NA	5 U	NA	5 U	NA	9	NA
Fluoride	NA	0.148	NA	0.06 U	NA	NA	NA	0.078	NA	0.08	NA	0.087	NA
Hardness	NA	445	NA	148	NA	NA	NA	305	NA	179	NA	278	NA
Nitrate+Nitrite	NA	0.332	NA	2.7	NA	NA	NA	0.457	NA	1.93	NA	0.493	NA
Sulfate	NA	13.1	NA	20.7	NA	NA	NA	23.8	NA	20.9	NA	41.4	NA
Sulfide	NA		NA	0.01 UJ	NA	NA	NA	0.01 UJ	NA	0.01 UJ	NA	0.01 UJ	NA
TDS	NA	515	NA	186	NA	NA	NA	378	NA	233	NA	365	NA
TOC	NA	1.88	NA	1 U	NA	NA	NA	7.28	NA	1.12	NA	3.35	NA
TSS	NA	2.1 U	NA	2.1 U	NA	NA	NA	2 U	NA	2.1 U	NA	2.1 U	NA

Key is at the end of the table.

Table 4-85

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(SEPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384354	99384355	99384358	99384359	99384363	99384364	99394020	99394021
Sample Location		Ershigs-1D	Ershigs-1D	MWLSC01	MWLSC01	MWLSC03	MWLSC03	TC-5	TC-5
Sample Date		9/15/99	9/15/99	9/16/99	9/16/99	9/16/99	9/16/99	9/21/99	9/21/99
Semivolatile Organic Compounds (µg/L)									
1-Nitropyrene	NA	0.012 JN	NA	0.0048 U	NA	0.0049 U	NA	0.0048 U	NA
2-Methylnaphthalene	6.2 [c]	0.0071	NA	0.012	NA	0.019	NA	0.0062	NA
Acenaphthene	370 [c]	0.0048 U	NA	0.0048 U	NA	0.02	NA	0.0048 U	NA
Acenaphthylene	370 [c]	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA	0.0048 U	NA
Anthracene	1800 [c]	0.0048 U	NA	0.022 JN	NA	0.0087	NA	0.0048	NA
Benzo(a)anthracene	0.092 [c]	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA	0.0048 U	NA
Benzo(g,h,i)perylene	180 [c]	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA	0.0048 U	NA
Benzoic acid	150000 [c]	0.048 U	NA	0.048 U	NA	0.049 UJ	NA	0.048 UJ	NA
Benzyl alcohol	11000 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.045	NA
Chrysene	9.2 [c]	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA	0.0048 U	NA
Dibenzofuran	24 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA	0.018	NA
Fluorene	240 [c]	0.0048 U	NA	0.0048 U	NA	0.0049 U	NA	0.0048 U	NA
Isophorone	NA	0.024 U	NA	0.0067 JN	NA	0.024 U	NA	0.024 U	NA
Naphthalene	6.2 [c]	0.01	NA	0.013	NA	0.16	NA	0.012 J	NA
Pentachlorophenol	0.56 [c]	0.024 U	NA	0.024 U	NA	0.37	NA	0.024 U	NA
Phenanthrene	1800 [c]	0.0048 U	NA	0.018	NA	0.01	NA	0.044	NA
Phenol	22000 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.033	NA
Pyrene	180 [c]	0.0048 U	NA	0.0048 U	NA	0.0058 J	NA	0.012 JN	NA
Tetrachlorophenols	1100 [c]	0.024 U	NA	0.024 U	NA	0.04	NA	0.024 U	NA
Dioxin/Furans (pg/L)									
2,3,7,8-TCDD TEQ	0.45 [c]	0.001	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	4.466 U	NA	2.109 U	NA	6.221 U	NA	5.874 U	NA
OCDD	NA	14.686	NA	4.015 U	NA	20.971 U	NA	5.363 U	NA
OCDF	NA	10.236 U	NA	3.753 U	NA	12.341 U	NA	5.368 U	NA
Water Quality Parameters (mg/L)									
Alkalinity	NA	128	NA	170	NA	140	NA	123	NA
Biochemical Oxygen Demand	NA	2.3 U	NA	2.3 U	NA	2.3 U	NA	2.3 U	NA
Chloride	NA	22.7	NA	12.1	NA	8.6	NA	26.4	NA
COD	NA	5 U	NA	5 U	NA	5	NA	5 U	NA
Fluoride	NA	0.069	NA	0.078	NA	0.106	NA	0.065	NA
Hardness	NA	134	NA	180	NA	158	NA	142	NA
Nitrate+Nitrite	NA	2.2	NA	0.723	NA	0.535	NA	2.14	NA
Sulfate	NA	24.6	NA	20	NA	24.4	NA	25.7	NA
Sulfide	NA	0.0322 J	NA	0.01 UJ	NA	0.0342 J	NA	0.1 U	NA
TDS	NA	233	NA	252	NA	203	NA	250	NA
TOC	NA	1 U	NA	1.04	NA	1.33	NA	1 U	NA
TSS	NA	42.2	NA	2.1 U	NA	16.5	NA	2 U	NA

Key is on the next page.

Table 4-85

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(SEPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
J	= The analyte was positively identified. The associated numerical result is an estimate.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(SEMPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384040	99384041	99384356	99384357	99384360	99384361	99384362	99394000	99394001	99394002	99394003
Sample Location		Ershigs-1A	Ershigs-1A	Ershigs-3	Ershigs-3	MW31-S	MW31-S	Ershigs-3	MW35-S	MW35-S	MW36-S	MW36-S
Sample Date		9/15/99	9/15/99	9/15/99	9/15/99	9/16/99	9/16/99	9/16/99	9/19/99	9/19/99	9/19/99	9/19/99
Volatile Organic Compounds (µg/L)												
1,2-Dichloroethane	0.12 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
Benzene	0.41 [c]	5 U	NA	5 U	NA	5 U	NA	NA	5 U	NA	5 U	NA
Ethylbenzene	1300 [c]	5 U	NA	5 U	NA	5 U	NA	NA	5 U	NA	5 U	NA
Isopropylbenzene	660 [c]	1 U	NA	1 U	NA	2	NA	NA	1 U	NA	1 U	NA
m&p-Xylene	1400 [c]	10 U	NA	10 U	NA	10 U	NA	NA	10 U	NA	10 U	NA
n-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
n-Propylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
o-Xylene	1400 [c]	5 U	NA	5 U	NA	5 U	NA	NA	5 U	NA	5 U	NA
p-Isopropyltoluene	NA	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
sec-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
tert-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
Toluene	720 [c]	5 U	NA	5 U	NA	5 U	NA	NA	5 U	NA	5 U	NA
Semivolatile Organic Compounds (µg/L)												
1,2,4-Trimethylbenzene	12 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
1,3,5-Trimethylbenzene	12 [c]	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
1,3-Dichlorobenzene	5.5 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
2,4,5-Trichlorophenol	NA	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
2,4,6-Trichlorophenol	6.1 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.034	NA	0.043	NA
2,4-Dichlorophenol	110 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
2,4-Dimethylphenol	730 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
2-Methylnaphthalene	6.2 [c]	0.0048 R	NA	0.0067	NA	2.5	NA	NA	0.048 U	NA	0.0048 U	NA
2-Methylphenol	1800 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
3&4-Methylphenol	180 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
4-Chlorotoluene	NA	1 U	NA	1 U	NA	1 U	NA	NA	1 U	NA	1 U	NA
Acenaphthene	370 [c]	0.0048 R	NA	0.0048 U	NA	0.48	NA	NA	0.0048 U	NA	0.0048 U	NA
Acenaphthylene	370 [c]	0.0048 R	NA	0.0048 U	NA	0.18	NA	NA	0.0048 U	NA	0.0071	NA
Anthracene	1800 [c]	0.0048 R	NA	0.0048 U	NA	0.299	NA	NA	0.02	NA	0.084	NA
Benzo(a)anthracene	0.092 [c]	0.0048 R	NA	0.0048 U	NA	0.0049 U	NA	NA	0.0048 U	NA	0.0048 U	NA
Benzyl alcohol	11000 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
Carbazole	3.4 [c]	0.024 R	NA	0.024 U	NA	0.49	NA	NA	0.024 U	NA	0.024 U	NA
Dibenzofuran	24 [c]	0.024 R	NA	0.024 U	NA	0.1	NA	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	0.0048 R	NA	0.021	NA	0.054	NA	NA	0.0048 U	NA	0.0048 U	NA

Key is at the end of the table.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (SEMPTEMBER 1999) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99384040	99384041	99384356	99384357	99384360	99384361	99384362	99394000	99394001	99394002	99394003
Sample Location		Ershigs-1A	Ershigs-1A	Ershigs-3	Ershigs-3	MW31-S	MW31-S	Ershigs-3	MW35-S	MW35-S	MW36-S	MW36-S
Sample Date		9/15/99	9/15/99	9/15/99	9/15/99	9/16/99	9/16/99	9/16/99	9/19/99	9/19/99	9/19/99	9/19/99
Semivolatile Organic Compounds (µg/L) Continued												
Fluorene	240 [c]	0.0048 R	NA	0.0048 U	NA	0.29	NA	NA	0.0048 U	NA	0.0048 U	NA
Naphthalene	6.2 [c]	0.0048 R	NA	0.011	NA	1.4	NA	NA	0.0095	NA	0.0067	NA
Pentachlorophenol	0.56 [c]	0.024 R	NA	0.024 U	NA	**420**	NA	NA	0.026	NA	25	NA
Phenanthrene	1800 [c]	0.0048 R	NA	0.0048 U	NA	0.0049 U	NA	NA	0.0048	NA	0.0048 U	NA
Phenol	22000 [c]	0.024 R	NA	0.024 U	NA	0.025 U	NA	NA	0.024 U	NA	0.024 U	NA
Pyrene	180 [c]	0.0048 R	NA	0.0048 U	NA	0.0093 J	NA	NA	0.0048 UJ	NA	0.019 J	NA
Tetrachlorophenols	1100 [c]	0.024 R	NA	0.024 U	NA	38	NA	NA	0.14	NA	3.3	NA
Petroleum Hydrocarbons (µg/L)												
C10-C12 Aliphatics	NA	49 U	NA	48 U	NA	50 U	NA	NA	47 U	NA	48 U	NA
C10-C12 Aromatics	NA	49 U	NA	48 U	NA	50 U	NA	NA	47 U	NA	48 U	NA
C12-C16 Aliphatics	NA	49 U	NA	48 U	NA	50 U	NA	NA	47 U	NA	48 U	NA
C12-C16 Aromatics	NA	49 U	NA	48 U	NA	50 U	NA	NA	47 U	NA	48 U	NA
C16-C21 Aromatics	NA	49 U	NA	48 U	NA	59 J	NA	NA	47 U	NA	48 U	NA
C5-C6 Aliphatics	NA	49 U	NA	15 U	NA	15 U	NA	NA	15 U	NA	15 U	NA
C6-C8 Aliphatics	NA	10 U	NA	10 U	NA	10 U	NA	NA	10 U	NA	10 U	NA
C8-C10 Aliphatics	NA	64 U	NA	68 U	NA	50 U	NA	NA	47 U	NA	55 U	NA
C8-C10 Aromatics	NA	25 U	NA	25 U	NA	25 U	NA	NA	25 U	NA	25 U	NA
Dioxin/Furans (pg/L)												
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	NA	NA	0.160	NA	NA	NA	NA	0.089	NA
1,2,3,4,6,7,8-HpCDD	NA	4.417 U	NA	2.782 U	NA	14.914	NA	NA	6.486 U	NA	8.109	NA
OCDD	NA	6.389 U	NA	8.715 U	NA	112.702	NA	NA	9.751 U	NA	81.278	NA
OCDF	NA	11.484 U	NA	5.257 U	NA	17.623 U	NA	NA	12.723 U	NA	3.699 U	NA
Water Quality Parameters (mg/L)												
Alkalinity	NA	233	NA	153	NA	194	NA	NA	151	NA	131	NA
Biochemical Oxygen Demand	NA	2.3 U	NA	NA	NA	2.3 U	NA	2.3 U	NA	NA	NA	NA
Bromide	NA	0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	0.5 U	NA	0.5 U	NA
Chloride	NA	4.7	NA	17	NA	15.5	NA	NA	6.4	NA	5.4	NA
COD	NA	13	NA	5 U	NA	13	NA	NA	51	NA	7	NA
Fluoride	NA	0.266	NA	0.098	NA	0.142	NA	NA	0.151	NA	0.07	NA
Hardness	NA	239	NA	179	NA	212	NA	NA	146	NA	139	NA
Nitrate+Nitrite	NA	0.506	NA	2.55	NA	0.29	NA	NA	0.156	NA	0.967	NA
Sulfate	NA	21.1	NA	26	NA	18	NA	NA	39.5	NA	18	NA
Sulfide	NA	0.1 U	NA	0.0192 J	NA	0.01 UJ	NA	NA	0.1 U	NA	0.1 U	NA
TDS	NA	282	NA	259	NA	278	NA	NA	259	NA	192	NA
TOC	NA	7.32	NA	2.11	NA	3.72	NA	NA	9.67	NA	3.23	NA
TSS	NA	3.38	NA	2.1 U	NA	2.76	NA	NA	2.1 U	NA	2 U	NA

Key is at the end of the table.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (SEMPTEMBER 1999) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99394004	99394005	99394006	99394007	99394008	99394009	99394011	99394012	99394013	99394014
Sample Location		MW15-S	MW15-S	MW22-S	MW22-S	MW09-S	MW09-S	MW08-S	MW08-S	MW32-S	MW32-S
Sample Date		9/19/99	9/19/99	9/19/99	9/19/99	9/20/99	9/20/99	9/20/99	9/20/99	9/20/99	9/20/99
Volatile Organic Compounds (µg/L)											
1,2-Dichloroethane	0.12 [c]	**1**	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
Benzene	0.41 [c]	**44**	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Ethylbenzene	1300 [c]	1100 J	NA	16	NA	5 U	NA	5 U	NA	5 U	NA
Isopropylbenzene	660 [c]	298	NA	7.2	NA	1 U	NA	1 U	NA	1 U	NA
m&p-Xylene	1400 [c]	**2500 J**	NA	15	NA	10 U	NA	10 U	NA	10 U	NA
n-Butylbenzene	61 [c]	**66.3 J**	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
n-Propylbenzene	61 [c]	**283**	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
o-Xylene	1400 [c]	**1900 J**	NA	11	NA	5 U	NA	5 U	NA	5 U	NA
p-Isopropyltoluene	NA	56.8 J	NA	1.1	NA	1 U	NA	1 U	NA	1 U	NA
sec-Butylbenzene	61 [c]	**62.9 J**	NA	0.93 J	NA	1 U	NA	1 U	NA	1 U	NA
tert-Butylbenzene	61 [c]	1.7	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
Toluene	720 [c]	390 J	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Semivolatile Organic Compounds (µg/L)											
1,2,4-Trimethylbenzene	12 [c]	**2690**	NA	**25.2**	NA	1 U	NA	1 U	NA	1 U	NA
1,3,5-Trimethylbenzene	12 [c]	**648**	NA	7.9	NA	1 U	NA	1 U	NA	1 U	NA
1,3-Dichlorobenzene	5.5 [c]	0.24 U	NA	0.24 U	NA	0.024 U	NA	0.017 J	NA	0.0067 J	NA
2,4,5-Trichlorophenol	NA	3.7	NA	0.24 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
2,4,6-Trichlorophenol	6.1 [c]	0.24 U	NA	0.24 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
2,4-Dichlorophenol	110 [c]	0.24 U	NA	0.24 U	NA	0.024 U	NA	0.039	NA	0.018 J	NA
2,4-Dimethylphenol	730 [c]	0.24 U	NA	6	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
2-Methylnaphthalene	6.2 [c]	**340**	NA	**410**	NA	0.0071	NA	0.026	NA	0.0086	NA
2-Methylphenol	1800 [c]	29	NA	0.42 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
3&4-Methylphenol	180 [c]	26	NA	0.69 U	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
4-Chlorotoluene	NA	1.8	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
Acenaphthene	370 [c]	36	NA	**530**	NA	0.019	NA	0.014	NA	0.0067	NA
Acenaphthylene	370 [c]	1.4	NA	13	NA	0.0048 U	NA	0.0048 U	NA	0.0048 U	NA
Anthracene	1800 [c]	2.3	NA	26	NA	0.0048 U	NA	0.038	NA	0.0067	NA
Benzo(a)anthracene	0.092 [c]	0.048 U	NA	**0.83**	NA	0.0048 U	NA	0.0048 U	NA	0.0048 U	NA
Benzyl alcohol	11000 [c]	0.24 U	NA	0.24 U	NA	0.024 U	NA	0.041	NA	0.03	NA
Carbazole	3.4 [c]	**39**	NA	**350**	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Dibenzofuran	24 [c]	14	NA	**180**	NA	0.024 U	NA	0.026	NA	0.024 U	NA
Fluoranthene	1500 [c]	0.64	NA	24	NA	0.0048 U	NA	0.028	NA	0.0048 U	NA

Key is at the end of the table.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (SEMPTEMBER 1999) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99394004	99394005	99394006	99394007	99394008	99394009	99394011	99394012	99394013	99394014
Sample Location		MW15-S	MW15-S	MW22-S	MW22-S	MW09-S	MW09-S	MW08-S	MW08-S	MW32-S	MW32-S
Sample Date		9/19/99	9/19/99	9/19/99	9/19/99	9/20/99	9/20/99	9/20/99	9/20/99	9/20/99	9/20/99
Semivolatile Organic Compounds (µg/L)											
Fluorene	240 [c]	13	NA	**210**	NA	0.0048 U	NA	0.0048 U	NA	0.0048 U	NA
Naphthalene	6.2 [c]	**3600**	NA	**2600**	NA	0.074	NA	0.16 J	NA	0.032 J	NA
Pentachlorophenol	0.56 [c]	**1900**	NA	**170**	NA	0.024 U	NA	0.053	NA	0.032	NA
Phenanthrene	1800 [c]	9.4	NA	230	NA	0.0067	NA	0.12	NA	0.029	NA
Phenol	22000 [c]	0.24 U	NA	0.24 U	NA	0.024 U	NA	0.034	NA	0.028	NA
Pyrene	180 [c]	0.42 J	NA	18 J	NA	0.0048 UJ	NA	0.015 J	NA	0.01 J	NA
Tetrachlorophenols	1100 [c]	260 U	NA	22	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Petroleum Hydrocarbons (µg/L)											
C10-C12 Aliphatics	NA	3600	NA	860	NA	47 U	NA	48 U	NA	52 U	NA
C10-C12 Aromatics	NA	6100	NA	4900	NA	47 U	NA	48 UJ	NA	52 UJ	NA
C12-C16 Aliphatics	NA	57	NA	47 U	NA	47 U	NA	48 U	NA	52 U	NA
C12-C16 Aromatics	NA	890	NA	2100	NA	47 U	NA	48 UJ	NA	52 UJ	NA
C16-C21 Aromatics	NA	1200	NA	1400	NA	47 U	NA	48 U	NA	52 U	NA
C5-C6 Aliphatics	NA	6.3 J	NA	15 U	NA	15 U	NA	15 U	NA	15 U	NA
C6-C8 Aliphatics	NA	260	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
C8-C10 Aliphatics	NA	4000	NA	63 U	NA	47 U	NA	48 U	NA	52 U	NA
C8-C10 Aromatics	NA	17000 J	NA	250	NA	100	NA	25 U	NA	25 U	NA
Dioxin/Furans (pg/L)											
2,3,7,8-TCDD TEQ	0.45 [c]	0.018	NA	NA	NA	NA	NA	0.037	NA	0.005	NA
1,2,3,4,6,7,8-HpCDD	NA	14.249 UJ	NA	15.424 UJ	NA	3.832 U	NA	32.834 U	NA	3.38 U	NA
OCDD	NA	175.843	NA	38.104 U	NA	5.862 U	NA	341.429	NA	50.075	NA
OCDF	NA	36.666 U	NA	42.209 U	NA	6.253 U	NA	27.369	NA	4.037 U	NA
Water Quality Parameters (mg/L)											
Alkalinity	NA	214	NA	298	NA	264	NA	185	NA	157	NA
Biochemical Oxygen Demand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.3 U
Bromide	NA	0.5 U	NA	0.5 U	NA	0.5 U	NA	0.5 U	NA	0.925	NA
Chloride	NA	18.5	NA	6.6	NA	3.8	NA	3.9	NA	13.9	NA
COD	NA	160	NA	66	NA	11	NA	6	NA	5 U	NA
Fluoride	NA	0.103	NA	0.206	NA	0.063	NA	0.13	NA	0.142	NA
Hardness	NA	228	NA	293	NA	243	NA	198	NA	206	NA
Nitrate+Nitrite	NA	0.01 U	NA	0.01 U	NA	0.01	NA	0.036	NA	7.24	NA
Sulfate	NA	10.2	NA	5.3	NA	1.1	NA	31.3	NA	49	NA
Sulfide	NA	0.1 U	NA	0.1 U	NA	0.1 U	NA	0.112	NA	0.1 U	NA
TDS	NA	385	NA	386	NA	315	NA	262	NA	311	NA
TOC	NA	50.8	NA	23.5	NA	4.52	NA	3.13	NA	2	NA
TSS	NA	2.26	NA	2 U	NA	13.4	NA	12.8	NA	2.1 U	NA

Key is at the end of the table.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (SEMPTEMBER 1999) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99394015	99394016	99394018	99394019	99394022	99394024	99394025	99394026	99394027	99394028
Sample Location		MW36-S	MW22-S	MW10-S	MW10-S	MW32-S	MW15-S	MW09-S	MW08-S	MW19-S	MW19-S
Sample Date		9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99
Volatile Organic Compounds (µg/L)											
1,2-Dichloroethane	0.12 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
Benzene	0.41 [c]	NA	NA	5 U	NA	NA	NA	NA	NA	NA	5 U
Ethylbenzene	1300 [c]	NA	NA	5 U	NA	NA	NA	NA	NA	NA	5 U
Isopropylbenzene	660 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
m&p-Xylene	1400 [c]	NA	NA	10 U	NA	NA	NA	NA	NA	NA	10 U
n-Butylbenzene	61 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
n-Propylbenzene	61 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
o-Xylene	1400 [c]	NA	NA	5 U	NA	NA	NA	NA	NA	NA	5 U
p-Isopropyltoluene	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	2 U
sec-Butylbenzene	61 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
tert-Butylbenzene	61 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
Toluene	720 [c]	NA	NA	5 U	NA	NA	NA	NA	NA	NA	5 U
Semivolatile Organic Compounds (µg/L)											
1,2,4-Trimethylbenzene	12 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
1,3,5-Trimethylbenzene	12 [c]	NA	NA	1 U	NA	NA	NA	NA	NA	NA	2 U
1,3-Dichlorobenzene	5.5 [c]	NA	NA	0.0052 J	NA	NA	NA	NA	NA	NA	0.0067 J
2,4,5-Trichlorophenol	NA	NA	NA	0.024 U	NA	NA	NA	NA	NA	NA	0.024 U
2,4,6-Trichlorophenol	6.1 [c]	NA	NA	0.028	NA	NA	NA	NA	NA	NA	0.024 U
2,4-Dichlorophenol	110 [c]	NA	NA	0.0071 J	NA	NA	NA	NA	NA	NA	0.024 U
2,4-Dimethylphenol	730 [c]	NA	NA	0.024 U	NA	NA	NA	NA	NA	NA	0.024 U
2-Methylnaphthalene	6.2 [c]	NA	NA	0.01	NA	NA	NA	NA	NA	NA	0.0048 U
2-Methylphenol	1800 [c]	NA	NA	0.024 U	NA	NA	NA	NA	NA	NA	0.024 U
3&4-Methylphenol	180 [c]	NA	NA	0.024 U	NA	NA	NA	NA	NA	NA	0.024 U
4-Chlorotoluene	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	1 U
Acenaphthene	370 [c]	NA	NA	0.0048 U	NA	NA	NA	NA	NA	NA	0.0048 U
Acenaphthylene	370 [c]	NA	NA	0.0043 J	NA	NA	NA	NA	NA	NA	0.0048 U
Anthracene	1800 [c]	NA	NA	0.12	NA	NA	NA	NA	NA	NA	0.053
Benzo(a)anthracene	0.092 [c]	NA	NA	0.0048 U	NA	NA	NA	NA	NA	NA	0.0048 U
Benzyl alcohol	11000 [c]	NA	NA	0.037	NA	NA	NA	NA	NA	NA	0.024 U
Carbazole	3.4 [c]	NA	NA	0.024 U	NA	NA	NA	NA	NA	NA	0.024 U
Dibenzofuran	24 [c]	NA	NA	0.0038 J	NA	NA	NA	NA	NA	NA	0.024 U
Fluoranthene	1500 [c]	NA	NA	0.0048 U	NA	NA	NA	NA	NA	NA	0.02

Key is at the end of the table.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (SEMPTEMBER 1999) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99394015	99394016	99394018	99394019	99394022	99394024	99394025	99394026	99394027	99394028
Sample Location		MW36-S	MW22-S	MW10-S	MW10-S	MW32-S	MW15-S	MW09-S	MW08-S	MW19-S	MW19-S
Sample Date		9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99	9/21/99
Semivolatile Organic Compounds (µg/L)											
Fluorene	240 [c]	NA	NA	0.0048 U	NA	NA	NA	NA	NA	NA	0.0048 U
Naphthalene	6.2 [c]	NA	NA	0.023 J	NA	NA	NA	NA	NA	NA	0.0048 U
Pentachlorophenol	0.56 [c]	NA	NA	**11**	NA	NA	NA	NA	NA	NA	**22**
Phenanthrene	1800 [c]	NA	NA	0.028	NA	NA	NA	NA	NA	NA	0.026
Phenol	22000 [c]	NA	NA	0.024 U	NA	NA	NA	NA	NA	NA	0.024 U
Pyrene	180 [c]	NA	NA	0.01 JN	NA	NA	NA	NA	NA	NA	0.019
Tetrachlorophenols	1100 [c]	NA	NA	0.57	NA	NA	NA	NA	NA	NA	1.3
Petroleum Hydrocarbons (µg/L)											
C10-C12 Aliphatics	NA	NA	NA	48 U	NA	NA	NA	NA	NA	NA	48 U
C10-C12 Aromatics	NA	NA	NA	48 UJ	NA	NA	NA	NA	NA	NA	48 U
C12-C16 Aliphatics	NA	NA	NA	48 U	NA	NA	NA	NA	NA	NA	48 U
C12-C16 Aromatics	NA	NA	NA	48 UJ	NA	NA	NA	NA	NA	NA	48 U
C16-C21 Aromatics	NA	NA	NA	48 U	NA	NA	NA	NA	NA	NA	48 U
C5-C6 Aliphatics	NA	NA	NA	15 U	NA	NA	NA	NA	NA	NA	15 U
C6-C8 Aliphatics	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	10 U
C8-C10 Aliphatics	NA	NA	NA	54 U	NA	NA	NA	NA	NA	NA	48 U
C8-C10 Aromatics	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	25 U
Dioxin/Furans (pg/L)											
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	0.004	NA	NA	NA	NA	NA	NA	0.006
1,2,3,4,6,7,8-HpCDD	NA	NA	NA	3.292 U	NA	NA	NA	NA	NA	NA	7.103 U
OCDD	NA	NA	NA	41.254	NA	NA	NA	NA	NA	NA	61.156
OCDF	NA	NA	NA	4.467 U	NA	NA	NA	NA	NA	NA	3.688 U
Water Quality Parameters (mg/L)											
Alkalinity	NA	NA	NA	254	NA	NA	NA	NA	NA	NA	284
Biochemical Oxygen Demand	NA	2.3 U	13	2.3 U	NA	2.3 U	28.6	2.3 U	2.3 U		2.3 U
Bromide	NA	NA	NA	0.5 U	NA	NA	NA	NA	NA	NA	0.5 U
Chloride	NA	NA	NA	8.2	NA	NA	NA	NA	NA	NA	8.94
COD	NA	NA	NA	9 U	NA	NA	NA	NA	NA	NA	23
Fluoride	NA	NA	NA	0.087	NA	NA	NA	NA	NA	NA	0.092
Hardness	NA	NA	NA	296	NA	NA	NA	NA	NA	NA	308
Nitrate+Nitrite	NA	NA	NA	0.07	NA	NA	NA	NA	NA	NA	0.015 U
Sulfate	NA	NA	NA	59.7	NA	NA	NA	NA	NA	NA	31
Sulfide	NA	NA	NA	0.1 U	NA	NA	NA	NA	NA	NA	0.1 U
TDS	NA	NA	NA	383	NA	NA	NA	NA	NA	NA	390
TOC	NA	NA	NA	5.05	NA	NA	NA	NA	NA	NA	5.95
TSS	NA	NA	NA	2.1 U	NA	NA	NA	NA	NA	NA	5.65

Key is on the next page.

Table 4-86

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(SEMPTEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JN	= The analyte was tentatively identified, and the numerical result is estimated.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
R	= Rejected.
SVOCs	= Semivolatile Organic Compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99504012	99504013	99504016	99504017	99504018	99504019	99504022
Sample Location		MW17-D	MW17-D	MW18-D	MW18-D	MW35-D	MW35-D	MWLSC03
Sample Date		12/7/99	12/7/99	12/7/99	12/7/99	12/7/99	12/7/99	12/8/99
Volatile Organic Compounds (µg/L)								
m&p-Xylene	1400 [c]	10 U	NA	10 U	NA	10 U	NA	10 U
o-Xylene	1400 [c]	5 U	NA	5 U	NA	5 U	NA	5 U
Semivolatile Organic Compounds (µg/L)								
2-Methylnaphthalene	6.2 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0071
Acenaphthene	370 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0061
Acenaphthylene	370 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Anthracene	1800 [c]	0.055	NA	0.075	NA	0.028	NA	0.031
Benzo(g,h,i)perylene	180 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Carbazole	3.4 [c]	0.049 U	NA	0.047 U	NA	0.049 U	NA	0.047 U
Dibenzofuran	24 [c]	0.024 U	NA	0.024 U	NA	0.025 U	NA	0.024 U
Fluoranthene	1500 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Fluorene	240 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Naphthalene	6.2 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.012
Pentachlorophenol	0.56 [c]	0.089	NA	0.024 U	NA	0.025 U	NA	0.024 U
Phenanthrene	1800 [c]	0.012	NA	0.0047 U	NA	0.0069	NA	0.0099
Pyrene	180 [c]	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Tetrachlorophenols	1100 [c]	0.052	NA	0.024 U	NA	0.025 U	NA	0.0066 U
Petroleum Hydrocarbons (µg/L)								
C12-C16 Aromatics	NA	49 U	NA	49 U	NA	47 U	NA	47 U
C16-C21 Aromatics	NA	49 UJ	NA	51 J	NA	48 J	NA	47 UJ
C21-C34 Aliphatics	NA	49 UJ	NA	49 UJ	NA	47 UJ	NA	350 J
C21-C34 Aromatics	NA	49 UJ	NA	49 UJ	NA	47 UJ	NA	47 UJ
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	0.001	NA	0.001	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	5.764 U	NA	5.244 U	NA	4.529 U	NA	5.442 U
1,2,3,4,6,7,8-HpCDF	NA	9.73 U	NA	2.65 U	NA	2.567 U	NA	2.398 U
OCDD	NA	46.887	NA	14.239	NA	19.007 U	NA	41.574 U
OCDF	NA	4.887 U	NA	4.92 U	NA	3.398 U	NA	3.286 U
Total HxCDD	NA	6.704 U	NA	5.078 U	NA	4.739 U	NA	4.641 U
Total HpCDD	NA	5.764 U	NA	5.244 U	NA	4.529 U	NA	2.639 U
Total HpCDF	NA	9.73 U	NA	2.65 U	NA	2.567 U	NA	2.398 U
Water Quality Parameters (mg/L)								
Alkalinity	NA	220	NA	215	NA	113	NA	151
Bromide	NA	0.2 U	NA	0.2 U	NA	0.2 U	NA	0.2 U
Chloride	NA	15	NA	14.9	NA	12.7	NA	7.32
COD	NA	5 U	NA	5 U	NA	13	NA	5 U
Fluoride	NA	0.09	NA	0.09	NA	0.064	NA	0.093
Hardness	NA	244	NA	230	NA	135	NA	171
Nitrate+Nitrite	NA	2.06	NA	1.1	NA	2.7	NA	0.327
Sulfate	NA	18.4	NA	21.1	NA	18.4	NA	26.6
TDS	NA	286	NA	293	NA	196	NA	211
TOC	NA	1.51	NA	1.61	NA	1.21	NA	1.25
TSS	NA	3.2 U	NA	2.1 U	NA	2 U	NA	2 U

Key is at the end of the table.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99504023	99504024	99504025	99504026	99504027	99504028	99504029
Sample Location		MWLSC03	MW03-D	MW03-D	MW24-D	MW24-D	MW02-D	MW02-D
Sample Date		12/8/99	12/9/99	12/9/99	12/9/99	12/9/99	12/8/99	12/8/99
Volatile Organic Compounds (µg/L)								
m&p-Xylene	1400 [c]	NA	10 U	NA	10 U	NA	10 U	NA
o-Xylene	1400 [c]	NA	5 U	NA	5 U	NA	5 U	NA
Semivolatile Organic Compounds (µg/L)								
2-Methylnaphthalene	6.2 [c]	NA	0.0047 U	NA	0.0047 U	NA	0.0047 U	NA
Acenaphthene	370 [c]	NA	0.0047 U	NA	0.0066 U	NA	0.0047 U	NA
Acenaphthylene	370 [c]	NA	0.0047 U	NA	0.076	NA	0.0047 U	NA
Anthracene	1800 [c]	NA	0.0061	NA	0.46	NA	0.078	NA
Benzo(g,h,i)perylene	180 [c]	NA	0.0047 U	NA	0.0047 U	NA	0.0047 U	NA
Carbazole	3.4 [c]	NA	0.024 U	NA	0.047 U	NA	0.047 U	NA
Dibenzofuran	24 [c]	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	NA	0.0047 U	NA	0.0047 U	NA	0.0047 U	NA
Fluorene	240 [c]	NA	0.0047 U	NA	0.012	NA	0.0047 U	NA
Naphthalene	6.2 [c]	NA	0.0047 U	NA	0.0047 U	NA	0.023 U	NA
Pentachlorophenol	0.56 [c]	NA	0.024 U	NA	0.18	NA	0.024 U	NA
Phenanthrene	1800 [c]	NA	0.0047	NA	0.024	NA	0.0057 U	NA
Pyrene	180 [c]	NA	0.0047 U	NA	0.018	NA	0.013	NA
Tetrachlorophenols	1100 [c]	NA	0.024 U	NA	0.14	NA	0.046	NA
Petroleum Hydrocarbons (µg/L)								
C12-C16 Aromatics	NA	NA	56	NA	47 U	NA	47 U	NA
C16-C21 Aromatics	NA	NA	120 J	NA	47 UJ	NA	63 J	NA
C21-C34 Aliphatics	NA	NA	88 J	NA	84 J	NA	51 J	NA
C21-C34 Aromatics	NA	NA	140 J	NA	80 J	NA	70 J	NA
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	24.054 U	NA	3.505 U	NA	2.33 U	NA
1,2,3,4,6,7,8-HpCDF	NA	NA	8.336 U	NA	2.437 U	NA	1.475 U	NA
OCDD	NA	NA	12.952 U	NA	16.824 U	NA	27.106 U	NA
OCDF	NA	NA	12.004 U	NA	2.643 U	NA	2.946 U	NA
Total HxCDD	NA	NA	12.027 U	NA	3.867 U	NA	3.071 U	NA
Total HpCDD	NA	NA	24.054 U	NA	3.505 U	NA	2.33 U	NA
Total HpCDF	NA	NA	8.336 U	NA	2.437 U	NA	1.475 U	NA
Water Quality Parameters (mg/L)								
Alkalinity	NA	NA	177	NA	309	NA	354	NA
Bromide	NA	NA	0.2 U	NA	0.2 U	NA	0.2 U	NA
Chloride	NA	NA	14.6	NA	13.7	NA	23.5	NA
COD	NA	NA	5 U	NA	7	NA	9	NA
Fluoride	NA	NA	0.052	NA	0.116	NA	0.081	NA
Hardness	NA	NA	213	NA	321	NA	359	NA
Nitrate+Nitrite	NA	NA	1.63	NA	0.465	NA	0.01 U	NA
Sulfate	NA	NA	34.2	NA	17.6	NA	24.2	NA
TDS	NA	NA	278	NA	381	NA	440	NA
TOC	NA	NA	1 U	NA	3.36	NA	2.33	NA
TSS	NA	NA	2.1 U	NA	2.1 U	NA	2.1 U	NA

Key is at the end of the table.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99504030	99504031	99504036	99504037	99504038	99504039	99504040
Sample Location		MW33-D	MW33-D	Ershigs-1	Ershigs-1	MWLSC01	MWLSC01	MWLSC02
Sample Date		12/8/99	12/8/99	12/9/99	12/9/99	12/9/99	12/9/99	12/10/99
Volatile Organic Compounds (µg/L)								
m&p-Xylene	1400 [c]	10 U	NA	10 U	NA	10 U	NA	10 U
o-Xylene	1400 [c]	5 U	NA	5 U	NA	5 U	NA	5 U
Semivolatile Organic Compounds (µg/L)								
2-Methylnaphthalene	6.2 [c]	0.0047 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Acenaphthene	370 [c]	0.0071	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Acenaphthylene	370 [c]	0.0047 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Anthracene	1800 [c]	0.015	NA	0.0047 U	NA	0.027	NA	0.051
Benzo(g,h,i)perylene	180 [c]	0.0047 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Carbazole	3.4 [c]	0.047 U	NA	0.024 U	NA	0.049 U	NA	0.047 U
Dibenzofuran	24 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U
Fluoranthene	1500 [c]	0.0047 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Fluorene	240 [c]	0.0047 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U
Naphthalene	6.2 [c]	0.013	NA	0.0047 U	NA	0.0078 U	NA	0.0047 U
Pentachlorophenol	0.56 [c]	0.024	NA	0.024 U	NA	0.025	NA	0.058
Phenanthrene	1800 [c]	0.013	NA	0.0061	NA	0.0053	NA	0.0057
Pyrene	180 [c]	0.0071	NA	0.0061	NA	0.0063	NA	0.0047 U
Tetrachlorophenols	1100 [c]	0.024 U	NA	0.024 U	NA	0.024 U	NA	0.024 U
Petroleum Hydrocarbons (µg/L)								
C12-C16 Aromatics	NA	47 U	NA	47 U	NA	47 U	NA	47 U
C16-C21 Aromatics	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
C21-C34 Aliphatics	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
C21-C34 Aromatics	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	0.090	NA	NA	NA	NA	NA	0.005
1,2,3,4,6,7,8-HpCDD	NA	9.02	NA	13.591 U	NA	4.311 U	NA	3.95 U
1,2,3,4,6,7,8-HpCDF	NA	2.426 U	NA	8.505 U	NA	2.691 U	NA	5.056 U
OCDD	NA	72.542 U	NA	10.029 U	NA	13.013 U	NA	50.914
OCDF	NA	2.72 U	NA	10.063 U	NA	5.771 U	NA	3.878 U
Total HxCDD	NA	2.541 U	NA	11.436 U	NA	8.099 U	NA	8.229 U
Total HpCDD	NA	9.02	NA	13.591 U	NA	4.311 U	NA	3.95 U
Total HpCDF	NA	2.426 U	NA	8.505 U	NA	2.691 U	NA	5.056 U
Water Quality Parameters (mg/L)								
Alkalinity	NA	196	NA	120	NA		NA	136
Bromide	NA	0.2 U	NA	0.2 U	NA		NA	0.2 U
Chloride	NA	10.3	NA	20.7	NA		NA	8.82
COD	NA	5 U	NA	5 U	NA	5 U	NA	5 U
Fluoride	NA	0.085	NA	0.057	NA		NA	0.066
Hardness	NA	211	NA	138	NA	181	NA	160
Nitrate+Nitrite	NA	1.22	NA	2.36	NA	0.561	NA	2.1
Sulfate	NA	28.2	NA	22.4	NA		NA	22.4
TDS	NA	277	NA	213	NA	232	NA	210
TOC	NA	1	NA	1.41	NA	1.1	NA	1.42
TSS	NA	2.1 U	NA	2.1 U	NA	2.2 U	NA	2 U

Key is at the end of the table.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99504041	99504046	99504047	99504048	99504049	99504850	99504851
Sample Location		MWLSC02	Ershigs-4A	Ershigs-4A	MW06-D	MW06-D	MW25-D	MW25-D
Sample Date		12/10/99	12/9/99	12/9/99	12/10/99	12/10/99	12/10/99	12/10/99
Volatile Organic Compounds (µg/L)								
m&p-Xylene	1400 [c]	NA	10 U	NA	10 U	NA	10 U	NA
o-Xylene	1400 [c]	NA	5 U	NA	5 U	NA	5 U	NA
Semivolatile Organic Compounds (µg/L)								
2-Methylnaphthalene	6.2 [c]	NA	0.0057	NA	0.0048 U	NA	0.0047 U	NA
Acenaphthene	370 [c]	NA	0.0061	NA	0.0048 U	NA	0.0047 U	NA
Acenaphthylene	370 [c]	NA	0.0047 U	NA	0.0048 U	NA	0.012	NA
Anthracene	1800 [c]	NA	0.012 U	NA	0.0048 U	NA	0.15	NA
Benzo(g,h,i)perylene	180 [c]	NA	0.029	NA	0.0048 U	NA	0.0047 U	NA
Carbazole	3.4 [c]	NA	0.047 U	NA	0.048 U	NA	0.047 U	NA
Dibenzofuran	24 [c]	NA	0.024 U	NA	0.024 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	NA	0.0047 U	NA	0.0034 J	NA	0.0047 U	NA
Fluorene	240 [c]	NA	0.0047 U	NA	0.0048 U	NA	0.0047 U	NA
Naphthalene	6.2 [c]	NA	0.0061	NA	0.0067	NA	0.0047 U	NA
Pentachlorophenol	0.56 [c]	NA	0.016 J	NA	0.024 U	NA	**1.1**	NA
Phenanthrene	1800 [c]	NA	0.0047 U	NA	0.0048 U	NA	0.0047 U	NA
Pyrene	180 [c]	NA	0.018	NA	0.0072	NA	0.0047 U	NA
Tetrachlorophenols	1100 [c]	NA	0.024 U	NA	0.024 U	NA	1.8	NA
Petroleum Hydrocarbons (µg/L)								
C12-C16 Aromatics	NA	NA	47 U	NA	47 U	NA	47 U	NA
C16-C21 Aromatics	NA	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA
C21-C34 Aliphatics	NA	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA
C21-C34 Aromatics	NA	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	NA	0.0008	NA	NA	NA	0.002	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	4.086 U	NA	6.042 U	NA	4.744 U	NA
1,2,3,4,6,7,8-HpCDF	NA	NA	1.821 U	NA	2.55 U	NA	2.757 U	NA
OCDD	NA	NA	8.373	NA	4.359 U	NA	19.187	NA
OCDF	NA	NA	3.204 U	NA	4.367 U	NA	3.415 U	NA
Total HxCDD	NA	NA	6.814 U	NA	6.916 U	NA	5.657 U	NA
Total HpCDD	NA	NA	4.086 U	NA	6.042 U	NA	4.744 U	NA
Total HpCDF	NA	NA	1.821 U	NA	2.55 U	NA	2.757 U	NA
Water Quality Parameters (mg/L)								
Alkalinity	NA	NA	134	NA	87	NA	351	NA
Bromide	NA	NA	0.2 U	NA	0.2 U	NA	0.2 U	NA
Chloride	NA	NA	14.4	NA	9.78	NA	26.6	NA
COD	NA	NA	5 U	NA	5 U	NA	13	NA
Fluoride	NA	NA	0.044	NA	0.054	NA	0.128	NA
Hardness	NA	NA	155	NA	113	NA	368	NA
Nitrate+Nitrite	NA	NA	2.89	NA	5.08	NA	0.127	NA
Sulfate	NA	NA	19.5	NA	19.6	NA	25	NA
TDS	NA	NA	227	NA	177	NA	439	NA
TOC	NA	NA	1 U	NA	1 U	NA	2.76	NA
TSS	NA	NA	2.1 U	NA	2.1 U	NA	2.1 U	NA

Key is at the end of the table.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99504852	99504853	99514002	99514003	99514004	99514005	99514006
Sample Location		MW20-D	MW20-D	MW01-D	MW01-D	MW34-D	MW34-D	MW05-D
Sample Date		12/10/99	12/10/99	12/13/99	12/13/99	12/13/99	12/13/99	12/14/99
Volatile Organic Compounds (µg/L)								
m&p-Xylene	1400 [c]	10 U	NA	10 U	NA	10 U	NA	10 U
o-Xylene	1400 [c]	5 U	NA	5 U	NA	5 U	NA	5 U
Semivolatile Organic Compounds (µg/L)								
2-Methylnaphthalene	6.2 [c]	0.0047 U	NA	0.0047 U	NA	0.005 U	NA	0.005 U
Acenaphthene	370 [c]	0.0047 U	NA	0.0047 U	NA	0.012	NA	2.3
Acenaphthylene	370 [c]	0.0047 U	NA	0.0047 U	NA	0.005 U	NA	0.35
Anthracene	1800 [c]	0.077	NA	0.11	NA	0.028	NA	0.69
Benzo(g,h,i)perylene	180 [c]	0.011	NA	0.0047 U	NA	0.005 U	NA	0.005 U
Carbazole	3.4 [c]	0.047 U	NA	0.047 U	NA	0.05 U	NA	0.078
Dibenzofuran	24 [c]	0.024 U	NA	0.024 U	NA	0.025 U	NA	0.23
Fluoranthene	1500 [c]	0.0047 U	NA	0.0047	NA	0.005 U	NA	0.11
Fluorene	240 [c]	0.0047 U	NA	0.0047 U	NA	0.005 U	NA	0.33
Naphthalene	6.2 [c]	0.0061	NA	0.0047 U	NA	0.005 U	NA	0.005 U
Pentachlorophenol	0.56 [c]	0.042	NA	0.25	NA	0.059	NA	**2**
Phenanthrene	1800 [c]	0.0052	NA	0.0066	NA	0.0055 U	NA	0.016 U
Pyrene	180 [c]	0.0047 U	NA	0.0047 U	NA	0.017	NA	0.06
Tetrachlorophenols	1100 [c]	0.028	NA	0.17	NA	0.025 U	NA	0.8
Petroleum Hydrocarbons (µg/L)								
C12-C16 Aromatics	NA	47 U	NA	47 U	NA	47 U	NA	47 U
C16-C21 Aromatics	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	57 J
C21-C34 Aliphatics	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
C21-C34 Aromatics	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	63 J
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	NA	NA	**0.703**	NA	0.003	NA	0.012
1,2,3,4,6,7,8-HpCDD	NA	3.601 U	NA	272.498 U	NA	3.521 U	NA	9.859 U
1,2,3,4,6,7,8-HpCDF	NA	2.766 U	NA	42.228	NA	2.813 U	NA	3.259 U
OCDD	NA	21.665	NA	2593.078	NA	30.624	NA	122.073
OCDF	NA	4.502 U	NA	211.842	NA	6.852 U	NA	6.281 U
Total HxCDD	NA	5.588 U	NA	7.891 U	NA	4.227 U	NA	4.167 U
Total HpCDD	NA	3.601 U	NA	188.933 J	NA	3.521 U	NA	4.416 U
Total HpCDF	NA	2.766 U	NA	42.228	NA	2.813 U	NA	3.259 U
Water Quality Parameters (mg/L)								
Alkalinity	NA	222	NA	468	NA	238	NA	297
Bromide	NA	0.2 U	NA	0.204	NA	0.2 U	NA	0.2 U
Chloride	NA	11.5	NA	8.48	NA	13.6	NA	12.1
COD	NA	5 U	NA	5 U	NA	5 U	NA	11
Fluoride	NA	0.077	NA	0.122	NA	0.078	NA	0.088
Hardness	NA	249	NA	458	NA	242	NA	319
Nitrate+Nitrite	NA	3.58	NA	0.275	NA	0.779	NA	0.508
Sulfate	NA	16	NA	12.5	NA	37.3	NA	22.9
TDS	NA	292	NA	506	NA	329	NA	379
TOC	NA	1.24	NA	2.19	NA	1 U	NA	7.28
TSS	NA	14.9	NA	2 U	NA	2.1 U	NA	2.1 U

Key is at the end of the table.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99514007	99514008	99514009	99514020	99514021	99514022	99514023
Sample Location		MW05-D	MW06-D	MW06-D	MW23-D	MW23-D	MW30-D	MW30-D
Sample Date		12/14/99	12/14/99	12/14/99	12/15/99	12/15/99	12/15/99	12/15/99
Volatile Organic Compounds (µg/L)								
m&p-Xylene	1400 [c]	NA	10 U	NA	0.082	NA	0.056	NA
o-Xylene	1400 [c]	NA	5 U	NA	0.039	NA	0.028	NA
Semivolatile Organic Compounds (µg/L)								
2-Methylnaphthalene	6.2 [c]	NA	0.0066	NA	0.017	NA	0.017	NA
Acenaphthene	370 [c]	NA	0.0047 U	NA	0.0051 U	NA	0.026	NA
Acenaphthylene	370 [c]	NA	0.0047 U	NA	0.013	NA	0.0047 U	NA
Anthracene	1800 [c]	NA	0.0047 U	NA	0.18	NA	0.0047 U	NA
Benzo(g,h,i)perylene	180 [c]	NA	0.0047 U	NA	0.0051 U	NA	0.024	NA
Carbazole	3.4 [c]	NA	0.047 U	NA	0.051 U	NA	0.047 U	NA
Dibenzofuran	24 [c]	NA	0.024 U	NA	0.026 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	NA	0.0047 U	NA	0.0051 U	NA	0.0047 U	NA
Fluorene	240 [c]	NA	0.0047 U	NA	0.0051 U	NA	0.0047 U	NA
Naphthalene	6.2 [c]	NA	0.0047 U	NA	0.062	NA	0.05	NA
Pentachlorophenol	0.56 [c]	NA	0.024 U	NA	0.35	NA	0.049	NA
Phenanthrene	1800 [c]	NA	0.0047 U	NA	0.0066	NA	0.0047 U	NA
Pyrene	180 [c]	NA	0.0047 U	NA	0.0051 U	NA	0.011	NA
Tetrachlorophenols	1100 [c]	NA	0.024 U	NA	0.13	NA	0.024 U	NA
Petroleum Hydrocarbons (µg/L)								
C12-C16 Aromatics	NA	NA	47 U	NA	47 U	NA	47 U	NA
C16-C21 Aromatics	NA	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA
C21-C34 Aliphatics	NA	NA	47 U	NA	47 UJ	NA	89	NA
C21-C34 Aromatics	NA	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	NA	0.004	NA	0.006	NA	0.019	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	5.308 U	NA	4.818 U	NA	6.374 U	NA
1,2,3,4,6,7,8-HpCDF	NA	NA	2.606 U	NA	2.916 U	NA	3.894 U	NA
OCDD	NA	NA	35.081	NA	61.18	NA	150.616	NA
OCDF	NA	NA	5.233 U	NA	6.917 U	NA	35.623	NA
Total HxCDD	NA	NA	12.859 U	NA	4.329 U	NA	8.051 U	NA
Total HpCDD	NA	NA	5.308 U	NA	4.818 U	NA	6.374 U	NA
Total HpCDF	NA	NA	2.606 U	NA	2.916 U	NA	3.894 U	NA
Water Quality Parameters (mg/L)								
Alkalinity	NA	NA	81.8	NA	253	NA	85.1	NA
Bromide	NA	NA	0.2 U	NA	0.2 U	NA	0.2 U	NA
Chloride	NA	NA	13.2	NA	17.4	NA	13	NA
COD	NA	NA	5 U	NA	6	NA	5 U	NA
Fluoride	NA	NA	0.057	NA	0.088	NA	0.049	NA
Hardness	NA	NA	115	NA	288	NA	106	NA
Nitrate+Nitrite	NA	NA	5.15	NA	0.474	NA	3.52	NA
Sulfate	NA	NA	19.4	NA	40.5	NA	20.3	NA
TDS	NA	NA	171	NA	354	NA	165	NA
TOC	NA	NA	1 U	NA	3.39	NA	1 U	NA
TSS	NA	NA	3.41	NA	2.1 U	NA	2 U	NA

Key is on the next page.

Table 4-87

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
R	= Rejected.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99504010	99504011	99504014	99504015	99504032	99504033	99504042	99504043	99504044	99504045	99504854
Sample Location	Screening	MW09-S	MW09-S	MW10-S	MW10-S	Ershigs-1A	Ershigs-1A	Ershigs-4	Ershigs-4	Ershigs-3	Ershigs-3	MW35-S
Sample Date	Levels [a b]	12/7/99	12/7/99	12/7/99	12/7/99	12/9/99	12/9/99	12/9/99	12/9/99	12/10/99	12/10/99	12/10/99
Volatile Organic Compounds (µg/L)												
1,1-Dichloroethene	0.046 [c]	0.02 U	NA	0.02 U	NA	0.02 U	NA	**0.054**	NA	0.02 U	NA	0.02 U
Benzene	0.41 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U
Ethylbenzene	1300 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U
Isopropylbenzene	660 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
m&p-Xylene	1400 [c]	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U
n-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
n-Propylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
o-Xylene	1400 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U
p-Isopropyltoluene	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
sec-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
tert-Butylbenzene	61 [c]	1 U	NA	1 U	NA	1 U	NA	2 U	NA	1 U	NA	2 U
Tetrachloroethene	1.1 [c]	0.02 U	NA	0.02 U	NA	0.02 U	NA	0.1	NA	0.02 U	NA	2 U
Toluene	720 [c]	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA	5 U
Semivolatile Organic Compounds (µg/L)												
1,2,4-Trimethylbenzene	12 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
1,3,5-Trimethylbenzene	12 [c]	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
1,3-Dichlorobenzene	5.5 [c]	0.026	NA	0.026	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
1,4-Dichlorobenzene	NA	0.025 U	NA	0.025 U	NA	0.024 U	NA	2	NA	0.024 U	NA	0.024 U
2,4,5-Trichlorophenol	NA	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.21
2,4,6-Trichlorophenol	6.1 [c]	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
2,4-Dichlorophenol	110 [c]	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
2-Chloronaphthalene	NA	0.0099 U	NA	0.0098 U	NA	0.0094 U	NA	0.0098 U	NA	0.0094 U	NA	0.0096 U
2-Chlorophenol	30 [c]	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
2-Methylnaphthalene	6.2 [c]	0.01	NA	0.0054	NA	0.0047 U	NA	0.0083 U	NA	0.008	NA	0.0048 U
3&4-Methylphenol	180 [c]	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
Acenaphthene	370 [c]	0.005 U	NA	0.01	NA	0.0047 U	NA	0.0049 U	NA	0.0057	NA	0.0048 U
Acenaphthylene	370 [c]	0.005 U	NA	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U	NA	0.0063
Anthracene	1800 [c]	0.08	NA	0.24	NA	0.0047 U	NA	0.0098 U	NA	0.0047 U	NA	0.11
Benzo(a)anthracene	0.092 [c]	0.005 U	NA	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U	NA	0.0048 U
Benzo(g,h,i)perylene	180 [c]	0.005 U	NA	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.038 U	NA	0.0048 U
Carbazole	3.4 [c]	0.05 U	NA	0.049 U	NA	0.024 U	NA	0.049 U	NA	0.047 U	NA	0.048 U
Dibenzofuran	24 [c]	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
Fluoranthene	1500 [c]	0.005 U	NA	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U	NA	0.0048 U
Fluorene	240 [c]	0.005 U	NA	0.0049 U	NA	0.0047 U	NA	0.0049 U	NA	0.0047 U	NA	0.0048 U
Naphthalene	6.2 [c]	0.023	NA	0.029	NA	0.0071	NA	0.025	NA	0.023	NA	0.0063
Pentachlorophenol	0.56 [c]	0.13	NA	**5**	NA	0.25	NA	0.025 U	NA	0.012 J	NA	0.11 U

Key is at the end of the table.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99504010	99504011	99504014	99504015	99504032	99504033	99504042	99504043	99504044	99504045	99504854
Sample Location	Screening	MW09-S	MW09-S	MW10-S	MW10-S	Ershigs-1A	Ershigs-1A	Ershigs-4	Ershigs-4	Ershigs-3	Ershigs-3	MW35-S
Sample Date	Levels [a b]	12/7/99	12/7/99	12/7/99	12/7/99	12/9/99	12/9/99	12/9/99	12/9/99	12/10/99	12/10/99	12/10/99
Semivolatile Organic Compounds (µg/L) Continued												
Phenanthrene	1800 [c]	0.0059	NA	0.0078	NA	0.0071	NA	0.0049 U	NA	0.0075	NA	0.0072 U
Phenol	22000 [c]	0.025 U	NA	0.025 U	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.024 U
Pyrene	180 [c]	0.005 U	NA	0.035 U	NA	0.0047 U	NA	0.0049 U	NA	0.019	NA	0.0048 U
Tetrachlorophenols	1100 [c]	0.025 U	NA	0.93	NA	0.024 U	NA	0.025 U	NA	0.024 U	NA	0.76
Petroleum Hydrocarbons (µg/L)												
C10-C12 Aliphatics	NA	47 UJ	NA	47 UJ	NA	48 UJ	NA	47 U	NA	47 U	NA	47 U
C10-C12 Aromatics	NA	47 UJ	NA	47 UJ	NA	48 U	NA	47 U	NA	47 U	NA	47 U
C12-C16 Aromatics	NA	47 U	NA	47 U	NA	48 U	NA	47 U	NA	47 U	NA	47 U
C16-C21 Aromatics	NA	55 J	NA	60 J	NA	48 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
C21-C34 Aliphatics	NA	47 UJ	NA	47 UJ	NA	48 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
C21-C34 Aromatics	NA	47 UJ	NA	71 J	NA	48 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ
C5-C6 Aliphatics	NA	15 U	NA	15 U	NA	15 U	NA	15 U	NA	15 U	NA	15 U
C6-C8 Aliphatics	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U
C8-C10 Aliphatics	NA	47 UJ	NA	47 UJ	NA	48 UJ	NA	47 U	NA	47 U	NA	30 U
C8-C10 Aromatics	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U
Dioxin/Furans (pg/L)												
2,3,7,8-TCDD TEQ	0.45 [c]	**2.430**	NA	0.098	NA	NA	NA	0.002	NA	NA	NA	0.001
1,2,3,6,7,8-HxCDD	NA	6.501	NA	4.115 U	NA	11.348 U	NA	7.246 U	NA	5.225 U	NA	6.814 U
1,2,3,4,6,7,8-HpCDD	NA	174.036	NA	9.258	NA	13.478 U	NA	5.497 U	NA	6.348 U	NA	4.179 U
OCDD	NA	352.256	NA	58.917	NA	9.323 U	NA	15.727	NA	3.705 U	NA	10.449
OCDF	NA	44.505	NA	5.034 U	NA	10.907 U	NA	3.519 U	NA	3.955 U	NA	4.627 U
Total HpCDD	NA	216.896	NA	9.258	NA	13.478 U	NA	5.497 U	NA	6.348 U	NA	4.179 U
Total HpCDF	NA	39.476	NA	4.109 U	NA	6.053 U	NA	2.315 U	NA	2.552 U	NA	4.356 U
Total HxCDD	NA	6.501	NA	4.115 U	NA	11.348 U	NA	7.246 U	NA	5.225 U	NA	6.814 U
Total HxCDF	NA	3.98 U	NA	2.409 U	NA	5.046 U	NA	3.13 U	NA	2.167 U	NA	2.444 U
Water Quality Parameters (mg/L)												
Alkalinity	NA	187	NA	258	NA	248	NA	234	NA	172	NA	139
Bromide	NA	0.2 U	NA	0.202	NA	0.251	NA	0.2 U	NA	0.2 U	NA	0.2 U
Chloride	NA	4.13	NA	7.64	NA	3	NA	17.6	NA	14	NA	13.6
COD	NA	16	NA	14	NA	24	NA	13	NA	7	NA	22
Fluoride	NA	0.103	NA	0.091	NA	0.301	NA	0.214	NA	0.083	NA	0.138
Hardness	NA	184	NA	347	NA	258	NA	246	NA	205	NA	168
Nitrate+Nitrite	NA	0.939	NA	0.016	NA	0.1 U	NA	4.01	NA	2.67	NA	1.37
Sulfate	NA	8.75	NA	105	NA	18.2	NA	47.5	NA	25	NA	54.8
Sulfide	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
TDS	NA	256	NA	451	NA	320	NA	367	NA	263	NA	285
TSS	NA	2.4 U	NA	2.4 U	NA	39.9	NA	2 U	NA	2.1 U	NA	2.1 U

Key is at the end of the table.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99504855	99514000	99514001	99514010	99514011	99514012	99514013	99514014	99514015	99514016
Sample Location	Screening	MW35-S	MW28-S	MW28-S	MW32-S	MW32-S	MW15-S	MW15-S	MW08-S	MW08-S	MW36-S
Sample Date	Levels [a b]	12/10/99	12/13/99	12/13/99	12/14/99	12/14/99	12/15/99	12/15/99	12/14/99	12/14/99	12/14/99
Volatile Organic Compounds (µg/L)											
1,1-Dichloroethene	0.046 [c]	NA	0.02 U	NA	0.02 U	NA	0.02 U	NA	0.02 U	NA	0.02 U
Benzene	0.41 [c]	NA	5 U	NA	5 U	NA	**17**	NA	5 U	NA	5 U
Ethylbenzene	1300 [c]	NA	5 U	NA	5 U	NA	740	NA	5 U	NA	5 U
Isopropylbenzene	660 [c]	NA	1 U	NA	1 U	NA	285	NA	1 U	NA	1 U
m&p-Xylene	1400 [c]	NA	10 U	NA	10 U	NA	**2000**	NA	10 U	NA	10 U
n-Butylbenzene	61 [c]	NA	1 U	NA	1 U	NA	**94.2 J**	NA	1 U	NA	1 U
n-Propylbenzene	61 [c]	NA	1 U	NA	1 U	NA	**270**	NA	1 U	NA	1 U
o-Xylene	1400 [c]	NA	5 U	NA	5 U	NA	1200	NA	5 U	NA	5 U
p-Isopropyltoluene	NA	NA	1 U	NA	1 U	NA	80.7 J	NA	1 U	NA	1 U
sec-Butylbenzene	61 [c]	NA	1 U	NA	1 U	NA	**97.3 J**	NA	1 U	NA	1 U
tert-Butylbenzene	61 [c]	NA	2 U	NA	1 U	NA	1.4	NA	1 U	NA	1 U
Tetrachloroethene	1.1 [c]	NA	0.02 U	NA	0.02 U	NA	0.51	NA	0.02 U	NA	0.02 U
Toluene	720 [c]	NA	5 U	NA	5 U	NA	210	NA	5 U	NA	5 U
Semivolatile Organic Compounds (µg/L)											
1,2,4-Trimethylbenzene	12 [c]	NA	1 U	NA	1 U	NA	**2680**	NA	1 U	NA	1 U
1,3,5-Trimethylbenzene	12 [c]	NA	1 U	NA	1 U	NA	**636**	NA	1 U	NA	1 U
1,3-Dichlorobenzene	5.5 [c]	NA	0.025 U	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.025 U
1,4-Dichlorobenzene	NA	NA	0.025 U	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.025 U
2,4,5-Trichlorophenol	NA	NA	0.54	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.025 U
2,4,6-Trichlorophenol	6.1 [c]	NA	1.1	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.065
2,4-Dichlorophenol	110 [c]	NA	0.025 U	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.031
2-Chloronaphthalene	NA	NA	0.01 U	NA	0.0099 U	NA	0.096 U	NA	0.0095 U	NA	0.01 U
2-Chlorophenol	30 [c]	NA	0.72	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.025 U
2-Methylnaphthalene	6.2 [c]	NA	1.7	NA	0.005 U	NA	**700**	NA	0.0048 U	NA	0.14
3&4-Methylphenol	180 [c]	NA	0.025 U	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.025 U
Acenaphthene	370 [c]	NA	5.9	NA	0.005 U	NA	76	NA	0.0048 U	NA	1.5
Acenaphthylene	370 [c]	NA	0.58	NA	0.005 U	NA	2.7	NA	0.0048 U	NA	0.08
Anthracene	1800 [c]	NA	0.0051 U	NA	0.015	NA	18	NA	0.057	NA	1.2
Benzo(a)anthracene	0.092 [c]	NA	0.0051 U	NA	0.005 U	NA	**0.12**	NA	0.0048 U	NA	0.0051 U
Benzo(g,h,i)perylene	180 [c]	NA	0.0051 U	NA	0.005 U	NA	0.048 U	NA	0.0048 U	NA	0.0051 U
Carbazole	3.4 [c]	NA	0.051 U	NA	0.05 U	NA	110	NA	0.048 U	NA	1.4
Dibenzofuran	24 [c]	NA	**48**	NA	0.025 U	NA	**23**	NA	0.024 U	NA	2.3
Fluoranthene	1500 [c]	NA	0.0051 U	NA	0.005 U	NA	2.4	NA	0.0048 U	NA	0.85
Fluorene	240 [c]	NA	0.0051 U	NA	0.005 U	NA	25	NA	0.0048 U	NA	0.0051 U
Naphthalene	6.2 [c]	NA	0.97	NA	0.014	NA	**7500**	NA	0.0048 U	NA	0.25
Pentachlorophenol	0.56 [c]	NA	**3500**	NA	0.095	NA	**3700**	NA	0.033	NA	**41**

Key is at the end of the table.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99504855	99514000	99514001	99514010	99514011	99514012	99514013	99514014	99514015	99514016
Sample Location	Screening	MW35-S	MW28-S	MW28-S	MW32-S	MW32-S	MW15-S	MW15-S	MW08-S	MW08-S	MW36-S
Sample Date	Levels [a b]	12/10/99	12/13/99	12/13/99	12/14/99	12/14/99	12/15/99	12/15/99	12/14/99	12/14/99	12/14/99
Semivolatile Organic Compounds (µg/L)											
Phenanthrene	1800 [c]	NA	0.0051 U	NA	0.0069	NA	22	NA	0.0057 U	NA	0.59
Phenol	22000 [c]	NA	0.025 U	NA	0.025 U	NA	0.24 U	NA	0.024 U	NA	0.025 U
Pyrene	180 [c]	NA	1.1	NA	0.005 U	NA	0.95	NA	0.0048 U	NA	0.43
Tetrachlorophenols	1100 [c]	NA	380	NA	0.025 U	NA	280	NA	0.08	NA	4.7
Petroleum Hydrocarbons (µg/L)											
C10-C12 Aliphatics	NA	NA	53 U	NA	47 U	NA	1200	NA	47 U	NA	49 U
C10-C12 Aromatics	NA	NA	53 U	NA	47 UJ	NA	11000 J	NA	47 UJ	NA	49 UJ
C12-C16 Aromatics	NA	NA	100	NA	47 U	NA	1300	NA	47 U	NA	49 U
C16-C21 Aromatics	NA	NA	940 J	NA	47 UJ	NA	1100 J	NA	47 UJ	NA	62 J
C21-C34 Aliphatics	NA	NA	53 U	NA	58	NA	85	NA	47 U	NA	56
C21-C34 Aromatics	NA	NA	53 UJ	NA	47 UJ	NA	47 UJ	NA	47 UJ	NA	49 UJ
C5-C6 Aliphatics	NA	NA	15 U	NA	15 U	NA	15 U	NA	15 U	NA	15 U
C6-C8 Aliphatics	NA	NA	10 U	NA	10 U	NA	210	NA	10 U	NA	10 U
C8-C10 Aliphatics	NA	NA	53 U	NA	30 U	NA	8800	NA	30 U	NA	30 U
C8-C10 Aromatics	NA	NA	25 U	NA	25 U	NA	11000	NA	25	NA	25 U
Dioxin/Furans (pg/L)											
2,3,7,8-TCDD TEQ	0.45 [c]	NA	0.005	NA	0.003	NA	0.151	NA	0.012	NA	0.004
1,2,3,6,7,8-HxCDD	NA	NA	5.746 U	NA	13.481 U	NA	5.816 U	NA	9.579 U	NA	9.043 U
1,2,3,4,6,7,8-HpCDD	NA	NA	8.591 U	NA	8.12 U	NA	13.256	NA	10.982 U	NA	11.655 U
OCDD	NA	NA	52.23	NA	33.678	NA	171.264	NA	123.119	NA	44.242
OCDF	NA	NA	5.364 U	NA	4.737 U	NA	16.796	NA	13.896 U	NA	6.858 U
Total HpCDD	NA	NA	8.591 U	NA	8.12 U	NA	13.256	NA	10.982 U	NA	11.655 U
Total HpCDF	NA	NA	5.942 U	NA	5.214 U	NA	3.061 U	NA	5.293 U	NA	3.148 U
Total HxCDD	NA	NA	5.746 U	NA	13.481 U	NA	5.816 U	NA	9.579 U	NA	9.043 U
Total HxCDF	NA	NA	3.398 U	NA	3.905 U	NA	3.401 U	NA	5.092 U	NA	5.357 U
Water Quality Parameters (mg/L)											
Alkalinity	NA	NA	416	NA	163	NA	223	NA	201	NA	132
Bromide	NA	NA	0.222	NA	1.12	NA	0.2 U	NA	0.2 U	NA	0.2 U
Chloride	NA	NA	15.1	NA	15.4	NA	11.8	NA	3.79	NA	5.63
COD	NA	NA	46	NA	5 U	NA	64	NA	5 U	NA	5 U
Fluoride	NA	NA	0.109	NA	0.128	NA	0.109	NA	0.133	NA	0.049
Hardness	NA	NA	412	NA	229	NA	220	NA	219	NA	142
Nitrate+Nitrite	NA	NA	0.012	NA	7.16	NA	0.05 U	NA	0.05 U	NA	1.17
Sulfate	NA	NA	8.23	NA	34.9	NA	4.25	NA	33.9	NA	15.6
Sulfide	NA	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA	1 U
TDS	NA	NA	491	NA	298	NA	342	NA	270	NA	194
TSS	NA	NA	2.2 U	NA	2 U	NA	2.5 U	NA	10.4	NA	2.1 U

Key is at the end of the table.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99514017	99514018	99514019	99514024	99514025	99514026	99514027	99514028	99514029
Sample Location		MW36-S	MW31-S	MW31-S	MW22-S	MW22-S	MW29-S	MW29-S	MW19-S	MW19-S
Sample Date		12/14/99	12/14/99	12/14/99	12/15/99	12/15/99	12/15/99	12/15/99	12/16/99	12/16/99
Volatile Organic Compounds (µg/L)										
1,1-Dichloroethene	0.046 [c]	NA	0.02 U	NA	0.02 U	NA	0.02 U	NA	0.02 U	NA
Benzene	0.41 [c]	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Ethylbenzene	1300 [c]	NA	5 U	NA	9.7	NA	5 U	NA	5 U	NA
Isopropylbenzene	660 [c]	NA	1 U	NA	8.5	NA	1 U	NA	1 U	NA
m&p-Xylene	1400 [c]	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
n-Butylbenzene	61 [c]	NA	1 U	NA	1.6	NA	1 U	NA	1 U	NA
n-Propylbenzene	61 [c]	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
o-Xylene	1400 [c]	NA	5 U	NA	6.7	NA	5 U	NA	5 U	NA
p-Isopropyltoluene	NA	NA	1 U	NA	1.1	NA	1 U	NA	1 U	NA
sec-Butylbenzene	61 [c]	NA	1 U	NA	1.3	NA	1 U	NA	1 U	NA
tert-Butylbenzene	61 [c]	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
Tetrachloroethene	1.1 [c]	NA	0.02 U	NA	0.02 U	NA	0.02 U	NA	0.02 U	NA
Toluene	720 [c]	NA	5 U	NA	5 U	NA	5 U	NA	5 U	NA
Semivolatile Organic Compounds (µg/L)										
1,2,4-Trimethylbenzene	12 [c]	NA	1 U	NA	**23.3**	NA	1 U	NA	1 U	NA
1,3,5-Trimethylbenzene	12 [c]	NA	1 U	NA	7.6	NA	1 U	NA	1 U	NA
1,3-Dichlorobenzene	5.5 [c]	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.024 U	NA
1,4-Dichlorobenzene	NA	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.024 U	NA
2,4,5-Trichlorophenol	NA	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.024 U	NA
2,4,6-Trichlorophenol	6.1 [c]	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.024 U	NA
2,4-Dichlorophenol	110 [c]	NA	0.031	NA	2.4 U	NA	0.025 U	NA	0.073	NA
2-Chloronaphthalene	NA	NA	0.0094 U	NA	55	NA	0.01 U	NA	0.0094 U	NA
2-Chlorophenol	30 [c]	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.024 U	NA
2-Methylnaphthalene	6.2 [c]	NA	0.0047 U	NA	**450**	NA	0.03	NA	0.086	NA
3&4-Methylphenol	180 [c]	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.037	NA
Acenaphthene	370 [c]	NA	0.72	NA	**550**	NA	0.018	NA	0.027	NA
Acenaphthylene	370 [c]	NA	0.089	NA	14	NA	0.0076	NA	0.0047 U	NA
Anthracene	1800 [c]	NA	0.3	NA	29	NA	0.16	NA	0.0047 U	NA
Benzo(a)anthracene	0.092 [c]	NA	0.0047 U	NA	0.48 U	NA	0.0051 U	NA	0.0047 U	NA
Benzo(g,h,i)perylene	180 [c]	NA	0.028	NA	0.48 U	NA	0.0051 U	NA	0.0047 U	NA
Carbazole	3.4 [c]	NA	0.047 U	NA	**370**	NA	0.051 U	NA	0.047 U	NA
Dibenzofuran	24 [c]	NA	0.024 U	NA	**200**	NA	0.025 U	NA	0.024 U	NA
Fluoranthene	1500 [c]	NA	0.017	NA	19	NA	0.0051 U	NA	0.016	NA
Fluorene	240 [c]	NA	0.0047 U	NA	220	NA	0.0091 U	NA	0.3 U	NA
Naphthalene	6.2 [c]	NA	0.0052	NA	**4700**	NA	0.27	NA	0.17	NA
Pentachlorophenol	0.56 [c]	NA	**170**	NA	**340**	NA	**8.8**	NA	**2500**	NA

Key is at the end of the table.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	99514017	99514018	99514019	99514024	99514025	99514026	99514027	99514028	99514029
Sample Location		MW36-S	MW31-S	MW31-S	MW22-S	MW22-S	MW29-S	MW29-S	MW19-S	MW19-S
Sample Date		12/14/99	12/14/99	12/14/99	12/15/99	12/15/99	12/15/99	12/15/99	12/16/99	12/16/99
Semivolatile Organic Compounds (µg/L)										
Phenanthrene	1800 [c]	NA	0.0047 U	NA	210	NA	0.012 U	NA	0.0047 U	NA
Phenol	22000 [c]	NA	0.024 U	NA	2.4 U	NA	0.025 U	NA	0.047	NA
Pyrene	180 [c]	NA	0.059	NA	11	NA	0.0051 U	NA	0.0047 U	NA
Tetrachlorophenols	1100 [c]	NA	14	NA	36	NA	0.58 U	NA	140	NA
Petroleum Hydrocarbons (µg/L)										
C10-C12 Aliphatics	NA	NA	47 U	NA	49 U	NA	50 U	NA	47 U	NA
C10-C12 Aromatics	NA	NA	47 UJ	NA	5200 J	NA	50 UJ	NA	47 UJ	NA
C12-C16 Aromatics	NA	NA	47 U	NA	1800	NA	50 U	NA	47 U	NA
C16-C21 Aromatics	NA	NA	47 UJ	NA	1200 J	NA	50 UJ	NA	490 J	NA
C21-C34 Aliphatics	NA	NA	47 U	NA	54 J	NA	50 UJ	NA	54 J	NA
C21-C34 Aromatics	NA	NA	47 UJ	NA	290 J	NA	57 J	NA	71 J	NA
C5-C6 Aliphatics	NA	NA	15 U	NA	20	NA	15 U	NA	15 U	NA
C6-C8 Aliphatics	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
C8-C10 Aliphatics	NA	NA	30 U	NA	49 U	NA	50 U	NA	47 U	NA
C8-C10 Aromatics	NA	NA	25 U	NA	170	NA	25 U	NA	25 U	NA
Dioxin/Furans (pg/L)										
2,3,7,8-TCDD TEQ	0.45 [c]	NA	0.018	NA	0.024	NA	NA	NA	0.004	NA
1,2,3,6,7,8-HxCDD	NA	NA	7.123 U	NA	4.737 U	NA	5.188 U	NA	6.662 U	NA
1,2,3,4,6,7,8-HpCDD	NA	NA	7.721 U	NA	4.584 U	NA	6.511 U	NA	5.063 U	NA
OCDD	NA	NA	176.013	NA	233.584	NA	24.583 U	NA	36.051	NA
OCDF	NA	NA	10.262 U	NA	10.921	NA	5.853 U	NA	7.376 U	NA
Total HpCDD	NA	NA	7.721 U	NA	4.584 U	NA	6.511 U	NA	5.063 U	NA
Total HpCDF	NA	NA	4.727 U	NA	3.744 U	NA	3.571 U	NA	3.608 U	NA
Total HxCDD	NA	NA	7.123 U	NA	4.737 U	NA	5.188 U	NA	6.662 U	NA
Total HxCDF	NA	NA	6.971	NA	1.897 U	NA	3.956 U	NA	3.685 U	NA
Water Quality Parameters (mg/L)										
Alkalinity	NA	NA	141	NA	296	NA	229	NA	270	NA
Bromide	NA	NA	0.2 U	NA	0.2 U	NA	0.2 U	NA	0.2 U	NA
Chloride	NA	NA	36.4	NA	7.14	NA	5.4	NA	8.66	NA
COD	NA	NA	5 U	NA	40	NA	8	NA	36	NA
Fluoride	NA	NA	0.108	NA	0.2	NA	0.099	NA	0.108	NA
Hardness	NA	NA	200	NA	295	NA	293	NA	302	NA
Nitrate+Nitrite	NA	NA	0.958	NA	0.187	NA	0.232	NA	0.05 U	NA
Sulfate	NA	NA	16.8	NA	6.6	NA	63.8	NA	32.7	NA
Sulfide	NA	NA	1 U	NA	1 U	NA	1 U	NA	1 U	NA
TDS	NA	NA	255	NA	384	NA	354	NA	349	NA
TSS	NA	NA	2 U	NA	2.5 UJ	NA	2.4 U	NA	2.8 UJ	NA

Key is on the next page.

Table 4-88

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(DECEMBER 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-89

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	00094050	00094052	00094055	00094056	00094058	00094065	00094066
Sample Location		MW24-D	MW17-D	MW35-D	MW08-D	MW33-D	MW05-D	MW34-D
Sample Date		2/27/99	2/27/99	2/28/99	2/28/99	2/28/99	2/28/99	2/28/99
Volatile Organic Compounds (µg/L)								
Benzene	0.41 [c]	5 U	0.34	5 U	5 U	0.034	5 U	5 U
Ethylbenzene	1300 [c]	0.14	5 U	5 U	5 U	5 U	5 U	5 U
m&p-Xylene	1400 [c]	0.5	10 U	10 U	5 U	10 U	10 U	10 U
o-Xylene	1400 [c]	0.16	5 U	5 U	10 U	5 U	5 U	5 U
Tetrachloroethene	1.1 [c]	0.0074 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Semivolatile Organic Compounds (µg/L)								
2,4-Dimethylphenol	730 [c]	0.024 U	0.027 U	0.024 U	0.025 U	0.025 U	0.028 U	0.028 U
2-Methylnaphthalene	62 [c]	0.0086	0.012	0.0048 U	0.005 U	0.005 U	0.0056 U	0.0055 U
3&4-Methylphenol	180 [c]	0.024 U	0.027 U	0.024 U	0.025 U	0.025 U	0.028 U	0.028 U
Acenaphthene	370 [c]	0.0067	0.0054 U	0.0048 U	0.005 U	0.005 U	2.9	0.0055 U
Acenaphthylene	370 [c]	0.093	0.011	0.0048 U	0.005 U	0.005 U	0.62	0.0055 U
Anthracene	1800 [c]	0.54	0.1	0.021	0.096	0.021	0.87	0.064
Benzo(a)anthracene	0.092 [c]	0.0048 U	0.0054 U	0.0048 U	0.005 U	0.005 U	0.0056 U	0.0055 U
Benzoic acid	150000 [c]	0.048 UJ	0.054 UJ	0.048 UJ	0.05 U	0.05 UJ	0.056 UJ	0.055 UJ
Benzyl alcohol	11000 [c]	0.031	0.028	0.032	0.025 U	0.025 U	0.028 U	0.028 U
Chrysene	9.2 [c]	0.0048 U	0.0054 U	0.0048 U	0.005 U	0.005 U	0.0056 U	0.0055 U
Dibenzofuran	24 [c]	0.024 U	0.027 U	0.024 U	0.025 U	0.025 U	0.82	0.028 U
Fluoranthene	1500 [c]	0.0076	0.0054 U	0.0048 U	0.005 U	0.005 U	0.12	0.0055 U
Fluorene	240 [c]	0.011	0.0049 U	0.0048 U	0.005 U	0.005 U	3.7	0.0077
Naphthalene	6.2 [c]	0.02	0.032	0.0048 U	0.022 U	0.0064	0.036	0.02
Pentachlorophenol	0.56 [c]	0.38	0.25	0.024 U	0.086	0.025 U	16	0.16
Phenanthrene	1800 [c]	0.013	0.0087	0.0057	0.007	0.0054	0.42	0.0055 U
Phenol	22000 [c]	0.024 U	0.045	0.027	0.032	0.033	0.028 U	0.028 U
Pyrene	180 [c]	0.012	0.0054 U	0.0048 U	0.005 U	0.005 U	0.074	0.0055 U
Tetrachlorophenols	1100 [c]	0.16	0.097	NA	0.047	NA	1.4	0.057
Petroleum Hydrocarbons (µg/L)								
C21-C34 Aliphatics	NA	51 U	48 U	48 U	48 U	48 U	49 U	56 U
C6-C8 Aliphatics	NA	10 U	10 U	10 U	11 U	10 U	10 U	10 U
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	0.0005	0.002	0.002	0.002	0.004	0.240	0.002
1,2,3,4,6,7,8-HpCDD	NA	2.82 U	4.524 U	4.168 U	3.551 U	4.876 U	21.481	6.571 U
OCDD	NA	13.244 X	18.59	23.637 X	22.881	41.189	245.585	25.648
OCDF	NA	6.587 U	5.461 U	2.19 U	4.305 U	3.753 U	10.416	7.596 U
Total TCDD	NA	2.82 U	4.524 U	4.168 U	3.551 U	4.876 U	4.591	6.571 U
Water Quality Parameters (mg/L)								
Alkalinity	NA	317	234	111	207	210	300	228
Bromide	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloride	NA	14.7	13	11.9	14.6	13.5	11.8	13.7
COD	NA	NA	NA	NA	NA	NA	14	5 U
Fluoride	NA	0.116	0.0894	0.0615	0.0826	0.0955	0.0935	0.0513
Hardness	NA	300	253	136	219	218	311	265
Nitrate+Nitrite	NA	0.475	2.03	2.71	1.02	1.65	0.578	1.76
Sulfate	NA	13.1	18.4	18.6	22.2	34.5	20.8	20.2
Sulfide	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TDS	NA	381	295	185	280	298	381	291
TOC	NA	3.46	1.31	1.02	1.5	1 U	7.73	1 U
TSS	NA	2.4 U	2.1 U	2.2 U	2.2 U	2.1 U	2.2 U	2.1 U

Key is at the end of the table.

Table 4-89

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	00094067	00094070	00094071	00094072	00094073	00094074	00094075
Sample Location	Screening	MW23-D	MW20-D	MW30-D	MW01-D	MW25-D	MW03-D	MWLSC03
Sample Date	Levels [a b]	2/29/99	2/29/99	2/29/99	2/29/99	3/1/99	3/1/99	3/1/99
Volatile Organic Compounds (µg/L)								
Benzene	0.41 [c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	1300 [c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
m&p-Xylene	1400 [c]	10 U	10 U	10 U	10 U	10 U	10 U	10 U
o-Xylene	1400 [c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	1.1 [c]	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Semivolatile Organic Compounds (µg/L)								
2,4-Dimethylphenol	730 [c]	0.024 U	0.025 U	0.024 U	0.024 U	0.025 U	0.024 U	0.024 U
2-Methylnaphthalene	62 [c]	0.0048 U	0.17	0.036	0.029	0.033	0.02	0.014
3&4-Methylphenol	180 [c]	0.024 U	0.025 U	0.024 U	0.024 U	0.025 U	0.024 U	0.024 U
Acenaphthene	370 [c]	0.0048 U	0.035	0.018	0.016	0.025	0.021	0.0057
Acenaphthylene	370 [c]	0.012 U	0.0051 U	0.0047 U	0.0048 U	0.016	0.0048 U	0.0048 U
Anthracene	1800 [c]	0.18	0.071	0.0047 U	0.079	0.14	0.0076	0.03
Benzo(a)anthracene	0.092 [c]	0.0048 U	0.0051 U	0.0047 U	0.0048 U	0.005 U	0.0048 U	0.0048 U
Benzoic acid	150000 [c]	0.048 UJ	0.051 UJ	0.047 UJ	0.048 UJ	0.05 UJ	0.048 UJ	0.064
Benzyl alcohol	11000 [c]	0.024 U	0.025 U	0.024 U	0.0095 U	0.025 U	0.024 U	0.03 U
Chrysene	9.2 [c]	0.0048 U	0.0051 U	0.0047 U	0.0048 U	0.005 U	0.0048 U	0.0048 U
Dibenzofuran	24 [c]	0.024 U	0.028	0.024 U	0.024 U	0.025 U	0.024 U	0.025 U
Fluoranthene	1500 [c]	0.0048 U	0.0051 U	0.0047 U	0.0048	0.005 U	0.0048	0.0048 U
Fluorene	240 [c]	0.0048 U	0.023	0.013	0.019	0.005 U	0.01	0.0048 U
Naphthalene	6.2 [c]	0.0048 U	0.64	0.25 U	0.2	0.25	0.24	0.096
Pentachlorophenol	0.56 [c]	0.3	0.41	0.024 U	0.36	1.2	0.032	0.054
Phenanthrene	1800 [c]	0.0052	0.034	0.019	0.028	0.018	0.014	0.01
Phenol	22000 [c]	0.024 U	0.018 U	0.024 U	0.024 U	0.025 U	0.034	0.024 U
Pyrene	180 [c]	0.0048 U	0.0051 U	0.0047 U	0.0048	0.005 U	0.0048 U	0.0048 U
Tetrachlorophenols	1100 [c]	NA	0.057	NA	0.21	1.9	0.032	NA
Petroleum Hydrocarbons (µg/L)								
C21-C34 Aliphatics	NA	48 U	49 U	50 U	52 U	55 U	48 U	61
C6-C8 Aliphatics	NA	10 U	10 U	10 U	10 U	10 U	10 U	17
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	0.109	0.004	NA	NA	0.189	0.002	0.011
1,2,3,4,6,7,8-HpCDD	NA	9.744	3.969 U	5.883 U	3.77 U	17.646	3.357 U	2.401 U
OCDD	NA	116.524	43.265	36.138 U	3.486 U	129.093	17.349	101.19
OCDF	NA	2.872 U	3.127 U	4.129 U	3.957 U	4.104 U	4.788 U	12.628
Total TCDD	NA	4.166	3.24 U	4.87 U	3.346 U	5.961 U	3.471 U	3.116 U
Water Quality Parameters (mg/L)								
Alkalinity	NA	255	211	83.6	474	344	181	99.3
Bromide	NA	0.2 U	0.2 U	0.2 U	0.233	0.2 U	0.2 U	0.2 U
Chloride	NA	17.5	11.6	10.7	9.77	28.5	13.6	8.79
COD	NA	5.4	5 U	5 U	5 U	7	6	5 U
Fluoride	NA	0.0808	0.0704	0.055	0.127	0.139	0.0511	0.0864
Hardness	NA	264	242	108	459	339	219	124
Nitrate+Nitrite	NA	0.436	2.96	3.41	0.399	0.115	1.57	0.83
Sulfate	NA	38.5	17.8	20.1	13	21.7	31.6	19.1
Sulfide	NA	1 U	1 U	1 U	11	1 U	1 U	1 U
TDS	NA	364	286	173	503	426	256	163
TOC	NA	3.44	1 U	1 U	1.59	2.54	1 U	1.23
TSS	NA	2.2 U	2.1 U	2.1 U	2.1 U	2.4 U	2 U	2.1 U

Key is at the end of the table.

Table 4-89

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	00094078	00094080	00094081	00094082	00094083	00094087
Sample Location		Ershigs-4A	MWLSC02	MWLSC01	MW06-D	Ershigs-1	MW02-D
Sample Date		3/2/99	3/1/99	3/1/99	3/1/99	3/2/99	3/2/99
Volatile Organic Compounds (µg/L)							
Benzene	0.41 [c]	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	1300 [c]	5 U	5 U	5 U	5 U	5 U	5 U
m&p-Xylene	1400 [c]	10 U	10 U	10 U	10 U	10 U	10 U
o-Xylene	1400 [c]	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	1.1 [c]	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Semivolatile Organic Compounds (µg/L)							
2,4-Dimethylphenol	730 [c]	0.024 U	0.049	0.024 U	0.024 U	0.025 U	0.024 U
2-Methylnaphthalene	62 [c]	0.028	0.37	0.011	0.034	0.028	0.063
3&4-Methylphenol	180 [c]	0.024 U	0.055	0.024 U	0.024 U	0.025 U	0.024 U
Acenaphthene	370 [c]	0.0062	0.15	0.0048	0.01 U	0.011	0.024
Acenaphthylene	370 [c]	0.0048 U	0.0092	0.0048 U	0.0048 U	0.005 U	0.0048 U
Anthracene	1800 [c]	0.021	0.082	0.016	0.0048 U	0.005 U	0.054
Benzo(a)anthracene	0.092 [c]	0.0048 U	0.011	0.0048 U	0.0048 U	0.005 U	0.0048 U
Benzoic acid	150000 [c]	0.048 U	0.049 U	0.048 U	0.048 U	0.05 U	0.048 U
Benzyl alcohol	11000 [c]	0.051	0.024 U	0.024 U	0.041	0.025 U	0.024 U
Chrysene	9.2 [c]	0.0048 U	0.0068	0.0048 U	0.0048 U	0.005 U	0.0048 U
Dibenzofuran	24 [c]	0.024 U	0.21	0.024 U	0.024 U	0.025 U	0.024 U
Fluoranthene	1500 [c]	0.0048 U	0.05	0.0048 U	0.0048	0.005	0.0048 U
Fluorene	240 [c]	0.0048 U	0.15	0.0048 U	0.0095	0.005 U	0.016
Naphthalene	6.2 [c]	0.086	1	0.11	0.14	0.21	0.69
Pentachlorophenol	0.56 [c]	0.059	0.17	0.025	0.084	0.057	0.27
Phenanthrene	1800 [c]	0.011	0.22	0.0086	0.022	0.019	0.026
Phenol	22000 [c]	0.037	0.024 U	0.024 U	0.038 U	0.025 U	0.024 U
Pyrene	180 [c]	0.0048 U	0.043	0.0048	0.0062	0.0064	0.0048 U
Tetrachlorophenols	1100 [c]	NA	NA	NA	NA	NA	0.068
Petroleum Hydrocarbons (µg/L)							
C21-C34 Aliphatics	NA	59	48 U	50 U	48 U	54	48 U
C6-C8 Aliphatics	NA	10 U	10 U	10 U	10 U	10 U	10 U
Dioxin/Furans (pg/L)							
2,3,7,8-TCDD TEQ	0.45 [c]	0.0003	0.003	0.0008	0.0004	0.006	0.0009
1,2,3,4,6,7,8-HpCDD	NA	2.491 U	5.258 U	2.901 U	1.524 U	1.707 U	1.819 U
OCDD	NA	3.222 X	26.966	8.471	4.587	64.086 X	8.973
OCDF	NA	1.973 U	3.247 U	2.345 U	2.253 U	1.95 U	1.552 U
Total TCDD	NA	2.491 U	5.132 U	2.901 U	1.524 U	1.707 U	1.819 U
Water Quality Parameters (mg/L)							
Alkalinity	NA	134	130	162	85	117	342
Bromide	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloride	NA	14.9	10.1	10.9	8.43	19.1	26.7
COD	NA	5 U	13	5 U	5 U	NA	NA
Fluoride	NA	0.04 U	0.0736	0.0612	0.0549	0.0577	0.0813
Hardness	NA	155	151	177	106	137	330
Nitrate+Nitrite	NA	2.74	2.13	0.574	3.22	2.48	0.028
Sulfate	NA	19.1	18.5	17.8	21.9	21.6	21.7
Sulfide	NA	1 U	1 U	1 U	1 U	1 U	1 U
TDS	NA	229	198	219	168	203	427
TOC	NA	1 U	1.42	1.04	1 U	1 U	1.41
TSS	NA	2.2 U	2 U	2 U	2.1 U	2 U	2.02

Key is on the next page.

Table 4-89

SUMMARY OF RESULTS FROM DEEP GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
J	= The analyte was positively identified. The associated numerical result is an estimate.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
X	= Estimated maximum potential concentration.

Table 4-90

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary	00094051	00094053	00094054	00094056	00094059	00094060	00094061	00094062	00094064
Sample Location	Screening	MW08-S	MW09-S	MW10-S	MW08-S	MW22-S	MW32-S	MW19-S	MW35-S	MW28-S
Sample Date	Levels [a b]	2/27/00	2/27/00	2/28/00	2/28/00	2/28/00	2/28/00	2/28/00	2/28/00	2/28/00
Volatile Organic Compounds (µg/L)										
1,1-Dichloroethane	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	0.046 [c]	0.02 U	0.02 U	0.02 U	0.02 U	1 U	0.02 U	0.02 U	0.02 U	0.02 U
Benzene	0.41 [c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	1300 [c]	5 U	5 U	5 U	5 U	10	5 U	5 U	5 U	5 U
Isopropylbenzene	660 [c]	1 U	1 U	1 U	1 U	7.5	1 U	1 U	1 U	1 U
m&p-Xylene	1400 [c]	10 U	10 U	10 U	10 U	11	10 U	10 U	10 U	10 U
n-Butylbenzene	61 [c]	1 U	1 U	1 U	1 U	2	1 U	1 U	1 U	1 U
n-Propylbenzene	61 [c]	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
o-Xylene	1400 [c]	5 U	5 U	5 U	5 U	7.4	5 U	5 U	5 U	5 U
p-Isopropyltoluene	NA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
sec-Butylbenzene	61 [c]	1 U	1 U	1 U	1 U	1.5	1 U	1 U	1 U	1.8
tert-Butylbenzene	61 [c]	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1.1 [c]	0.02 U	0.02 U	0.02 U	0.02 U	1 U	0.02 U	0.02 U	0.02 U	0.02 U
Toluene	720 [c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Semivolatile Organic Compounds (µg/L)										
1,2,4-Trimethylbenzene	12 [c]	1 U	1 U	1 U	1 U	**23.7**	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	12 [c]	1 U	1 U	1 U	1 U	7.5	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	NA	0.025 U	0.027 U	0.028 U	0.025 U	0.29 U	0.025 U	0.024 U	0.024 U	0.24 U
2,4,5-Trichlorophenol	NA	0.025 U	0.027 U	0.093	0.025 U	0.29 U	0.025 U	0.088	0.22	1.6
2,4,6-Trichlorophenol	6.1 [c]	0.025 U	0.027 U	0.028 U	0.025 U	0.29 U	0.025 U	0.077	0.027	0.24 U
2,4-Dichlorophenol	110 [c]	0.036	0.027 U	0.028 U	0.025 U	0.29 U	0.029	0.068	0.024 U	6.5
2,4-Dimethylphenol	730 [c]	0.025 U	0.027 U	0.028 U	0.025 U	0.29 U	0.025 U	0.024 U	0.024 U	0.24 U
2,4-Dinitrotoluene	73 [c]	0.025 U	0.027 U	0.028 U	0.025 U	2.6	0.025 U	0.024 U	0.024 U	0.24 U
2-Chloronaphthalene	NA	0.01 U	0.011 U	0.011 U	0.01 U	0.11 U	0.0098 U	0.0097 U	0.0094 U	0.094 U
2-Chlorophenol	30 [c]	0.025 U	0.027 U	0.028 U	0.025 U	0.29 U	0.025 U	0.024 U	0.024 U	0.69
2-Methylnaphthalene	6.2 [c]	0.012	0.0054 U	0.0056 U	0.005 U	0.057 U	0.01	0.13 U	0.0066	0.052
2-Methylphenol	1800 [c]	0.025 U	0.027 U	0.028 U	0.025 U	1	0.025 U	0.024 U	0.024 U	0.24 U
3&4-Methylphenol	180 [c]	0.025 U	0.027 U	0.028 U	0.025 U	1.2	0.025 U	0.024 U	0.024 U	0.24 U
Acenaphthene	370 [c]	0.0065	0.0054 U	0.0056 U	0.005 U	**490**	0.0049	0.13	0.0047 U	17
Acenaphthylene	370 [c]	0.005 U	0.0054 U	0.0084	0.005	9.6	0.0049 U	0.0049 U	0.0061	3.1
Anthracene	1800 [c]	0.076	0.042	0.26	0.096	22	0.014	0.1 J	0.084	8 J
Benzo(a)anthracene	0.092 [c]	0.005 U	0.0054 U	0.0056 U	0.005 U	0.057 U	0.0049 U	0.0049 U	0.0047 U	0.047 U
Benzo(a)pyrene	0.0092 [c]	0.005 U	0.0054 U	0.0056 U	0.005 U	0.057 U	0.0049 U	0.0049 U	0.0047 U	0.047 U
Benzoic acid	150000 [c]	0.05 UJ	0.054 UJ	0.056 UJ	0.05 UJ	0.57 UJ	0.049 UJ	0.049 UJ	0.047 UJ	2.9 J
Benzyl alcohol	11000 [c]	0.03 U	0.027 U	0.03	0.025 U	0.29 U	0.025 U	0.024 U	0.024 U	0.24 U

Key is at the end of the table.

Table 4-90

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(FEBRUARY/MARCH 2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	00094051	00094053	00094054	00094056	00094059	00094060	00094061	00094062	00094064
Sample Location	Screening	MW08-S	MW09-S	MW10-S	MW08-S	MW22-S	MW32-S	MW19-S	MW35-S	MW28-S
Sample Date	Levels [a b]	2/27/00	2/27/00	2/28/00	2/28/00	2/28/00	2/28/00	2/28/00	2/28/00	2/28/00
Semivolatile Organic Compounds (µg/L) Continued										
Carbazole	3.4 [c]	0.05 U	0.054 U	0.056 U	0.05 U	**320**	0.049 U	0.049 U	0.047 U	**6.8**
Chrysene	9.2 [c]	0.005 U	0.0054 U	0.0056 U	0.005 U	0.057 U	0.0049 U	0.0049 U	0.0047 U	0.047 U
Dibenzofuran	24 [c]	0.025 U	0.027 U	0.028 U	0.025 U	**200**	0.025 U	0.024 U	0.024 U	**50**
Fluoranthene	1500 [c]	0.005 U	0.0054 U	0.0056 U	0.005 U	12	0.0049 U	0.0049 UJ	0.0047 U	1.6
Fluorene	240 [c]	0.005 U	0.0054 U	0.0056 U	0.005 U	220	0.0049 U	0.25	0.0047 U	66
Naphthalene	6.2 [c]	0.067	0.046	0.025	0.022 U	**1400**	0.1	0.4	0.04	2
Pentachlorophenol	0.56 [c]	0.039	0.11	**5.7**	0.086	**250**	0.11	**250**	0.2	**2200**
Phenanthrene	1800 [c]	0.009	0.0081	0.01	0.007	220	0.0054	0.0049 UJ	0.0066	64.8
Phenol	22000 [c]	0.086	0.062	0.05	0.032	0.29 U	0.033	0.12	0.024 U	0.24 U
Pyrene	240 [c]	0.005 U	0.0054 U	0.01	0.005 U	9.8	0.0049 U	0.031	0.0047 U	2.7
Tetrachlorophenols	1100 [c]	0.083	0.11	1.2	0.047	0.29 U	0.025 U	22	0.67	360
Petroleum Hydrocarbons (µg/L)										
C10-C12 Aliphatics	NA	51 U	53 U	57 U	48 U	59 U	48 U	48 U	48 U	49 U
C10-C12 Aromatics	NA	51 U	53 U	57 U	48 U	8500	48 U	48 U	48 U	52
C12-C16 Aliphatics	NA	51 U	53 U	57 U	48 U	59 U	48 U	48 U	48 U	49 U
C12-C16 Aromatics	NA	51 U	53 U	57 U	48 U	2300	48 U	48 U	48 U	190
C16-C21 Aromatics	NA	51 U	53 U	57 U	48 U	1200	48 U	48 U	48 U	750
C21-C34 Aliphatics	NA	51 U	53 U	57 U	48 U	59 U	48 U	48 U	48 U	49 U
C6-C8 Aliphatics	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
C8-C10 Aliphatics	NA	51 U	53 U	57 U	48 U	59 U	48 U	48 U	48 U	49 U
C8-C10 Aromatics	NA	25 U	25 U	25 U	25 U	72	25 U	25 U	25 U	25 U
Dioxin/Furans (pg/L)										
2,3,7,8-TCDD TEQ	0.45 [c]	0.006	0.186	0.002	0.002	**4.576**	0.002	0.012	0.006	0.015
1,2,3,4,6,7,8-HpCDD	NA	24.484 U	18.213	3.008 U	3.551 U	151.095 X	4.996 U	5.118 U	10.06 U	7.945 U
OCDD	NA	58.769	34.897	22.939 X	22.881	28815.324	23.525	116.137	57.462	153.642
OCDF	NA	23.274 U	2.313 U	3.339 U	4.305 U	107.371	4.137 U	6.636 U	6.839 U	7.087 U
Total TCDD	NA	24.484 U	4.48	3.008 U	3.551 U	18.694	4.996 U	5.118 U	10.06 U	7.945 U
Water Quality Parameters (mg/L)										
Alkalinity	NA	198	245	292	207	264	161	257	140	424
Bromide	NA	0.2 U	0.2 U	0.257	0.2 U	0.2 U	0.981	0.2 U	0.2 U	0.209
Chloride	NA	3.34	4.25	7.65	14.6	5.41	18	8.22	5.77	14.6
COD	NA					47	5 U	7.2	13	38
Fluoride	NA	0.133	0.0641	0.0892	0.0826	0.178	0.12	0.105	0.13	0.086
Hardness	NA	217	239	348	219	257	275	283	166	438
Nitrate+Nitrite	NA	0.015 U	0.176	0.015	1.02	0.41	6.97	0.015 U	0.251	0.015 U
Sulfate	NA	28.9	5.99	92.6	22.2	6.32	27.6	32.7	49.9	7.61
TDS	NA	256	293	437	280	348	309	331	251	485
TOC	NA	2.85	4.71	5.74	1.5	20.9	2.01	5.92	6.94	15.1
TSS	NA	2.1 U	2.1 U	2.3 U	2.2 U	2.3 U	2.2 U	2.61	2 U	2 U

Key is at the end of the table.

Table 4-90

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	00094068	00094069	00094077	00094079	00094084	94085	00094088
Sample Location	Screening	MW29-S	MW31-S	MW36-S	MW15-S	Ershigs-1	Ershigs-4	Ershigs-3
Sample Date	Levels [a b]	2/29/00	2/29/00	3/1/00	3/1/00	3/2/00	3/2/00	3/2/00
Volatile Organic Compounds (µg/L)								
1,1-Dichloroethane	NA	1 U	1 U	1 U	1 U	1 U	1.7	1 U
1,1-Dichloroethene	0.046 [c]	0.02 U	0.02 U	0.02 U	1 U	0.02 U	**0.074**	0.02 U
Benzene	0.41 [c]	5 U	5 U	5 U	**12**	5 U	5 U	5 U
Ethylbenzene	1300 [c]	5 U	5 U	5 U	680	5 U	5 U	5 U
Isopropylbenzene	660 [c]	1 U	2	1 U	294	1 U	1 U	1 U
m&p-Xylene	1400 [c]	10 U	10 U	10 U	**2500**	10 U	10 U	10 U
n-Butylbenzene	61 [c]	1 U	1 U	1 U	**84.8**	1 U	1 U	1 U
n-Propylbenzene	61 [c]	1 U	1 U	1 U	**283**	1 U	1 U	1 U
o-Xylene	1400 [c]	5 U	5 U	5 U	1300	5 U	5 U	5 U
p-Isopropyltoluene	NA	2 U	2 U	2 U	70.5	2 U	2 U	2 U
sec-Butylbenzene	61 [c]	1 U	1 U	1 U	**81.8**	1 U	1 U	1 U
tert-Butylbenzene	61 [c]	1 U	1 U	1 U	1.2	1 U	1 U	1 U
Tetrachloroethene	1.1 [c]	0.02 U	0.02 U	0.02 U	1 U	0.02 U	0.14	0.02 U
Toluene	720 [c]	5 U	5 U	5 U	130	5 U	5 U	5 U
Semivolatile Organic Compounds (µg/L)								
1,2,4-Trimethylbenzene	12 [c]	1 U	0.98 J	1 U	**3120**	1 U	1 U	1 U
1,3,5-Trimethylbenzene	12 [c]	1 U	1 U	1 U	**593**	1 U	1 U	1 U
1,4-Dichlorobenzene	NA	0.025 U	0.03 U	0.025 U	0.28 UJ	0.027 U	4.6	0.026 U
2,4,5-Trichlorophenol	NA	0.025 U	0.03 U	0.025 U	0.28 UJ	0.027 U	0.024 U	0.026 U
2,4,6-Trichlorophenol	6.1 [c]	0.025 U	0.03 U	0.046	0.28 UJ	0.027 U	0.024 U	0.026 U
2,4-Dichlorophenol	110 [c]	0.094	0.03 UJ	0.015 U	0.28 UJ	0.027 U	0.024 U	0.026 U
2,4-Dimethylphenol	730 [c]	0.025 U	0.03 UJ	0.025 U	7 UJ	0.027 U	0.051	0.026 U
2,4-Dinitrotoluene	73 [c]	0.025 U	0.03 U	0.025 U	0.28 UJ	0.027 U	0.024 U	0.026 U
2-Chloronaphthalene	NA	0.0098 U	0.21	0.034	0.11 UJ	0.011 U	0.0096 U	0.01 U
2-Chlorophenol	30 [c]	0.025 U	0.03 U	0.025 U	0.28 UJ	0.027 U	0.024 U	0.026 U
2-Methylnaphthalene	6.2 [c]	0.086	1.9	0.044	**500**	0.016	0.027 U	0.022
2-Methylphenol	1800 [c]	0.025 U	0.057	0.025 U	9.8 UJ	0.027 U	0.025	0.026 U
3&4-Methylphenol	180 [c]	0.025 U	0.074	0.025 U	15 J	0.027 U	0.07	0.026 U
Acenaphthene	370 [c]	0.027	1.5	0.88	33 J	0.0082	0.016	0.0073
Acenaphthylene	370 [c]	0.032 U	0.67	0.05	3 J	0.0054 U	0.0048 U	0.0052 U
Anthracene	1800 [c]	0.095	0.61 U	1.1	5.7 J	0.0065	0.019 U	0.0052 U
Benzo(a)anthracene	0.092 [c]	0.02	0.0061 U	0.005 U	0.057 UJ	0.0054 U	0.0048 U	0.0052 U
Benzo(a)pyrene	0.0092 [c]	0.0049 U	0.0061 U	**0.016**	0.057 UJ	0.0054 U	0.0048 U	0.0052 U
Benzoic acid	150000 [c]	0.049 U	0.061 UJ	0.05 UJ	0.57 UJ	0.14 U	0.048 U	0.052 U
Benzyl alcohol	11000 [c]	0.025 U	0.03 U	0.025 U	0.28 UJ	0.041	0.024 U	0.026 U

Key is at the end of the table.

Table 4-90

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS (FEBRUARY/MARCH 2000) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels [a b]	00094068	00094069	00094077	00094079	00094084	94085	00094088
Sample Location		MW29-S	MW31-S	MW36-S	MW15-S	Ershigs-1	Ershigs-4	Ershigs-3
Sample Date		2/29/00	2/29/00	3/1/00	3/1/00	3/2/00	3/2/00	3/2/00
Semivolatile Organic Compounds (µg/L) Continued								
Carbazole	3.4 [c]	0.049 U	0.63	0.99	**39 J**	0.054 U	0.048 U	0.052 U
Chrysene	9.2 [c]	0.055	0.0061 U	0.005 U	0.057 UJ	0.054 U	0.0048 U	0.0052 U
Dibenzofuran	24 [c]	0.025 U	0.79	9.8	20 J	0.027 U	0.038	0.026 U
Fluoranthene	1500 [c]	0.047	0.025	1.2	1.1 J	0.0054 U	0.0048 U	0.0052 U
Fluorene	240 [c]	0.11	0.73	0.088	14 J	0.0054 U	0.0048 U	0.0052 U
Naphthalene	6.2 [c]	0.41	46	0.28	**7100**	0.13	0.15	0.16
Pentachlorophenol	0.56 [c]	3.2 U	**270**	**15**	**1800**	0.04	0.024 U	0.05
Phenanthrene	1800 [c]	0.41	0.61 U	0.55	9.3 J	0.01	0.0048 U	0.0089
Phenol	22000 [c]	0.025 U	0.03 U	0.028	0.28 UJ	0.027 U	0.059	0.026 U
Pyrene	240 [c]	0.061	0.057	0.58	0.8 J	0.0054 U	0.0048 U	0.0052 U
Tetrachlorophenols	1100 [c]	0.3	35	2.9	120	0.027 U	0.024 U	0.026 U
Petroleum Hydrocarbons (µg/L)								
C10-C12 Aliphatics	NA	53 U	54 U	50 U	1300	50 U	48 U	53 U
C10-C12 Aromatics	NA	53 U	190 U	50 U	15000	50 U	48 U	53 U
C12-C16 Aliphatics	NA	53 U	54 U	50 U	52	50 U	48 U	53 U
C12-C16 Aromatics	NA	53 U	54 U	50 U	2200 J	50 U	48 U	53 U
C16-C21 Aromatics	NA	53 U	57 U	50 U	960	50 U	48 U	53 U
C21-C34 Aliphatics	NA	53 U	54 U	50 U	50 U	50 U	48 U	53 U
C6-C8 Aliphatics	NA	10 U	10 U	10 U	110	10 U	10 U	10 U
C8-C10 Aliphatics	NA	53 U	30 U	50 U	3300 J	50 U	48 U	53 U
C8-C10 Aromatics	NA	25 U	25 U	25 U	11000 J	25 UJ	25 UJ	25 UJ
Dioxin/Furans (pg/L)								
2,3,7,8-TCDD TEQ	0.45 [c]	**0.781**	NA	0.003	0.194	0.002	0.0006	0.0004
1,2,3,4,6,7,8-HpCDD	NA	71.895	4.376 U	5.224 U	17.249	1.344 U	1.2 U	1.774 U
OCDD	NA	583.965 J	12.956 U	34.838 X	219.434	15.55 X	5.876	3.931
OCDF	NA	41.4	5.053 U	2.533 U	6.251 U	2.703 U	2.806 U	1.46 U
Total TCDD	NA	6.971 U	3.835 U	5.224 U	5.026	1.344 U	1.2 U	1.774 U
Water Quality Parameters (mg/L)								
Alkalinity	NA	248	161	132	225	224	226	164
Bromide	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.208	0.2 U	0.2 U
Chloride	NA	5.55	24.5	6.03	9.23	3.34	14.8	20.5
COD	NA		19	19	82	NA		
Fluoride	NA	0.0922	0.0879	0.0461	0.0799	0.307	0.208	0.0738
Hardness	NA		196	153	238	241	217	194
Nitrate+Nitrite	NA	0.355	0.417	2.18	0.015 U	0.036	0.341	2.41
Sulfate	NA	59.6	16.3	15.7	2.67	16.4	45.1	25.2
TDS	NA	358	259	195	340	279	313	262
TOC	NA	3.31	3.02	2.81	30.5	9.54	5.52	2.71
TSS	NA	202	2.1 U	2.1 U	2.2 U	44.5	2.1 U	2 U

Key is on the next page.

Table 4-90

SUMMARY OF RESULTS FROM SHALLOW GROUNDWATER MONITORING WELLS
(FEBRUARY/MARCH 2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSL criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II), update February 1996. Values are based on revised MTCA (February 2001).

Key:

COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
J	= The analyte was positively identified. The associated numerical result is an estimate.
mg/L	= Milligrams per liter.
µg/L	= Micrograms per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PSLs	= Preliminary screening levels.
SVOCs	= Semivolatile Organic Compounds.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic compound.
TSS	= Total suspended solids.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
X	= Estimated maximum potential concentration.

Table 4-91

1999-2000 GROUNDWATER ANALYTICAL SUMMARY - DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detects	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.0006767 - 0.0012	Ershigs-1a	2/61	-	0/61	0.0092	0/61	0.0120	NA	NA
Benzo(a)anthracene	0.0067	MW05-D	1/61	0.0047-0.0056	0/61	0.0921	0/61	0.1199	NA	NA
Chrysene	0.0067	MW05-D	1/61	0.0047-0.0056	0/61	9.2098	0/61	11.9863	NA	NA
Dioxins/Furans (ug/l)										
1,2,3,4,6,7,8-HpCDD	0.00000295 - 0.000021481	MW05-D	6/64	0.000001344-0.000272498	0/64	0.00004482	0/64	0.000058	NA	NA
1,2,3,4,6,7,8-HpCDF	0.000042228	MW01-D	1/64	0.000000758-0.00000973	0/64	0.00004482	0/64	0.000058	NA	NA
2,3,7,8-TCDD TEQ	0.0000000003222 - 0.000000702772	MW01-D	39/64	-	1/64	0.00000045	1/64	0.0000006	0/64	0.000030
OCDD	0.000004587 - 0.002593078	MW01-D	36/64	0.000003486-0.000175206	0/64	0.00448210	0/64	0.005833	NA	NA
OCDF	0.000007891 - 0.000211842	MW01-D	4/64	0.000001552-0.000026128	0/64	0.00448210	0/64	0.005833	NA	NA
Total HpCDD	0.00000902 - 0.000188933	MW01-D	2/18	0.00000233-0.000024054	NA	NA	NA	NA	NA	NA
Total HpCDF	0.000042228	MW01-D	1/18	0.000001475-0.00000973	NA	NA	NA	NA	NA	NA
Total HxCDF	0.000002082	MW33-D	1/18	0.000001581-0.000006012	NA	NA	NA	NA	NA	NA
Total TCDD	0.000001639 - 0.000004591	MW05-D	3/64	0.000000675-0.000009455	NA	NA	NA	NA	NA	NA
Petroleum (ug/l)										
C10-C12 Aliphatics	24	MW18-D	2/64	24-56	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	24 - 38	MW02-D	5/64	24-56	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	24	MW18-D	2/64	24-56	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	24 - 56	MW34-D	3/64	24-56	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	38	MW18-D	1/64	24-79	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	47 - 120	MW03-D	7/64	47-56	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	51 - 89	MW30-D	6/64	47-220	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	47 - 140	MW03-D	6/64	47-56	NA	NA	NA	NA	NA	NA
C8-C10 Aliphatics	24	MW18-D	1/123	24-64	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	36 - 94	MW03-D	2/63	25-73	NA	NA	NA	NA	NA	NA
EPH	34 - 404	MW03-D	13/64	-	NA	NA	0/64	500	NA	NA
VPH	36 - 94	MW03-D	2/63	-	NA	NA	0/63	800	NA	NA
ncPAHs (ug/l)										
2-Methylnaphthalene	0.0047 - 0.17	MW20-D	29/54	0.0047-0.48	0/54	6.20	0/54	160	NA	NA
Acenaphthene	0.0047 - 2.9	MW05-D	28/61	0.0047-0.01	0/61	365	0/61	480	NA	NA
Acenaphthylene	0.011 - 0.62	MW05-D	11/61	0.0047-0.13	0/61	365	0/61	480	NA	NA
Anthracene	0.0061 - 0.87	MW05-D	46/61	0.0047-0.29	0/61	1825	0/61	2400	NA	NA
Benzo(g,h,i)perylene	0.011 - 0.032	MW20-D	5/61	0.0047-0.0056	0/61	182.5	0/61	240	NA	NA
Fluoranthene	0.0034 - 0.12	MW05-D	24/61	0.0047-0.04	0/61	1460.00	0/61	640	NA	NA
Fluorene	0.0047 - 3.7	MW05-D	18/61	0.0047-0.0054	0/61	243.33	0/61	320	NA	NA
Naphthalene	0.0061 - 0.69	MW02-D	40/125	0.0047-2	0/125	6.20	0/125	160	NA	NA
ncPAH	0.0066 - 8.74	MW05-D	61/61	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0047 - 0.42	MW05-D	48/61	0.0047-0.016	0/61	1825	0/61	2400	NA	NA
Pyrene	0.0028 - 0.074	MW05-D	36/61	0.0047-0.0055	0/61	182.5	0/61	240	NA	NA

Table 4-91

1999-2000 GROUNDWATER ANALYTICAL SUMMARY - DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detects	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
Other Organics (ug/l)										
2,4-Dinitrotoluene	0.12	MW18-D	1/61	0.024-0.5	0/61	73.0000	0/61	32	NA	NA
Benzene	0.034	MW33-D	1/127	0.02-5	0/127	0.3539	0/127	0.7955	0/127	5
Benzoic acid	0.049	MW20-D	1/60	0.047-1	0/60	145979	0/60	64000	NA	NA
Benzyl alcohol	0.028 - 0.051	Ershigs-4a	6/60	0.0095-0.5	0/60	10950	0/60	4800	NA	NA
Carbazole	0.078	MW05-D	1/40	0.024-0.056	0/40	3.3616	0/40	4.375	NA	NA
Dibenzofuran	0.0034 - 0.82	MW05-D	6/61	0.024-0.5	0/61	24.3333	0/61	32	NA	NA
Ethylbenzene	0.14	MW24-D	1/127	0.05-5	0/127	1340	0/127	800	0/127	700
m&p-Xylene	0.056 - 0.5	MW24-D	4/127	0.04-10	0/127	1431	0/127	16000	0/127	10000
o-Xylene	0.028 - 0.16	MW24-D	3/127	0.02-11	0/127	1431	0/127	16000	0/127	10000
Tetrachloroethene	0.0074	MW24-D	1/64	0.02-1	0/64	1.0818	0/64	0.8413	0/64	5
Phenols (ug/l)										
Pentachlorophenol	0.016 - 16	MW05-D	31/60	0.024-0.5	7/60	0.5603	7/60	0.7292	6/60	1
Phenol	0.027 - 0.045	MW17-D	5/60	0.018-0.5	0/60	21900	0/60	9600	NA	NA
Tetrachlorophenols	0.0067 - 1.9	MW25-D	25/59	0.024-0.5	0/59	1095	0/59	480	NA	NA

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbons.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDF	= Hexachlorodibenzofuran.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TEQ	= Toxicity Equivalent Quotient.
VPH	= Volatile petroleum hydrocarbons.

Table 4-92

1999-2000 GROUNDWATER ANALYTICAL SUMMARY - SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
cPAHs (ug/l)										
B(a)P Equivalent	0.002055 - 0.67327	MW14-S	6/52	-	5/52	0.0092	5/52	0.0120	NA	NA
Benzo(a)anthracene	0.02 - 0.83	MW22-S	5/52	0.0047-0.5	4/52	0.0921	4/52	0.1199	NA	NA
Benzo(a)pyrene	0.016 - 0.64	MW14-S	2/52	0.0047-0.5	2/52	0.0092	2/52	0.0120	1/52	0.2
Benzo(b)fluoranthene	0.05	MW14-S	1/21	0.0047-0.5	0/21	0.0921	0/21	0.1199	NA	NA
Chrysene	0.055 - 0.27	MW14-S	3/52	0.0047-0.5	0/52	9.2098	0/52	11.9863	NA	NA
Dioxins/Furans (ug/l)										
1,2,3,4,6,7,8-HpCDD	0.000008109 - 0.001063845	MW14-S	14/52	0.0000012-0.000032834	6/52	0.00004482	6/52	0.00005833	NA	NA
1,2,3,4,6,7,8-HpCDF	0.00001728 - 0.000049923	MW08-S	2/52	0.00000118-0.000080728	1/52	0.00004482	0/52	0.00005833	NA	NA
1,2,3,4,7,8-HxCDF	0.0000167	MW14-S	1/52	0.000001-0.000016214	1/52	0.00000448	1/52	0.00000583	NA	NA
1,2,3,6,7,8-HxCDD	0.000006501 - 0.00006207	MW14-S	2/52	0.000001129-0.00001576	2/52	0.00000448	2/52	0.00000583	NA	NA
2,3,7,8-TCDD TEQ	0.0000000003931 - 0.0000190007095	MW14-S	39/52	-	6/52	0.00000045	6/52	0.00000058	0/52	0.000030
OCDD	0.00001045 - 0.028815324	MW22-S	37/52	0.000003705-0.00016976	2/52	0.00448210	1/52	0.00583333	NA	NA
OCDF	0.000010921 - 0.000123189	MW14-S	7/52	0.00000146-0.000101475	0/52	0.00448210	0/52	0.00583333	NA	NA
Total HpCDD	0.000009258 - 0.000216896	MW09-S	3/15	0.000004179-0.000013478	NA	NA	NA	NA	NA	NA
Total HpCDF	0.000039476	MW09-S	1/15	0.000002315-0.000006053	NA	NA	NA	NA	NA	NA
Total HxCDD	0.000006501	MW09-S	1/15	0.000004115-0.000013481	NA	NA	NA	NA	NA	NA
Total HxCDF	0.000006971	MW31-S	1/15	0.000001897-0.000005357	NA	NA	NA	NA	NA	NA
Total TCDD	0.00000448 - 0.000018694	MW22-S	4/52	0.000001033-0.000024484	NA	NA	NA	NA	NA	NA
Total TCDF	0.000004504 - 0.000007097	MW14-S	3/52	0.000001336-0.00001615	NA	NA	NA	NA	NA	NA
Petroleum (ug/l)										
C10-C12 Aliphatics	25 - 9300	MW15-S	8/51	24-59	NA	NA	NA	NA	NA	NA
C10-C12 Aromatics	25 - 15000	MW15-S	13/51	24-190	NA	NA	NA	NA	NA	NA
C12-C16 Aliphatics	25 - 1200	MW15-S	6/51	24-59	NA	NA	NA	NA	NA	NA
C12-C16 Aromatics	25 - 2300	MW22-S	12/51	24-57	NA	NA	NA	NA	NA	NA
C16-C21 Aliphatics	25 - 36	MW14-S	3/51	24-130	NA	NA	NA	NA	NA	NA
C16-C21 Aromatics	49 - 1800	MW15-S	17/51	47-57	NA	NA	NA	NA	NA	NA
C21-C34 Aliphatics	50 - 85	MW15-S	9/51	47-140	NA	NA	NA	NA	NA	NA
C21-C34 Aromatics	49 - 290	MW22-S	7/51	47-59	NA	NA	NA	NA	NA	NA
C5-C6 Aliphatics	6.3 - 20	MW22-S	2/52	15-15	NA	NA	NA	NA	NA	NA
C6-C8 Aliphatics	100 - 260	MW15-S	4/52	10-10	NA	NA	NA	NA	NA	NA
C8-C10 Aliphatics	13 - 12000	MW15-S	16/99	24-68	NA	NA	NA	NA	NA	NA
C8-C10 Aromatics	21 - 17000	MW15-S	12/52	25-25	NA	NA	NA	NA	NA	NA
EPH	34 - 22812	MW15-S	22/51	-	NA	NA	12/51	500	NA	NA
VPH	21 - 35200.3	MW15-S	12/52	-	NA	NA	4/52	800	NA	NA
ncPAHs (ug/l)										
2-Chloronaphthalene	0.034 - 55	MW22-S	3/42	0.0094-0.11	0/42	486.67	0/42	640	NA	NA
2-Methylnaphthalene	0.0054 - 700	MW15-S	29/46	0.0047-0.51	7/46	6.203	7/46	160	NA	NA
Acenaphthene	0.0047 - 550	MW22-S	35/52	0.0047-0.0056	4/52	365	3/52	480	NA	NA
Acenaphthylene	0.0043 - 14	MW22-S	23/52	0.0047-0.032	0/52	365	0/52	480	NA	NA
Anthracene	0.0067 - 30	MW22-S	38/52	0.0047-0.61	0/52	1825	0/52	2400	NA	NA
Benzo(g,h,i)perylene	0.028	MW31-S	1/52	0.0047-0.5	0/52	182.5	0/52	240	NA	NA
Fluoranthene	0.005 - 24	MW22-S	23/52	0.0047-0.0056	0/52	1460	0/52	640	NA	NA
Fluorene	0.0047 - 220	MW22-S	19/52	0.0047-0.3	0/52	243.3	0/52	320	NA	NA
Naphthalene	0.0052 - 13500	MW15-S	61/104	0.0047-2	22/104	6.203	18/104	160	NA	NA

Table 4-92

1999-2000 GROUNDWATER ANALYTICAL SUMMARY - SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range of Detected Concentrations	Location of Maximum Detected Concentration	Detection Frequency	Range of Detection Limits	Frequency Exceeding EPA PRGs	EPA PRG	Frequency Exceeding MTCA Method B Standard	MTCA Method B Standard	Frequency Exceeding MCL	MCL
ncPAHs (ug/l)										
ncPAH	0.0142 - 8347.05	MW15-S	52/52	-	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0048 - 230	MW22-S	39/52	0.0047-0.61	0/52	1825	0/52	2400	NA	NA
Pyrene	0.0047 - 18	MW22-S	31/52	0.0047-0.035	0/52	182.5	0/52	240	NA	NA
Other Organics (ug/l)										
1,1-Dichloroethene	0.012 - 0.14	Ershigs-4	4/52	0.02-1	3/52	0.0456	2/52	0.0729	0/52	7
1,2,4-Trimethylbenzene	0.98 - 3120	MW15-S	10/52	1-1	9/52	12.33	4/52	400	NA	NA
1,2-Dichloroethane	1	MW22-S	1/52	0.02-1.1	1/52	0.1231	1/52	0.4808	0/52	5
1,3,5-Trimethylbenzene	7.5 - 648	MW15-S	9/52	1-2	5/52	12.33	4/52	400	NA	NA
1,3-Dichlorobenzene	0.0052 - 0.026	Ershigs-3	6/104	0.024-2.4	0/104	5.475	0/104	7.2	NA	NA
1,4-Dichlorobenzene	1.7 - 6.1	Ershigs-4	6/104	0.024-2.4	6/104	0.5018	5/104	1.823	0/104	75
2,4-Dinitrotoluene	0.15 - 2.6	MW22-S	2/52	0.024-2.4	0/52	73.00	0/52	32	NA	NA
Benzene	0.017 - 49.6	MW15-S	16/104	0.02-5	9/104	0.3539	8/104	0.7955	8/104	5
Benzoic acid	2.9	MW28-S	1/52	0.047-4.8	0/52	145979	0/52	64000	NA	NA
Benzyl alcohol	0.03 - 0.041	MW08-S	4/52	0.024-2.4	0/52	10950	0/52	4800	NA	NA
Carbazole	0.49 - 370	MW22-S	11/42	0.024-0.056	7/42	3.362	7/42	4.375	NA	NA
cis-1,2-Dichloroethene	0.86	Ershigs-4	1/52	1-2	0/52	60.83	0/52	80	0/52	70
Dibenzofuran	0.0038 - 200	MW22-S	18/52	0.024-0.51	8/52	24.33	7/52	32	NA	NA
Ethylbenzene	0.18 - 1170	MW15-S	21/104	0.05-5	0/104	1340	6/104	800	7/104	700
Isopropylbenzene	2 - 298	MW15-S	11/52	1-2	0/52	658.2	0/52	800	NA	NA
m&p-Xylene	0.054 - 3900	MW15-S	27/104	0.04-10	7/104	1431	0/104	16000	0/104	10000
n-Butylbenzene	1.6 - 94.2	MW15-S	7/52	1-1	4/52	60.83	3/52	80	NA	NA
n-Propylbenzene	0.67 - 283	MW15-S	6/52	1-1	4/52	60.83	4/52	80	NA	NA
o-Xylene	0.024 - 1960	MW15-S	30/104	0.02-11	4/104	1431	0/104	16000	0/104	10000
p-Isopropyltoluene	1.1 - 80.7	MW15-S	7/52	1-2	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	0.93 - 97.3	MW15-S	10/52	1-2	4/52	60.83	2/52	80	NA	NA
tert-Butylbenzene	1.2 - 1.7	MW15-S	4/52	1-2	0/52	60.83	0/52	80	NA	NA
Tetrachloroethene	0.1 - 1	MW22-S	5/52	0.02-2	0/52	1.082	1/52	0.8413	0/52	5
Toluene	1.5 - 390	MW15-S	13/104	1-5	0/104	723.4	0/104	1600	0/104	1000
Trichloromethane	0.025 - 4	MW22-S	11/52	0.02-2	7/52	0.1646	0/52	7.172	NA	NA
Phenols (ug/l)										
2-Chlorophenol	0.69 - 0.72	MW28-S	2/52	0.024-2.4	0/52	30.42	0/52	40	NA	NA
2,4,5-Trichlorophenol	0.088 - 3.7	MW15-S	7/52	0.024-7.3	0/52	3650	0/52	1600	NA	NA
2,4,6-Trichlorophenol	0.027 - 1.1	MW28-S	8/52	0.024-2.4	0/52	6.112	0/52	7.955	NA	NA
2,4-Dichlorophenol	0.0071 - 6.5	MW28-S	11/52	0.015-2.4	0/52	109.5	0/52	48	NA	NA
2,4-Dimethylphenol	0.051 - 6	MW22-S	2/52	0.024-7	0/52	730.0	0/52	320	NA	NA
2-Methylphenol	0.025 - 29	MW15-S	5/52	0.024-9.8	0/52	1825	0/52	800	NA	NA
3&4-Methylphenol	0.037 - 26	MW15-S	6/52	0.024-2.4	0/52	182.5	0/52	80	NA	NA
Pentachlorophenol	0.012 - 3700	MW15-S	41/52	0.024-3.2	26/52	0.5603	26/52	0.7292	26/52	1
Phenol	0.028 - 0.12	MW19-S	11/52	0.024-2.4	0/52	21900	0/52	9600	NA	NA
Tetrachlorophenols	0.047 - 380	MW28-S	28/51	0.024-260	0/51	1095	0/51	480	NA	NA

Table 4-92

1999-2000 GROUNDWATER ANALYTICAL SUMMARY - SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
EPH	= Extractable petroleum hydrocarbons.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
MCL	= Maximum contaminant level.
µg/L	= Micrograms per liter.
MTCA	= Model Toxics Control Act.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PRG	= Preliminary remediation goal.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity Equivalent Quotient.
VPH	= Volatile petroleum hydrocarbon.

Table 4-93

1999-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D	MW17-D	MW18-D	MW20-D	MW23-D	MW24-D
2,3,7,8-TCDD TEQ	P,B									
Pentachlorphenol				P,B,M						

Key is at the end of the table.

Table 4-93

1999-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW25-D	MW30-D	MW33-D	MW34-D	MW35-D	Ershigs 1A	Ershigs 4a	TC-5	TC-6
2,3,7,8-TCDD TEQ									
Pentachlorphenol	P,B,M								

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalency quotient.

Table 4-94

1999-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21-S	MW22-S	MW26-S	MW28-S	MW29-S	MW31-S
cPAHs															
Benzo(a)anthracene						P,B	P,B				P,B				
Benzo(a)pyrene						P,B,M									
B(a)P Equivalents						P,B	P,B				P,B				
ncPAHs															
2-Methylnaphthalene							P,B				P,B				
Acenapthene											P,B				
Naphthalene						P,B	P,B				P,B		P		P
Phenols															
Pentachlorphenol				P,B,M		P,B,M	P,B,M		P,B,M		P,B,M		P,B,M	P,B,M	P,B,M
Other Organics															
1,1-Dichloroethene															
1,2,4-Trimethylbenzene						P	P,B				P				
1,2-Dichloroethane							P,B								
1,3,5-Trimethylbenzene						P	P,B								
1,4-Dichlorobenzene															
Benzene							P,B,M				P				
Carbazole							P,B				P,B		P,B		
Dibenzofuran						P,B	P				P,B		P,B		
Ethyl benzene							B,M								
m&p-Xylene							P								
n-Butylbenzene							P,B								
n-Propylbenzene							P,B								
o-Xylene							P								
sec-Butylbenzene							P,B								
Tetrachloroethene						B									

Key is at the end of the table.

Table 4-94

1999-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21-S	MW22-S	MW26-S	MW28-S	MW29-S	MW31-S
Dioxins/Furans															
1,2,3,4,6,7,8-HpCDD		P,B	P,B			P,B	P,B				P,B			P,B	
1,2,3,4,6,7,8-HpCDF		P													
1,2,3,4,7,8-HxCDF						P,B									
1,2,3,6,7,8-HxCDD			P,B			P,B									
2,3,7,8-TCDD TEQ		P,B	P,B			P,B,M	P,B				P,B			P,B	
OCDD						P					P,B				
Petroleum Hydrocarbons															
EPH						B	B				B		B		
VPH							B								

Key is at the end of the table.

Table 4-94

1999-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW32-S	MW33-S	MW35-S	MW36-S	MWLSC01	MWLSC02	MWLSC03	MWLSC04	Ershigs 1	Ershigs 3	Ershigs 4
cPAHs											
Benzo(a)anthracene											
Benzo(a)pyrene				P,B							
B(a)P Equivalents				P,B							
ncPAHs											
2-Methylnaphthalene											
Acenapthene											
Naphthalene											
Phenols											
Pentachlorphenol				P,B,M							
Other Organics											
1,1-Dichloroethene											P,B
1,2,4-Trimethylbenzene											
1,2-Dichloroethane											
1,3,5-Trimethylbenzene											
1,4-Dichlorobenzene											P,B
Benzene											
Carbazole											
Dibenzofuran											
Ethyl benzene											
m&p-Xylene											
n-Butylbenzene											
n-Propylbenzene											
o-Xylene											
sec-Butylbenzene											
Tetrachloroethene											

Key is at the end of the table.

Table 4-94

1999-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW32-S	MW33-S	MW35-S	MW36-S	MWLSC01	MWLSC02	MWLSC03	MWLSC04	Ershigs 1	Ershigs 3	Ershigs 4
Dioxins/Furans											
1,2,3,4,6,7,8-HpCDD											
1,2,3,4,6,7,8-HpCDF											
1,2,3,4,7,8-HxCDF											
1,2,3,6,7,8-HxCDD											
2,3,7,8-TCDD TEQ											
OCDD											
Petroleum Hydrocarbons											
EPH											
VPH											

Key:

B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
EPA = United States Environmental Protection Agency.
EPH = Extractable petroleum hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
M = Above EPA maximum contaminant level (MCL).
ncPAHs = Non-carcinogenic polycyclic aromatic hydrocarbons.
OCDD = Octachlorodibenzo-p-dioxin.
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalency quotient.
VPH = Volatile petroleum hydrocarbon.

Table 4-95

SUMMARY OF RESULTS FROM PIEZOMETER GROUNDWATER WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070500	99070501	99070502	99070503	99070504	99070505	99070507	99070508	99070509	99070665	99070699
Sample Location		PZ-T24	PZ-I21	PZ-L17	PZ-S16	PZ-Q14	PZ-P14	PZ-M16	PZ-P27	PZ-T22	PZ-H21	PZ-O13
Sample Date		7/27/99	7/27/990	7/27/99	7/28/99	7/28/99	7/28/99	7/28/99	7/28/99	7/28/99	8/13/99	8/18/99
Semivolatile Organic Compounds (µg/L)												
1,2-Dichlorobenzene	370 [c]	0.049 U	0.049 U	0.02 JQ	0.049 U	0.049 U	0.049 U	0.049 U	0.048 U	0.089 U	0.025 U	0.024 U
1,3-Dichlorobenzene	5.5 [c]	0.0088 JQ	0.0068 JQ	0.054 U	0.049 U	0.049 U	0.049 U	0.049 U	0.048 U	0.089 U	0.025 U	0.024 U
2,4,5-Trichlorophenol	NA	0.049 U	0.049 U	0.49	0.049 U	0.049 U	0.049 U	0.74	0.048 U	0.089 U	0.025 U	0.024 U
2,4,6-Trichlorophenol	6.1 [c]	0.049 U	0.049 U	0.3	0.011 JQ	0.049 U	0.049 U	0.29	0.048 U	0.089 U	0.025 U	0.024 U
2,4-Dichlorophenol	110 [c]	0.023 JQ	0.017 JQ	1.5	0.022 JQ	0.049 U	0.074	2.6	0.031 J	0.089 U	0.025 U	0.024 U
2,4-Dimethylphenol	730 [c]	0.049 U	0.049 U	0.046 JQ	0.049 U	0.049 U	0.049 U	0.049 U	0.048 U	0.089 U	0.025 U	0.024 U
2,6-Dinitrotoluene	36 [c]	0.049 U	0.049 U	0.054 U	0.049 U	0.049 U	0.049 U	0.049 U	0.048 U	0.089 U	0.16 U	0.057 JN
2-Chlorophenol	30 [c]	0.049 U	0.049 U	0.038 JQ	0.049 U	0.049 U	0.049 U	0.38	0.048 U	0.089 U	0.025 U	0.024 U
2-Methylnaphthalene	6.2 [c]	0.0088 JQ	0.18	0.73	0.014	0.0097 U	0.011	0.029	0.013	**220 J**	0.027 U	0.029
2-Methylphenol	1800 [c]	0.049 U	0.049 U	0.054 U	0.049 U	0.049 U	0.049 U	0.13	0.048 U	0.089 U	0.025 U	0.024 U
3&4-Methylphenol	180 [c]	0.049 U	0.049 U	0.054 U	0.049 U	0.023 JQ	0.049 U	0.049 U	0.048 U	0.089 U	0.025 U	0.024 U
4-Chloroaniline	NA	0.049 U	0.049 U	0.1	0.049 U	0.049 U	0.049 U	0.049 U	0.048 U	0.089 U	0.025 U	0.024 U
Acenaphthene	370 [c]	0.0098 U	0.031	0.91	0.018	0.0097 U	0.0098 U	0.0097 U	0.0095 U	330	0.014	0.061
Acenaphthylene	370 [c]	0.0098 U	0.0097 U	0.037	0.0088 JQ	0.0097 U	0.0098 U	0.1	0.0095 U	0.018 U	0.0051 U	0.0049 U
Anthracene	1800 [c]	0.08	0.041	0.52	0.082	0.076	0.043	1.1 J	0.0095 U	30	0.026	0.065
Benzo(a)anthracene	0.092 [c]	0.014	0.0097 U	0.011 U	0.014	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**17**	0.0051 U	0.031
Benzo(a)pyrene	0.0092 [c]	0.0098 U	0.0097 U	0.011 U	0.016	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**7.7**	0.0051 U	0.0049 U
Benzo(b)fluoranthene	0.092 [c]	0.0098 U	0.014	0.011 U	0.04	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**14**	0.0051 U	0.01 J
Benzo(g,h,i)perylene	180 [c]	0.0098 U	0.0097 U	0.011 U	0.019	0.0097 U	0.0098 U	0.0097 U	0.01	0.16	0.0051 U	0.0049 U
Benzo(j)fluoranthene	0.12 [d]	0.098 U	0.097 U	0.11 U	0.098 U	0.097 U	0.098 U	0.097 U	0.095 U	**5.1 J**	0.051 U	0.01 J
Benzo(k)fluoranthene	0.92 [c]	0.0098 U	0.0097 U	0.011 U	0.0098	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**5.1 J**	0.0051 U	0.01 J
Benzoic acid	150000 [c]	0.098 UJK	0.097 UJK	0.11 UJK	0.17 JL	0.097 UJK	0.098 UJK	0.097 UJ	0.095 UJ	0.18 UJ	0.16	0.09
Chrysene	9.2 [c]	0.0098 U	0.012	0.016	0.052	0.0097 U	0.0098 U	0.0097 U	0.0095 U	11	0.0051 U	0.023
Dibenzo(a,e)pyrene	0.0012 [d]	0.0098 U	0.0097 U	0.011 U	0.0098 U	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**1.2**	0.0051 U	0.0049 U
Dibenzo(a,h)acridine	NA	0.0098 U	0.0097 U	0.011 U	0.0098 U	0.0097 U	0.0098 U	0.0097 U	0.0095 U	0.018 U	0.0051 U	0.0049 U
Dibenzo(a,h)anthracene	0.0092 [c]	0.0098 U	0.0097 U	0.011 U	0.0098 U	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**0.11**	0.0051 U	0.0049 U
Dibenzo(a,i)pyrene	0.0012 [d]	0.0098 U	0.0097 U	0.011 U	0.0098 U	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**0.23**	0.0051 U	0.0049 U
Dibenzofuran	24 [c]	0.049 U	0.02 JQ	0.36	0.0088 JQ	0.049 U	0.049 U	9.7	0.048 U	**120**	0.012 JQ	0.04
Fluoranthene	1500 [c]	0.012	0.019	0.13	0.049	0.017	0.0098 U	0.049 J	0.019	78	0.016	0.089
Fluorene	240 [c]	0.0098 U	0.0097 U	0.67	0.015	0.0097 U	0.0098 U	11	0.0095	150	0.01	0.06
Indeno(1,2,3-cd)pyrene	0.92 [c]	0.0098 U	0.0097 U	0.011 U	0.021	0.0097 U	0.0098 U	0.0097 U	0.0095 U	**2.6**	0.0051 U	0.0049 U
Naphthalene	6.2 [c]	0.0098 U	0.32	1.6	0.035	0.0097 U	0.021	0.13	0.016	**1600**	0.016	0.015
Nitrobenzene	NA	0.049 U	0.049 U	0.054 U	0.049 U	0.049 U	0.049 U	0.049 U	0.048 U	0.089 U	0.026	0.024 U
Pentachlorophenol	0.56 [c]	0.15	**1.5**	**150**	0.39	0.45	**220 JL**	**790**	0.27	**18**	**0.87**	**6.1**
Phenanthrene	1800 [c]	0.022	0.049	0.75	0.043	0.023	0.032	2.1 J	0.047	260	0.014	0.1
Phenol	22000 [c]	0.049 U	0.049 U	0.054 U	0.049 U	0.049 U	0.049 U	0.068	0.048 U	0.26	0.13	0.094
Pyrene	180 [c]	0.014	0.018	0.09	0.047	0.018	0.012	0.091	0.035	70	0.013	0.059
Tetrachlorophenols	1100 [c]	0.049 U	0.18	41	0.12	0.075	4	170	0.048 U	2.3	0.068	0.26
Petroleum Hydrocarbons (µg/L)												
Diesel	500 [e]	320 JN	180 JN	930 JN	170 JN	250 JN	NA	2400 JN	240 U	NA	NA	240 U
Gasoline	800 [e]	100 U	100 U	56 JQ	100 U	100 U	NA	76 JQ	100 U	NA	NA	100 U
Motor Oil	500 [e]	310 J	480 U	**620**	310 JN	400 J	NA	**980**	480 U	NA	NA	480 U

Key is on the next page.

Table 4-95

SUMMARY OF RESULTS FROM PIEZOMETER GROUNDWATER WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.
[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).
[e] MTCA Method A cleanup level.

Key:

	= United States Environmental Protection Agency.
EPA	= The analyte was positively identified. The associated numerical result is an estimate.
J	= The analyte was positively identified. The associated numerical result is an estimate, biased low.
JL	= The analyte was tentatively identified and the numerical result is estimated.
JN	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
JQ	= Micrograms per liter.
µg/L	= Not applicable.
NA	= Preliminary screening levels.
PSLs	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
U	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-96

SUMMARY OF WATER QUALITY PARAMETER RESULTS (1999-2000)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte (mg/L)	Minimum	Location	Maximum	Location
Alkalinity	64.3	SW02	476	MW01-D
BOD	2.81	MW25-D	28.6	MW15-S
Bromide	0.202	MW10-S	1.12	MW32-S
Chloride	3	Ershigs-01	36.4	MW31-S
COD	5	MWLSC03	160	MW15-S
Flouride	0.044	Ershigs-04	0.307	Ershigs-1a
Hardness	73.2	SW07	73.2	SW07
Nitrate and Nitrite	0.01	MW09-S	7.24	MW32-S
Sulfate	1.1	MW09-S	105	MW10-S
Sulfide	0.0192	Ershigs-3	11	MW01-D
TDS	120	SW02	515	MW01-D
TSS	2.02	MW02-D	202	MW29-S

Key:

BOD = Biochemical oxygen demand.
COD = Chemical oxygen demand.
mg/L = Milligrams per liter.
TDS = Total dissolved solids.
TSS = Total suspended solids.

Table 4-97

SUMMARY OF RESULTS FROM WELL POINT SAMPLE
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99070515	99070516
Sample Location		WP1	WP2
Sample Date		8/11/99	8/11/99
Semivolatile Organic Compounds (µg/L)			
2,4-Dinitrotoluene	73 [c]	25 JN	0.027 U
2-Methylnaphthalene	62 [c]	**340**	0.035
2-Methylphenol	1800 [c]	2.7 U	0.24
3&4-Methylphenol	180 [c]	2.7 U	0.052
Acenaphthene	370 [c]	**930**	0.11
Acenaphthylene	370 [c]	0.54 U	0.084
Anthracene	1800 [c]	430	1
Benzo(a)anthracene	0.092 [c]	**380**	**0.99**
Benzo(a)pyrene	0.0092 [c]	**150**	**1.2**
Benzo(b)fluoranthene	0.092 [c]	**100 J**	**0.61 J**
Benzo(g,h,i)perylene	180 [c]	28	0.5
Benzo(j)fluoranthene	0.12 [d]	**100 J**	**0.61 J**
Benzo(k)fluoranthene	0.92 [c]	**100 J**	0.61 J
Benzoic acid	150000 [c]	25	4.7 U
Benzyl alcohol	11000 [c]	9.8	1
Chrysene	9.2 [c]	**300**	1.7
Dibenzo(a,e)pyrene	0.0012 [d]	**3.4**	**0.15**
Dibenzo(a,h)anthracene	0.0092 [c]	**12**	**0.11**
Dibenzo(a,j)acridine	0.12 [d]	**2.6**	0.0055 U
Dibenzofuran	24 [c]	**490**	0.052
Fluoranthene	1500 [c]	1400	2
Fluorene	240 [c]	**940**	0.18
Indeno(1,2,3-cd)pyrene	0.92 [c]	**37**	0.56
Naphthalene	62 [c]	**85**	0.022
Pentachlorophenol	0.56 [c]	2.7 U	**0.84**
Phenanthrene	1800 [c]	1700	0.17
Phenol	22000 [c]	0.6 J	0.11
Pyrene	180 [c]	**1100**	1.8
Petroleum Hydrocarbons (µg/L)			
Diesel	500 [e]	53000 JN	**1900**
Motor Oil	500 [e]	9200 JN	2400 JN

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA, Region 9, risk-based concentration derived from EPA, Region 9, Preliminary Remediation Goals (PRGs), 2000, prepared by Stanford J. Smucker, PhD., Regional Toxicologist, San Francisco, California.

[d] State of Washington Model Toxics Control Act (MTCA) Method B risk-based concentration derived from MTCA (CLARC II) update, February 1996. Values are based on revised MTCA (February 2001).

[e] MTCA Method A cleanup level.

Key:

EPA = United States Environmental Protection Agency.
J = The analyte was positively identified. The associated numerical result is an estimate.
JN = The analyte was tentatively identified, and the numerical result is estimated.
µg/L = Micrograms per liter.
NA = Not applicable.
PSLs = Preliminary screening levels.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-98

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW01-D	MW02-D	MW03-D	MW05-D	MW06-D	MW17-D	MW18-D	MW20-D	MW23-D	MW24-D
1995										
Benzo(a)pyrene				P,B						
B(a)P Equivalents				P,B						
1,1-Dichloroethene	P,B				P,B					
1,2-Dichloroethane	P,B	P,B		P	P					
1996										
Benzo(a)pyrene				P,B						
B(a)P Equivalents				P,B						
Pentachlorphenol	P,B,M	P		P,B,M						
1,1-Dichloroethene		P,B								
1,2-Dichloroethane		P,B	P,B	P,B	P,B					
1997										
Benzo(a)anthracene						P,B				
Benzo(a)pyrene						P,B			P,B	P,B
B(a)P Equivalents				P,B		P,B			P,B	P,B
Benzo(b)fluoranthene				P,B		P,B				
Dibenzo(a,h)anthracene						P,B				
Pentachlorphenol	P,B			P,B,M		P,B,M	P,B,M		P,B,M	P,B
1,2-Dichloroethane			P,B	P,B	P,B					
TPH-D						B				
1998										
Benzo(a)anthracene				P,B					P,B	P,B
Benzo(a)pyrene				P,B					P,B,M	P,B,M
B(a)P Equivalents				P,B	P				P,B	P,B
Benzo(b)fluoranthene				P,B					P,B	P,B
Pentachlorphenol				P,B,M		P,B,M			P,B,M	P,B,M
2-Methylnaphthalene									P	
Naphthalene									P	
1999-2000										
2,3,7,8-TCDD TEQ	P,B									
Pentachlorphenol				P,B,M						

Key is at the end of the table.

Table 4-98

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN DEEP WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW25-D	MW30-D	MW33-D	MW34-D	MW35-D	Ershigs 1A	Ershigs 4a	TC-5	TC-6
1995									
Benzo(a)pyrene									
B(a)P Equivalents									
1,1-Dichloroethene									
1,2-Dichloroethane									
1996									
Benzo(a)pyrene									
B(a)P Equivalents									
Pentachlorphenol									
1,1-Dichloroethene									
1,2-Dichloroethane									
1997									
Benzo(a)anthracene									
Benzo(a)pyrene								P,B	P
B(a)P Equivalents	P,B							P,B	P,B
Benzo(b)fluoranthene									
Dibenzo(a,h)anthracene									
Pentachlorphenol	P,B,M								
1,2-Dichloroethane									
TPH-D									
1998									
Benzo(a)anthracene									
Benzo(a)pyrene									
B(a)P Equivalents									
Benzo(b)fluoranthene									
Pentachlorphenol	P,B								
2-Methylnaphthalene									
Naphthalene									
1999-2000									
2,3,7,8-TCDD TEQ									
Pentachlorphenol	P,B,M								

Key:

= Well did not exist or cannot be accessed.
B = Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P = Benzo(a)pyrene.
EPA = United States Environmental Protection Agency.
M = Above EPA maximum contaminant level (MCL).
P = Above EPA, Region 9, preliminary remediation goal (PRG).
PSL = Preliminary screening level.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalency quotient.
TPH-D = Total petroleum hydrocarbon as diesel.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21-S	MW22-S	MW26-S	MW28-S	MW29-S
1995														
No shallow wells were on site in 1995														
1996														
Benzo(a)anthracene	P,B													
Benzo(a)pyrene	P,B,M													
Benzo(b)fluoranthene	P,B													
Benzo(k)fluoranthene	P,B													
Chrysene	P,B													
Indeno(1,2,3-cd)pyrene	P,B													
B(a)P Equivalent	P,B													
Carbazole	P,B													
Flourene	P													
Pentachlorphenol	P,B,M			P,B,M										
1,2,4-Trimethylbenzene	P													
1,2-Dichloroethane	P,B	P,B	P,B	P,B										
1-Methylnapthalene	P,B													
2-Methylnapthalene	P,B													
Naphthalene	P													
N-nitrosodiphenylamine	P,B													
1997														
Acenaphthene						P,B					P			
Anthracene						P								
Benzene							P,B,M							
Benzo(a)anthracene						P,B	P,B	P,B	P,B		P,B	P,B		
Benzo(a)pyrene						P,B,M	P,B,M		P,B,M		P,B,M	P,B,M		
Benzo(b)fluoranthene						P,B	P,B	P,B	P,B		P,B	P,B		
Benzo(k)fluoranthene						P,B			P		P,B			
Chrysene						P,B					P			
Dibenzo(a,h)anthracene						P,B			P,B		P,B			
Indeno(1,2,3-cd)pyrene						P,B	P,B		P,B		P,B			
B(a)P Equivalent						P,B	P,B	P,B	P,B		P,B	P,B		
Fluoranthene						P,B								
Fluorene						P,B								
2-Chloronaphthalene														
1-Methylnapthalene	P,B													
2-Methylnaphthalene	P,B				P,B	P,B	P,B	P,B			P,B	P,B		
Naphthalene	P				P	P,B	P,B	P,B			P,B	P,B		
Phenanthrene						P,B								

Key is at the end of the table.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21-S	MW22-S	MW26-S	MW28-S	MW29-S
1997														
Pyrene						P,B								
3&4-Methylphenol								B						
Pentachlorphenol	P,B,M		P,B,M	P,B,M	P,B,M	P,B,M	P,B,M	P,B,M	P,B,M		P,B,M	P,B,M		
1,2-Dichloroethane	P,B	P,B	P,B	P,B										
Ethyl Benzene							B,M							
Carbazole					P,B	P,B	P,B	P,B			P,B	P,B		
Dibenzofuran						P,B	P,B	P,B			P,B	P,B		
N-nitrosodiphenylamine						P,B								
1,3,5-Trimethylbenzene	P													
m&p-Xylenes							P,M							
o-Xylene							P,M							
TPH-D							B		B		B	B		
1998														
Benzo(a)anthracene	P,B				P,B	P,B	P,B		P,B		P,B	P,B		
Benzo(a)pyrene	P,B,M				P,B,M	P,B,M	P,B,M		P,B,M		P,B,M	P,B,M		
Benzo(b)fluoranthene	P,B				P,B	P,B	P,B		P,B		P,B	P,B		
Benzo(k)fluoranthene	P,B				P,B	P,B			P,B		P,B	P,B		
Chrysene	P,B				P,B	P,B					P,B	P,B		
Dibenzo(a,h)anthracene	P,B					P,B			P,B					
Indeno(1,2,3-cd)pyrene	P,B				P,B	P,B			P,B		P,B	P,B		
B(a)P Equivalent	P,B				P,B	P,B	P,B		P,B		P,B	P,B		
Acenaphthene	P,B				P,B	P,B					P,B	P,B		
Anthracene	P				P,B							P,B		
2-Chloronaphthalene					P,B									
Flouranthene	B				P,B							P,B		
Fluorene	P,B				P,B	P,B					P	P,B		
2-Methylnaphthalene	P,B				P,B	P,B	P,B		P		P,B	P,B		
Naphthalene	P,B				P,B	P,B	P,B		P		P,B	P,B		
Phenanthrene	P,B				P,B							P,B		
Pyrene	P,B				P,B	P,B						P,B		
Pentachlorphenol	P,B,M			P,B,M	P,B,M	P,B,M	P,B,M		P,B,M		P,B,M	P,B,M		
Dibenzofuran					P,B	P,B					P,B	P,B		
1999-2000														
Benzo(a)anthracene						P,B	P,B				P,B			
Benzo(a)pyrene						P,B,M								
B(a)P Equivalent						P,B	P,B				P,B			
2-Chloronapthalene														

Key is at the end of the table.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW07-S	MW08-S	MW09-S	MW10-S	MW13-S	MW14-S	MW15-S	MW16-S	MW19-S	MW21-S	MW22-S	MW26-S	MW28-S	MW29-S
1999-2000														
2-Methylnaphthalene							P,B				P,B			
Acenapthene											P			
Naphthalene						P,B	P,B				P,B		P	
Pentachlorphenol				P,B,M		P,B,M	P,B,M		P,B,M		P,B,M		P,B,M	P,B,M
1,1-Dichloroethene														
1,2,4-Trimethylbenzene						P	P,B				P			
1,2-Dichloroethane							P,B							
1,3,5-Trimethylbenzene						P	P,B							
1,4-Dichlorobenzene														
Benzene							P,B,M				P			
Carbazole							P,B				P,B		P,B	
Dibenzofuran						P,B	P				P,B		P,B	
Ethyl benzene							B,M							
m&p-Xylene							P							
n-Butylbenzene							P,B							
N-Nitrosodiphenylamine														
n-Propylbenzene							P,B							
o-Xylene							P							
sec-Butylbenzene							P,B							
Tetrachloroethene						B								
1,2,3,4,6,7,8-HpCDD		P,B	P,B			P,B	P,B				P,B			P,B
1,2,3,4,6,7,8-HpCDF		P												
1,2,3,4,7,8-HxCDF						P,B								
1,2,3,6,7,8-HxCDD			P,B			P,B								
2,3,7,8-TCDD TEQ		P,B	P,B			P,B,M	P,B				P,B			P,B
OCDD						P					P,B			
EPH						B	B				B		B	
VPH							B							

Key is at the end of the table.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW31-S	MW32-S	MW33-S	MW35-S	MW36-S	MWLSC01	MWLSC02	MWLSC03	MWLSC04	Ershigs 1	Ershigs 3	Ershigs 4	GP05	GP22	GP23
1995															
No shallow wells were on site in 1995															
1996															
Benzo(a)anthracene															
Benzo(a)pyrene															
Benzo(b)fluoranthene															
Benzo(k)fluoranthene															
Chrysene															
Indeno(1,2,3-cd)pyrene															
B(a)P Equivalent															
Carbazole															
Flourene															
Pentachlorphenol															
1,2,4-Trimethylbenzene															
1,2-Dichloroethane															
1-Methylnapthalene															
2-Methylnapthalene															
Naphthalene															
N-nitrosodiphenylamine															
1997															
Acenaphthene															
Anthracene															
Benzene															
Benzo(a)anthracene													P,B	P,B	P,B
Benzo(a)pyrene													P,B,M	P,B,M	P,B,M
Benzo(b)fluoranthene													P,B		
Benzo(k)fluoranthene													P,B		
Chrysene													P,B		
Dibenzo(a,h)anthracene															
Indeno(1,2,3-cd)pyrene															
B(a)P Equivalent													P,B	P,B	P,B
Fluoranthene															
Fluorene															
2-Chloronaphthalene															
1-Methylnapthalene															
2-Methylnaphthalene													P,B	P	
Naphthalene													P,B	P,B	P
Phenanthrene															

Key is at the end of the table.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW31-S	MW32-S	MW33-S	MW35-S	MW36-S	MWLSC01	MWLSC02	MWLSC03	MWLSC04	Ershigs 1	Ershigs 3	Ershigs 4	GP05	GP22	GP23
1997															
Pyrene															
3&4-Methylphenol															
Pentachlorphenol													P,B,M	P,B,M	P,B,M
1,2-Dichloroethane															
Ethyl Benzene															
Carbazole													P,B		
Dibenzofuran													P,B	P,B	
N-nitrosodiphenylamine															
1,3,5-Trimethylbenzene															
m&p-Xylenes															
o-Xylene															
TPH-D															
1998															
Benzo(a)anthracene															
Benzo(a)pyrene															
Benzo(b)fluoranthene															
Benzo(k)fluoranthene															
Chrysene															
Dibenzo(a,h)anthracene															
Indeno(1,2,3-cd)pyrene															
B(a)P Equivalent															
Acenaphthene															
Anthracene															
2-Chloronaphthalene															
Flouranthene															
Fluorene															
2-Methylnaphthalene															
Naphthalene															
Phenanthrene															
Pyrene															
Pentachlorphenol															
Dibenzofuran															
1999-2000															
Benzo(a)anthracene															
Benzo(a)pyrene					P,B										
B(a)P Equivalent					P,B										
2-Chloronapthalene															

Key is at the end of the table.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Well Number	MW31-S	MW32-S	MW33-S	MW35-S	MW36-S	MWLSC01	MWLSC02	MWLSC03	MWLSC04	Ershigs 1	Ershigs 3	Ershigs 4	GP05	GP22	GP23
1999-2000															
2-Methylnaphthalene															
Acenapthene															
Naphthalene	P														
Pentachlorphenol	P,B,M				P,B,M										
1,1-Dichloroethene												P,B			
1,2,4-Trimethylbenzene															
1,2-Dichloroethane															
1,3,5-Trimethylbenzene															
1,4-Dichlorobenzene												P,B			
Benzene															
Carbazole															
Dibenzofuran															
Ethyl benzene															
m&p-Xylene															
n-Butylbenzene															
N-Nitrosodiphenylamine															
n-Propylbenzene															
o-Xylene															
sec-Butylbenzene															
Tetrachloroethene															
1,2,3,4,6,7,8-HpCDD															
1,2,3,4,6,7,8-HpCDF															
1,2,3,4,7,8-HxCDF															
1,2,3,6,7,8-HxCDD															
2,3,7,8-TCDD TEQ															
OCDD															
EPH															
VPH															

Key is on the next page.

Table 4-99

1995-2000 SUMMARY OF GROUNDWATER PSL EXCEEDENCES IN SHALLOW WELLS
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

	= Well did not exist or cannot be accessed.
B	= Above Washington Model Toxics Control Act (MTCA B) value.
B(a)P	= Benzo(a)pyrene.
EPA	= United States Environmental Protection Agency.
EPH	= Extractable petroleum hydrocarbon.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
M	= Above EPA maximum contaminant level (MCL).
OCDD	= Octachlorodibenzo-p-dioxin.
P	= Above EPA, Region 9, preliminary remediation goal (PRG).
TCDD	= Tetrachlorodibenzo-p-dioxin.
TEQ	= Toxicity equivalency quotient.
TPH-D	= Total petroleum hydrocarbon as diesel.
VPH	= Volatile petroleum hydrocarbon.

Table 4-100

1999 AIR DATA
STATION AS21
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/27/99	9/28/99	9/29/99	10/1/99	10/1/99	10/2/99
cPAHs (µg/m^3)										
Benzo(a)anthracene	0.0000488	0.0000839	0.000058 J	NA	0.000367	NA	0.000326	NA	0.000349	NA
Benzo(a)pyrene	0.0000192	0.0000617	0.0000242	NA	0.000342	NA	0.000349	NA	0.00043	NA
Benzo(b)fluoranthene	0.000114	0.000192	0.000113	NA	0.000782	NA	0.000745	NA	0.000913	NA
Benzo(e)pyrene	0.0000569	0.0000913	0.0000731	NA	0.000318	NA	0.000326	NA	0.00043	NA
Benzo(k)fluoranthene	0.0000352	0.0000691	0.0000353	NA	0.000203	NA	0.000193	NA	0.000322	NA
Chrysene	0.000352	0.000345	0.00053 J	NA	0.000513	NA	0.000535	NA	0.00051	NA
Dibenzo(a,h)anthracene	0.0000136 U	0.0000123 U	0.0000126 U	NA	0.0000611	NA	0.0000675	NA	0.000102 J	NA
Indeno(1,2,3-cd)pyrene	0.0000298	0.0000666	0.0000353	NA	0.000293	NA	0.000279	NA	0.000376	NA
B(a)P Equivalent	0.000039164	0.000096986	0.000045713	NA	0.000549843	NA	0.000553965	NA	0.00069953	NA
Dioxins/Furans (µg/m^3)										
1,2,3,4,6,7,8-HpCDD	0.00000921	0.00000345	0.0000139	NA	0.00000733	NA	0.00000303	NA	0.00000376	NA
1,2,3,4,6,7,8-HpCDF	0.00000542 U	0.00000345 U	0.0000113 U	NA	0.00000269 U	NA	0.00000121	NA	0.00000148 U	NA
1,2,3,4,7,8,9-HpCDF	0.000000325	0.000000138	0.000000429	NA	0.000000213	NA	0.000000114 J	NA	0.000000113 J	NA
1,2,3,4,7,8-HxCDD	0.000000111 J	0.000000153	0.000000303	NA	0.000000112 J	NA	0.0000000791 J	NA	0.00000022	NA
1,2,3,4,7,8-HxCDF	0.000000157	0.000000148	0.000000303	NA	0.000000127	NA	0.0000000489 J	NA	0.0000000725 J	NA
1,2,3,6,7,8-HxCDD	0.000000325	0.000000244	0.000000479	NA	0.000000293	NA	0.00000017	NA	0.000000252	NA
1,2,3,6,7,8-HxCDF	0.0000000542 U	0.000000104 J	0.000000232	NA	0.000000088 J	NA	0.0000000512 J	NA	0.0000000564 U	NA
1,2,3,7,8,9-HxCDD	0.000000198	0.000000212	0.000000454	NA	0.00000022	NA	0.000000102 J	NA	0.000000242	NA
1,2,3,7,8,9-HxCDF	0.0000000298 U	0.000000016 J	0.0000000353 J	NA	0.000000022 U	NA	0.00000000815 U	NA	0.0000000266 J	NA
1,2,3,7,8-PeCDD	0.0000000867 J	0.000000116 J	0.000000161	NA	0.0000000782 J	NA	0.0000000559 J	NA	0.000000051 J	NA
1,2,3,7,8-PeCDF	0.0000000434 U	0.0000000395 J	0.0000000454 J	NA	0.0000000489 U	NA	0.0000000233 U	NA	0.000000025 J	NA
2,3,4,6,7,8-HxCDF	0.000000127 J	0.000000111 J	0.000000277	NA	0.000000103 J	NA	0.0000000559 J	NA	0.0000000483 J	NA
2,3,4,7,8-PeCDF	0.0000000434 U	0.0000000567 J	0.000000184	NA	0.0000000513 U	NA	0.0000000396 U	NA	0.000000043 J	NA
2,3,7,8-TCDD	0.0000000249 U	0.0000000493	0.0000000504	NA	0.0000000244 U	NA	0.0000000186 U	NA	0.0000000269	NA
2,3,7,8-TCDD TEQ	0.000000289	0.000000336	0.000000676	NA	0.000000259	NA	0.000000154	NA	0.000000228	NA
2,3,7,8-TCDF	0.0000000214 U	0.000000022 J	0.0000000224 J	NA	0.0000000244 U	NA	0.0000000137 U	NA	0.0000000148 U	NA
OCDD	0.000136	0.0000271	0.000144	NA	0.0000953	NA	0.0000303	NA	0.0000231	NA
OCDF	0.0000122	0.00000543	0.0000242	NA	0.000012	NA	0.00000605	NA	0.00000456	NA
Total HpCDD	0.0000171	0.00000666	0.0000245	NA	0.0000137	NA	0.00000559	NA	0.00000671	NA
Total HpCDF	0.0000209 J	0.00000863 J	0.0000353 J	NA	0.0000112 J	NA	0.00000372	NA	0.00000376 J	NA
Total HxCDD	0.00000266	0.00000244	0.00000404	NA	0.00000293	NA	0.00000135	NA	0.00000295	NA
Total HxCDF	0.00000542 J	0.00000469 J	0.0000101 J	NA	0.00000269 J	NA	0.00000137	NA	0.00000158 J	NA

Key is at the end of the table.

Table 4-100

1999 AIR DATA
STATION AS21
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/27/99	9/28/99	9/29/99	10/1/99	10/1/99	10/2/99
Dioxins/Furans (µg/m^3)										
Total PeCDD	0.00000065	0.00000106	0.00000139	NA	0.000000904	NA	0.000000216	NA	0.000000806	NA
Total PeCDF	0.00000298 J	0.0000037 J	0.00000404 J	NA	0.00000105	NA	0.000000791	NA	0.000000832	NA
Total TCDD	0.000000596	0.00000074	0.000000757	NA	0.000000103	NA	0.0000000512	NA	0.000000295	NA
Total TCDF	0.00000127	0.00000185 J	0.00000134	NA	0.000000513	NA	0.000000372	NA	0.000000403	NA
ncPAHs (µg/m^3)										
2-Methylnaphthalene	16.5 J	3.45 J	4.29	NA	1.42 J	NA	39.6 J	NA	1.29 J	NA
Acenaphthene	0.434 J	0.0666 J	0.141 J	NA	0.0782	NA	0.372 J	NA	0.113	NA
Acenaphthylene	0.152 J	0.0271 J	0.0235 J	NA	0.0183	NA	0.13	NA	0.0207	NA
Anthracene	0.325 J	0.0493	0.0378	NA	0.0208	NA	0.184	NA	0.0591	NA
Benzo(g,h,i)perylene	0.0000434	0.0000962	0.0000681	NA	0.000513	NA	0.000465	NA	0.000671 J	NA
Fluoranthene	0.00678	0.0239 J	0.0197	NA	0.00538	NA	0.00698	NA	0.00591	NA
Fluorene	0.813 J	0.111 J	0.404 J	NA	0.127	NA	0.675	NA	0.161	NA
Naphthalene	0.976 J	0.37	0.555	NA	0.562 J	NA	1.12 J	NA	0.403	NA
Perylene	0.0000136 U	0.0000321	0.0000126 U	NA	0.0000978	NA	0.0000791	NA	0.000118	NA
Phenanthrene	0.434 J	0.212 J	0.252 J	NA	0.137	NA	0.489	NA	0.193	NA
Pyrene	0.00623	0.0141 J	0.0126	NA	0.00269	NA	0.00465	NA	0.00349	NA
ncPAH	19.6470534	4.3241283	5.7356681	NA	2.3719808	NA	42.5821741	NA	2.249989	NA
VOCs (µg/m^3)										
1,2,4-Trimethylbenzene	15000	NS	2400	3	10	20	20	6	3.3	6
1,3,5-Trimethylbenzene	3800	NS	680	1	3	5	5	1.6	1	1.8
Benzene	170	NS	36 U	4	3	2	2	2.4	2.6	3.2
Ethylbenzene	3000	NS	940	2	4	7	4	2.1	1.7	3.4
Isopropylbenzene	4900	NS	1000	0.2 J	5	10	6	1.6	0.6	1.6
m&p-Xylene	3000	NS	860	8	10	20	10	7	6	10
n-Butylbenzene	280 U	NS	61 U	0.3 U	0.4 U	0.3 U	10	0.28 U	0.28 U	0.28 U
n-Propylbenzene	6600	NS	1300	0.7	6	10	10	2.9	1.2	3
o-Xylene	3100	NS	810	3	5	8	5	2.8	1.7	3.4
p-Isopropyltoluene	3800	NS	560	0.2 J	3 J	6 J	7 J	3.2	0.56	1.3
sec-Butylbenzene	9700	NS	1200	0.3 J	6	10	10	2.4	0.89	2.3
Styrene	88 J	NS	39 J	0.5	3	10	30	20	0.73 J	1.9 J
tert-Butylbenzene	1800	NS	61 U	0.3 U	0.4 U	0.3 U	0.3 U	0.28 U	0.28 U	0.28 U
Toluene	3400	NS	1300	10	10	10	9	5 J	8	8

Key is at the end of the table.

Table 4-100

1999 AIR DATA
STATION AS21
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/27/99	9/28/99	9/29/99	10/1/99	10/1/99	10/2/99
Other Organics (µg/m^3)										
Dibenzofuran	0.84	0.116	0.113		0.0562	NA	0.279	NA	0.0725	NA
Phenols (µg/m^3)										
4-Methylphenol	0.0678 UJ	0.0123 U	0.0252 UJ	NA	0.0293	NA	0.0233 U	NA	0.0269 U	NA
Pentachlorophenol	2.98	0.765	0.908 J	NA	0.0978 R	NA	0.698	NA	0.164 J	NA
Phenol	0.0678 UJ	0.0123 U	0.0252 UJ	NA	0.0318	NA	0.0233 U	NA	0.0403	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
NA = Not applicable.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
NS = No sample.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
R = Rejected.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-101

1999 AIR DATA
STATION AS22
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/28/99	9/29/99	9/30/99	10/1/99	10/2/99
cPAHs (µg/m^3)									
Benzo(a)anthracene	0.000389	0.0014	0.00411 J	0.000849 J	NA	0.000809	NA	0.000371	NA
Benzo(a)pyrene	0.0000337	0.00012	0.000152	0.000388	NA	0.000301	NA	0.000325	NA
Benzo(b)fluoranthene	0.000363	0.00112	0.002	0.000971	NA	0.000925	NA	0.000835	NA
Benzo(e)pyrene	0.000109	0.000324	0.000797	0.000388	NA	0.00037	NA	0.000371	NA
Benzo(k)fluoranthene	0.000135	0.000349	0.000604 J	0.000291	NA	0.000229	NA	0.000216	NA
Chrysene	0.000907	0.00249	0.00725 J	0.000971 J	NA	0.00116	NA	0.000487	NA
Dibenzo(a,h)anthracene	0.000013 U	0.0000249	0.0000242	0.0000607	NA	0.0000601	NA	0.0000951	NA
Indeno(1,2,3-cd)pyrene	0.0000285	0.0000997	0.0000966	0.000316	NA	0.000254	NA	0.000348	NA
B(a)P Equivalent	0.000114007	0.00041285	0.00081015	0.000666181	NA	0.00056335	NA	0.000578147	NA
Dioxins/Furans (µg/m^3)									
1,2,3,4,6,7,8-HpCDD	0.0000518	0.000127	0.000266	0.0000177	NA	0.0000278	NA	0.00000278	NA
1,2,3,4,7,8,9-HpCDF	0.000000622	0.00000112	0.00000237	0.000000364	NA	0.00000037	NA	0.000000051 J	NA
1,2,3,4,7,8-HxCDD	0.000000337	0.00000135	0.00000314	0.000000177	NA	0.000000439	NA	0.000000144	NA
1,2,3,4,7,8-HxCDF	0.00000044	0.000000847	0.00000181	0.000000243	NA	0.000000393	NA	0.0000000789 J	NA
1,2,3,6,7,8-HxCDD	0.00000192	0.00000424	0.00000966	0.000000631	NA	0.00000106	NA	0.000000255	NA
1,2,3,6,7,8-HxCDF	0.0000000881	0.000000324	0.000000435	0.0000000922 J	NA	0.000000134 U	NA	0.0000000464 J	NA
1,2,3,7,8,9-HxCDD	0.000000855	0.00000224	0.00000483	0.000000267	NA	0.000000486	NA	0.0000002	NA
1,2,3,7,8,9-HxCDF	0.0000000518 J	0.0000000798	0.000000167	0.0000000243 J	NA	0.0000000208 J	NA	0.0000000255 J	NA
1,2,3,7,8-PeCDD	0.000000311	0.000000723 J	0.000000845	0.000000129	NA	0.00000016	NA	0.000000114 J	NA
1,2,3,7,8-PeCDF	0.000000114 J	0.000000274	0.00000029	0.0000000655 J	NA	0.0000000601 J	NA	0.0000000418 J	NA
2,3,4,6,7,8-HxCDF	0.000000249 U	0.000000548	0.00000114	0.000000291	NA	0.00000015	NA	0.0000000394 J	NA
2,3,4,7,8-PeCDF	0.00000015 J	0.000000349	0.000000411	0.000000109 J	NA	0.000000102 J	NA	0.0000000673 J	NA
2,3,7,8-TCDD	0.0000000648	0.00000016	0.000000179	0.0000000485	NA	0.0000000416	NA	0.0000000302	NA
2,3,7,8-TCDD TEQ	0.000001406	0.000003436	0.000006258	0.000000621	NA	0.000000821	NA	0.000000292	NA
2,3,7,8-TCDF	0.0000000829	0.000000222	0.000000213	0.0000000558	NA	0.0000000509	NA	0.0000000255	NA
OCDD	0.00044	0.000922	0.00179	0.000243	NA	0.000217	NA	0.0000169	NA
OCDF	0.0000337	0.0000623	0.000114	0.0000243	NA	0.0000199	NA	0.00000137	NA
Total HpCDD	0.0000933	0.000239	0.000507	0.000034	NA	0.0000532	NA	0.00000534	NA
Total HpCDF	0.0000492 J	0.000107 J	0.000217 J	0.0000216 J	NA	0.0000254 J	NA	0.000002 J	NA
Total HxCDD	0.000014	0.0000399	0.000087	0.00000413	NA	0.00000856	NA	0.0000023	NA

Key is at the end of the table.

Table 4-101

1999 AIR DATA
STATION AS22
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/28/99	9/29/99	9/30/99	10/1/99	10/2/99
Dioxins/Furans (µg/m^3)									
Total HxCDF	0.0000155 J	0.0000299 J	0.0000628 J	0.00000534 J	NA	0.00000763 J	NA	0.00000186 J	NA
Total PeCDD	0.00000166	0.00000399	0.00000628	0.00000119	NA	0.000000925	NA	0.000000858	NA
Total PeCDF	0.0000057	0.0000137 J	0.0000133 J	0.00000267 J	NA	0.00000278 J	NA	0.00000176 J	NA
Total TCDD	0.000000311	0.00000155	0.0000029	0.000000388	NA	0.000000278	NA	0.000000278	NA
Total TCDF	0.00000114	0.00000349 J	0.00000362 J	0.00000109	NA	0.000000971	NA	0.000000789	NA
ncPAHs (µg/m^3)									
2-Methylnaphthalene	0.256 J	0.947 J	1.11 J	0.995 J	NA	0.879	NA	0.418	NA
Acenaphthene	0.044 J	0.189 J	0.0797	0.104	NA	0.0763	NA	0.0348	NA
Acenaphthylene	0.00337 J	0.0182	0.00483	0.017	NA	0.00994	NA	0.0121	NA
Anthracene	0.0389 J	0.0157	0.114	0.0752	NA	0.111	NA	0.022	NA
Benzo(g,h,i)perylene	0.0000544 J	0.000127	0.000111	0.000558	NA	0.000439	NA	0.000464	NA
Fluoranthene	0.0256	0.0773	0.099	0.0206	NA	0.0278	NA	0.00882	NA
Fluorene	0.153 J	0.773 J	0.7	0.201	NA	0.192 J	NA	0.0696	NA
Naphthalene	0.0777 J	0.224	0.196	0.485 J	NA	0.416	NA	0.51	NA
Perylene	0.0000142	0.0000399	0.0000773 J	0.000112	NA	0.0000463	NA	0.0000882	NA
Phenanthrene	0.249 J	0.823	0.531	0.291	NA	0.324	NA	0.0998	NA
Pyrene	0.0158	0.0274	0.0531	0.0155	NA	0.0171	NA	0.00487	NA
ncPAH	0.8634386	3.0947669	2.8878183	2.20497	NA	2.0536253	NA	1.1805422	NA
VOCs (µg/m^3)									
1,2,4-Trimethylbenzene	2.9	4.8	2.4	2	4	4	2.9	2.5	3.8
1,3,5-Trimethylbenzene	0.75	1.6	0.8	0.8	1	1	0.95	0.75	1.3
Benzene	0.36	2	0.49	2	2	3	3	2.4	3
Ethylbenzene	0.57	2.6	1.1	3	1	2	1.9	1.4	1.6
Isopropylbenzene	0.4	1.8	0.75	1	1	0.9	0.25	0.35	0.65
m&p-Xylene	0.92	3.5	1.4	9	5	6	7	5	6
n-Butylbenzene	0.78	0.28 U	0.28 U	0.3 U	0.3 U	1	0.28 U	0.28 U	0.28 U
n-Propylbenzene	0.65	2.3	1	2	2	2	0.75	0.8	1.4
o-Xylene	0.75	2.9	1.1	4	2	2	2.4	2	2.4
p-Isopropyltoluene	0.5	0.84	0.5	0.6	1 J	0.9 J	0.39	0.39	0.72
sec-Butylbenzene	0.84	1.8	0.72	0.6	2	1	0.28	0.39	0.78

Key is at the end of the table.

Table 4-101

1999 AIR DATA
STATION AS22
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/28/99	9/29/99	9/30/99	10/1/99	10/2/99
VOCs (µg/m^3)									
Styrene	21	8.2	32 J	6	20	40	1.6	0.86 J	1.6
Toluene	2.9	8.5	3.9	9	6	9	7 J	7	5 J
Other organics (µg/m^3)									
Dibenzofuran	0.0803	0.165	0.152	0.0898	NA	0.0809	NA	0.0441	NA
Phenols (µg/m^3)									
2-Methylphenol	0.13 U	0.125 U	0.242 UJ	0.0364	NA	0.0925 U	NA	0.0232 U	NA
4-Methylphenol	0.13 U	0.125 U	0.242 UJ	0.0558	NA	0.0925 U	NA	0.0232 U	NA
Pentachlorophenol	1.53	7.23	10.4 J	1.12 J	NA	1.83	NA	0.128 J	NA
Phenol	0.13 U	0.125 U	0.242 UJ	0.0437	NA	0.0925 U	NA	0.0255	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
NA = Not applicable.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-102

1999 AIR DATA
STATION AS23
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99
cPAHs (µg/m^3)			
B(a)P Equivalent	0.000033406	0.000110817	0.000032617
Benzo(a)anthracene	0.0000219	0.0000629	0.0000262 J
Benzo(a)pyrene	0.0000217	0.0000605	0.0000207
Benzo(b)fluoranthene	0.0000694	0.000198	0.0000644
Benzo(e)pyrene	0.0000389	0.0000992	0.0000668
Benzo(k)fluoranthene	0.0000242	0.0000677	0.0000286
Chrysene	0.000114	0.00029	0.000191
Dibenzo(a,h)anthracene	0.0000139 U	0.000016	0.0000119 U
Indeno(1,2,3-cd)pyrene	0.0000222	0.0000726	0.0000238
Dioxins/Furans (µg/m^3)			
1,2,3,4,6,7,8-HpCDD	0.00000214	0.00000201	0.0000031
1,2,3,4,6,7,8-HpCDF	0.000000944	0.000000919 U	0.00000119
1,2,3,4,7,8,9-HpCDF	0.00000005 U	0.0000000435 J	0.0000000668 J
1,2,3,4,7,8-HxCDD	0.0000000694 U	0.0000000992 J	0.000000093 J
1,2,3,4,7,8-HxCDF	0.0000000472 U	0.0000000605 J	0.000000062 J
1,2,3,6,7,8-HxCDD	0.000000106 U	0.000000145	0.000000169
1,2,3,6,7,8-HxCDF	0.0000000333 U	0.0000000484 J	0.0000000477 J
1,2,3,7,8,9-HxCDD	0.000000103 U	0.000000109 J	0.000000148
1,2,3,7,8-PeCDD	0.0000000389 U	0.0000000653 J	0.0000000644 J
1,2,3,7,8-PeCDF	0.0000000361 U	0.000000022 J	0.0000000191 U
2,3,4,6,7,8-HxCDF	0.0000000389 U	0.0000000387 J	0.0000000501 J
2,3,4,7,8-PeCDF	0.0000000361 U	0.0000000387 J	0.0000000382 J
2,3,7,8-TCDD	0.0000000233 U	0.0000000235 J	0.0000000236 J
2,3,7,8-TCDD TEQ	0.000000033	0.000000182	0.000000211
OCDD	0.0000228	0.0000148	0.000031
OCDF	0.00000219	0.00000164	0.00000286
Total HpCDD	0.00000417	0.00000411	0.00000572
Total HpCDF	0.00000256	0.00000215 J	0.0000031
Total HxCDD	0.000000611	0.00000155	0.00000129
Total HxCDF	0.00000103	0.0000015 J	0.0000016
Total PeCDD	0.0000000389 U	0.000000411	0.000000238
Total PeCDF	0.000000667	0.00000152 J	0.00000105
Total TCDD	0.0000000233 U	0.000000131	0.0000000906
Total TCDF	0.000000225	0.000000556	0.000000429
ncPAHs (µg/m^3)			
2-Methylnaphthalene	0.389 J	1.23 J	0.501
Acenaphthene	0.0333	0.0798 J	0.0501
Acenaphthylene	0.00278	0.0119	0.00358
Anthracene	0.00917	0.0152	0.015
Benzo(g,h,i)perylene	0.0000444	0.000119	0.0000477
Fluoranthene	0.00722	0.0177	0.0143
Fluorene	0.1 J	0.29 J	0.114 J
Naphthalene	0.0861	0.121	0.0978
Perylene	0.0000139 U	0.000029	0.0000119 U
Phenanthrene	0.0722 J	0.131 J	0.105
Pyrene	0.00306	0.0075	0.00334
ncPAH	0.7028744	1.904248	0.9041677

Key is at the end of the table.

Table 4-102

1999 AIR DATA
STATION AS23
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99
VOCs (µg/m^3)			
1,2,4-Trimethylbenzene	2.6	9	2.7
1,3,5-Trimethylbenzene	0.85	2.8	1
Benzene	0.65	2.1	0.65
Ethylbenzene	0.79	4	2.1
Isopropylbenzene	0.75	3.2	1.3
m&p-Xylene	1.1	4.9	2.1
n-Propylbenzene	1	4.4	1.6
o-Xylene	0.88	4	1.6
p-Isopropyltoluene	0.5	1.6	0.5
sec-Butylbenzene	1	3	0.84
Styrene	10	78	57
Toluene	3.4	11	5.3
Other Organics (µg/m^3)			
Dibenzofuran	0.0472	0.0629	0.0429
Phenols (µg/m^3)			
Pentachlorophenol	0.128	0.174	0.0477 U

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Table 4-103

1999 AIR DATA
STATION AS24
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
cPAHs (µg/m^3)						
B(a)P Equivalent	0.0000239085	0.000039545	0.0000343128	0.000559813	0.000376564	0.000454766
Benzo(a)anthracene	0.0000131 U	0.0000233 J	0.0000316 J	0.00044	0.000219	0.000235
Benzo(a)pyrene	0.0000163	0.0000259	0.0000224	0.000363	0.000231	0.000282
Benzo(b)fluoranthene	0.0000525	0.0000698	0.0000575	0.000648	0.000461	0.000611
Benzo(e)pyrene	0.0000289	0.000044	0.0000489	0.000337	0.000231	0.000306
Benzo(k)fluoranthene	0.0000176	0.0000284	0.0000178	0.000215	0.000111	0.000136
Chrysene	0.0000525	0.000171 J	0.0000948 J	0.000363	0.000254	0.000306
Dibenzo(a,h)anthracene	0.0000131 U	0.0000129 UJ	0.0000144 U	0.000057	0.0000577	0.0000635
Indeno(1,2,3-cd)pyrene	0.0000213	0.0000388 J	0.0000273	0.000285	0.000185	0.00023
Dioxins/Furans (µg/m^3)						
1,2,3,4,6,7,8-HpCDD	0.000000108 J	0.000000137	0.000000135 J	0.000000466	0.00000141	0.000000564
1,2,3,4,6,7,8-HpCDF	0.0000000315 U	0.0000000491 J	0.0000000431 U	0.0000000958 J	0.0000000761 J	0.000000146
1,2,3,6,7,8-HxCDD	0.0000000289 U	0.0000000204 U	0.0000000374 U	0.0000000518 J	0.00000006 J	0.0000000941 U
1,2,3,7,8,9-HxCDD	0.0000000289 U	0.0000000207 U	0.0000000374 U	0.0000000223 U	0.0000000692 J	0.0000000941 U
2,3,7,8-TCDD TEQ	0.000000001	0.000000002	0.000000001	0.000000011	0.00000003	0.000000007
OCDD	0.000000551	0.000000595	0.000000862	0.0000021	0.0000226	0.00000141
OCDF	0.0000000866 U	0.0000000595 J	0.000000092 J	0.000000142	0.000000101 J	0.0000000988 U
Total HpCDD	0.000000108 J	0.000000253	0.000000247	0.000000984	0.00000323	0.00000106
Total HpCDF	0.0000000315 U	0.0000000828 J	0.0000000431 J	0.000000166	0.000000161	0.000000146
Total HxCDD	0.0000000367 U	0.0000000776 J	0.0000000517 U	0.000000518	0.000000369	0.000000423
Total HxCDF	0.0000000213 U	0.0000000388 J	0.0000000431 J	0.000000101 J	0.00000009 J	0.000000205
Total PeCDF	0.000000022 U	0.0000000543 J	0.000000046 J	0.0000000622	0.0000000554	0.000000129
Total TCDD	0.000000021 U	0.0000000246 J	0.0000000118 U	0.0000000829	0.0000000212 U	0.000000023 U
Total TCDF	0.0000000157 U	0.0000000246 J	0.0000000172 J	0.000000202	0.0000000226 U	0.0000000682
ncPAHs (µg/m^3)						
2-Methylnaphthalene	0.00761	0.114	0.0152 J	0.0674	0.0507	0.0753
Acenaphthene	0.00656	0.0414 J	0.0138 J	0.00958	0.0083	0.00353
Acenaphthylene	0.00063	0.00388 J	0.00121 J	0.0104	0.0101	0.00706
Anthracene	0.000735	0.00414 J	0.00109	0.00414	0.00173	0.00423
Benzo(g,h,i)perylene	0.0000367	0.000103 J	0.0000661	0.000622	0.000438	0.000564
Fluoranthene	0.00289	0.0044	0.0046 J	0.00256	0.00254	0.00235
Fluorene	0.00892	0.145 J	0.0181	0.0127	0.0104	0.0122
Naphthalene	0.0189 J	0.0621	0.0345	0.207 J	0.231 J	0.181
Perylene	0.0000131 U	0.0000129 U	0.0000178	0.000101	0.0000438	0.0000776
Phenanthrene	0.0155	0.103 J	0.0236	0.0158	0.0127	0.019
Pyrene	0.00129	0.00171	0.00118 J	0.00241	0.00166	0.00162
ncPAH	0.0630717	0.479733	0.1133639	0.332713	0.3296118	0.3069316
VOCs (µg/m^3)						
1,2,4-Trimethylbenzene	0.65 U	1.8 J	1.2 U	2	0.35 J	1.8
1,3,5-Trimethylbenzene	0.25 J	3.3 U	1.2 U	1 J	1.6 U	0.7 J
Benzene	0.55	2.2 U	0.78 U	3	2.1	2
Ethylbenzene	0.31 J	0.7 J	0.4 J	2	1.5	2.5
Isopropylbenzene	0.65 U	3.4 U	1.2 U	0.1 U	1.6 U	1.2 U
m&p-Xylene	0.62	1.2 J	0.75 J	20	8	10
n-Propylbenzene	0.65 U	3.4 U	1.2 U	0.5 J	1.6 U	0.35 J
o-Xylene	0.44 J	2.9 U	1 U	9	3.2	2.7
Styrene	0.6	5	2.2	4	1.4 J	3.6 J
Toluene	1.9	4.2	1.8	20	10 J	20 J

Key is at the end of the table.

Table 4-103

1999 AIR DATA
STATION AS24
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
Other Organics (µg/m^3)						
Dibenzofuran	0.0129	0.0246	0.0149	0.0104	0.0083	0.00988
Phenols (µg/m^3)						
4-Methylphenol	0.0131 U	0.0129 U	0.0144 U	0.0311	0.0231 U	0.0235 U
Phenol	0.0131 U	0.0129 U	0.0144 U	0.044	0.0323	0.0306

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
NA = Not applicable.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDF = Pentachlorodibenzofuran.
R = Rejected.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-104

1999 AIR DATA
STATION AS25
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
cPAHs (µg/m^3)						
Benzo(a)anthracene	0.0000152	0.000146 J	0.000044 J	0.000564	0.000347	0.000375
Benzo(a)pyrene	0.0000147	0.0000473	0.00002	0.000395	0.000347	0.000348
Benzo(b)fluoranthene	0.0000613	0.000209	0.0000792	0.000958	0.000769	0.00091
Benzo(e)pyrene	0.0000347	0.000248	0.000066	0.000366	0.000347	0.000428
Benzo(k)fluoranthene	0.0000208	0.0000946	0.0000242	0.000203	0.000164	0.000211
Chrysene	0.0000693	0.00036 J	0.000191 J	0.000479	0.000422	0.000482
Dibenzo(a,h)anthracene	0.0000133 U	0.0000293 J	0.000011 U	0.0000676	0.0000669	0.000091
Indeno(1,2,3-cd)pyrene	0.0000197	0.000122 J	0.0000211	0.00031	0.000273	0.000348
B(a)P Equivalent	0.0000245973	0.000125606	0.000034863	0.000648309	0.000554862	0.000604892
Dioxins/Furans (µg/m^3)						
1,2,3,4,6,7,8-HpCDD	0.000002	0.00000198	0.00000352	0.00000104	0.00000183	0.00000161
1,2,3,4,6,7,8-HpCDF	0.00000088 U	0.000000495 U	0.00000099 U	0.000000366	0.000000471	0.000000294
1,2,3,4,7,8,9-HpCDF	0.0000000347 U	0.0000000189 U	0.0000000528 J	0.000000022 U	0.0000000273 J	0.000000023 U
1,2,3,4,7,8-HxCDD	0.0000000773 U	0.0000000518 J	0.0000000572 J	0.0000000423 J	0.0000000372 U	0.0000000937 J
1,2,3,4,7,8-HxCDF	0.00000004 U	0.0000000338 J	0.0000000506 J	0.000000031 U	0.0000000422 J	0.0000000375 U
1,2,3,6,7,8-HxCDD	0.000000104 J	0.00000011 J	0.000000141	0.0000000874 J	0.0000000868 J	0.00000015
1,2,3,6,7,8-HxCDF	0.0000000293 U	0.0000000104 U	0.0000000264 J	0.0000000251 U	0.0000000298 J	0.0000000268 U
1,2,3,7,8,9-HxCDD	0.0000000907 U	0.000000072 J	0.0000000792 J	0.0000000535 J	0.0000000322 U	0.000000153
1,2,3,7,8-PeCDD	0.0000000267 U	0.0000000405 J	0.0000000352 J	0.0000000507 U	0.0000000397 U	0.0000000589 J
2,3,4,6,7,8-HxCDF	0.0000000347 U	0.0000000117 U	0.0000000286 J	0.0000000245 U	0.0000000298 J	0.0000000268 U
2,3,4,7,8-PeCDF	0.0000000373 U	0.00000002 J	0.0000000213 J	0.000000062 J	0.0000000196 U	0.0000000321 U
2,3,7,8-TCDD TEQ	0.000000033	0.000000099	0.000000124	0.000000064	0.000000044	0.000000118
OCDD	0.0000229	0.0000144	0.0000352	0.00000874	0.0000183	0.00000776
OCDF	0.00000224	0.000000923	0.00000242	0.000000592	0.00000119	0.000000375
Total HpCDD	0.00000373	0.00000405	0.0000066	0.0000022	0.00000372	0.00000321
Total HpCDF	0.00000227 J	0.00000151 J	0.0000033 J	0.000000789	0.00000134	0.000000669
Total HxCDD	0.000000533	0.0000011	0.00000103	0.00000118	0.000000521	0.00000161
Total HxCDF	0.00000064 J	0.000000743 J	0.0000013 J	0.000000479	0.000000645	0.000000401
Total PeCDD	0.0000000267 U	0.00000027	0.000000174	0.000000535	0.0000000471 U	0.000000589
Total PeCDF	0.0000004	0.000000608 J	0.000000616	0.000000761	0.000000298	0.000000294
Total TCDD	0.0000000267 U	0.0000000315 J	0.0000000209 U	0.000000149	0.0000000193 U	0.0000000509
Total TCDF	0.0000000587	0.000000221	0.000000198	0.000000451	0.0000000942	0.000000228
ncPAHs (µg/m^3)						
2-Methylnaphthalene	0.587 J	0.248 J	0.185	0.282	0.645 J	0.244
Acenaphthene	0.0293 J	0.045 J	0.0308	0.0203	0.0545	0.0201
Acenaphthylene	0.0032	0.0072 J	0.00462 J	0.0121	0.0139	0.0126
Anthracene	0.0259	0.0081 J	0.0077	0.0178	0.0201	0.0161
Benzo(g,h,i)perylene	0.000032	0.000158 J	0.000044	0.00062	0.000496	0.000589
Fluoranthene	0.00267	0.0115 J	0.00902	0.00338	0.00397	0.00321
Fluorene	0.133	0.164 J	0.0902	0.0366	0.0694 J	0.0375
Naphthalene	0.0667	0.0991	0.0748	0.282 J	0.397 J	0.294 J
Perylene	0.0000133 U	0.0000144	0.0000167	0.0000902	0.0000769	0.000115
Phenanthrene	0.0507	0.072 J	0.0726 J	0.0395	0.0545	0.0428
Pyrene	0.00149	0.00171 J	0.00194	0.00259	0.00208	0.00241
ncPAH	0.899992	0.6567824	0.4767407	0.6969802	1.2610229	0.673424
VOCs (µg/m^3)						
1,2,4-Trimethylbenzene	11	NS	4.7	3	3.3	2.3
1,3,5-Trimethylbenzene	0.25 U	NS	1.6	1	0.9	0.7
Benzene	0.65	NS	0.55	2	0.49	3.2

Key is at the end of the table.

Table 4-104

1999 AIR DATA
STATION AS25
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
VOCs (µg/m^3)						
Ethylbenzene	3.6	NS	3.5	2	0.7	1.5
Isopropylbenzene	4.8	NS	3	1	1.2	0.3 U
m&p-Xylene	3.9	NS	3.2	10	1.8	6
n-Propylbenzene	6.4	NS	3.6	2	2.1	0.45
o-Xylene	3.6	NS	2.6	8	1	2
p-Isopropyltoluene	2.8	NS	2.3	0.8	1.2	0.17 J
sec-Butylbenzene	5.8	NS	1.9	1	2.2	0.3 U
Styrene	66	NS	20	10	20 J	1.1 J
tert-Butylbenzene	1.3	NS	0.5	0.3 U	0.28 U	0.3 U
Toluene	4.4	NS	5.5	5	1.3 J	8
Other Organics (µg/m^3)						
Dibenzofuran	0.0427	0.045	0.0189	0.00564 U	0.0422	0.0163
Phenols (µg/m^3)						
4-Methylphenol	0.0133 U	0.027	0.011 U	0.0451	0.0248	0.0268 U
Pentachlorophenol	0.197	0.14	0.044 U	0.113 R	0.104	0.107 UJ
Phenol	0.0133 U	0.0113 U	0.011 U	0.0817	0.0471	0.0401

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
NS = No sample.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
R = Rejected.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-105

1999 AIR DATA
STATION AS26
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99
cPAHs (µg/m^3)			
B(a)P Equivalent	0.0000076177	0.000083186	0.000024993
Benzo(a)anthracene	0.0000148	0.000121 J	0.0000158 J
Benzo(a)pyrene	0.0000137 U	0.0000518	0.0000169
Benzo(b)fluoranthene	0.000044	0.000106	0.0000441
Benzo(e)pyrene	0.0000206	0.000079	0.0000337
Benzo(k)fluoranthene	0.0000137 U	0.0000395	0.000013 U
Chrysene	0.0000577	0.000151 J	0.000083 J
Indeno(1,2,3-cd)pyrene	0.0000168	0.0000814 J	0.0000202
Dioxins/Furans (µg/m^3)			
1,2,3,4,6,7,8-HpCDD	0.0000000907 J	0.00000017	0.0000000856 J
1,2,3,4,6,7,8-HpCDF	0.0000000412 U	0.000000104 J	0.0000000623 J
2,3,7,8-TCDD TEQ	0.000000001	0.000000003	0.000000002
OCDD	0.000000604	0.000000765	0.000000415
OCDF	0.000000102 U	0.0000000716 J	0.0000000441 J
Total HpCDD	0.0000000907 J	0.00000037	0.000000171
Total HpCDF	0.0000000412 U	0.00000018	0.000000104 J
Total HxCDD	0.0000000495 U	0.000000178	0.0000000908 J
Total HxCDF	0.0000000632 J	0.000000247	0.000000189
Total PeCDF	0.000000275	0.000000321	0.000000285
Total TCDD	0.0000000143 U	0.0000000118 U	0.0000000197 J
Total TCDF	0.000000033	0.0000000839	0.000000174
ncPAHs (µg/m^3)			
2-Methylnaphthalene	0.0412 J	0.0839 J	0.0519 J
Acenaphthene	0.0107 J	0.0296 J	0.0249 J
Acenaphthylene	0.00118	0.00395 J	0.00187 J
Anthracene	0.00214	0.00271 J	0.00104
Benzo(g,h,i)perylene	0.0000302	0.0000987 J	0.0000363
Fluoranthene	0.00253	0.00567	0.00415 J
Fluorene	0.0179 J	0.074 J	0.0285
Naphthalene	0.0253 J	0.0765	0.0623
Perylene	0.0000137 U	0.0000188	0.000013 U
Phenanthrene	0.0228	0.0247 J	0.0285
Pyrene	0.00124	0.00148	0.000908 J
ncPAH	0.1250202	0.3026275	0.2041043
VOCs (µg/m^3)			
1,2,4-Trimethylbenzene	0.45	0.25	0.25 J
1,3,5-Trimethylbenzene	0.15 J	0.25 U	0.36 U
Benzene	0.26	0.32	0.23 U
Ethylbenzene	0.26	0.26	0.18 J
Isopropylbenzene	0.2 J	0.25 U	0.36 U
m&p-Xylene	0.35	0.62	0.31 J
n-Propylbenzene	0.2 J	0.25 U	0.36 U
o-Xylene	0.31	0.44	0.32 U
p-Isopropyltoluene	0.056 J	0.28 U	0.4 U
sec-Butylbenzene	0.11 J	0.28 U	0.4 U

Key is at the end of the table.

Table 4-105

1999 AIR DATA
STATION AS26
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99
VOCs (µg/m^3)			
Styrene	49 J	4	19
Toluene	1	1.2	1.6
Other Organics (µg/m^3)			
Dibenzofuran	0.0126	0.0345	0.0192

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-106

1999 AIR DATA
STATION AS27
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	9/30/99	10/1/99
cPAHs (µg/m^3)							
B(a)P Equivalent	0.0000233846	0.00007218	0.000034934	0.000703422	0.000904826	NA	0.00187676
Benzo(a)anthracene	0.0000178	0.0000815 J	0.0000321 J	0.00051	0.000537	NA	0.00198
Benzo(a)pyrene	0.0000147	0.000048	0.0000213	0.000433	0.000583	NA	0.00118
Benzo(b)fluoranthene	0.0000489	0.0000887	0.0000717	0.0011	0.00121	NA	0.00242
Benzo(e)pyrene	0.0000276	0.000105	0.000042	0.000408	0.000467	NA	0.000822
Benzo(k)fluoranthene	0.0000187	0.0000527	0.0000178	0.000204	0.000222	NA	0.000387
Chrysene	0.0000776	0.000163 J	0.000106 J	0.000382	0.000606	NA	0.00169
Dibenzo(a,h)anthracene	0.0000144 U	0.000012 U	0.0000124 U	0.0000739	0.0001	NA	0.000186
Indeno(1,2,3-cd)pyrene	0.0000175	0.0000647	0.0000297	0.000331	0.000443	NA	0.000652
Dioxins/Furans (µg/m^3)							
1,2,3,4,6,7,8-HpCDD	0.000000632	0.00000201	0.00000183	0.0000051	0.00000443	NA	0.00000203
1,2,3,4,6,7,8-HpCDF	0.000000345	0.000000815 U	0.000000494	0.00000127 U	0.0000007	NA	0.00000029 U
1,2,3,4,7,8,9-HpCDF	0.0000000431 U	0.0000000216 U	0.0000000297 U	0.0000000714 J	0.0000000373 U	NA	0.0000000338 J
1,2,3,4,7,8-HxCDD	0.000000069 U	0.0000000719 J	0.000000042 J	0.0000000867 J	0.000000063 U	NA	0.000000126
1,2,3,4,7,8-HxCDF	0.0000000517 U	0.0000000647 J	0.000000042 J	0.00000012 J	0.000000049 U	NA	0.0000000483 J
1,2,3,6,7,8-HxCDD	0.0000000575 U	0.000000141	0.0000000964 J	0.000000255	0.000000194	NA	0.000000239
1,2,3,6,7,8-HxCDF	0.0000000431 U	0.0000000288 J	0.0000000242 J	0.0000000739 J	0.0000000373 U	NA	0.000000029 J
1,2,3,7,8,9-HxCDD	0.0000000575 U	0.0000000959 J	0.0000000642 J	0.000000107 J	0.000000056 U	NA	0.00000023
1,2,3,7,8,9-HxCDF	0.000000046 U	0.0000000105 U	0.00000000865 U	0.0000000189 J	0.000000021 U	NA	0.0000000222 J
1,2,3,7,8-PeCDD	0.0000000345 U	0.0000000575 J	0.0000000297 J	0.000000051 U	0.0000000257 U	NA	0.000000118 J
1,2,3,7,8-PeCDF	0.0000000374 U	0.0000000113 U	0.0000000168 J	0.0000000357 J	0.0000000303 U	NA	0.0000000314 U
2,3,4,6,7,8-HxCDF	0.0000000489 U	0.000000036 J	0.0000000208 J	0.0000000612 J	0.0000000373 U	NA	0.000000029 J
2,3,4,7,8-PeCDF	0.0000000374 U	0.0000000312 J	0.0000000208 J	0.0000000765 J	0.0000000583 U	NA	0.0000000459 J
2,3,7,8-TCDD	0.0000000247 U	0.0000000288	0.0000000114 U	0.0000000178 U	0.0000000198 U	NA	0.0000000225 J
2,3,7,8-TCDD TEQ	0.000000011	0.000000168	0.000000095	0.000000171	0.000000076	NA	0.000000257
OCDD	0.0000069	0.0000158	0.0000175	0.0000663	0.000049	NA	0.00000507
OCDF	0.000000661	0.00000105	0.00000101	0.0000028	0.00000215	NA	0.000000184 J
Total HpCDD	0.00000124	0.00000384	0.00000346	0.00000943	0.00000863	NA	0.00000435
Total HpCDF	0.00000092	0.00000211 J	0.00000158	0.00000331 J	0.0000021	NA	0.000000556 J
Total HxCDD	0.000000178	0.0000011	0.000000741	0.00000186	0.000000863	NA	0.0000029
Total HxCDF	0.000000345	0.00000149 J	0.000000865	0.00000176 J	0.000000746	NA	0.000000701 J
Total PeCDD	0.0000000345 U	0.000000384	0.000000188	0.000000484	0.0000000676 U	NA	0.00000114
Total PeCDF	0.00000046	0.00000113 J	0.000000741	0.00000102	0.000000397	NA	0.00000058
Total TCDD	0.0000000345 U	0.00000011	0.0000000469	0.000000133	0.0000000198 U	NA	0.000000162
Total TCDF	0.0000000575	0.00000036	0.000000297	0.00000051	0.000000049	NA	0.000000338
ncPAHs (µg/m^3)							
2-Methylnaphthalene	0.0862 J	0.163 J	0.121 J	0.125	0.208	NA	0.101
Acenaphthene	0.0124	0.0432 J	0.0247 J	0.0156	0.0257	NA	0.0058
Acenaphthylene	0.00135	0.0048 J	0.00227 J	0.0102	0.0128	NA	0.0198
Anthracene	0.00402 J	0.00432 J	0.00297	0.00714	0.0049	NA	0.00435
Benzo(g,h,i)perylene	0.0000316	0.000113	0.0000519	0.000586	0.000653	NA	0.000991
Fluoranthene	0.00267	0.00767	0.00519	0.00306	0.00397	NA	0.00532
Fluorene	0.0241 J	0.132 J	0.0445	0.0214	0.035	NA	0.0266
Naphthalene	0.025 J	0.0743	0.042	0.232 J	0.233 J	NA	0.29
Perylene	0.0000144 U	0.0000194	0.0000124 U	0.000102	0.00014	NA	0.000338
Phenanthrene	0.0316 J	0.048 J	0.0445	0.0255	0.035	NA	0.0362
Pyrene	0.00138	0.00194	0.00198	0.00227	0.00217	NA	0.00411
ncPAH	0.1887516	0.4793624	0.2891619	0.442858	0.561333	NA	0.494509
VOCs (µg/m^3)							
1,2,4-Trimethylbenzene	0.6	NS	0.45	2	0.65	0.7	0.9 J
1,3,5-Trimethylbenzene	0.2 J	NS	0.2 J	0.7	0.25 J	0.2 J	0.35 J
Benzene	0.46	NS	0.36	1	0.65	1	0.88
Ethylbenzene	0.35	NS	0.31	1	0.35	0.57	0.79 J
Isopropylbenzene	0.25 U	NS	0.25 U	0.4 U	0.1 J	0.3 U	1 U

Key is at the end of the table.

Table 4-106

1999 AIR DATA
STATION AS27
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	9/30/99	10/1/99
VOCs (µg/m^3)							
m&p-Xylene	0.53	NS	0.4	10	1.4	2.1	2.9
n-Butylbenzene	0.28 U	NS	0.28 U	0.5 U	0.3 U	0.056 J	1.1 U
n-Propylbenzene	0.2 J	NS	0.2 J	0.6	0.2 J	0.1 J	0.2 J
o-Xylene	0.4	NS	0.31	5	0.53	0.62	0.84 J
p-Isopropyltoluene	0.28 U	NS	0.28 U	0.6 J	0.11 J	0.33 U	1.1 U
sec-Butylbenzene	0.28 U	NS	0.28 U	0.6 J	0.17 J	0.33 U	1.1 U
Styrene	4.8	NS	4.1	10	6	0.34 J	1.1 J
tert-Butylbenzene	0.28 U	NS	0.28 U	0.5 U	0.3 U	0.11 J	1.1 U
Toluene	2.1	NS	1.4	8	2.4 J	2.9	7
Other Organics (µg/m^3)							
Dibenzofuran	5.9	0.036	0.0185	0.0148	0.0233	NA	0.0179
Phenols (µg/m^3)							
4-Methylphenol	0.0144 U	0.012 U	0.0124 U	0.0306	0.0397	NA	0.0387
Phenol	0.0144 U	0.012 U	0.0124 U	0.0408	0.0373	NA	0.0701

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
NA = Not applicable.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
NS = No sample.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-107

1999 AIR DATA
STATION AS28
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
cPAHs (µg/m^3)						
B(a)P Equivalent	0.0000274093	0.00006532	0.000037791	0.000346158	0.000408132	0.000854391
Benzo(a)anthracene	0.000016	0.0000642 J	0.0000426 J	0.000358	0.000235	0.000838
Benzo(a)pyrene	0.0000178	0.0000401	0.0000223	0.000197	0.000258	0.000512
Benzo(b)fluoranthene	0.0000585	0.000112	0.0000734	0.000507	0.00054	0.00123
Benzo(e)pyrene	0.0000305	0.0000722	0.0000403	0.000206	0.000235	0.000442
Benzo(k)fluoranthene	0.0000173	0.0000375	0.0000199	0.00014	0.000125	0.000203
Chrysene	0.0000763	0.000265 J	0.000142 J	0.000358	0.000282	0.000861
Dibenzo(a,h)anthracene	0.0000127 U	0.0000134 UJ	0.0000118 U	0.0000448	0.0000493	0.0000978
Indeno(1,2,3-cd)pyrene	0.0000191	0.0000696 J	0.0000355	0.000161	0.000218	0.000349
Dioxins/Furans (µg/m^3)						
1,2,3,4,6,7,8-HpCDD	0.000000224 J	0.00000104	0.000000426	0.00000143	0.000000376	0.00000186
1,2,3,4,6,7,8-HpCDF	0.000000148 J	0.000000321 U	0.000000159	0.00000026	0.0000000987 J	0.000000279 U
1,2,3,4,7,8,9-HpCDF	0.0000000382 U	0.0000000107 U	0.00000000877 U	0.0000000233 U	0.0000000143 U	0.0000000349 J
1,2,3,4,7,8-HxCDD	0.0000000305 U	0.0000000321 J	0.0000000332 U	0.0000000567 U	0.000000047 U	0.000000107 J
1,2,3,4,7,8-HxCDF	0.000000028 U	0.0000000268 U	0.0000000133 U	0.0000000418 U	0.0000000329 U	0.0000000512 J
1,2,3,6,7,8-HxCDD	0.0000000585 U	0.0000000883 J	0.000000045 J	0.0000000835 J	0.0000000423 U	0.000000216
1,2,3,6,7,8-HxCDF	0.0000000234 U	0.0000000214 U	0.0000000102 U	0.0000000328 U	0.0000000258 U	0.0000000349 J
1,2,3,7,8,9-HxCDD	0.0000000254 U	0.0000000562 J	0.0000000232 U	0.0000000477 U	0.0000000399 U	0.000000165
1,2,3,7,8,9-HxCDF	0.0000000249 U	0.0000000241 U	0.0000000114 U	0.0000000143 U	0.0000000146 U	0.0000000279 J
1,2,3,7,8-PeCDD	0.0000000224 U	0.0000000294 J	0.0000000194 U	0.000000026 U	0.0000000423 U	0.0000000861 J
1,2,3,7,8-PeCDF	0.0000000242 U	0.0000000265 U	0.0000000199 U	0.0000000298 U	0.0000000423 U	0.0000000203 J
2,3,4,6,7,8-HxCDF	0.0000000254 U	0.0000000246 U	0.0000000116 U	0.0000000254 U	0.0000000258 U	0.0000000256 J
2,3,4,7,8-PeCDF	0.0000000242 U	0.0000000257 U	0.0000000192 U	0.0000000477 U	0.0000000446 U	0.0000000303 J
2,3,7,8-TCDD	0.0000000173 U	0.0000000249 U	0.00000000924 U	0.0000000289 U	0.0000000202 U	0.0000000168 J
2,3,7,8-TCDD TEQ	0.000000004	0.000000058	0.000000011	0.000000027	0.000000005	0.000000203
2,3,7,8-TCDF	0.0000000127 U	0.000000015 U	0.000000013 U	0.0000000176 U	0.0000000146 U	0.0000000119 J
OCDD	0.00000135	0.00000455	0.00000332	0.0000149	0.00000258	0.00000582
OCDF	0.0000000941 U	0.000000246 J	0.000000284	0.000000895	0.000000305	0.000000303
Total HpCDD	0.000000509	0.00000238	0.000000877	0.00000283	0.000000705	0.00000396
Total HpCDF	0.000000148 J	0.000000722 J	0.000000426	0.000000835	0.000000216	0.000000675 J
Total HxCDD	0.000000183	0.000000883	0.000000237	0.000000746	0.000000101 U	0.00000223
Total HxCDF	0.000000214 J	0.000000696 J	0.000000284	0.000000328	0.0000000587 J	0.000000559 J
Total PeCDD	0.0000000224 U	0.000000171	0.0000000194 U	0.000000328	0.0000000423 U	0.000000652
Total PeCDF	0.000000117 J	0.000000321	0.0000000971 J	0.000000128 J	0.0000000446 U	0.000000442
Total TCDD	0.0000000173 U	0.0000000249 U	0.0000000213 J	0.000000116	0.0000000202 U	0.000000177
Total TCDF	0.0000000127 U	0.0000000348	0.000000013 U	0.000000388	0.0000000329 U	0.000000279
ncPAHs (µg/m^3)						
2-Methylnaphthalene	0.0216 J	0.375 J	0.109 J	0.358	0.399 J	0.349
Acenaphthene	0.0109 J	0.0803 J	0.0521 J	0.0215	0.0282	0.0279
Acenaphthylene	0.000891	0.00803 J	0.00379 J	0.00746	0.0094	0.0142
Anthracene	0.00122	0.00455 J	0.00284	0.00448	0.00916	0.0135
Benzo(g,h,i)perylene	0.0000382	0.000104 J	0.0000663	0.000328	0.000352	0.000512 J
Fluoranthene	0.00356	0.0128	0.00734	0.00388	0.00305	0.00512
Fluorene	0.0127 J	0.222 J	0.064 J	0.0298	0.0376	0.0489
Naphthalene	0.028 J	0.112	0.09 J	0.2 J	0.305 J	0.303 J
Perylene	0.0000127 U	0.0000134 UJ	0.0000118 U	0.0000567	0.0000564	0.000149
Phenanthrene	0.0178	0.0722 J	0.0829	0.0328	0.0329	0.0582
Pyrene	0.00153	0.00428	0.00261	0.00328	0.00197	0.00349
ncPAH	0.0982392	0.891264	0.4146463	0.6615847	0.8266884	0.823971

Key is at the end of the table.

Table 4-107

1999 AIR DATA
STATION AS28
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
VOCs (µg/m^3)						
1,2,4-Trimethylbenzene	2	2.8	3.9	1	2.9	1.7
1,3,5-Trimethylbenzene	0.85	0.9	1.4	0.5	0.85	0.55
Benzene	0.58	2.2	0.81 U	2	2.7	1.8
Ethylbenzene	0.35 J	1.5	1.6	1	1.3	1
Isopropylbenzene	0.75 U	0.45 J	1.2 U	0.5	0.3 J	0.15 J
m&p-Xylene	0.66	2.8	2.1	3	6	4.4
n-Propylbenzene	0.2 J	0.8	0.9 J	0.6	0.75	0.45
o-Xylene	0.62 J	1.9	1.6	1	2.3	1.4
p-Isopropyltoluene	0.67 J	0.5 J	1.4 U	0.2 J	0.67	0.22 J
sec-Butylbenzene	0.84 U	0.45 J	1.4 U	0.6	0.45	0.22 J
Styrene	38	100	86	56	20 J	43
Toluene	2.3	8.9	6	7	6 J	5
Other Organics (µg/m^3)						
Dibenzofuran	0.014	0.0589	0.0284	0.0179	0.0211	0.0279
Phenols (µg/m^3)						
4-Methylphenol	0.0127 U	0.0134 U	0.0118 U	0.0298 U	0.0235 U	0.0256
Phenol	0.0127 U	0.0134 U	0.0118 U	0.0358	0.0282	0.0489

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-108

1999 AIR DATA
STATION AS29
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
cPAHs (µg/m^3)						
B(a)P Equivalent	0.000026887	0.000227504	0.000021473	0.000540164	0.000511805	0.000581113
Benzo(a)anthracene	0.0000181	0.000187	0.000026	0.00037	0.000401	0.000314 J
Benzo(a)pyrene	0.0000157	0.000122	0.0000146	0.000345	0.000307	0.000338
Benzo(b)fluoranthene	0.0000703	0.000336	0.0000177	0.000715	0.000731	0.000965
Benzo(e)pyrene	0.0000351	0.000161	0.0000472	0.000321	0.000307	0.000362
Benzo(k)fluoranthene	0.000027	0.000122	0.0000163	0.000242	0.000158	0.000133
Chrysene	0.000127	0.000384	0.00017 J	0.000444	0.000425	0.000483 J
Dibenzo(a,h)anthracene	0.0000135 U	0.000036	0.0000118 U	0.0000567	0.0000613	0.0000796 J
Indeno(1,2,3-cd)pyrene	0.0000195	0.000156	0.0000217	0.000271	0.000283	0.000338 J
Dioxins/Furans (µg/m^3)						
1,2,3,4,6,7,8-HpCDD	0.0000108	0.0000036	0.00000496	0.000000765	0.00000101	0.00000125
1,2,3,4,6,7,8-HpCDF	0.00000676 U	0.00000182 U	0.00000283 U	0.000000227	0.000000448	0.000000241 U
1,2,3,4,7,8,9-HpCDF	0.000000432	0.0000000719 J	0.000000153	0.0000000136 U	0.0000000425 U	0.000000029 J
1,2,3,4,7,8-HxCDD	0.000000186	0.000000201	0.000000175	0.0000000617 U	0.0000000896 U	0.000000106 J
1,2,3,4,7,8-HxCDF	0.000000159	0.0000000887 J	0.000000116 J	0.0000000567 J	0.0000000259 U	0.000000041 J
1,2,3,6,7,8-HxCDD	0.000000514	0.000000312	0.000000283	0.0000000567 U	0.0000000826 U	0.000000125
1,2,3,6,7,8-HxCDF	0.000000324	0.0000000647 J	0.0000000684 J	0.0000000493 J	0.0000000205 U	0.000000029 J
1,2,3,7,8,9-HxCDD	0.000000324	0.000000312	0.000000283	0.0000000543 U	0.0000000778 U	0.00000014
1,2,3,7,8,9-HxCDF	0.0000000378 U	0.0000000141 U	0.0000000135 U	0.00000000765 U	0.0000000113 U	0.0000000198 J
1,2,3,7,8-PeCDD	0.000000116 J	0.00000012	0.0000000968 J	0.0000000395 U	0.0000000543 U	0.0000000676 J
1,2,3,7,8-PeCDF	0.0000000649 U	0.0000000288 J	0.0000000283 J	0.0000000321 U	0.000000033 U	0.0000000205 J
2,3,4,6,7,8-HxCDF	0.000000159	0.0000000911 J	0.000000106 J	0.0000000592 J	0.0000000201 U	0.0000000265 J
2,3,4,7,8-PeCDF	0.0000000649 U	0.0000000384 J	0.0000000401 J	0.0000000543 J	0.000000033 U	0.0000000362 J
2,3,7,8-TCDD	0.000000027 U	0.0000000312	0.000000033	0.0000000183 U	0.0000000236 U	0.0000000159 J
2,3,7,8-TCDD TEQ	0.000000408	0.00000032	0.000000311	0.000000054	0.000000016	0.000000166
2,3,7,8-TCDF	0.0000000241 U	0.0000000204 J	0.0000000125 U	0.0000000205 U	0.0000000205 U	0.00000000941 J
OCDD	0.000111	0.0000173	0.0000425	0.00000567	0.0000116	0.0000041
OCDF	0.0000216	0.00000264	0.00000755	0.000000567	0.00000153	0.000000314
Total HpCDD	0.0000184	0.00000743	0.00000897	0.00000155	0.00000189	0.00000236
Total HpCDF	0.0000186 J	0.00000432 J	0.00000755 J	0.000000543	0.00000137	0.000000579 J
Total HxCDD	0.00000324	0.00000384	0.00000236	0.000000863	0.000000259	0.00000147
Total HxCDF	0.00000514 J	0.00000288 J	0.0000033 J	0.000000617	0.000000637	0.000000651 J
Total PeCDD	0.000000219	0.0000006	0.000000425	0.000000543	0.0000000543 U	0.000000531
Total PeCDF	0.00000176 J	0.00000192 J	0.00000175 J	0.000000715	0.00000033	0.000000627 J
Total TCDD	0.000000027 U	0.000000173	0.000000153	0.00000017	0.0000000236 U	0.000000159
Total TCDF	0.000000324	0.000000647	0.000000566	0.000000666	0.000000137	0.00000041
ncPAHs (µg/m^3)						
2-Methylnaphthalene	0.622 J	2.11 J	2.36	1.55 J	2.24 J	1.25
Acenaphthene	0.0514	0.216	0.378	0.131	0.191	0.106
Acenaphthylene	0.00676	0.194	0.0472	0.021	0.0519	0.0181
Anthracene	0.0486	0.108	0.215 J	0.136	0.167	0.0651
Benzo(g,h,i)perylene	0.0000378	0.000209	0.0000425	0.000493	0.000472	0.000531 J
Fluoranthene	0.00568	0.012	0.0111	0.0037	0.00425	0.00386
Fluorene	0.459 J	0.743	1.53	0.229	0.33 U	0.227
Naphthalene	0.0676	0.209	0.234	0.345 J	0.472 J	0.338 J
Perylene	0.0000135 U	0.0000552	0.0000118 U	0.0000937	0.0000661	0.000104
Phenanthrene	0.324 J	0.528	1.04 J	0.247	0.33	0.236
Pyrene	0.00351	0.00528	0.00219	0.00321	0.00283	0.0029
ncPAH	1.5885878	4.1255442	5.8175325	2.6664967	3.4595181	2.247595

Key is at the end of the table.

Table 4-108

1999 AIR DATA
STATION AS29
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	10/1/99
VOCs (µg/m^3)						
1,2,4-Trimethylbenzene	2.4	8.2	10	6	3.3	2.4
1,3,5-Trimethylbenzene	0.75	0.25 U	2.8	2	0.8	0.65
Benzene	0.32	0.49	0.58	1	0.49	0.84
Ethylbenzene	0.88	2.6	2.9	2	0.57	0.88
Isopropylbenzene	0.85	2.9	3.3	23	0.8	0.4 J
m&p-Xylene	1	2.5	3	3	1.5	2.9
n-Propylbenzene	1.1	4	4.4	3	1.6	0.85
o-Xylene	0.84	2.4	2.7	3	0.7	0.92
p-Isopropyltoluene	0.5	1.9	2.1	2	2.9	0.78
sec-Butylbenzene	0.95	3.4	4.2	3	2	1.1
Styrene	12	84	24	30	20 J	2.8 J
tert-Butylbenzene	0.28	0.95	0.28 U	0.3 U	0.28 U	0.67 U
Toluene	2.3	3.7	4.8	7	2.2 J	7.6
Other Organics (µg/m^3)						
Dibenzofuran	36	0.264	0.189	0.109	0.134	0.0893
Phenols (µg/m^3)						
4-Methylphenol	0.027 U	0.0264 J	0.059 U	0.037	0.0236 U	0.0241 U
Pentachlorophenol	0.919	2.4	1.79	0.469 J	0.613	0.338 J
Phenol	0.027 U	0.06 U	0.059 U	0.0395	0.0236	0.0314

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-109

1999 AIR DATA
STATION AS30
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	9/30/99	10/1/99	10/2/99
cPAHs (µg/m^3)								
B(a)P Equivalent	0.0000559213	0.00012325	0.0000300085	0.000651946	0.000226698	NA	0.000335399	NA
Benzo(a)anthracene	0.0000354	0.0000611	0.0000348 J	0.000272	0.000144	NA	0.000223	NA
Benzo(a)pyrene	0.0000404	0.0000717	0.0000191	0.000471	0.000126	NA	0.000199	NA
Benzo(b)fluoranthene	0.0000808	0.000165 J	0.0000447	0.000693	0.000332	NA	0.000491	NA
Benzo(e)pyrene	0.000048	0.0000849	0.0000298	0.000396	0.000171	NA	0.00027	NA
Benzo(k)fluoranthene	0.0000278	0.0000372	0.0000139	0.000225	0.0000643	NA	0.000108	NA
Chrysene	0.0000833	0.000138 J	0.0000895 J	0.000396	0.000155	NA	0.000319	NA
Dibenzo(a,h)anthracene	0.0000126 U	0.0000194	0.0000124 U	0.0000471	0.0000377	NA	0.0000417	NA
Indeno(1,2,3-cd)pyrene	0.0000354	0.0000903	0.0000273	0.000347	0.000146	NA	0.000219	NA
Dioxins/Furans (µg/m^3)								
1,2,3,4,6,7,8-HpCDD	0.000000053 J	0.000000141	0.0000000547 J	0.000000619	0.000000155	NA	0.0000128	NA
1,2,3,4,6,7,8-HpCDF	0.0000000303 U	0.0000000903 J	0.0000000298 J	0.0000000793 J	0.0000000465 J	NA	0.000000565 U	NA
1,2,3,4,7,8,9-HpCDF	0.00000000859 U	0.00000000956 U	0.0000000102 U	0.0000000116 U	0.00000000975 U	NA	0.0000000442 J	NA
1,2,3,4,7,8-HxCDD	0.0000000247 U	0.0000000372 U	0.0000000273 U	0.0000000619 U	0.000000031 U	NA	0.000000737	NA
1,2,3,4,7,8-HxCDF	0.0000000194 U	0.0000000231 U	0.0000000129 U	0.0000000213 U	0.0000000288 U	NA	0.0000000467 J	NA
1,2,3,6,7,8-HxCDD	0.0000000202 U	0.0000000255 U	0.0000000194 U	0.000000057 U	0.0000000288 U	NA	0.000000958	NA
1,2,3,6,7,8-HxCDF	0.0000000157 U	0.0000000175 U	0.00000000994 U	0.0000000168 U	0.0000000222 U	NA	0.0000000246 J	NA
1,2,3,7,8,9-HxCDD	0.0000000199 U	0.0000000255 U	0.0000000194 U	0.0000000545 U	0.0000000266 U	NA	0.00000106	NA
1,2,3,7,8,9-HxCDF	0.0000000169 U	0.0000000196 U	0.0000000112 U	0.00000000916 U	0.0000000124 U	NA	0.0000000211 J	NA
1,2,3,7,8-PeCDD	0.0000000253 U	0.0000000173 U	0.0000000186 U	0.0000000272 U	0.0000000377 U	NA	0.00000027	NA
2,3,4,7,8-PeCDF	0.0000000222 U	0.0000000257 U	0.0000000189 U	0.0000000347 U	0.0000000377 U	NA	0.0000000231 J	NA
2,3,7,8-TCDD	0.0000000253 U	0.0000000162 U	0.0000000129 U	0.0000000186 U	0.0000000164 U	NA	0.0000000442	NA
2,3,7,8-TCDD TEQ	0.000000001	0.000000002	0.000000001	0.000000007	0.000000002	NA	0.000000742	NA
OCDD	0.00000024 J	0.000000478	0.000000224 J	0.00000191	0.000000709	NA	0.000027	NA
OCDF	0.0000000909 U	0.000000069 U	0.0000000348 U	0.0000000793 U	0.0000000643 J	NA	0.000000241	NA
Total HpCDD	0.000000053 J	0.000000292	0.000000107 J	0.00000134	0.000000332	NA	0.0000344	NA
Total HpCDF	0.0000000303 U	0.000000138	0.0000000298 J	0.0000000793 J	0.0000000864 J	NA	0.00000101 J	NA
Total HxCDD	0.0000000247 U	0.000000234	0.0000000696 J	0.000000545	0.0000000709 U	NA	0.0000187	NA
Total HxCDF	0.0000000194 U	0.000000114 J	0.0000000597 J	0.0000000867 J	0.0000000266 U	NA	0.000000909 J	NA
Total PeCDD	0.0000000253 U	0.0000000876 J	0.0000000186 U	0.000000272	0.0000000377 U	NA	0.00000467	NA

Key is at the end of the table.

Table 4-109

1999 AIR DATA
STATION AS30
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	9/30/99	10/1/99	10/2/99
Dioxins/Furans (µg/m^3)								
Total PeCDF	0.000000136	0.000000127 J	0.0000000572 J	0.000000052 J	0.0000000377 U	NA	0.000000393	NA
Total TCDD	0.0000000253 U	0.0000000929	0.0000000423	0.000000052	0.0000000164 U	NA	0.00000123	NA
Total TCDF	0.0000000146 U	0.0000000451	0.0000000159 U	0.000000243	0.0000000222 U	NA	0.000000174	NA
ncPAHs (µg/m^3)								
2-Methylnaphthalene	0.0111 J	0.0398	0.0176 J	0.052	0.0554	NA	0.081	NA
Acenaphthene	0.00455	0.0372	0.0109 J	0.00594	0.00709	NA	0.00786	NA
Acenaphthylene	0.00141	0.00319	0.00154 J	0.00867	0.0062	NA	0.00884	NA
Anthracene	0.000783	0.00252	0.000522	0.00371	0.00126	NA	0.00165	NA
Benzo(g,h,i)perylene	0.0000732	0.000167	0.0000522	0.00104	0.00031	NA	0.000491	NA
Fluoranthene	0.00187	0.00637	0.00273	0.00297	0.00195	NA	0.00216	NA
Fluorene	0.00682	0.0611	0.0157 J	0.00991	0.00997	NA	0.00982	NA
Naphthalene	0.0202 J	0.104	0.0273	0.193	0.211 J	NA	0.27	NA
Perylene	0.0000152	0.0000398	0.0000124 U	0.000141	0.0000222	NA	0.0000565	NA
Phenanthrene	0.0124	0.0398	0.0119	0.0154	0.0133	NA	0.0155	NA
Pyrene	0.00109	0.00244	0.000994	0.00371	0.00122	NA	0.0016	NA
ncPAH	0.0603114	0.2966268	0.0892382	0.296491	0.3077222	NA	0.3989775	NA
VOCs (µg/m^3)								
1,2,4-Trimethylbenzene	0.8	3.5	1.5	2	2	2.4	4	3.3
1,3,5-Trimethylbenzene	0.35	0.95	0.5	0.5	0.8	0.75	1.3	1.1
Benzene	0.49	2.4	0.91	2	2	2.7	4	3
Ethylbenzene	0.31	1.7	0.75	1	1	1.2	2	1.7
Isopropylbenzene	0.25 U	0.25 U	0.25 U	0.2 U	0.2 U	0.05 J	0.2 J	0.15 J
m&p-Xylene	0.57	3.2	1.8	5	6	5	8	7
n-Propylbenzene	0.1 J	0.45	0.2 J	0.5	0.5	0.35	0.75	0.65
o-Xylene	0.35	2.2	1.4	2	2	1.8	3.6	3.1
p-Isopropyltoluene	0.28 U	0.33	0.28 U	0.1 J	0.2 J	0.11 J	0.22 J	0.45
sec-Butylbenzene	0.28 U	0.056 J	0.28 U	0.3 U	0.06 J	0.056 J	0.056 J	0.056 J
Styrene	0.17 J	0.82	0.95	2	2	1.1	1.9	1.6
Toluene	2.2	9.5	3.6	8	7	6 J	7 J	7 J

Key is at the end of the table.

Table 4-109

1999 AIR DATA
STATION AS30
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	7/7/99	7/9/99	7/12/99	9/27/99	9/29/99	9/30/99	10/1/99	10/2/99
Other Organics ($\mu g/m^3$)								
Dibenzofuran	0.00581	0.0398	0.0109	0.00743	0.00753	NA	0.00958	NA
Phenols ($\mu g/m^3$)								
4-Methylphenol	0.0126 U	0.0664 U	0.0124 U	0.0272	0.0222 U	NA	0.0246 U	NA
Phenol	0.0126 U	0.0664 U	0.0124 U	0.0396	0.0288	NA	0.0393	NA

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
$\mu g/m^3$ = Micrograms per cubic meter.
NA = Not applicable.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-110

1999 AIR DATA
STATION AS32
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	9/27/99	9/29/99	10/1/99
cPAHs (µg/m^3)			
B(a)P Equivalent	0.000607842	0.000869946	0.000796339
Benzo(a)anthracene	0.000377	0.00051	0.000474
Benzo(a)pyrene	0.000377	0.000556	0.000498
Benzo(b)fluoranthene	0.00088	0.00107	0.00111
Benzo(e)pyrene	0.000352	0.000417	0.000427
Benzo(k)fluoranthene	0.000164	0.000229	0.000187
Chrysene	0.000402	0.000556	0.000569
Dibenzo(a,h)anthracene	0.0000729	0.000116	0.0000972
Indeno(1,2,3-cd)pyrene	0.000302	0.000371	0.000403
Dioxins/Furans (µg/m^3)			
1,2,3,4,6,7,8-HpCDD	0.000000704	0.000000603	0.00000171
1,2,3,4,6,7,8-HpCDF	0.000000234 U	0.000000232	0.000000261 U
1,2,3,4,7,8,9-HpCDF	0.0000000236 U	0.0000000199 U	0.0000000379 J
1,2,3,4,7,8-HxCDD	0.0000000402 J	0.0000000556 U	0.000000126
1,2,3,4,7,8-HxCDF	0.0000000453 J	0.0000000255 U	0.0000000403 J
1,2,3,6,7,8-HxCDD	0.0000000805 J	0.000000051 U	0.000000206
1,2,3,6,7,8-HxCDF	0.0000000302 J	0.0000000202 U	0.0000000285 J
1,2,3,7,8,9-HxCDD	0.0000000428 J	0.0000000487 U	0.000000187
1,2,3,7,8,9-HxCDF	0.0000000088 U	0.00000000464 U	0.0000000211 J
1,2,3,7,8-PeCDD	0.0000000428 J	0.0000000325 U	0.0000000877 J
1,2,3,7,8-PeCDF	0.0000000327 U	0.0000000162 U	0.0000000185 U
2,3,4,6,7,8-HxCDF	0.0000000478 J	0.0000000223 U	0.0000000261 J
2,3,4,7,8-PeCDF	0.0000000528 J	0.0000000206 U	0.0000000332 J
2,3,7,8-TCDD TEQ	0.000000105	0.000000009	0.000000186
OCDD	0.00000503	0.0000051	0.00000474
OCDF	0.000000428	0.000000626	0.000000285
Total HpCDD	0.00000143	0.00000107	0.00000332
Total HpCDF	0.000000478 J	0.000000603	0.000000545 J
Total HxCDD	0.00000116	0.000000225	0.00000213
Total HxCDF	0.000000503	0.000000417	0.000000498
Total PeCDD	0.000000604	0.0000000325 U	0.000000783
Total PeCDF	0.000000704	0.000000278	0.000000379
Total TCDD	0.000000166	0.0000000209 U	0.000000164
Total TCDF	0.000000503	0.000000188	0.000000213
ncPAHs (µg/m^3)			
2-Methylnaphthalene	0.453 J	0.394 J	0.216
Acenaphthene	0.0327	0.0487	0.0232
Acenaphthylene	0.0126	0.0146	0.0123
Anthracene	0.0153	0.0371	0.0147
Benzo(g,h,i)perylene	0.000579	0.000556	0.000617
Fluoranthene	0.00302	0.00325	0.00308
Fluorene	0.0654	0.0974 J	0.0427
Naphthalene	0.229 J	0.255 J	0.223 J
Perylene	0.000088	0.000107	0.000135
Phenanthrene	0.0654	0.0927	0.0593
Pyrene	0.00161	0.00202	0.00192
ncPAH	0.878697	0.945433	0.596952

Key is at the end of the table.

Table 4-110

1999 AIR DATA
STATION AS32
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	9/27/99	9/29/99	10/1/99
VOCs (µg/m^3)			
1,2,4-Trimethylbenzene	2	1	1.1
1,3,5-Trimethylbenzene	0.6	0.35 J	0.35 J
Benzene	2	0.49	0.91
Ethylbenzene	1	0.35 J	0.66 J
Isopropylbenzene	0.4 U	0.25 J	0.8 U
m&p-Xylene	6	1.5	2
n-Propylbenzene	0.8	0.4 J	0.35 J
o-Xylene	3	0.62	0.66 J
p-Isopropyltoluene	0.6	0.72	0.89 U
sec-Butylbenzene	0.6	0.5	0.28 J
Styrene	40	30	4 J
Toluene	7	3.6 J	7
Other Organics (µg/m^3)			
Dibenzofuran	0.0327	0.044	0.0206
Phenols (µg/m^3)			
2-Methylphenol	0.0277	0.0232 U	0.0237 U
4-Methylphenol	0.0453	0.0325	0.0285
Pentachlorophenol	0.0528 J	0.144	0.0949 UJ
Phenol	0.0528	0.0394	0.0498

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
µg/m^3 = Micrograms per cubic meter.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
VOCs = Volatile organic compounds.

Table 4-111

1999 AIR DATA
STATION AS33
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	9/27/99	9/29/99	10/1/99
cPAHs (µg/m^3)			
B(a)P Equivalent	0.0006602	0.000440698	0.000558485
Benzo(a)anthracene	0.00045	0.000232	0.000276
Benzo(a)pyrene	0.000425	0.000281	0.000345
Benzo(b)fluoranthene	0.0009	0.000609	0.000781
Benzo(e)pyrene	0.000375	0.000281	0.000345
Benzo(k)fluoranthene	0.000205	0.000117	0.000158
Chrysene	0.00065	0.000328	0.000505
Dibenzo(a,h)anthracene	0.0000675	0.0000516	0.0000758
Indeno(1,2,3-cd)pyrene	0.0003	0.000225	0.000299
Dioxins/Furans (µg/m^3)			
1,2,3,4,6,7,8-HpCDD	0.000000875	0.000000305	0.00000122
1,2,3,4,6,7,8-HpCDF	0.000000203	0.000000141	0.000000299
1,2,3,4,7,8-HxCDD	0.000000035 J	0.0000000422 U	0.0000000896 J
1,2,3,4,7,8-HxCDF	0.0000000475 J	0.0000000281 U	0.0000000299 J
1,2,3,6,7,8-HxCDD	0.000000115 J	0.0000000375 U	0.000000119
1,2,3,6,7,8-HxCDF	0.0000000425 J	0.0000000129 U	0.0000000225 J
1,2,3,7,8,9-HxCDD	0.0000000675 J	0.0000000375 U	0.000000117
1,2,3,7,8-PeCDD	0.000000035 J	0.0000000281 U	0.0000000505 J
2,3,4,6,7,8-HxCDF	0.0000000575 J	0.0000000124 U	0.000000022 J
2,3,4,7,8-PeCDF	0.0000000625 J	0.0000000258 U	0.0000000253 J
2,3,7,8-TCDD TEQ	0.000000116	0.000000005	0.000000119
2,3,7,8-TCDF	0.0000000223 J	0.0000000122 U	0.0000000145 U
OCDD	0.000003	0.00000197	0.00000345
OCDF	0.000000205 J	0.000000225 J	0.000000193 J
Total HpCDD	0.00000168	0.000000539	0.0000023
Total HpCDF	0.00000035	0.000000305	0.000000505
Total HxCDD	0.00000143	0.000000148	0.00000129
Total HxCDF	0.00000045	0.000000211	0.000000551
Total PeCDD	0.00000075	0.0000000281 U	0.000000528
Total PeCDF	0.000000625	0.000000105	0.000000322
Total TCDD	0.0000002	0.000000022 U	0.0000000225 U
Total TCDF	0.000000625	0.0000000469	0.000000133
ncPAHs (µg/m^3)			
2-Methylnaphthalene	0.055	0.0797	0.0597
Acenaphthene	0.0075	0.0162	0.00781
Acenaphthylene	0.0105	0.0082	0.00781
Anthracene	0.0024	0.00258	0.00597
Benzo(g,h,i)perylene	0.00055	0.000422	0.000505
Fluoranthene	0.0024	0.00281	0.00276
Fluorene	0.011	0.0216	0.0115
Naphthalene	0.18 J	0.199 J	0.184 J
Perylene	0.0001	0.000068	0.0000919
Phenanthrene	0.0138	0.0223	0.0198
Pyrene	0.00153	0.00159	0.00218
ncPAH	0.28478	0.35447	0.3021269

Key is at the end of the table.

Table 4-111

1999 AIR DATA
STATION AS33
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Collection Start Date	9/27/99	9/29/99	10/1/99
Other Organics ($\mu g/m^3$)			
Dibenzofuran	0.00975	0.0171	0.00942
Phenols ($\mu g/m^3$)			
2-Methylphenol	0.0275	0.0234 U	0.023 U
4-Methylphenol	0.045	0.0258	0.023 U
Phenol	0.0425	0.0281	0.0276

Key:

B(a)P = Benzo(a)pyrene.
cPAH = Carcinogenic polycyclic aromatic hydrocarbon.
HpCDD = Heptachlorodibenzo-b-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-b-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
$\mu g/m^3$ = Micrograms per cubic meter.
NA = Not applicable.
ncPAH = Noncarcinogenic polycyclic aromatic hydrocarbon.
NS = No sample.
OCDD = Octachlorodibenzo-b-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-b-dioxin.
PeCDF = Pentachlorodibenzofuran.
R = Rejected.
TCDD = Tetrachlorodibenzo-b-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity Equivalent Quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-112

COMPARISON OF DAILY CONCENTRATIONS IN AIR SAMPLES BY LOCATION FOR PENTACHLOROPHENOL (PCP) AND DIOXIN (AS 2,3,7,8-TCDD TEQ) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Sample Identification	Location Description	Pentachlorophenol ($\mu g/m^3$)	Location	Average Concentration	2,3,7,8-TCDD TEQ (pg/m^3)	Location	Average Concentration
July 7, 1999							
AS21	Source	**2.98**	Sources	1.546	**0.289**	Sources	0.576
AS22	Source	**1.53**			**1.406**		
AS23	Source	**0.128**			0.033		
AS29	Downwind Perimeter	**0.9189**	Downwind Perimeters	0.558	**0.408**	Downwind Perimeters	0.221
AS25	Downwind Perimeter	**0.197**			0.033		
AS27	Downwind Residence	0.0575 U	Downwind Residences	ND	0.011	Downwind Residences	0.006
AS26	Downwind Residence	0.0549 U			0.001		
AS28	Upwind Perimeter	0.0509 U	Upwind Perimeters	ND	0.004	Upwind Perimeters	0.002
AS24	Upwind Perimeter	0.0525 U			0.001		
AS30	Background	0.0505 U	Background	ND	0.001	Background	0.001
July 10, 1999							
AS21	Source	**0.765**	Sources	2.723	**0.336**	Sources	1.318
AS22	Source	**7.23**			**3.436**		
AS23	Source	**0.174**			**0.182**		
AS29	Downwind Perimeter	**2.4**	Downwind Perimeters	1.270	**0.320**	Downwind Perimeters	0.209
AS25	Downwind Perimeter	**0.14**			**0.099**		
AS27	Downwind Residence	0.0480 U	Downwind Residences	ND	**0.168**	Downwind Residences	0.085
AS26	Downwind Residence	0.0493 U			0.003		
AS28	Upwind Perimeter	0.0535 U	Upwind Perimeters	ND	**0.058**	Upwind Perimeters	0.030
AS24	Upwind Perimeter	0.0517 U			0.002		
AS30	Background	0.265 U	Background	ND	0.002	Background	0.002
July 12, 1999							
AS21	Source	**0.908 J**	Source Average	3.780	**0.676**	Source Average	2.382
AS22	Source	**10.4 J**			**6.258**		
AS23	Source	0.0477 U			**0.211**		
AS29	Downwind Perimeter	**1.79**	Downwind Perimeters	1.790	**0.311**	Downwind Perimeters	0.217
AS25	Downwind Perimeter	0.044 U			**0.124**		
AS27	Downwind Residence	0.0494 U	Downwind Residences	ND	**0.095**	Downwind Residences	0.048
AS26	Downwind Residence	0.0519 U			0.002		
AS28	Upwind Perimeter	0.0474 U	Upwind Perimeters	ND	0.011	Upwind Perimeters	0.006
AS24	Upwind Perimeter	0.0575 U			0.001		
AS30	Background	0.0497 U	Background	ND	0.001	Background	0.001

Key is at the end of the table.

Table 4-112

COMPARISON OF DAILY CONCENTRATIONS IN AIR SAMPLES BY LOCATION FOR PENTACHLOROPHENOL (PCP) AND DIOXIN (AS 2,3,7,8-TCDD TEQ) THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Sample Identification	Location Description	Pentachlorophenol ($\mu g/m^3$)	Location	Average Concentration	2,3,7,8-TCDD TEQ (pg/m^3)	Location	Average Concentration
September 27, 1999							
AS21	Source	Rejected	Source Average	1.12	**0.259**	Source Average	0.440
AS22	Source	**1.12 J**			**0.621**		
AS29	Downwind Perimeter	**0.469 J**	Downwind Perimeters	0.469	**0.054**	Downwind Perimeters	0.059
AS25	Downwind Perimeter	Rejected			**0.064**		
AS27	Downwind Residence	Rejected	Downwind Residences	0.053	**0.171**	Downwind Residences	0.131
AS32	Downwind Residence	0.0528 J			**0.105**		
AS33	Downwind Residence	Rejected			**0.116**		
AS28	Upwind Perimeter	Rejected	Upwind Perimeters	R	0.027	Upwind Perimeters	0.019
AS24	Upwind Perimeter	Rejected			0.011		
AS30	Background	Rejected	Background	R	0.007	Background	0.007
September 29, 1999							
AS21	Source	**0.698**	Source Average	1.264	**0.154**	Source Average	0.487
AS22	Source	**1.83**			**0.821**		
AS29	Downwind Perimeter	**0.613**	Downwind Perimeters	0.359	**0.016**	Downwind Perimeters	0.030
AS25	Downwind Perimeter	**0.104**			0.044		
AS27	Downwind Residence	0.0933 U	Downwind Residences	0.144	**0.076**	Downwind Residences	0.030
AS32	Downwind Residence	**0.144**			0.009		
AS33	Downwind Residence	0.0937 U			0.005		
AS28	Upwind Perimeter	0.094 U	Upwind Perimeters	ND	0.005	Upwind Perimeters	0.018
AS24	Upwind Perimeter	0.0923 U			0.030		
AS30	Background	0.0886 U	Background	ND	0.002	Background	0.002
October 1, 1999							
AS21	Source	**0.164 J**	Source Average	0.146	**0.228**	Source Average	0.260
AS22	Source	**0.128 J**			**0.292**		
AS28	Downwind Perimeter	0.0931 UJ	Downwind Perimeters	ND	**0.203**	Downwind Perimeters	0.105
AS24	Downwind Perimeter	0.0941 UJ			0.007		
AS29	Upwind Perimeter	**0.338 J**	Upwind Perimeters	0.338	**0.166**	Upwind Perimeters	0.142
AS25	Upwind Perimeter	0.107 UJ			**0.118**		
AS32	Upwind Residence	0.0949 UJ	Upwind Residences	ND	**0.186**	Upwind Residences	0.187
AS33	Upwind Residence	0.0919 UJ			**0.119**		
AS27	Upwind Residence	0.0967UJ			**0.257**		
AS30	Background	0.0982 UJ	Background	ND	**0.742**	Background	0.742

Key is on the next page.

Note: Bolded concentrations are above EPA, Region 9, PRGs. PCP = 0.056 µg/m^3, TCDD = 0.045 pg/m^3.
Upwind and downwind locations were determined daily based on wind direction and wind speed measurements collected at a meterorological station located on The Oeser Company property.

Key:

Source Samples:	AS21 - Retort
	AS22 - Evaporator
	AS23 - Tank Farm/Dip Tank (July sampling event only; moved to AS32 in September sampling event)
Perimeter Locations:	AS28 - Oak Harbor Freight
	AS24 - Whatcom County Fire District No. 8 Office
	AS29 - North Side next to the North Pole Yard
	AS25 - North Side of main treatment area
Residental Locations:	AS32 - North side of The Oeser Company (September sampling event only)
	AS33 - North side of The Oeser Company (September sampling event only)
	AS27 - Northeast corner of The Oeser Company
	AS26 - North side of The Oeser Company (July sampling event only; moved to AS33 in September sampling event)
Background:	AS30 - Columbia School

= Average concentration exceeds PRG.
= Downwind off-facility gradient.

J	= The analyte was positively identified. The associated numerical value is an estimate.
µg/m^3	= Micrograms per cubic meter.
ND	= Not detected.
pg/m^3 =	= Picograms per cubic meter.
PRG	= Preliminary Remediation Goal.
R	= Rejected sample failed laboratory quality assurance criteria.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TEQ	= Toxicity equivalency quotient.
U	= Not detected. The associated value is the sample quantitation limit.
UJ =	= Not detected. The associated numerical value is the estimated sample quantitation limit.

Average concentration calculations did not include rejected data or data with the following qualifiers: U and UJ.

Table 4-113

COMPARISON OF DAILY CONCENTRATIONS IN AIR SAMPLES BY LOCATION FOR cPAHS AND ncPAHS THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Station ID	Date	Location	Total cPAHs as B(a)P Equivalent ($\mu g/m^3$)	Location Average	Total ncPAHs ($\mu g/m^3$)	Location Average
AS21	7/7/99	Source	0.00004596	6.8942E-05	20.487	7.3936
AS22	7/7/99	Source	0.0001205		0.9437	
AS23	7/7/99	Source	0.00004036		0.75	
AS29	7/7/99	Downwind Perimeter	0.00003364	3.2442E-05	37.5886	19.2649
AS25	7/7/99	Downwind Perimeter	0.00003125		0.9412	
AS27	7/7/99	Downwind Residence	0.00003058	2.5985E-05	6.0887	3.1132
AS26	7/7/99	Downwind Residence	0.00002139		0.1376	
AS28	7/7/99	Upwind Perimeter	0.00003376	3.2436E-05	0.1122	0.0941
AS24	7/7/99	Upwind Perimeter	0.00003111		0.0759	
AS30	7/7/99	Background	0.00006222	6.222E-05	0.066	0.066
AS21	7/9/99	Source	0.0001031	20.893E-05	4.44	3.2222
AS22	7/9/99	Source	0.0004129		3.2596	
AS23	7/9/99	Source	0.0001108		1.967	
AS29	7/9/99	Downwind Perimeter	0.0002275	17.656E-05	4.3893	2.5455
AS25	7/9/99	Downwind Perimeter	0.0001256		0.7016	
AS27	7/9/99	Downwind Residence	0.00007818	8.3758E-05	0.5152	0.2756
AS26	7/9/99	Downwind Residence	0.00008934		0.036	
AS28	7/9/99	Upwind Perimeter	0.00007202	5.9008E-05	0.9503	0.7273
AS24	7/9/99	Upwind Perimeter	0.000046		0.5042	
AS30	7/9/99	Background	0.0001233	12.33E-05	0.3363	0.3363
AS21	7/12/99	Source	0.00005201	30.024E-05	5.8491	3.2786
AS22	7/12/99	Source	0.0008102		3.0397	
AS23	7/12/99	Source	0.00003857		0.947	
AS29	7/12/99	Downwind Perimeter	0.00002737	3.3868E-05	7.7965	4.1422
AS25	7/12/99	Downwind Perimeter	0.00004036		0.4879	
AS27	7/12/99	Downwind Residence	0.00004113	3.6346E-05	0.3076	0.2654
AS26	7/12/99	Downwind Residence	0.00003156		0.2233	
AS28	7/12/99	Upwind Perimeter	0.00004369	4.2602E-05	0.443	0.2856
AS24	7/12/99	Upwind Perimeter	0.00004151		0.1282	
AS30	7/12/99	Background	0.00003621	3.621E-05	0.1001	0.1001
AS21	9/27/99	Source	0.0005498	60.801E-05	2.4277	2.3609
AS22	9/27/99	Source	0.0006662		2.2942	
AS29	9/27/99	Downwind Perimeter	0.0005402	59.424E-05	37.5886	19.1425
AS25	9/27/99	Downwind Perimeter	0.0006483		0.6964	
AS27	9/27/99	Downwind Residence	0.0007034	65.715E-05	0.4571	0.5482
AS32	9/27/99	Downwind Residence	0.0006078		0.9108	
AS33	9/27/99	Downwind Residence	0.0006602		0.2767	
AS28	9/27/99	Upwind Perimeter	0.0003462	45.299E-05	0.6792	0.5108
AS24	9/27/99	Upwind Perimeter	0.0005598		0.3425	
AS30	9/27/99	Background	0.0006519	65.19E-05	0.3029	0.3029
AS21	9/29/99	Source	0.000554	55.866E-05	42.8609	22.4975
AS22	9/29/99	Source	0.0005634		2.1341	
AS29	9/29/99	Downwind Perimeter	0.0005118	53.333E-05	3.593	2.4479

Key is at the end of the table.

Table 4-113

COMPARISON OF DAILY CONCENTRATIONS IN AIR SAMPLES BY LOCATION FOR cPAHS AND ncPAHS THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Station ID	Date	Location	Total cPAHs as B(a)P Equivalent ($\mu g/m^3$)	Location Average	Total ncPAHs ($\mu g/m^3$)	Location Average
AS25	9/29/99	Downwind Perimeter	0.0005549		1.3027	
AS27	9/29/99	Downwind Residence	0.0009048	73.849E-05	0.584	0.6481
AS32	9/29/99	Downwind Residence	0.0008699		0.9889	
AS33	9/29/99	Downwind Residence	0.0004407		0.3715	
AS28	9/29/99	Upwind Perimeter	0.0004081	39.235E-05	0.8474	0.5925
AS24	9/29/99	Upwind Perimeter	0.0003766		0.3375	
AS30	9/29/99	Background	0.0002267	22.67E-05	0.3149	0.3149
AS21	10/1/99	Source	0.0006995	63.884E-05	2.3218	1.773
AS22	10/1/99	Source	0.0005781		1.2242	
AS28	10/1/99	Downwind Perimeter	0.0008544	65.458E-05	0.8514	0.5838
AS24	10/1/99	Downwind Perimeter	0.0004548		0.3162	
AS27	10/1/99	Downwind Residence	0.001877	107.72E-05	0.5114	0.4798
AS32	10/1/99	Downwind Residence	0.0007963		0.6169	
AS33	10/1/99	Downwind Residence	0.0005585		0.311	
AS29	10/1/99	Upwind Perimeter	0.0005811	59.3E-05	2.3364	1.5127
AS25	10/1/99	Upwind Perimeter	0.0006049		0.6891	
AS30	10/1/99	Background	0.0003354	33.54E-05	0.4081	0.4081

Key:

B(a)P = Benzo(a)pyrene.
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons.
ID = Identification.
$\mu g/m^3$ = Micrograms per cubic meter.
ncPAHs = Noncarcinogenic polycyclic aromatic hydrocarbons.

Table 4-114

IN/OUT-SECTOR VOC SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	99070228	99070229	99070230	99070231	99070260	99070261	99070262	99070263	99070313	99070314
Sample Location	AS24	AS24	AS28	AS28	AS24	AS24	AS28	AS28	AS24	AS24
In/Out Sector	In	Out	In	Out	In	Out	In	Out	In	Out
Sample Date	7/7/99	7/7/99	7/7/99	7/7/99	7/9/99	7/9/99	7/9/99	7/9/99	7/12/99	7/12/99
Analyte ($\mu g/m^3$)										
1,2,4-Trimethylbenzene	0.65 U	0.6	2	0.4	1.8 J	0.65	2.8	1.2	1.2 U	1.3
1,3,5-Trimethylbenzene	0.25 J	0.2 J	0.85	0.2 J	3.3 U	0.25	0.9	0.4	1.2 U	0.6
Benzene	0.55	0.52	0.58	0.32	2.2 U	1.1	2.2	1.2	0.78 U	0.46
Ethylbenzene	0.31 J	0.35	0.35 J	0.18 J	0.7 J	0.57	1.5	0.84	0.4 J	0.26
Isopropylbenzene	0.65 U	0.25 U	0.75 U	0.25 U	3.4 U	0.25 U	0.45 J	0.25 U	1.2 U	0.25 U
m&p-Xylene	0.62	0.66	0.66	0.31	1.2 J	0.92	2.8	1.9	0.75 J	0.53
n-Butylbenzene	0.72 U	0.28 U	0.84 U	0.28 U	3.7 U	0.28 U	0.67 U	0.28 U	1.3 U	0.28 U
n-Propylbenzene	0.65 U	0.05 J	0.2 J	0.25 U	3.4 U	0.1 J	0.8	0.2 J	1.2 U	0.1 J
o-Xylene	0.44 J	0.48	0.62 J	0.26	2.9 U	0.7	1.9	1.7	1 U	0.35
p-Isopropyltoluene	0.72 U	0.28 U	0.67 J	0.28 U	3.7 U	0.28 U	0.5 J	0.22 J	1.3 U	0.28 U
sec-Butylbenzene	0.72 U	0.28 U	0.84 U	0.28 U	3.7 U	0.28 U	0.45 J	0.11 J	1.3 U	0.28 U
Styrene	0.6	0.13 J	38	1.4	5	1.5	100	19	2.2	0.86
tert-Butylbenzene	0.72 U	0.28 U	0.84 U	0.28 U	3.7 U	0.28 U	0.67 U	0.28 U	1.3 U	0.17 J
Toluene	1.9	2.4	2.3	1.1	4.2	4.6	8.9	3.9	1.8	1.5

Key is at the end of the table.

Table 4-114

IN/OUT-SECTOR VOC SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	99070318	99070319	99090129	99090130	99090134	99090133	99090165	99090166	99090169	99090170
Sample Location	AS28	AS28	AS24	AS24	AS28	AS28	AS24	AS24	AS28	AS28
In/Out Sector	In	Out	In	Out	In	Out	In	Out	In	Out
Sample Date	7/12/99	7/12/99	9/27/99	9/27/99	9/27/99	9/27/99	9/29/99	9/29/99	9/29/99	9/29/99
Analyte ($\mu g/m^3$)										
1,2,4-Trimethylbenzene	3.9	0.5	2	2	1	1	0.35 J	1.1	2.9	1.2
1,3,5-Trimethylbenzene	1.4	0.25 U	1 J	0.7	0.5	0.5	1.6 U	0.4	0.85	0.4
Benzene	0.81 U	0.58	3	2	2	2	2.1	1.4	2.7	1.3
Ethylbenzene	1.6	0.4	2	0.9	0.9	1	1.5	0.75	1.3	0.88
Isopropylbenzene	1.2 U	0.25 U	0.1 U	0.2 U	0.3	0.5	1.6 U	0.25 U	0.3 J	0.25 U
m&p-Xylene	2.1	0.66	20	5	3	3	8	3.7	6	3.1
n-Butylbenzene	1.4 U	0.28 U	0.1 U	0.3 U	0.3 U	0.3 U	1.8 U	0.28 U	0.3 U	0.28 U
n-Propylbenzene	0.9 J	0.25 U	0.5 J	0.5	0.5	0.6	1.6 U	0.2 J	0.75	0.3
o-Xylene	1.6	0.48	9	3	1	1	3.2	1.3	2.3	1.1
p-Isopropyltoluene	1.4 U	0.28 U	0.1 U	0.06 J	0.2 J	0.2 J	1.8 U	0.28 U	0.67	0.22 J
sec-Butylbenzene	1.4 U	0.28 U	0.1 U	0.06 J	0.2 J	0.6	1.8 U	0.28 U	0.45	0.11 J
Styrene	86	4.5	4	2	10	56	1.4 J	0.6	20 J	7
tert-Butylbenzene	1.4 U	0.28 U	0.1 U	0.3 U	0.3 U	0.3 U	1.8 U	0.28 U	0.3 U	0.28 U
Toluene	6	1.5	20	8	5	7	10 J	3.6 J	6 J	2.6 J

Key is at the end of the table.

Table 4-114

IN/OUT-SECTOR VOC SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Sample Number	99090202	99090203	99090206	99090207
Sample Location	AS24	AS24	AS28	AS28
In/Out Sector	In	Out	In	Out
Sample Date	10/1/99	10/1/99	10/1/99	10/1/99
Analyte ($\mu g/m^3$)				
1,2,4-Trimethylbenzene	1.8	1.8	1.7	1.8
1,3,5-Trimethylbenzene	0.7 J	0.7	0.55	0.55
Benzene	2	1.1	1.8	1.8
Ethylbenzene	2.5	0.75	1	1.5
Isopropylbenzene	1.2 U	0.25 U	0.15 J	0.2 J
m&p-Xylene	10	4.4	4.4	5
n-Butylbenzene	1.4 U	0.28 U	0.28 U	0.28 U
n-Propylbenzene	0.35 J	0.2 J	0.45	0.5
o-Xylene	2.7	1.4	1.4	1.6
p-Isopropyltoluene	1.4 U	0.11 J	0.22 J	0.22 J
sec-Butylbenzene	1.4 U	0.28 U	0.22 J	0.22 J
Styrene	3.6 J	0.69 J	43	20
tert-Butylbenzene	1.4 U	0.28 U	0.28 U	0.28 U
Toluene	20 J	6	5	5

Key:

J = The analyte was positively identified. The associated numerical result is an estimate.
$\mu g/m^3$ = Micrograms per cubic meter.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
VOC = Volatile organic compounds.

Table 4-115

1999 AIR SUMMARY DATA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range	Location of Maximum	Frequency of Detect	Range of Non-Detects	#> PRGs	PRG	#> MTCA B	MTCA B
cPAHs (µg/m³)								
Dibenzo(a,h)anthracene	0.000016 - 0.000186	AS27	36/60	0.000011 - 0.005	0/60	0.00216893039049236	0/60	0.00282258073199428
B(a)P Equivalent	0.0000000131 - 0.00187676	AS27	60/60	-	0/60	0.00216893039049236	NA	NA
Benzo(a)anthracene	0.0000148 - 0.00411	AS22	59/60	0.0000131 - 0.0000131	0/60	0.0216893039049236	0/60	0.0282258062345304
Benzo(a)pyrene	0.0000146 - 0.00118	AS27	59/60	0.0000137 - 0.0000137	0/60	0.00216893039049236	0/60	0.00282258073199428
Benzo(b)fluoranthene	0.0000177 - 0.00242	AS27	60/60	-	0/60	0.0216893039049236	0/60	0.0282258062345304
Benzo(e)pyrene	0.0000206 - 0.000822	AS27	60/60	-	NA	NA	NA	NA
Chrysene	0.0000131 - 0.00725	AS22	60/60	-	0/60	2.16893039049236	0/60	2.82258056409456
Indeno(1,2,3-cd)pyrene	0.0000168 - 0.000652	AS27	60/60	-	0/60	0.0216893039049236	0/60	0.0282258062345304
Benzo(k)fluoranthene	0.0000139 - 0.000604	AS22	58/60	0.000013 - 0.0000137	0/60	0.216893039049236	0/60	0.282258069129132
Dioxins/Furans (µg/m³)								
1,2,3,7,8-PeCDF	0.0000000168 - 0.00000029	AS22	16/60	0.0000000113 - 0.000013	0/60	0.000000896491	0/60	0.00000116666666666667
Total HpCDF	0.0000000298 - 0.000217	AS22	57/60	0.00000000578 - 0.0000092	NA	NA	NA	NA
1,2,3,4,6,7,8-HpCDD	0.000000053 - 0.000266	AS22	60/60	0.0000000123 - 0.000021	12/60	0.00000448245614035088	10/60	0.00000583333333333333
Total HxCDF	0.0000000388 - 0.0000628	AS22	57/60	0.000000008 - 0.0000053	NA	NA	NA	NA
Total PeCDF	0.000000046 - 0.0000137	AS22	57/60	0.0000000123 - 0.000013	NA	NA	NA	NA
Total TCDD	0.0000000197 - 0.0000029	AS22	38/60	0.0000000118 - 0.0000056	NA	NA	NA	NA
2,3,7,8-TCDF	0.00000000941 - 0.000000222	AS22	12/60	0.00000000572 - 0.0000086	0/60	0.000000448245614035088	0/60	0.000000583333333333333
2,3,7,8-TCDD TEQ	0.00000000000526 - 0.0000062576	AS22	60/60	-	35/60	0.000000448245614035088	33/60	0.000000583333333333333
2,3,7,8-TCDD	0.0000000159 - 0.000000179	AS22	18/60	0.00000000675 - 0.0000056	6/66	0.000000448245614035088	3/60	0.000000583333333333333
Total TCDF	0.0000000172 - 0.00000362	AS22	52/60	0.00000000841 - 0.0000086	NA	NA	NA	NA
2,3,4,6,7,8-HxCDF	0.0000000208 - 0.00000114	AS22	29/60	0.000000007 - 0.0000041	2/60	0.000000448245614035088	1/60	0.000000583333333333333
Total HxCDD	0.0000000696 - 0.000087	AS22	54/60	0.000000016 - 0.000015	NA	NA	NA	NA
1,2,3,7,8-PeCDD	0.0000000294 - 0.000000845	AS22	31/60	0.00000000762 - 0.000018	25/60	0.000000448245614035088	21/60	0.000000583333333333333
1,2,3,7,8,9-HxCDF	0.000000016 - 0.000000167	AS22	15/60	0.00000000464 - 0.0000038	0/60	0.000000448245614035088	0/60	0.000000583333333333333
1,2,3,7,8,9-HxCDD	0.0000000428 - 0.00000483	AS22	34/60	0.0000000113 - 0.000013	6/60	0.000000448245614035088	4/60	0.000000583333333333333
1,2,3,6,7,8-HxCDF	0.0000000225 - 0.000000435	AS22	28/60	0.00000000625 - 0.0000042	0/60	0.000000448245614035088	0/60	0.000000583333333333333
1,2,3,6,7,8-HxCDD	0.000000045 - 0.00000966	AS22	40/60	0.0000000113 - 0.000014	8/60	0.000000448245614035088	6/60	0.000000583333333333333
1,2,3,4,7,8-HxCDF	0.0000000299 - 0.00000181	AS22	32/60	0.000000008 - 0.0000053	2/60	0.000000448245614035088	2/60	0.000000583333333333333
1,2,3,4,7,8-HxCDD	0.0000000321 - 0.00000314	AS22	33/60	0.000000016 - 0.000015	3/60	0.000000448245614035088	3/60	0.000000583333333333333
1,2,3,4,7,8,9-HpCDF	0.0000000273 - 0.00000237	AS22	25/60	0.00000000578 - 0.0000061	0/60	0.00000448245614035088	0/60	0.00000583333333333333
1,2,3,4,6,7,8-HpCDF	0.0000000298 - 0.00000121	AS21	29/60	0.00000000578 - 0.0000483	0/60	0.00000448245614035088	0/60	0.00000583333333333333
2,3,4,7,8-PeCDF	0.00000002 - 0.000000411	AS22	28/60	0.0000000118 - 0.000013	6/60	0.0000000896491	4/60	0.00000116666666666667
OCDF	0.0000000441 - 0.000114	AS22	52/60	0.0000000248 - 0.000019	0/60	0.000448245614035088	0/60	0.000583333333333333
OCDD	0.0000000526 - 0.00179	AS22	60/60	0.0000000275 - 0.000034	2/60	0.000448245614035088	2/60	0.000583333333333333
Total HpCDD	0.000000053 - 0.000507	AS22	60/60	-	0/60		0/60	
Total PeCDD	0.0000000876 - 0.00000628	AS22	38/60	0.0000000105 - 0.000018	0/60		0/60	

Table 4-115

1999 AIR SUMMARY DATA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Analyte	Range	Location of Maximum	Frequency of Detect	Range of Non-Detects	#> PRGs	PRG	#> MTCA B	MTCA B
ncPAHs (µg/m³)								
2-Methylnaphthalene	0.00006 - 39.6	AS21	60/60	-	4/60	3.12805	9/60	1.37599995359778
Pyrene	0.000908 - 0.0531	AS22	60/60	-	0/60	109.5	0/60	47.9999989271164
Phenanthrene	0.0000552 - 1.04	AS29	60/60	-	0/60	1095	0/60	480.000019073486
Perylene	0.0000142 - 0.000338	AS27	43/60	-	NA	NA	NA	NA
ncPAH	0.00028 - 42.5821741	AS21	60/60	-	NA	NA	NA	NA
Naphthalene	0.000175 - 1.12	AS21	60/60	-	0/60	3.12805	1/60	1.37599995359778
Acenaphthene	0.0000218 - 0.434	AS21	60/60	-	0/60	219	0/60	95.9999978542328
Acenaphthylene	0.00063 - 0.194	AS29	60/60	-	0/60	219	0/60	95.9999978542327
Benzo(g,h,i)perylene	0.0000302 - 0.00104	AS30	60/60	-	0/60	109.5	0/60	47.9999989271163
Fluoranthene	0.000015 - 0.099	AS22	60/60	-	0/60	146	0/60	63.9999985694885
Fluorene	0.0000342 - 1.53	AS29	59/60	0.33 - 0.33	0/60	146	0/60	63.9999985694885
Anthracene	0.000522 - 0.325	AS21	60/60	-	0/60	1095	0/60	480.000019073486
Other Organics (µg/m³)								
tert-Butylbenzene	0.11 - 1800	AS21	7/79	0.1 - 61	1/79	36.5	1/79	15.9999996423721
Styrene	0.13 - 100	AS28	79/79	-	0/79	1058.5	0/79	463.99998664856
sec-Butylbenzene	0.056 - 9700	AS21	53/79	0.1 - 3.7	2/79	36.5	2/79	15.9999996423721
Ethylbenzene	0.18 - 3000	AS21	79/79	-	1/79	1058.5	1/79	463.99998664856
p-Isopropyltoluene	0.056 - 3800	AS21	56/79	0.1 - 3.7	NA	NA	NA	NA
n-Propylbenzene	0.05 - 6600	AS21	71/79	0.25 - 3.4	2/79	36.5	2/79	15.9999996423721
1,3,5-Trimethylbenzene	0.15 - 3800	AS21	71/79	0.25 - 3.3	2/79	6.205	7/79	2.72000003606081
Toluene	0.077 - 3400	AS21	78/79	-	2/79	401.5	2/79	175.999999046325
o-Xylene	0.26 - 3100	AS21	76/79	0.32 - 2.9	2/79	730	2/79	320.000004768372
Isopropylbenzene	0.05 - 4900	AS21	44/79	0.1 - 3.4	2/79	401.5	2/79	175.999999046326
m&p-Xylene	0.31 - 3000	AS21	79/79	-	2/79	730	2/79	320.000004768372
Benzene	0.26 - 170	AS21	74/79	0.23 - 36	74/79	0.249025341130604	70/79	0.324074065667898
Dibenzofuran	0.00581 - 36	AS29	59/79	0.00564 - 0.00564	1/66	14.6	1/66	6.40000030398368
n-Butylbenzene	0.056 - 10	AS21	4/79	0.1 - 3.7	0/79	36.5	0/79	15.9999996423721
1,2,4-Trimethylbenzene	0.25 - 15000	AS21	77/79	0.65 - 1.2	10/79	6.205	31/79	2.72000003606081
Phenols (µg/m³)								
Pentachlorophenol	0.0528 - 10.4	AS22	24/60	0.044 - 40	23/60	0.056030701754386	23/60	0.0729166682964812
Phenol	0.0236 - 0.0817	AS25	28/60	0.011 - 10	0/60	2190	0/60	960.000038146972
2-Methylphenol	0.0275 - 0.0364	AS22	0/66	0.011 - 10	0/60	182.5	0/60	80.0000011920928
4-Methylphenol	0.0248 - 0.0558	AS22	18/60	0.011 - 10	0/60	18.25	0/60	7.99999982118606

Table 4-115

1999 AIR SUMMARY DATA
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

B(a)P	= Benzo(a)pyrene.B92
cPAHs	= Carcinogenic polycyclic aromatic hydrocarbons.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
ug/m3	= Micrograms per cubic meter.
NA	= Not applicable.
ncPAHs	= Noncarcinogenic polycyclic aromatic hydrocarbons.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalent quotient.

Table 4-116

COMPARISON OF OFF-FACILITY AIR SAMPLE RESULTS TO BACKGROUND AIR SAMPLE RESULTS FOR VOLATILE ORGANIC COMPOUNDS THE OESER COMPANY REMEDIAL INVESTIGATION BELLINGHAM, WASHINGTON

Analyte	EPA, Region 9, PRG ($\mu g/m^3$)	Off-facility[a] Concentration Range ($\mu g/m^3$)	Background[b] Concentration Range ($\mu g/m^3$)
1,2,4-Trimethyl benzene	6.2	0.25 - 3.9	0.8 - 4
Benzene	0.25	0.26 - 3	0.49 - 4
Ethyl benzene	1058.5	0.18 - 2.5	0.31 -2
Total Xylenes	730	0.31 - 20	0.57 - 8
Toluene	400	1 - 20	2.2 - 9.5

[a] Off-facility locations included in the concentration range were AS24, AS26, AS27 and AS28.

[b] Background samples were collected at AS30.

Key:

EPA = United States Environmental Protection Agency.
$\mu g/m^3$ = Micrograms per cubic meter.
PRG = Preliminary remediation goal.

Table 4-117

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE WATER SAMPLES
(JULY 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary Screening Levels[ab]	99244027[e]	99314150	99314151	99314152	99314153	99314154	99314155	99314157	99314158
Sample Location		**SEEP-1**	**SW01**	**SW02**	**SW03**	**SW04**	**SW05**	**SW06**	**SW07**	**SW08**
Sample Date		**6/10/99**	**7/26/99**	**7/26/99**	**7/26/99**	**7/26/99**	**7/26/99**	**7/26/99**	**7/26/99**	**7/26/99**
Volatile Organic Compounds (µg/L)										
Methyl tert-Butyl Ether	NA	NA	2.7 JQ	3 JQ	2.5 JQ	3.4 JQ	3.4 JQ	2.4 JQ	2.4 JQ	NA
o-Xylene	NA	NA	0.69 JQ	0.64 JQ	0.47 JQ	0.66 JQ	0.78 JQ	0.65 JQ	0.73 JQ	NA
Toluene	130[c]	NA	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.08 JQ	0.051 JQ	NA
Semivolatile Organic Compounds (µg/L)										
2,4-Dichlorophenol	NA	0.48 U	0.051 U	0.048 U	0.05 U	0.024 U	0.0077 JQ	0.025 U	0.025 U	0.024 U
2,4-Dimethylphenol	NA	0.48 U	0.051 U	0.048 U	0.05 U	0.024 U	0.15	0.025 U	0.025 U	0.024 U
2-Methylnaphthalene	24[c]	0.48 U	0.01 U	0.0096 U	0.0099 U	0.0048 U	0.012	0.0049 U	0.0051	0.0049 U
2-Methylphenol	NA	0.48 U	0.051 U	0.048 U	0.05 U	0.024 U	0.3 JH	0.025 U	0.025 U	0.024 U
3&4-Methylphenol	NA	0.48 UJK	0.051 U	0.048 U	0.05 U	0.0087 JQ	0.016 JQ	0.025 U	0.025 U	0.024 U
Acenaphthene	23[c]	0.02	0.04	0.11	0.0099 U	0.094	0.04	0.0049 U	0.0051 U	0.0049 U
Acenaphthylene	23[c]	0.0048 U	0.013	0.011	0.0099 U	0.0058	0.0048 U	0.0049 U	0.0051 U	0.0049 U
Anthracene	NA	0.012	0.016	0.015	0.013	0.025	0.0072	0.0049 U	0.0051 U	0.03
Benzo(a)pyrene	0.014[c]	0.0048 U	**0.036**	**0.015**	0.0099 U	**0.0053**	0.0048 U	0.0049 U	0.0051 U	0.0073
Benzo(b)fluoranthene	NA	0.0048 U	0.01 U	0.0096 U	0.0099 U	0.0072	0.0048 U	0.0049 U	0.0051 U	0.0049 U
Benzo(g,h,i)perylene	NA	0.0048 U	0.039	0.0096 U	0.0099 U	0.0048 U	0.0048 U	0.0049 U	0.0051 U	0.0049 U
Benzoic acid	NA	0.95 UJK	0.1 UJK	0.096 UJK	0.099 UJK	0.077	0.048 U	0.049 U	0.051 U	0.049 U
Benzyl alcohol	NA	0.48 U	0.051 UJK	0.048 UJK	0.05 UJK	0.024 U	0.024 U	0.0074 JQ	0.025 U	0.024 U
Dibenzo(a,h)anthracene	NA	0.0048 U	0.01 U	0.0096 U	0.0099 U	0.0048 U	0.0048 U	0.0049 U	0.0051 U	0.0049 U
Dibenzofuran	20[c]	0.48 U	0.0071 JQ	0.0087 JQ	0.05 U	0.0067 JQ	0.0038 JQ	0.025 U	0.025 U	0.024 U
Fluoranthene	8.1[c]	0.009	0.027	0.018	0.0099 U	0.03	0.028	0.0054	0.0056	0.011
Fluorene	3.9[c]	0.0048	0.02	0.047	0.0099 U	0.04	0.025	0.0049 U	0.0051 U	0.0049 U
Indeno(1,2,3-cd)pyrene	NA	0.0048 U	0.012	0.0096 U	0.0099 U	0.0048 U	0.0048 U	0.0049 U	0.0051 U	0.0073
Naphthalene	24[c]	0.05	0.4 U	0.4 U	0.4 U	0.0048 U	0.0063	0.0049 U	0.0066	0.0049 U
Pentachlorophenol	13[c]	0.48 U	0.055	0.063	0.05 U	0.027 JL	0.042 JL	0.025 UJK	0.025 UJK	0.024 UJK
Phenanthrene	6.3[c]	0.011	0.022	0.014	0.02	0.017	0.039	0.0049 U	0.0051 U	0.02
Phenol	2560[d]	0.48 U	0.051 U	0.048 U	0.05 U	0.066	0.11	0.025 U	0.025 U	0.058
Pyrene	NA	0.026	0.12	0.044	0.02	0.022	0.029	0.0083	0.0045 JQ	0.0092
Tetrachlorophenols	NA	0.48 U	NA	NA	NA	0.024 U	0.024 U	0.025 U	0.025 U	0.0083 JQ
Petroleum Hydrocarbons (µg/L)										
C10-C12 Aromatics	NA	38	49 U	50 U	50 U	48 UJK	50 U	50 U	50 U	NA
C8-C10 Aromatics	NA	NA	25 U	25 U	7.9 JQ	25 U	25 U	25 U	25 U	NA
Total EPH	NA	38	NA	NA	7.9 J	NA	NA	NA	NA	NA
Dioxin/Furans (pg/L)										
2,3,7,8-TCDD TEQ (mammal)	NA	NA	1.086	0.02	NA	0.033	1.481	NA	NA	2.276
2,3,7,8-TCDD TEQ (fish)	10[f]	NA	0.373	0.02	NA	0.033	0.295	NA	NA	0.449
1,2,3,4,6,7,8-HpCDD	NA	NA	79.143	10.713 U	13.982 U	17.442 U	131.833	10.324 U	6.036 U	203.031
1,2,3,4,6,7,8-HpCDF	NA	NA	18.751	8.954 U	12.914 U	4.756 U	28.648 U	6.054 U	6.015 U	57.574 U
OCDD	NA	NA	1009.773	201.989	12.647 U	289.937	1410.036	34.886 U	63.694 U	2049.482
OCDF	NA	NA	58.54	26.403 U	10.994 U	43.65	217.949	4.678 U	11.151 U	406.221
Total TCDD	NA	NA	9.826 U	19.034 U	18.985 U	10.228 U	9.334	8.17 U	4.531 U	5.545 U
Water Quality Parameters (mg/L)										
Alkalinity	NA	NA	126	147	130	133	83.2	80.3	79.1	NA
Bromide	NA	NA	0.204	0.209	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA
Chloride	NA	NA	15.2	12.6	15.1	13.3	7.7	7.5	12.5	NA
COD	NA	5 U	5 U	11	5 U	5 U	13	9	5 U	NA
Fluoride	NA	NA	0.086	0.093	0.078	0.08	0.093	0.099	0.087	NA
Hardness	NA	NA	145	157	149	148	91.6	88.6	87.5	NA
Nitrate+Nitrite	NA	NA	2.63	2.3	2.76	2.13	1.63	1.73	1.09	NA
Sulfate	NA	NA	23.3	24.1	22.2	20.5	14.8	14.3	16.6	NA
TDS	NA	NA	216	227	210	209	156	141	140	NA
TOC	NA	NA	1.73	1.98	1.2	1.6	4.64	4.8	1.79	NA

Key is on the next page.

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] Sample concentrations above PSLs are bolded.

[c] EPA "Ecotox Threshold Criteria," January 1996.

[d] AWQC "Protection of Aquatic Organism," EPA, August 1996.

[e] SEEP-1 was collected at location SW08 during the remedial investigation work, but prior to the surface water sampling event.

[f] Table 3 in Suter and Tsao (1996); EPA Region 9 chronic screening value.

Table 4-117

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE WATER SAMPLES
(JULY 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Key:

AWQC	= Ambient Water Quality Criteria.
COD	= Chemical oxygen demand.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JQ	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TDS	= Total dissolved solids.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic carbon.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJK	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit, biased unknown.

Table 4-118

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE WATER SAMPLES
DECEMBER 1999
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99504000	99504002	99504004	99504006	99504008	99504856	99504858	99504860	99504862
Sample Location	Screening	SW01	SW09	SW02	SW04	SW03	SW08	SW05	SW06	SW07
Sample Date	Levels[ab]	12/6/99	12/6/99	12/6/99	12/6/99	12/6/99	12/6/99	12/6/99	12/6/99	12/6/99
Volatile Organic Compounds (µg/L)										
Benzene	NA	5 U	5 U	5 U	5 U	5 U	5 U	0.15	5 U	5 U
m&p-Xylene	1.8[c]	10 U	10 U	10 U	10 U	10 U	10 U	0.12	10 U	10 U
o-Xylene	NA	5 U	5 U	5 U	5 U	5 U	5 U	0.088	5 U	5 U
Semivolatile Organic Compounds (µg/L)										
2-Methylnaphthalene	24[c]	0.0047 U	0.0047 U	0.022	0.03	0.0047 U	0.005 U	0.26	0.0053 U	0.0047 U
4-Chloroaniline	NA	0.024 U	0.024 U	0.024 U	0.025 U	0.024 U	0.042	0.024 U	0.026 U	0.024 U
Acenaphthene	23[c]	0.072	0.021	0.059	0.08	0.0047 U	0.005 U	0.12	0.0053 U	0.018
Acenaphthylene	23[c]	0.0047 U	0.0047 U	0.0047 U	0.0051 U	0.0047 U	0.049	0.05	0.0053 U	0.0047 U
Anthracene	NA	0.037	0.013	0.043	0.051	0.035	0.13	0.15	0.0089 JN	0.0066
Benzo(a)anthracene	NA	0.015	0.0047 U	0.0047 U	0.0051 U	0.0047 U	0.037	0.058	0.0053 U	0.0047 U
Benzo(a)pyrene	0.014[c]	**0.015**	0.0047 U	**0.032**	0.0051 U	0.0047 U	**0.2**	**0.16**	**0.018**	0.0047 U
Benzo(g,h,i)perylene	NA	0.0047 U	0.0047 U	0.0047 U	0.0051 U	0.0047 U	0.35	0.084	0.0053 U	0.0047 U
Benzofluoranthenes	NA	0.024	0.0047 U	0.0047 U	0.0051 U	0.0047 U	0.21	0.17	0.0053 U	0.0047 U
Benzyl alcohol	NA	0.03	0.024 U	0.024 U	0.025 U	0.024 U	0.11	0.024 U	0.026 U	0.024 U
Carbazole	NA	0.047 U	0.047 U	0.047 U	0.051 U	0.047 U	0.05 U	0.075	0.053 U	0.047 U
Chrysene	NA	0.02	0.0047 U	0.037	0.031	0.0047 U	0.12	0.12	0.025	0.0047 U
Dibenzo(a,h)anthracene	NA	0.0047 U	0.0047 U	0.0047 U	0.0051 U	0.0047 U	0.023	0.0047 U	0.0053 U	0.0047 U
Dibenzofuran	20[c]	0.024 U	0.024 U	0.024 U	0.017 J	0.024 U	0.025 U	0.074	0.026 U	0.024 U
Fluoranthene	8.1[c]	0.089	0.0047 U	0.074	0.049	0.0047 U	0.028	0.13	0.044	0.0038 J
Fluorene	3.9[c]	0.034	0.0047 U	0.0047 U	0.036	0.0047 U	0.005 U	0.19	0.0053 U	0.0047 U
Indeno(1,2,3-cd)pyrene	NA	0.0047 U	0.0047 U	0.0047 U	0.0051 U	0.0047 U	0.2	0.059	0.0053 U	0.0047 U
Naphthalene	24[c]	0.013	0.0047 U	0.051	0.062	0.0047 U	0.007	0.18	0.0053 U	0.0057 U
Pentachlorophenol	13[c]	**14**	0.024 U	8.5	7.2	0.024 U	0.33	**21**	0.17	0.065
Phenanthrene	6.3[c]	0.032	0.011	0.021	0.015	0.014	0.016 JN	0.19	0.023	0.0099
Pyrene	NA	0.082	0.0047 U	0.069	0.072	0.0047 U	0.083	0.17	0.034	0.02
Tetrachlorophenols	NA	0.46	0.024 U	0.26	0.27	0.0094 U	0.07	1	0.026 U	0.024 U
Petroleum Hydrocarbons (µg/L)										
C16-C21 Aromatics	NA	49 UJ	47 UJ	50 UJ	48 UJ	48 UJ	47 UJ	58 J	47 UJ	47 UJ
C21-C34 Aliphatics	NA	49 UJ	47 UJ	110 J	58 J	48 UJ	60 J	63 J	87 J	47 UJ
C21-C34 Aromatics	NA	49 UJ	47 UJ	50 UJ	48 UJ	48 UJ	52 J	47 UJ	47 UJ	47 UJ
Total EPH	NA	NA	NA	110	58	NA	112 J	121 J	87 J	NA
Dioxin/Furans (pg/L)										
2,3,7,8-TCDD TEQ (mammal)	NA	**24.588**	NA	**27.295**	**50.707**	0.211	**14.202**	**71.929**	0.898	0.011
2,3,7,8-TCDD TEQ (fish)	10[e]	6.614	NA	6.917	11.77	0.041	4.683	17.70	0.157	0.011
1,2,3,6,7,8-HxCDD	NA	48.661	3.802 U	61.389	103.324	4.186 U	14.648 U	147.171	6.023 U	9.082 U
1,2,3,7,8,9-HxCDD	NA	11.071 U	4.359 U	8.37 U	53.916	4.799 U	10.109 U	44.1 U	6.904 U	10.411 U
1,2,3,4,6,7,8-HpCDD	NA	1510.467	3.551 U	1650.334	2753.471	18.88	1057.645	4553.618	82.354	8.222 U
1,2,3,4,6,7,8-HpCDF	NA	279.003	2.468 U	279.813	447.392	3.523 U	226.023	592.388	8.925 U	5.22 U
OCDD	NA	16364.845	18.251 U	16392.819	26433.854	200.322	11699.973	54724	684.219	111.934
OCDF	NA	1903.814	3.455 U	2150.551	3311.486	25.507	1949.572	2791.716	59.183	11.664 U
Total HxCDD	NA	165.837	3.802 U	159.796	323.486	4.186 U	15.403 J	451.826 J	6.023 U	9.082 U
Total HxCDF	NA	68.804	2.234 U	126.305	157.869	1.789 U	20.497 U	29.035 U	4.991 U	6.151 U
Total HpCDD	NA	2622.5	3.551 U	2831.47	4716.683	34.535	1771.797	8278.498	126.56	8.222 U
Total HpCDF	NA	279.003	2.468 U	279.813	447.392	3.523 U	1493.651	2889.73	4.903 U	5.22 U
Total PeCDF	NA	9.306 U	4.247 U	5.998 U	69.717	4.859 U	8.621 U	149.632	5.787 U	8.203 U
Water Quality Parameters (mg/L)										
Alkalinity	NA	99	117	64.3	80.9	150	143	92.5	75.6	67.2
Chloride	NA	8.6	15.6	6.35	7.01	11	9.66	7.71	7.64	9.04
COD	NA	16	5 U	18	19	5 U	5 U	35	31	5 U
Fluoride	NA	0.099	0.055	0.046	0.051	0.064	0.067	0.057	0.05	0.063
Hardness	NA	137	143	89.5	97.8	173	171	117	95.3	73.2
Nitrate+Nitrite	NA	1.03	3.04	0.957	0.964	2.18	1.96	1.37	1.27	1.36
Sulfate	NA	33.7	22.9	12.9	15.2	20.3	20.9	18.3	16.9	11.2
TDS	NA	201	203	120	145	217	224	178	157	129
TOC	NA	7.09 JL	2.13 JL	7.11 JL	7.26 JL	1.27 JL	3.05	8.86	8.38	2.43
TSS	NA	3.35	2.2 U	7.35	8.23	2.1 U	119	5.96	4.12	2.5 U

Key is on the next page.

Table 4-118

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SURFACE WATER SAMPLES
DECEMBER 1999
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.
[b] Sample concentrations above PSLs are bolded.
[c] EPA "Ecotox Threshold Criteria," January 1996.
[d] AWQC "Protection of Aquatic Organism," EPA, August 1996.
[e] Table 3 of Suter and Tsao (1996); EPA Region 9 chronic screening value.

Key:

AWQC	= Ambient Water Quality Criteria.
EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JL	= The analyte was positively identified. The associated numerical result is an estimate, biased low.
JN	= The analyte was tentatively identified, and the numerical result is estimated.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDF	= Pentachlorodibenzofuran.
pg/L	= Picograms per liter.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
UJK	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit, biased unknown.

Table 4-119

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SEDIMENT SAMPLES
(JULY 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99070520	99070521	99070522	99070523	99070524	99070525	99070526	99070527	99070528	99070529	99070530
Sample Location	Screening	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08	SD09	SD10	SD11
Sample Date	Levels[ab]	7/28/99	7/28/99	7/28/99	7/28/99	7/28/99	7/29/99	7/29/99	7/29/99	7/29/99	7/29/99	7/29/99
Semivolatile Organic Compounds (mg/kg)												
2-Methylnaphthalene	0.48[c]	0.0022 U	0.04	0.011	0.0021 J	0.0024 J	0.026	0.003	0.0052	0.0068	0.065	0.011 U
3&4-Methylphenol	NA	0.011 U	0.013 U	0.008 J	0.006 J	0.012 J	0.1	0.012 U	0.003 J	0.037	0.011 U	0.054 U
7,12-Dimethylbenz(a)anthracene	NA	0.0022 U	0.18 U	0.0027 U	0.0023 U	0.017 U	0.0061 U	0.0025 U	0.0023 U	0.0024 U	0.14	0.011 U
7H-Dibenzo(c,g)carbazole	NA	0.0022 U	0.013	0.0027 U	0.0023 U	0.0026 U	0.0061 U	0.0025 U	0.0023 U	0.0024 U	0.0022 U	0.011 U
Acenaphthene	0.62[c]	0.0022 U	0.012	0.14	0.0035	0.029	0.081	0.011	0.014	0.0054	0.018	0.011 U
Acenaphthylene	0.62[c]	0.0022 U	0.047	0.0099	0.0044	0.022	0.093	0.02	0.054	0.0076	0.21	0.011 U
Anthracene	2.1[d]	0.0022 U	**2.2**	0.049	0.012	0.061	0.56	0.068	0.17	0.044	0.73	0.011 U
Benzo(a)anthracene	5.0[d]	0.003	3.7	0.059	0.022	0.12	1.7	0.14	0.37	0.073	1.3	0.011 U
Benzo(a)pyrene	0.43[c]	0.0041	**2.4**	0.087	0.042	0.34	**1.4**	0.28	**0.86**	0.072	**2.1**	0.011 U
Benzo(b)fluoranthene	11[d]	0.0044 J	0.82 J	0.048 J	0.021 J	0.15 J	0.7 J	0.13 J	0.38 J	0.031 J	1.1 JK	0.011 U
Benzo(g,h,i)perylene	0.66[c]	0.003	0.41	0.042	0.01	0.16	0.4	0.11	0.3	0.0024 U	**0.87**	0.011 U
Benzo(j)fluoranthene	NA	0.0044 J	0.82 J	0.048 J	0.021 J	0.15 J	0.7 J	0.13 J	0.38 J	0.031 J	1.1 JK	0.11 U
Benzo(k)fluoranthene	11[d]	0.0044 J	0.82 J	0.048 J	0.021 J	0.15 J	0.7 J	0.13 J	0.38 J	0.031 J	1.1 JK	0.011 U
Benzoic acid	NA	0.022 UJ	0.026 UJ	0.027 UJ	0.023 UJ	0.026 UJ	0.061 UJ	0.025 UJ	0.023 UJ	0.024 UJ	0.082	0.081 JQ
Chrysene	7.4[d]	0.0098	**8.3**	0.19	0.051	0.23	2.2	0.26	0.73	0.12	3.1	0.011 U
Dibenzo(a,e)pyrene	NA	0.0022 U	0.16	0.02	0.0023 U	0.07	0.0061 U	0.048	0.12	0.0024 U	0.0022 U	0.011 U
Dibenzo(a,h)anthracene	0.23[d]	0.0022 UJ	0.097 J	0.08	0.0023 UJ	0.024 J	0.0061 UJ	0.024 J	0.0087 J	0.0024 UJ	0.16	0.011 U
Dibenzo(a,h)pyrene	NA	0.0022 U	0.053	0.011	0.0023 U	0.04	0.0061 U	0.018	0.08	0.0024 U	0.21 U	0.011 U
Dibenzo(a,i)pyrene	NA	0.0022 U	0.023	0.0027 U	0.0023 U	0.0074 U	0.1	0.0059	0.019	0.0024 U	0.039 U	0.011 U
Dibenzo(a,l)pyrene	NA	0.0022 U	0.0096	0.0027 U	0.0023 U	0.0026 U	0.0061 U	0.0025 U	0.015	0.0024 U	0.034 U	0.011 U
Dibenzofuran	2.0[c]	0.011 U	0.025	0.017	0.0016 J	0.0042 J	0.035	0.0042 J	0.0066 J	0.008 J	0.06	0.054 U
Fluoranthene	2.9[c]	0.022	0.47	0.071	0.11	0.1	**3.2 J**	0.07	0.2	0.11	0.77	0.014
Fluorene	0.54[c]	0.0022 U	0.21	0.082	0.0063	0.034	0.13	0.016	0.034	0.014	0.075	0.011
Indeno(1,2,3-cd)pyrene	NA	0.0022	0.48	0.048	0.024	0.18	0.49	0.12	0.37	0.0024 U	0.96	0.011 U
Naphthalene	0.48[c]	0.0022 U	0.024	0.0054	0.0035	0.0058	0.025	0.012	0.011	0.0068	0.048	0.011 U
Pentachlorophenol	0.36[c]	0.0037 J	0.033	**2 J**	0.024	0.056	**0.46**	0.015	0.16	**1.1**	**2.9**	0.054 UJK
Phenanthrene	2.1[d]	0.0024	0.61	0.11	0.0072	0.041	0.41	0.029	0.08	0.15	0.2	0.012
Phenol	0.048[d]	0.011 U	0.013 U	0.013 U	0.012 U	0.013 U	0.031 U	0.012 U	0.011 U	0.016	0.011 U	0.054 U
Pyrene	0.66[c]	0.015	**0.66**	0.096	0.11	0.096	**2.9 J**	0.13	0.3	0.14	**1.8**	0.011 U
Tetrachlorophenols	NA	0.011 U	0.0054 J	0.03	0.0046 J	0.013 U	0.079	0.012 U	0.018	0.065	0.17	0.054 U
TOC	NA	2800	13000	7500	5200	18000	110000	7200	5400	13000	15000	120000
Petroleum Hydrocarbons (mg/kg)												
C12-C16 Aliphatics	NA	6.1 U	10	6.5 U	6.5 U	6.6 U	21	6.3 U	6.3 U	6.4 U	5.9 U	31 U
C16-C18 Aliphatics	NA	6.1 U	12	6.5 U	6.5 U	6.6 U	36	6.3 U	6.3 U	6.4 U	6.1	31 U
C18-C21 Aliphatics	NA	6.1 U	15	7.7	6.5 U	13	76	6.3 U	6.3 U	6.4 U	16	31 U
C18-C21 Aromatics	NA	6.1 U	30	6.5 U	6.5 U	13	110	6.3 U	9	6.4 U	12	31 U
C21-C28 Aliphatics	NA	6.1 U	64	46	34	100	470	30	23	57	48	220
C21-C28 Aromatics	NA	6.1 U	32	8.1	7.8	19	120	12	17	11	20	31 U
C28-C36 Aliphatics	NA	6.1 U	65	53	51	91	390	30	25	63	38	31 U
C28-C36 Aromatics	NA	6.1 U	50	22	26	38	170	32 J	30 J	30 J	30 J	170 J
Total EPH		NA	278	137	119	274	1393	104 J	104 J	161 J	170 J	390 J

Key is at the end of the table.

Table 4-119

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SEDIMENT SAMPLES
(JULY 1999)
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Number	Preliminary	99070520	99070521	99070522	99070523	99070524	99070525	99070526	99070527	99070528	99070529	99070530
Sample Location	Screening	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08	SD09	SD10	SD11
Sample Date	Levels[ab]	7/28/99	7/28/99	7/28/99	7/28/99	7/28/99	7/29/99	7/29/99	7/29/99	7/29/99	7/29/99	7/29/99
Dioxin/Furans (ng/kg)												
2,3,7,8-TCDD TEQ	7.2[c]	**8.869**	**161.997**	**190.447**	**20.514**	**21.7888**	**305.394**	**53.468**	**122.248**	**9.700**	**579.932**	5.343
2,3,7,8-TCDF	NA	0.491 U	4.771	3.52	0.4 U	0.329 U	0.579 U	0.395 U	4.858	1.374	8.993	1.856 U
1,2,3,7,8-PeCDD	NA	0.568 U	5.319 U	5.929	3	1.85 U	5.553 U	4.504	8.691	2.305	53.971	2.598 U
1,2,3,7,8-PeCDF	NA	1.594	22.305 U	14.531 U	0.568 U	0.287 U	2.904 U	1.184 U	26.92 U	0.496 U	4.473 U	1.264 U
2,3,4,7,8-PeCDF	NA	1.678	22.78 U	13.698	0.575 U	1.074 U	4.237	4.09	26.214 U	0.501 U	32.741	1.278 U
1,2,3,4,7,8-HxCDD	NA	1.073 U	3.808 U	15.386 U	5.923	4.949 U	16.681	12.646	30.14	4.34	196.558	3.44 U
1,2,3,6,7,8-HxCDD	NA	15.151	223.196	185.056	30.114	29.965	79.554	87.119	446.431	13.971	803.393	14.103
1,2,3,6,7,8-HxCDF	NA	3.193 U	39.108 U	11.506	4.958 U	3.649 U	3.51	5.059	19.317	2.118 U	43.159	1.423 U
1,2,3,7,8,9-HxCDD	NA	3.598	38.472	44.913	13.779	11.366	34.804	29.155	69.562	7.971	454.109	8.66
1,2,3,7,8,9-HxCDF	NA	5.055 U	61.91 U	8.047	7.848 U	5.777 U	2.81	3.163 U	4.09	3.352 U	2.525 U	2.253 U
1,2,3,4,6,7,8-HpCDD	NA	479.469	10139.06	12912.84	885.353	977.97	25065.218	2407.607	3407.412	371.542	26154.979	232.022
1,2,3,4,6,7,8-HpCDF	NA	67.368	1951.701	683.376	173.972	163.238	421.466	579.653	1617.347	59.695	6065.149	54.344
1,2,3,4,7,8,9-HpCDF	NA	4.226	68.289	43.759	11.841	10.675	31.611	45.128	116.955	9.421 U	296.912 U	13.489 U
OCDD	NA	5377	126172.735	153224.894	17031.057	60156.579	304146.498	28980.018	43508.543	2866.511	317675.38	1912
OCDF	NA	276.109	11456.75	6422.067	1173.87	1209.836	39422.173	2989.931	3494.816	309.311	50005.429	119.636
Total HpCDD	NA	887.063	18476.967	22450.187	1527.838	1780	43456.6	4163.527	36587.21 JL	642.762	45368.097	413.616
Total HpCDF	NA	71.594	1951.701	727.135	185.812	173.913	453.077	624.781	1734.302	59.695	6065.149	54.344
Total HxCDD	NA	62.162	819.708	787.195	140.106	130.297	380.781	367.808	1575.914	74.294	3910.667 JL	71.957
Total HxCDF	NA	113.917	1798.996	1170.426	179.308	174.872	472.93	515.453	2130.009	73.145	5865.605 JH	45.829
Total PeCDD	NA	0.568 U	5.595	13.393	6.313	1.249	9.851	11.086	18.403	4.369	83.798	2.598 U
Total PeCDF	NA	23.913	336.874	289.761	44.491	31.934	90.913	88.622	383.505	29.516	755.397	1.278 U
Total TCDD	NA	0.449 U	3.397	12.423	0.29 U	0.345 U	2.231	1.618	3.175	1.92	3.785	7.3
Total TCDF	NA	0.491 U	23.039	21.212	2.569	0.558	1.741	0.395 U	14.657	2.828	28.398	1.856 U

[a] - PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

[b] - Sample Concentrations above PSLs are shaded.

[c] - EPA "Ecotox Threshold Criteria," January 1996 and Ontario Ministry of the Environment, 1993.

[d] - State of Washington Department of Ecology, "Creation and Analysis of Freshwater Sediment Quality Values in Washington State," July 1997. Minimum of the available values.

Key:

EPA	= United States Environmental Protection Agency.
HpCDD	= Heptachlorodibenzo-p-dioxin.
HpCDF	= Heptachlorodibenzofuran.
HxCDD	= Hexachlorodibenzo-p-dioxin.
HxCDF	= Hexachlorodibenzofuran.
J	= The analyte was positively identified. The associated numerical result is an estimate.
JH	= The analyte was positively identified. The associated numerical result is an estimate, biased high.
JK	= The analyte was positively identified. The associated numerical result is an estimate, biased unknown.
JL	= The analyte was positively identified. The associated numerical result is an estimate, biased low.
JQ	= The result is estimated because it is below the Contract Required Detection Limit.
mg/kg	= Milligrams per kilogram.
ng/kg	= Nanograms per kilogram.
NA	= Not applicable.
OCDD	= Octachlorodibenzo-p-dioxin.
OCDF	= Octachlorodibenzofuran.
PeCDD	= Pentachlorodibenzo-p-dioxin.
PeCDF	= Pentachlorodibenzofuran.
PSLs	= Preliminary screening levels.
TCDD	= Tetrachlorodibenzo-p-dioxin.
TCDF	= Tetrachlorodibenzofuran.
TEQ	= Toxicity equivalency quotient.
TOC	= Total organic carbon.
U	= The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.
UJK	= The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit, biased unknown.

Table 4-120

SUMMARY OF RESULTS FROM LITTLE SQUALICUM CREEK SEDIMENT BIOACCUMULATION SAMPLES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels[a]	99070521-524 (Bioaccumulation)	99070525BIO (Bioaccumulation)	Baseline Control - 02	Baseline Control
Sample Location		SD02-SD05	SD06	NA	NA
Sample Date		7/28/99	7/29/99	NA	NA
Semivolatile Organic Compounds (mg/kg) wet weight					
2,4,6-Trichlorophenol	NA	NA	0.74 J	0.13 U	NA
2-Methylphenol	NA	NA	1 J	0.13 U	NA
3&4-Methylphenol	NA	NA	3.3 J	0.27 J	NA
Anthracene	NA	NA	0.37	0.027 U	NA
Benzo(a)anthracene	NA	NA	0.17 J	0.027 U	NA
Benzo(a)pyrene	NA	NA	0.4	0.027 U	NA
Benzo(b)fluoranthene	NA	NA	0.28 J	0.027 U	NA
Benzo(j)fluoranthene	NA	NA	0.28 J	0.27 U	NA
Benzo(k)fluoranthene	NA	NA	0.28 J	0.027 U	NA
Benzoic acid	NA	NA	5.3 J	0.27 U	NA
Benzyl alcohol	NA	NA	13 J	1.5 J	NA
Chrysene	NA	NA	0.46 J	0.027 U	NA
Fluoranthene	NA	NA	1.3	0.027 U	NA
Naphthalene	NA	NA	0.11	0.027 U	NA
Pentachlorophenol	NA	NA	2.1 J	0.13 UJ	NA
Phenanthrene	NA	NA	0.48	0.027 U	NA
Phenol	NA	NA	0.34 J	0.13 U	NA
Pyrene	NA	NA	0.43 J	0.027 U	NA
Tetrachlorophenols	NA	NA	4 J	0.13 U	NA
Dioxin/Furans (ng/kg) wet weight					
2,3,7,8-TCDD TEQ	NA	36.360	NA	NA	NA
1,2,3,4,7,8-HxCDD	NA	7.394	NA	NA	0.203 U
1,2,3,6,7,8-HxCDD	NA	119.973	NA	NA	0.14 U
1,2,3,4,6,7,8-HpCDD	NA	1883.668 J	NA	NA	1.907 UJ
1,2,3,4,6,7,8-HpCDF	NA	292.156	NA	NA	0.193 U
1,2,3,4,7,8,9-HpCDF	NA	15.068	NA	NA	0.275 UJ
OCDD	NA	16282.429	NA	NA	20.121 UJ
OCDF	NA	856.699	NA	NA	0.801 UJ
Total TCDD	NA	11.216	NA	NA	0.128 U
Total TCDF	NA	30.113	NA	NA	0.182 U
Total PeCDD	NA	6.804	NA	NA	0.197 U
Total PeCDF	NA	231.341	NA	NA	0.166 U
Total HxCDD	NA	346.827	NA	NA	0.14 U
Total HxCDF	NA	982.512	NA	NA	0.141 U
Total HpCDD	NA	3346.225	NA	NA	1.358
Total HpCDF	NA	307.225	NA	NA	1.274

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

Key:

EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
HpCDF = Heptachlorodibenzofuran.
HxCDD = Hexachlorodibenzo-p-dioxin.
HxCDF = Hexachlorodibenzofuran.
J = The analyte was positively identified. The associated numerical result is an estimate.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PeCDD = Pentachlorodibenzo-p-dioxin.
PeCDF = Pentachlorodibenzofuran.
PSLs = Preliminary screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TCDF = Tetrachlorodibenzofuran.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
UJ = The material was analyzed for, but was not detected. The associated value is the estimated sample quantitation limit.

Table 4-121

SUMMARY OF RESULTS FROM BERRIES
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

EPA Sample Number	Preliminary Screening Levels [a]	99080024	99080025	99080027	99080026	99080032	99080033	99080034	99080035
Sample Location		Berry4	Berry4	Berry3	Berry3	Berry2	Berry2	Berry1	Berry1
Description		Washed	Unwashed	Washed	Unwashed	Washed	Unwashed	Washed	Unwashed
Sample Date		8/20/99	8/20/99	8/20/99	8/20/99	8/20/99	8/20/99	8/20/99	8/20/99
Volatile Organic Compounds (mg/kg) wet weight									
p-Isopropyltoluene	NA	0.027 J	0.013	0.012 J	0.018	0.013	0.015 J	0.003	0.0067
Styrene	NA	0.0045	0.00061	0.0013	0.0022	0.00018 J	0.00022 J	0.0003 U	0.00034 J
Semivolatile Organic Compounds (mg/kg) wet weight									
1,2,3-Trichlorobenzene	NA	0.00033	0.00035 U	0.00032 UJ	0.00034 U	0.00036 U	0.00032 UJ	0.0003 U	0.00036 U
2-Methylnaphthalene	NA	0.0013 U	0.0013 U	0.0017	0.0011 J	0.0017	0.002	0.0013 U	0.0019 U
Benzoic acid	NA	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.032
Benzyl alcohol	NA	0.0063 U	0.0065 U	0.063	0.063	0.0065 U	0.04	0.056	0.06
Fluoranthene	NA	0.0041	0.0013 U	0.0012 J	0.0013 U	0.0013 U	0.0027 U	0.0047	0.0058
Fluorene	NA	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0032	0.0033
Naphthalene	NA	0.00033 U	0.00035 U	0.00032 UJ	0.00034 U	0.00036 U	0.00032 UJ	0.0003 U	0.00036 U
Phenanthrene	NA	0.0086	0.011	0.0053	0.0053	0.0087	0.0072	0.015	0.016
Phenol	NA	0.0063 U	0.0065 U	0.0065 U	0.009	0.0065 U	0.0065 U	0.0066 U	0.004 J
Pyrene	NA	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0037
Dioxin/Furans (ng/kg) wet weight									
2,3,7,8-TCDD TEQ	NA	NA	0.002	0.002	0.012	0.002	0.030	0.001	0.003
1,2,3,4,6,7,8-HpCDD	NA	0.924 U	0.922 U	2.209 U	1.065	1.591 U	2.695	1.498 U	3.186 U
OCDD	NA	10.892 U	17.724	22.021	9.447	17.835	31.07	14.469	30.419
OCDF	NA	0.913 U	0.871 U	1.035 U	2.519 U	1.457 U	2.905	1.356 U	2.715
Total HpCDD	NA	0.924 U	0.922 U	1.197 U	1.065	1.591 U	5.036	1.498 U	0.601 U

[a] PSLs criteria are provided herein only as a reference point against which to compare on-site and background analyte concentrations.

Key:

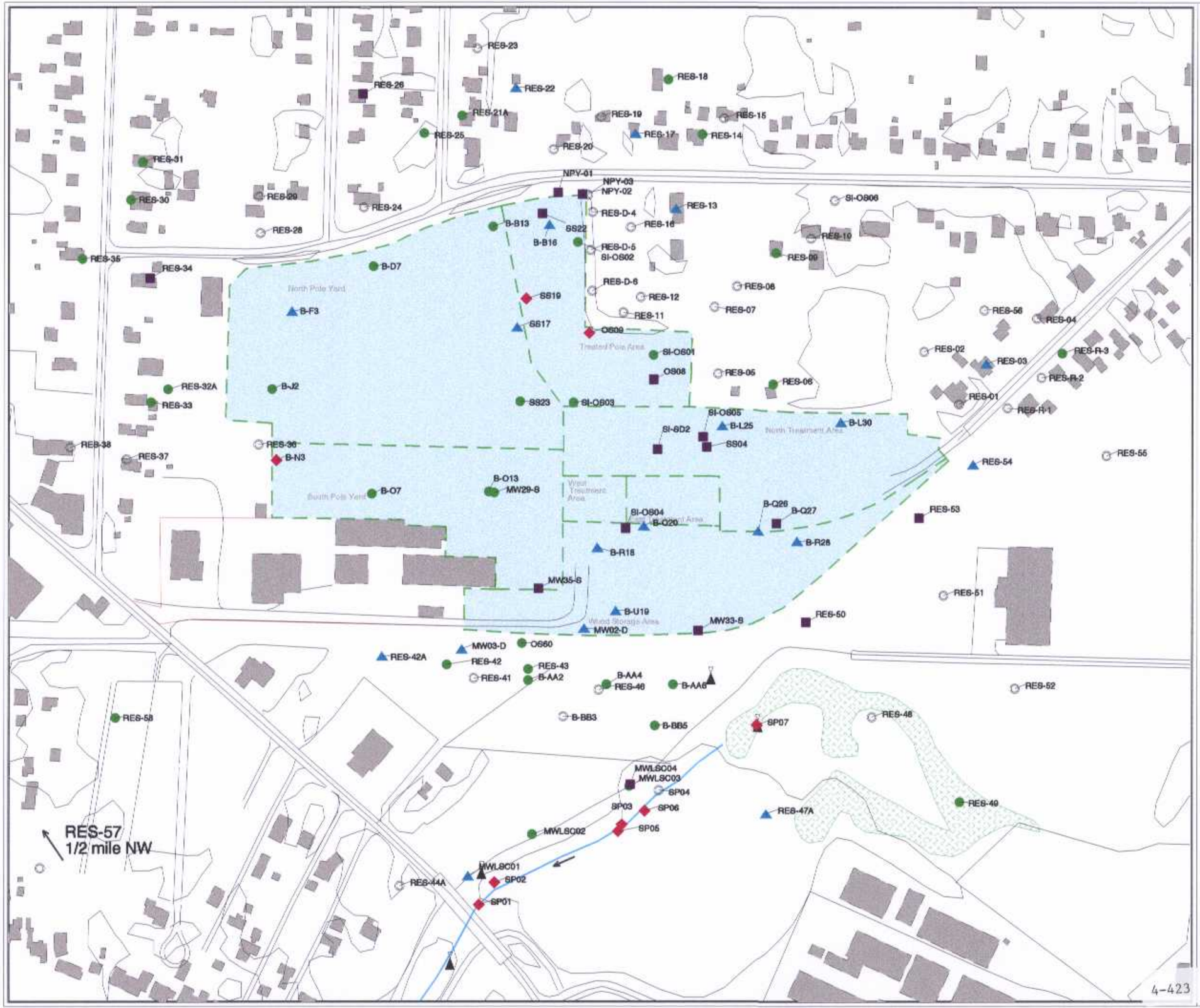
EPA = United States Environmental Protection Agency.
HpCDD = Heptachlorodibenzo-p-dioxin.
J = The analyte was positively identified. The associated numerical result is an estimate.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ng/kg = Nanograms per kilogram.
OCDD = Octachlorodibenzo-p-dioxin.
OCDF = Octachlorodibenzofuran.
PSLs = Preliminary screening levels.
TCDD = Tetrachlorodibenzo-p-dioxin.
TEQ = Toxicity equivalency quotient.
U = The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

Figure 4-1

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation



Total cPAH as B(a)P Equivalents in Surface Soil Concentration

LEGEND

- Not Detected
- < .062 mg/Kg
- => .062 and < .62 mg/Kg
- => .62 and < 6.2 mg/Kg
- => 6.2 mg/Kg
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-2

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total ncPAH
in Surface Soil
Concentration

LEGEND

- Not Detected
- < 1 mg/Kg
- => 1 and < 100 mg/Kg
- => 100 and < 1000 mg/Kg
- => 1000 mg/Kg
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

RES-57
1/2 mile NW

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Figure 4-3

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

2,3,7,8-TCDD TEQ in Surface Soil Concentration

LEGEND

- Not Detected
- < 3.9 ng/Kg
- => 3.9 and < 39 ng/Kg
- => 39 and < 390 ng/Kg
- => 390 ng/Kg
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

RES-57
1/2 mile NW

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Figure 4-4

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Pentachlorophenol in Surface Soil Concentration

LEGEND

- Not Detected
- < 2.98 mg/Kg
- => 2.98 and < 29.8 mg/Kg
- => 29.8 and < 298 mg/Kg
- => 298 mg/Kg
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1996 EPA, Region 9, Preliminary Remediation Goals table.

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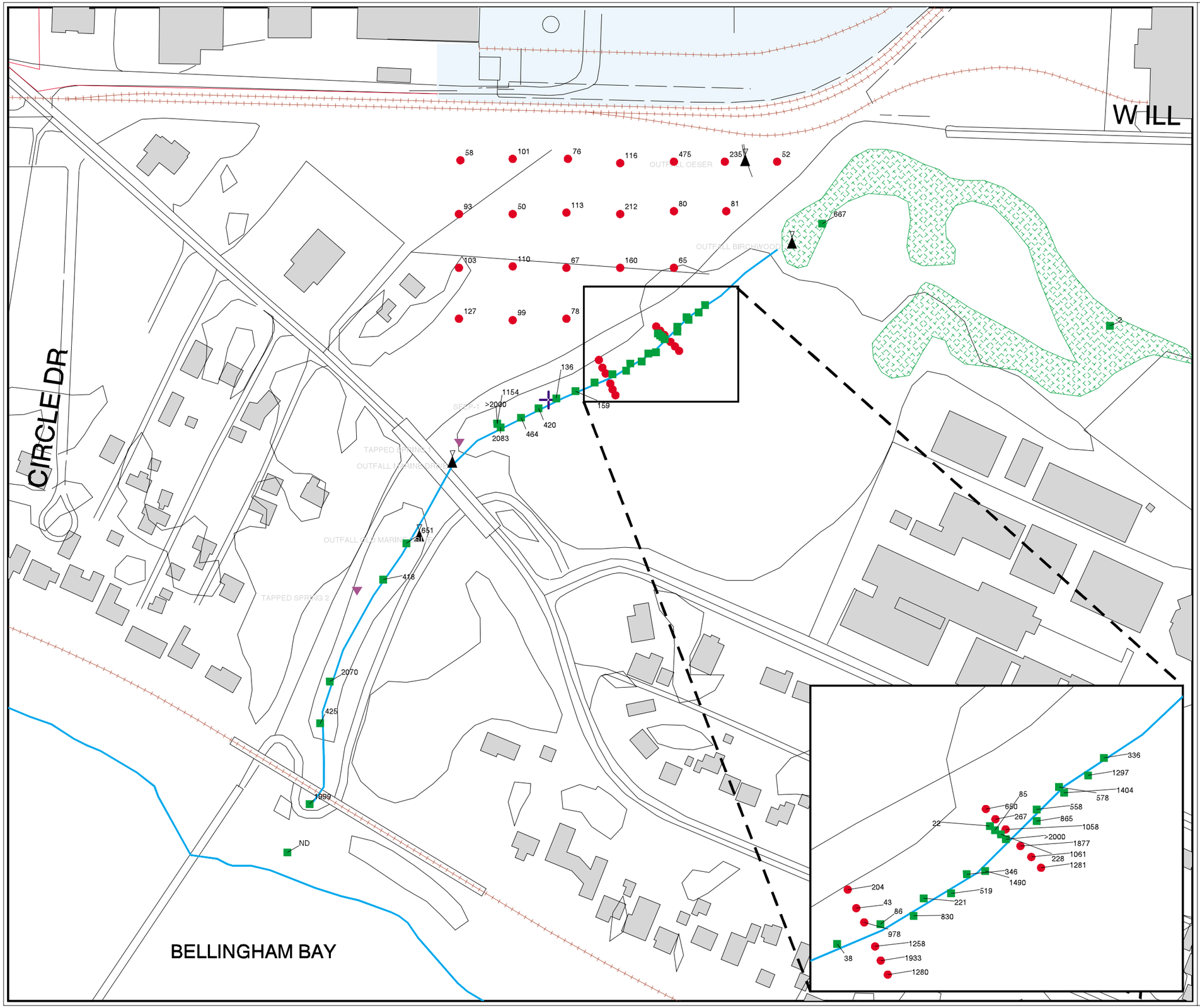
Figure 4-5

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

TPH Concentration in South Slope
Little Squalicum Creek
Surface Soil



Legend

- The Oeser Company Facility
- Wetlands
- Surface Soil Field Screening Location
- Suspected Spoils Field Screening Location
- Outfall Location
- Seep Location
- Tapped Spring Location

N
W E
S

0 100 200 300 400 500
Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

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/data1/oeser/rfs/fig4-5.aml

Figure 4-6

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total cPAH as B(a)P Equivalents in Subsurface Soil < 6 feet bgs. Concentration

LEGEND

- Not Detected
- < .062 mg/Kg
- => .062 and < .62 mg/Kg
- => .62 and < 6.2 mg/Kg
- => 6.2 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N

W E

S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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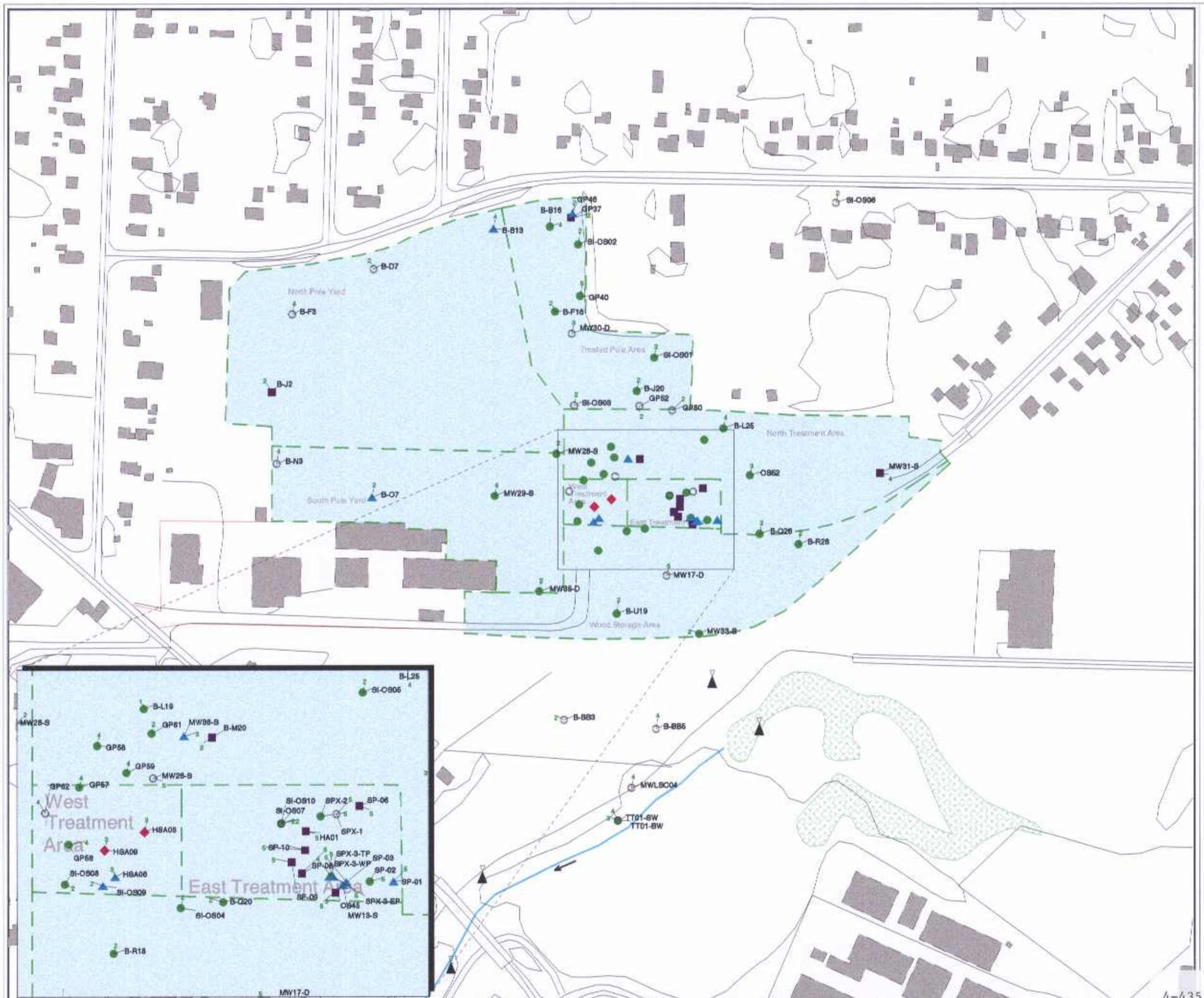

Figure 4-7

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total ncPAH
in Subsurface Soil < 6 feet bgs.
Concentration

LEGEND

- Not Detected
- < 1 mg/Kg
- => 1 and < 100 mg/Kg
- => 100 and < 1000 mg/Kg
- => 1000 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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Figure 4-8

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

2,3,7,8-TCDD TEQ in Subsurface Soil < 6 feet bgs. Concentration

LEGEND

- Not Detected
- < 3.9 ng/Kg
- => 3.9 and < 39 ng/Kg
- => 39 and < 390 ng/Kg
- => 390 ng/Kg
- Outfalls
- Depth bgs (feet)
- Location

N

W E

S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-9

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Pentachlorophenol in Subsurface Soil < 6 feet bgs. Concentration

LEGEND

- Not Detected
- < 2.98 mg/Kg
- => 2.98 and < 29.8 mg/Kg
- => 29.8 and < 298 mg/Kg
- => 298 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N

W E

S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-10

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total cPAH as B(a)P Equivalents in Subsurface Soil 6 to < 12 feet bgs. Concentration

LEGEND

- Not Detected
- < .062 mg/Kg
- => .062 and < .62 mg/Kg
- => .62 and < 6.2 mg/Kg
- => 6.2 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N

W E

S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-11

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total ncPAH
in Subsurface Soil 6 to < 12 feet bgs.
Concentration

LEGEND

- Not Detected
- < 1 mg/Kg
- => 1 and < 100 mg/Kg
- => 100 and < 1000 mg/Kg
- => 1000 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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4-443

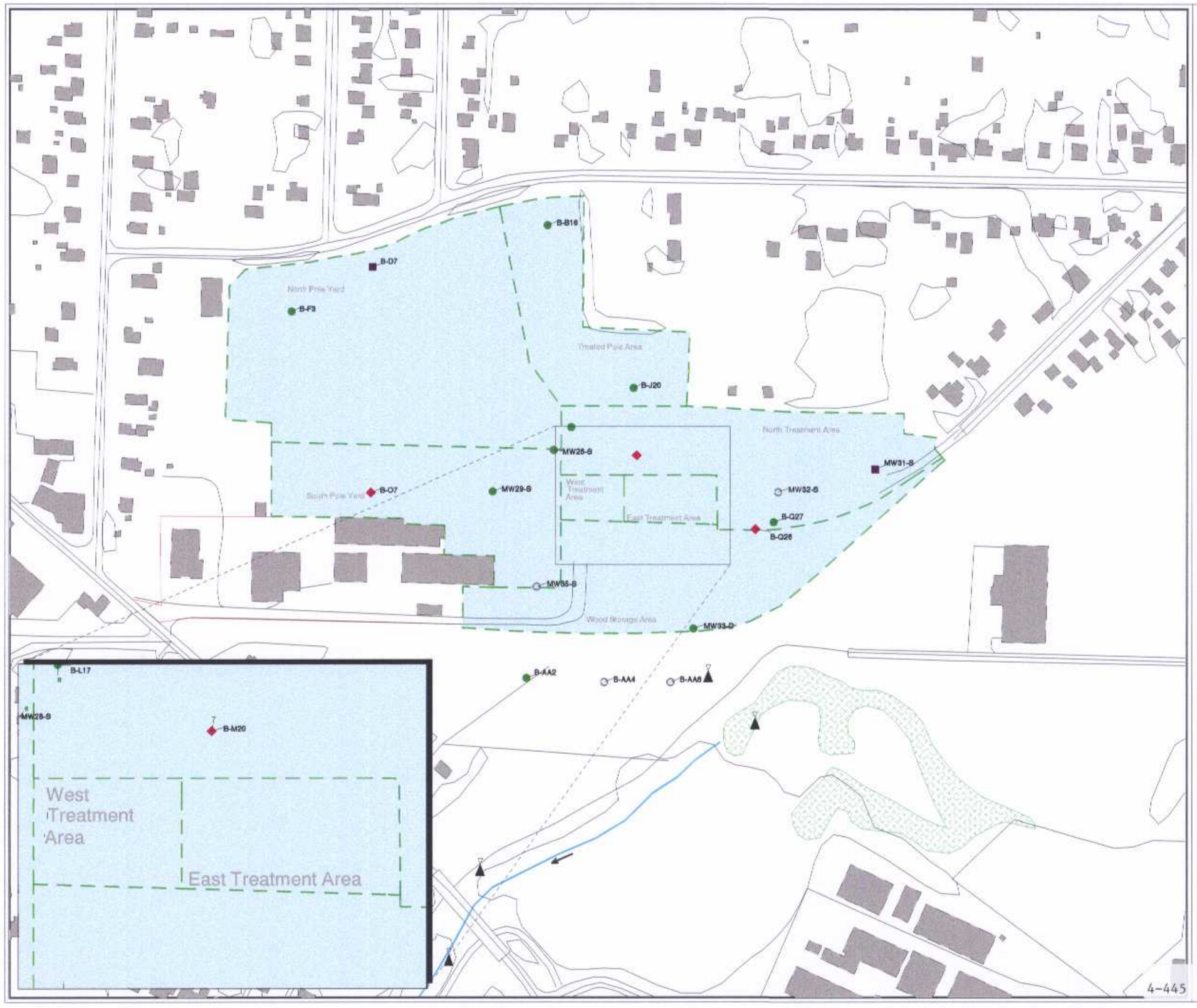

Figure 4-12

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

2,3,7,8-TCDD TEQ
in Subsurface Soil 6 to < 12 feet bgs.
Concentration

LEGEND

- Not Detected
- < 3.9 ng/Kg
- => 3.9 and < 39 ng/Kg
- => 39 and < 390 ng/Kg
- => 390 ng/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W
E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-13

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Pentachlorophenol
in Subsurface Soil 6 to < 12 feet bgs.
Concentration

LEGEND

- Not Detected
- < 2.98 mg/Kg
- => 2.98 and < 29.8 mg/Kg
- => 29.8 and < 298 mg/Kg
- => 298 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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4-447

Figure 4-14

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total cPAH as B(a)P Equivalents in Subsurface Soil >= 12 feet bgs. Concentration

LEGEND

- Not Detected
- < .062 mg/Kg
- => .062 and < .62 mg/Kg
- => .62 and < 6.2 mg/Kg
- => 6.2 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N

W E

S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-15

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Total ncPAH
in Subsurface Soil >= 12 feet bgs.
Concentration

LEGEND

- Not Detected
- < 1 mg/Kg
- => 1 and < 100 mg/Kg
- => 100 and < 1000 mg/Kg
- => 1000 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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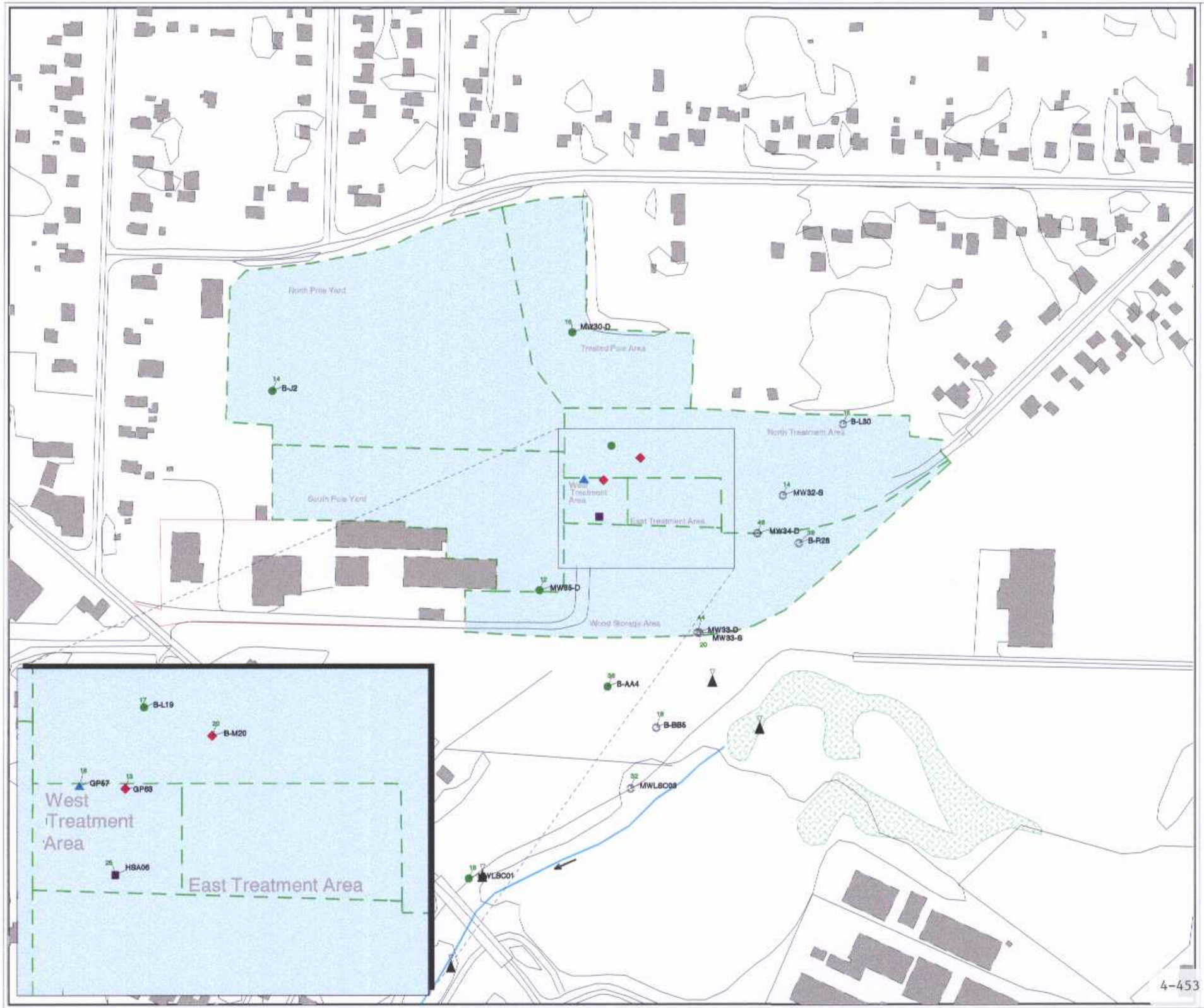

Figure 4-16

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

2,3,7,8-TCDD TEQ
in Subsurface Soil >= 12 feet bgs.
Concentration

LEGEND

- Not Detected
- < 3.9 ng/Kg
- => 3.9 and < 39 ng/Kg
- => 39 and < 390 ng/Kg
- => 390 ng/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-17

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Pentachlorophenol
in Subsurface Soil >= 12 feet bgs.
Concentration

LEGEND

- Not Detected
- < 2.98 mg/Kg
- => 2.98 and < 29.8 mg/Kg
- => 29.8 and < 298 mg/Kg
- => 298 mg/Kg
- Outfalls
- Depth bgs (feet)
- Location

N
W E
S

0 100 200 300 400 600

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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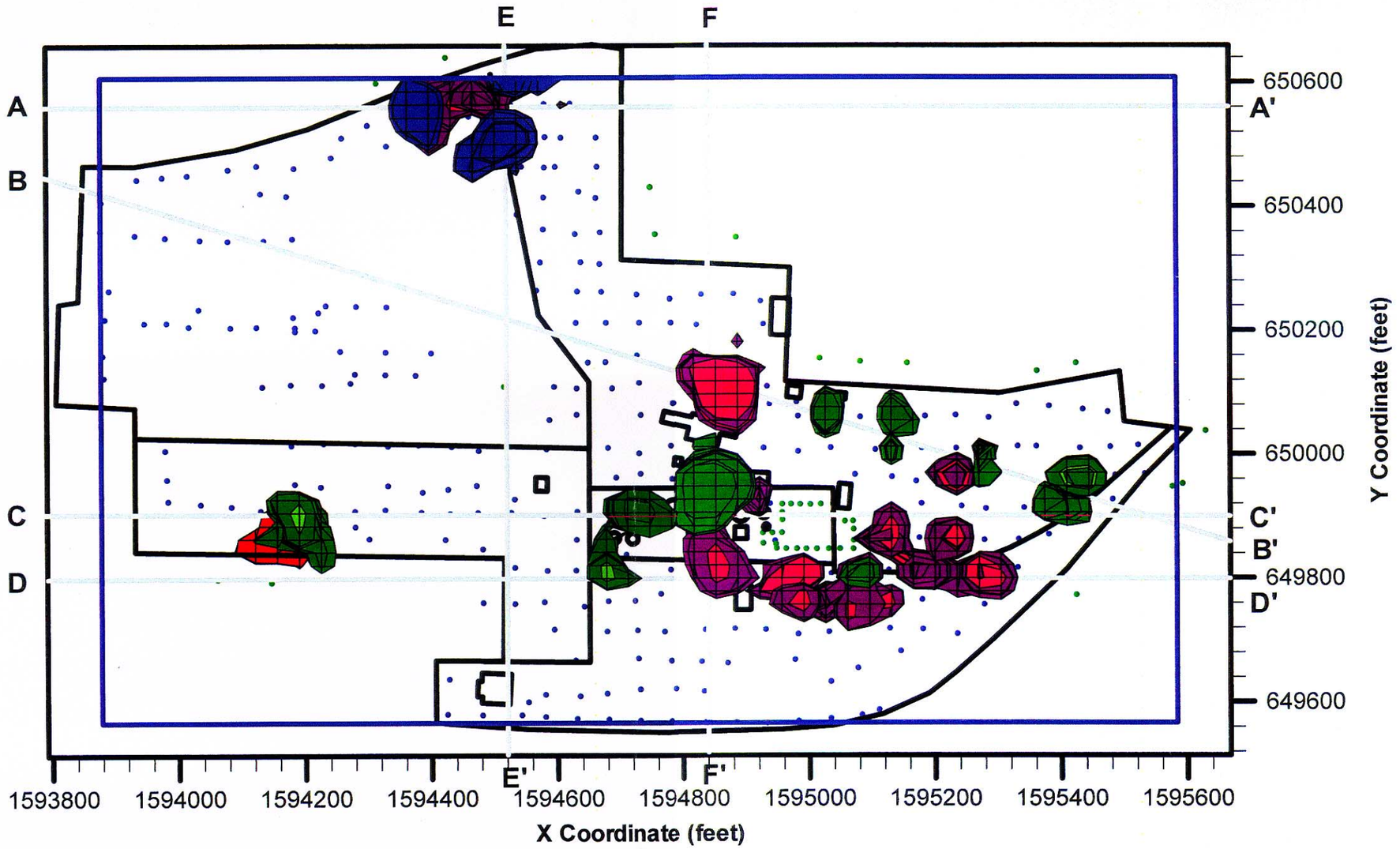


KEY

Diesel	Diesel/Creosote Mixture	Gasoline	Creosote
>5	>5	>5	>5
1-5	3-5	1-5	2-5
<1	<3	<1	<2

Units = percent of calibration standard

A — A' Cross Section Location

X and Y coordinates are in Washington State Plane North, North American Datum 1927

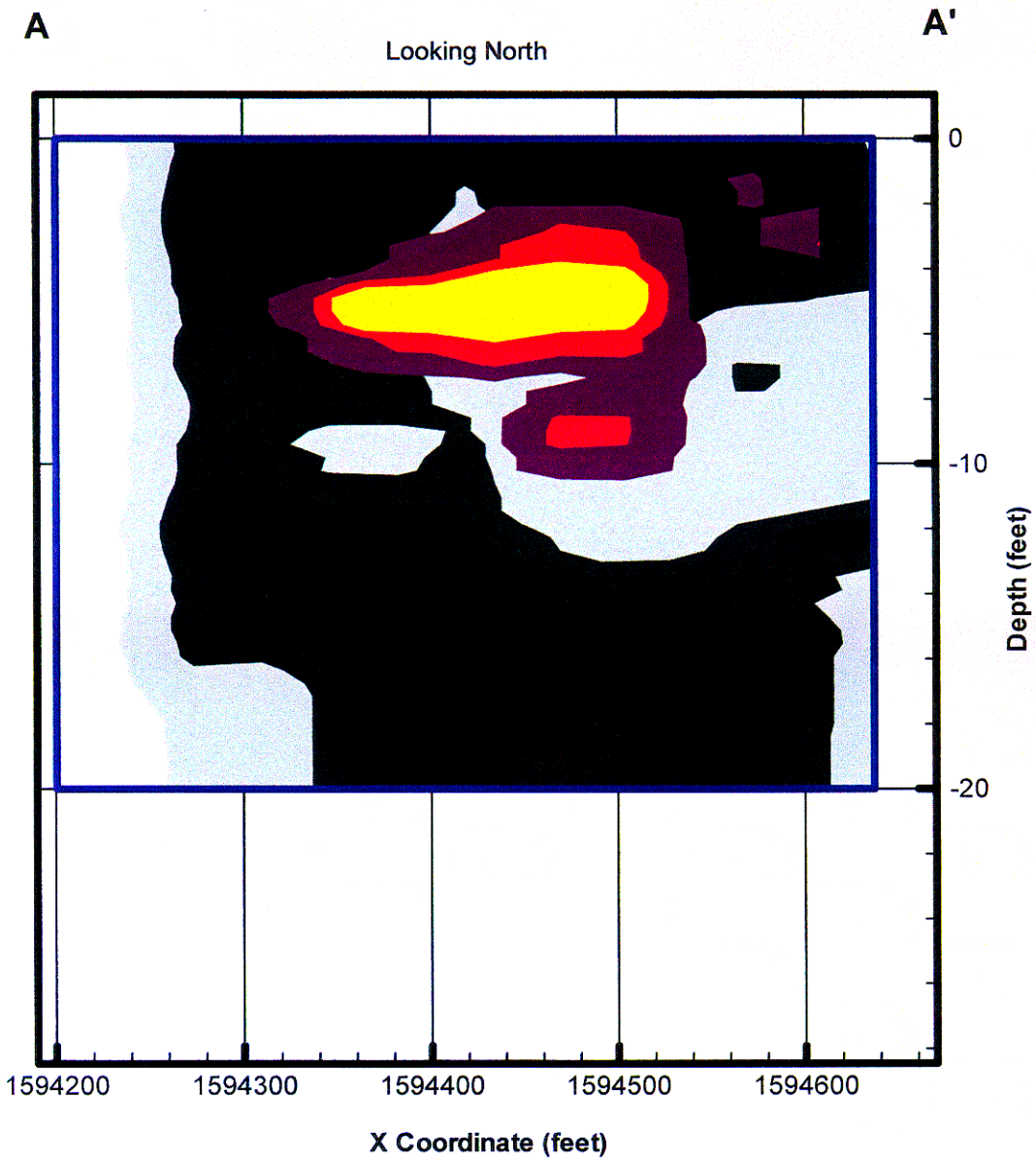
- Cone Penetrometer Test Boring Location
- Blanking Point
- Facility Boundary
- Data Boundary

0 100 200
Scale in Feet

FIGURE 4-18
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Tool Results: Map View

The Oeser Company
R vestigation
JE 4-457 Border.DWG, 9/00

Pacific Groundwater Group



KEY

Diesel/Creosote Mixture
- >5
- 3-5
- <3

Geology
- Clay
- Silt
- Sand
- Gravel

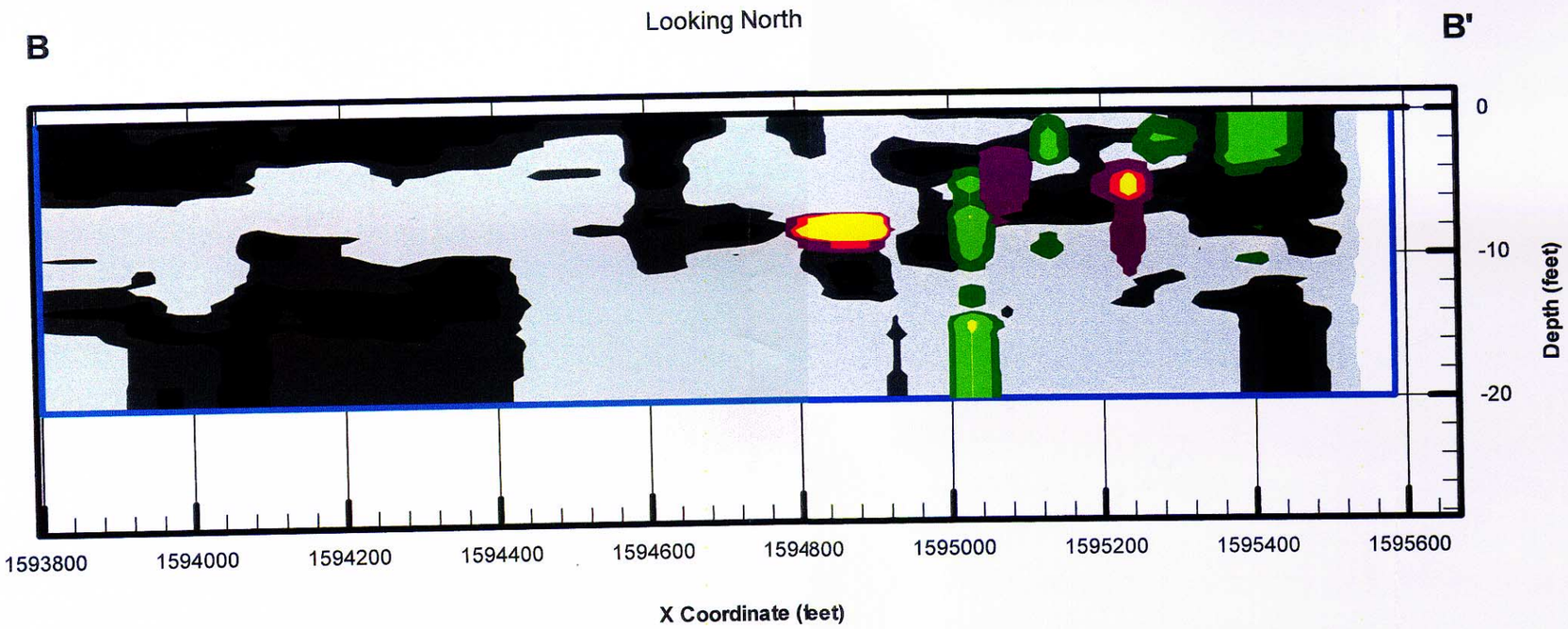
X Coordinates are in Washington State Plane North, North American Datum 1927. Units are % of calibration standard

0 50 100
Scale in Feet

FIGURE 4- 19
Cone Penetrometer - Laser Induced Fluorescence - Rapid Optical Screening Results: Cross-Section A - A'

The Oeser Company
Remedial Investigation
JE9803, Section A Border.dwg, 9/00

Pacific Groundwater Group



KEY

Diesel/Creosote Mixture
- >5
- 3-5
- <3

Creosote
- >5
- 2-5
- <2

Geology
- Clay
- Silt
- Sand
- Gravel

Units = percent of calibration standard

X coordinates are in Washington State Plane North, North American Datum 1927

0 100 200
Scale in Feet

FIGURE 4-20
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Tool Results: Cross-Section B - B'

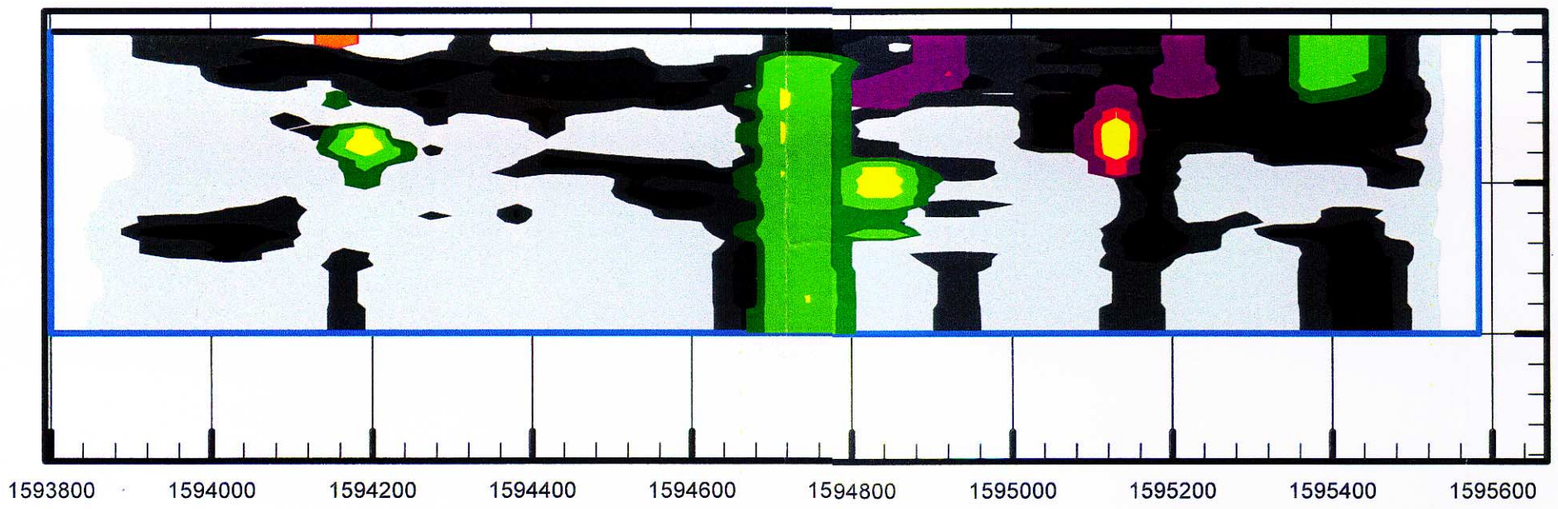
The Oeser Company
Remedial Investigation
Jl... border.DWG, 9/00

Pacific Groundwater Group

C

Looking North

C'



KEY

Diesel/Creosote Mixture
- >5
- 3-5
- <3

Gasoline
- >5
- 1-5
- <1

Creosote
- >5
- 2-5
- <2

Geology
- Clay
- Silt
- Sand
- Gravel

Units = percent of calibration standard

X coordinates are in Washington State Plane North, North American Datum 1927

0 100 200
Scale In Feet

FIGURE 4- 21
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Tool Results: Cross-Section C - C'

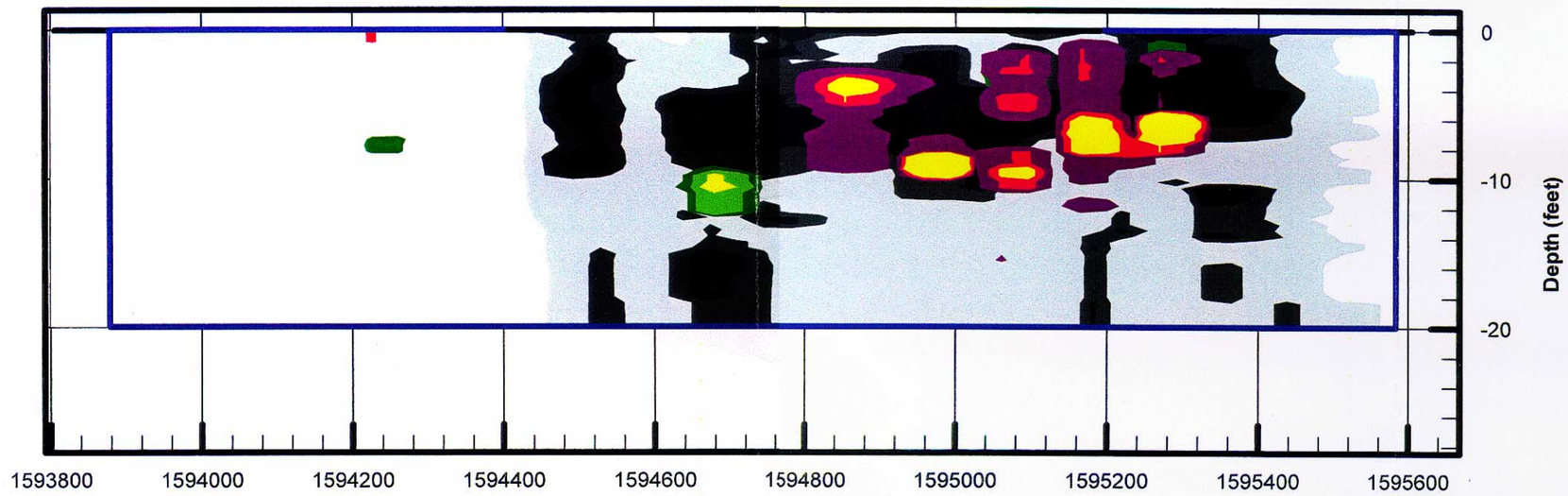
The Oeser Company
Remedial Investigation
C Border.DWG, 9/00

Pacific Groundwater Group

D

Looking North

D'



KEY

Diesel/Creosote Mixture
- >5
- 3-5
- <3

Gasoline
- >5
- 1-5
- <1

Creosote
- >5
- 2-5
- <2

Geology
- Clay
- Silt
- Sand
- Gravel

Units = percent of calibration standard

X coordinates are in Washington State Plane North, North American Datum 192'

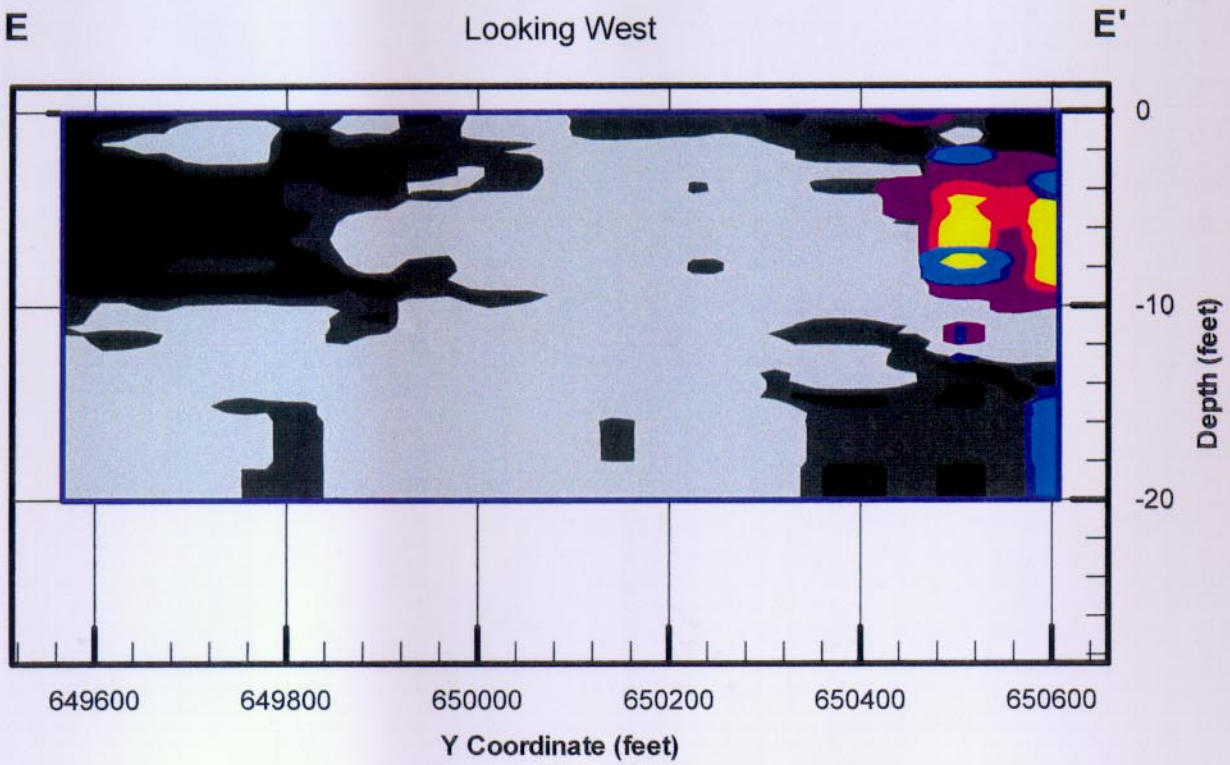
0 100 200
Scale in Feet

FIGURE 4- 22
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Tool Results: Cross-Section D - D'

The Oeser Company
Remedial Investigation

JES 4 Border.DWG, 9/00

Pacific Groundwater Group



KEY

Diesel
>5
1-5
<1

Diesel/Creosote Mixture
>5
3-5
<3

Geology
Clay
Silt
Sand
Gravel

Y Coordinates are in Washington State Plane North, North American Datum, 1927

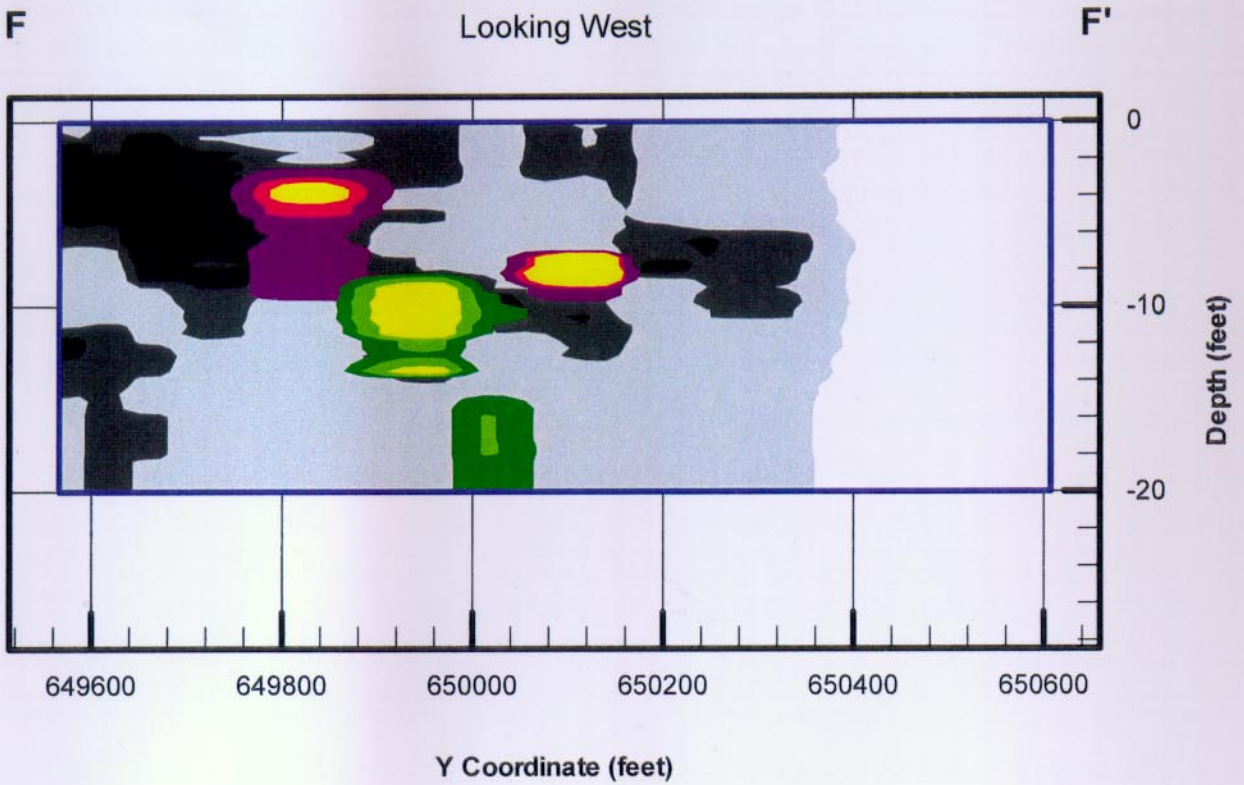
Units = percent of calibration standard

0 100 200

FIGURE 4- 23
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Results: Cross-Section E - E'

The Oeser Company

Pacific Groundwater



KEY

Diesel/Creosote Mixture
>5
3-5
<3

Creosote
>5
2-5
<2

Geology
Clay
Silt
Sand

Y Coordinates are in Washington State Plane North, North American Datum, 1927

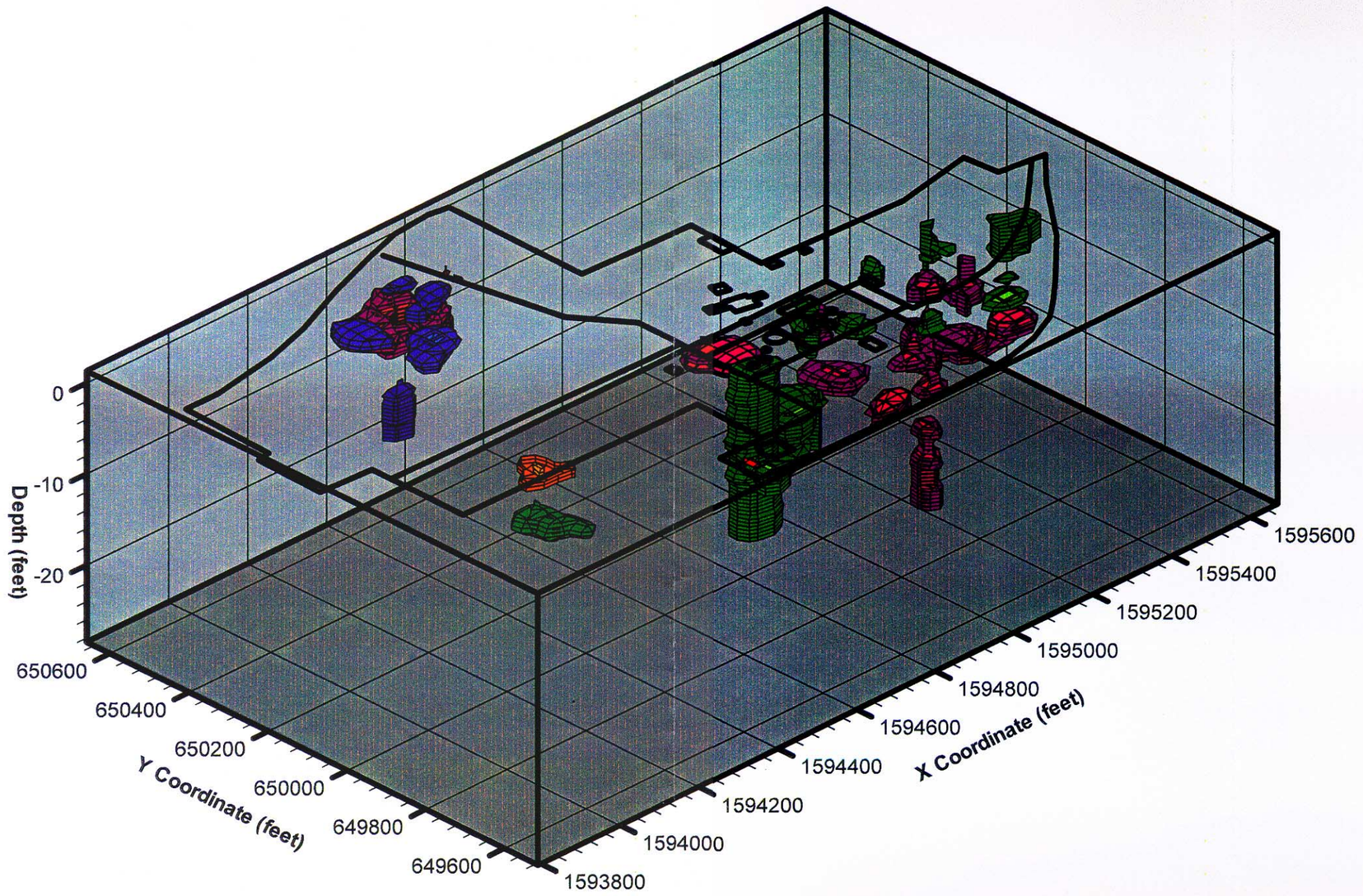
Units = percent of calibration standard

0 100 200

FIGURE 4- 24
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Results: Cross-Section F - F'

The Oeser Company

Pacific



KEY

Diesel	Diesel/Creosote Mixture	Gasoline	Creosote
>5	>5	>5	>5
1-5	3-5	1-5	2-5
<1	<3	<1	<2

Units = percent of calibration standard

— Facility Boundary

X and Y coordinates are in Washington State Plane North, North American Datum 1927

0 150 300
Scale in Feet

FIGURE 4- 25
Cone Penetrometer - Laser-Induced Fluorescence - Rapid Optical Screening Tool Results: Oblique View

The Oeser Company
P... Investigation
J... ue Border.DWG, 9/00

Pacific Groundwater Group

Figure 4-26

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

Piezometer Location Map

North Pole Yard

Treated Pole Area

Treatment Area

South Pole Yard

West Treatment Area

East Treatment Area

Wood Storage Area

PZ-H21
PZ-I21
PZ-J20
PZ-J22
PZ-K17
PZ-K19
PZ-L15
PZ-L17
PZ-L24
PZ-M19
PZ-M20
PZ-M16
PZ-M22
PZ-N26
PZ-O13
PZ-P14
PZ-Q14
PZ-P27
PZ-R25
PZ-S16
PZ-S14
PZ-T22
PZ-T16
PZ-T24

Legend

- The Oeser Company Facility
- Piezometer Location (wet)
- Piezometer Location (dry)

N
W
E
S

0 150 300 450 600

Feet

MAP SOURCE

City of Bellingham - Department of Public Works
Topographic Data Date: 1988

Oeser Company Site Map
Larry Steele & Associates
Survey Date: 12/3/1997

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/data1/oeser/rifs/fig4-26.aml

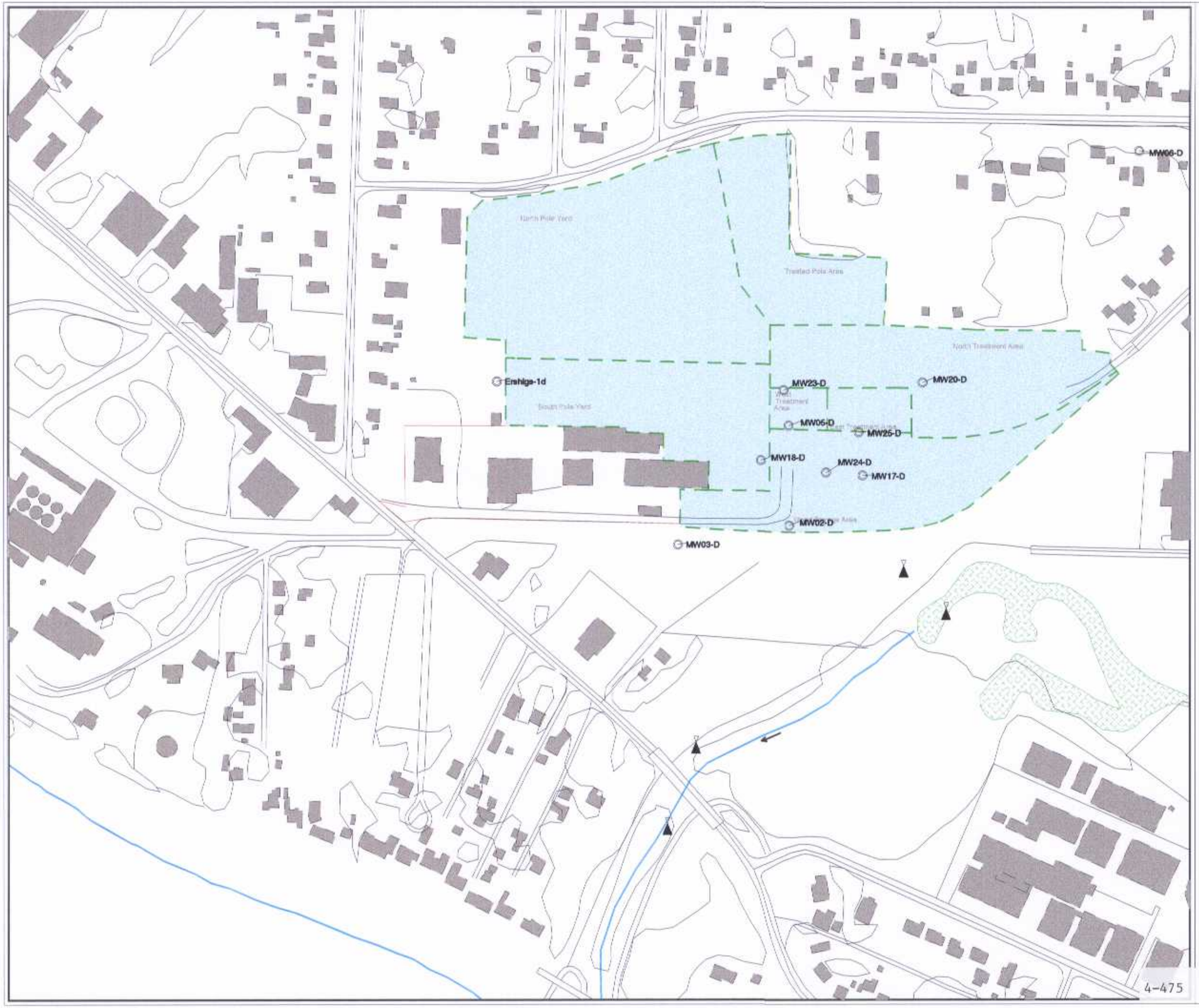

Figure 4-27

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

Total cPAH as B(a)P Equivalents in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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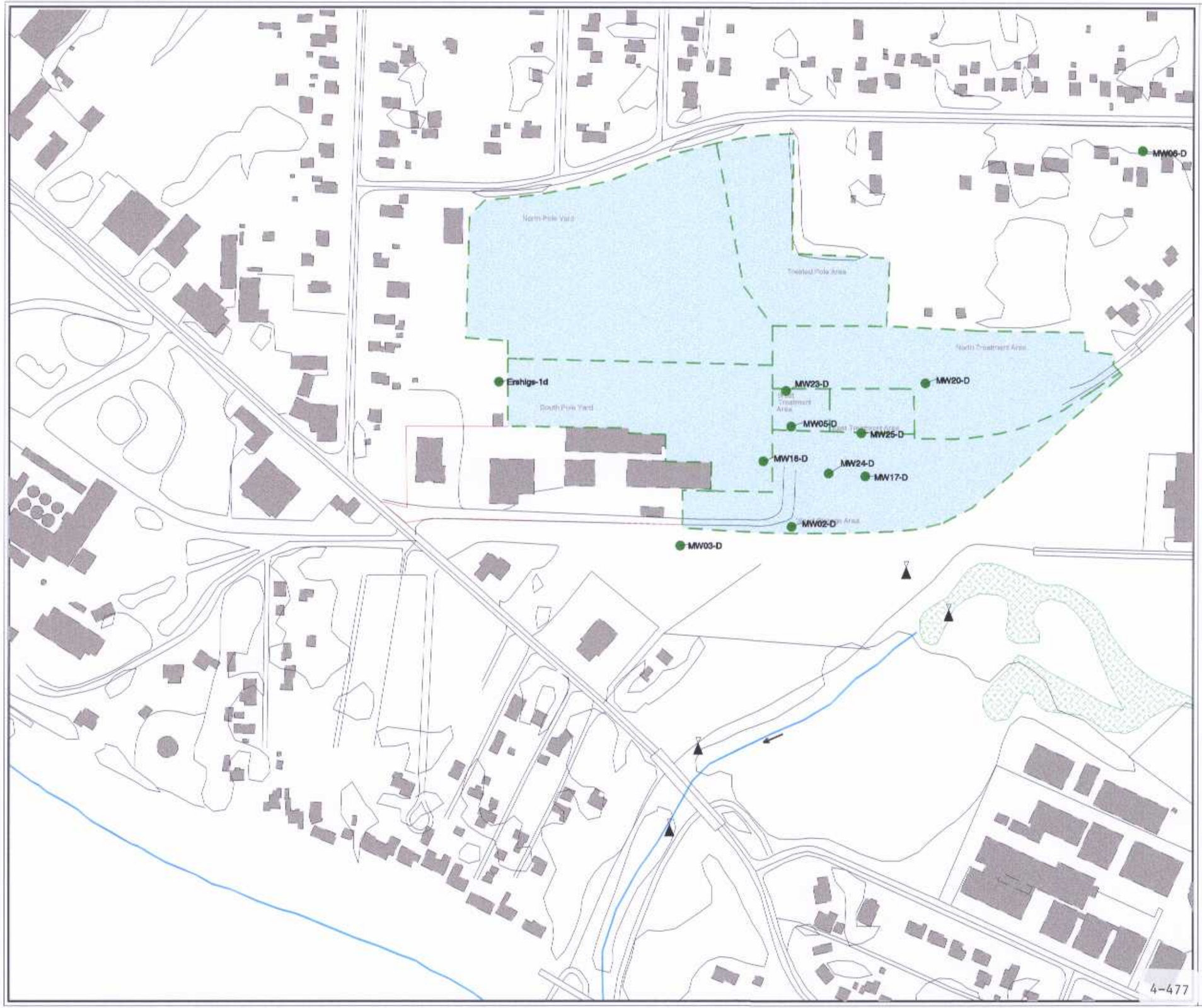

Figure 4-28

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

Total ncPAH in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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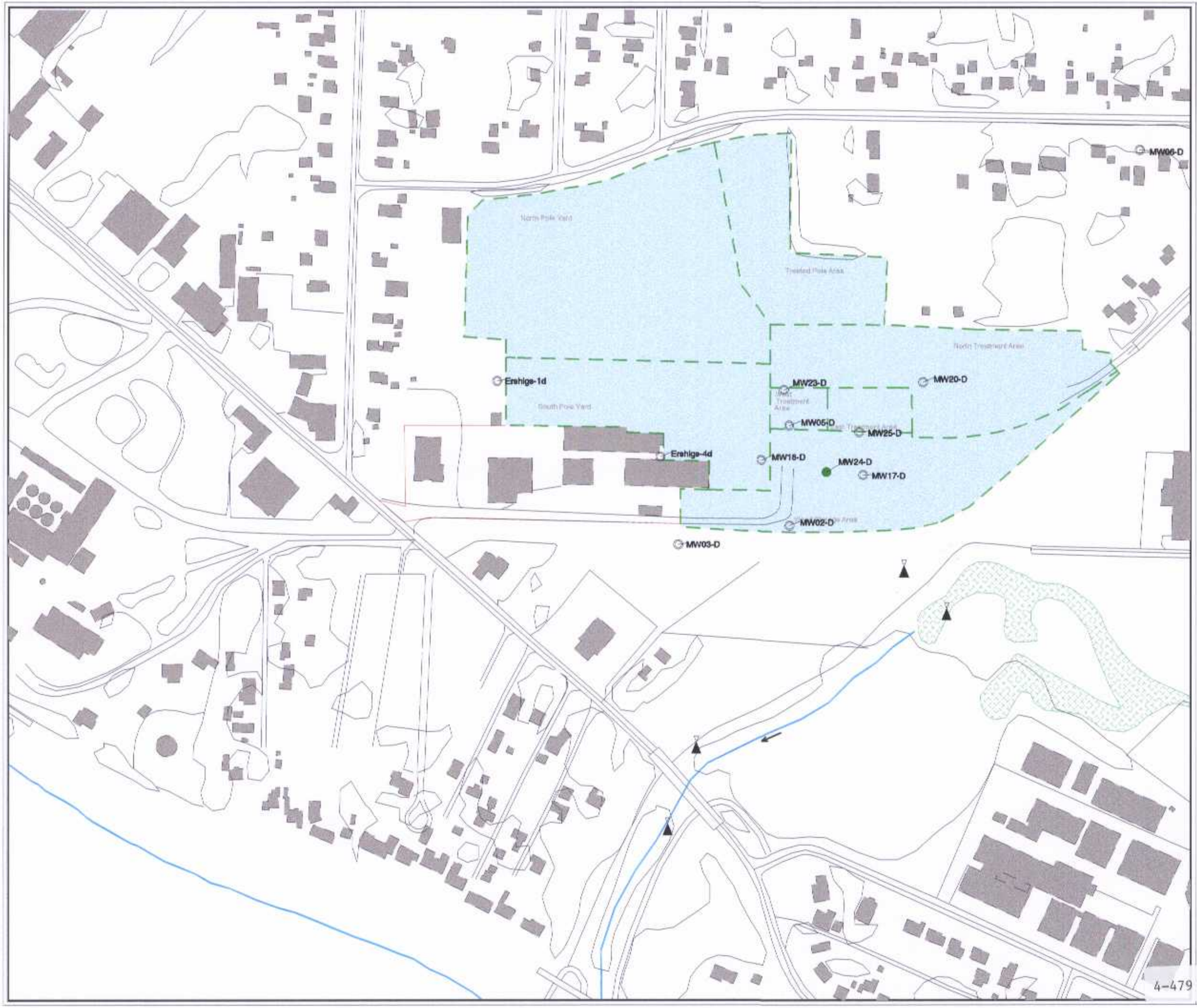

Figure 4-29

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

2,3,7,8-TCDD TEQ in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls

N

W E

S

0 100 200 300 400 600

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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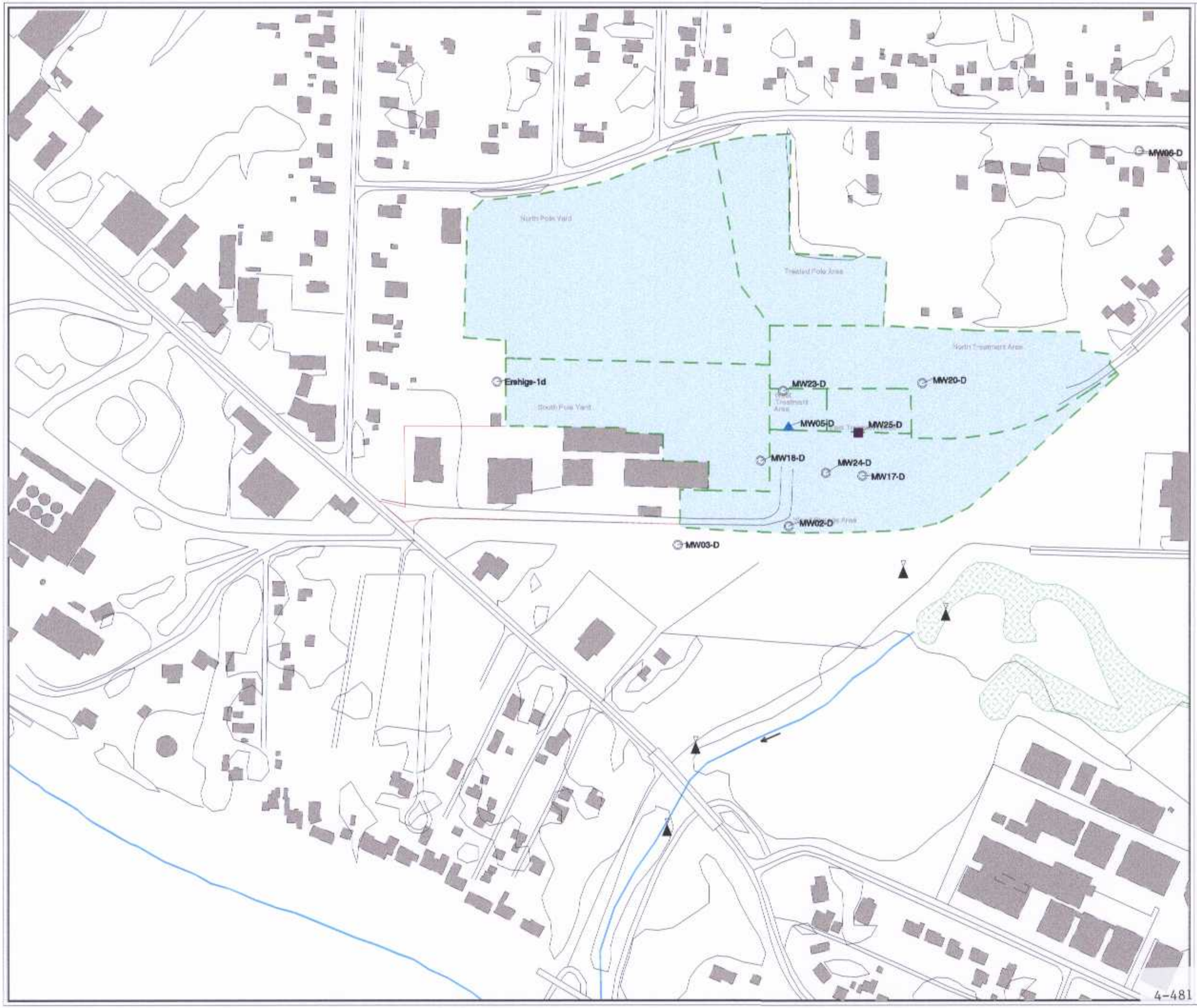

Figure 4-30

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

Pentachlorophenol in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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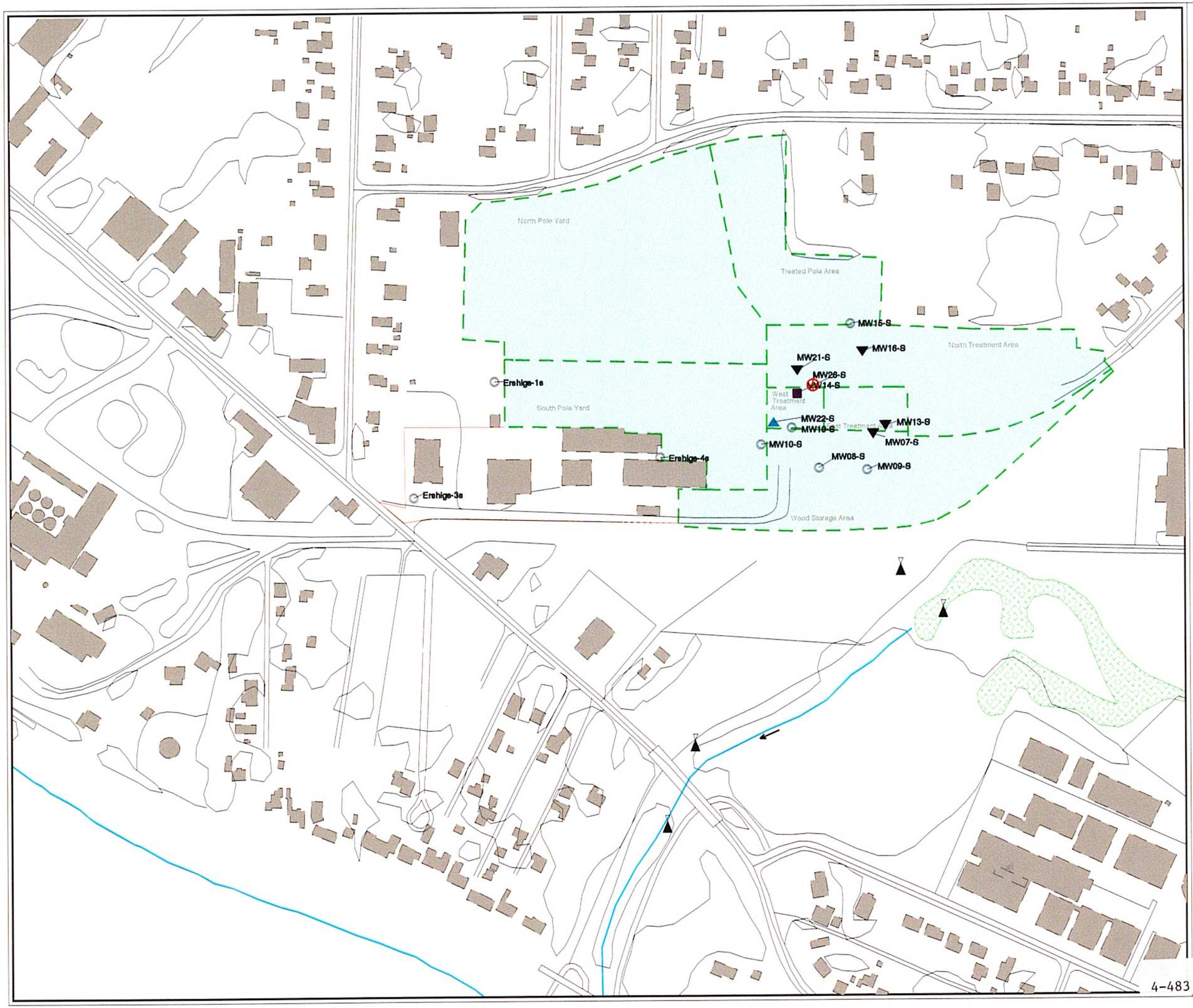

Figure 4-31

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

Total cPAH as B(a)P Equivalents in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N

W E

S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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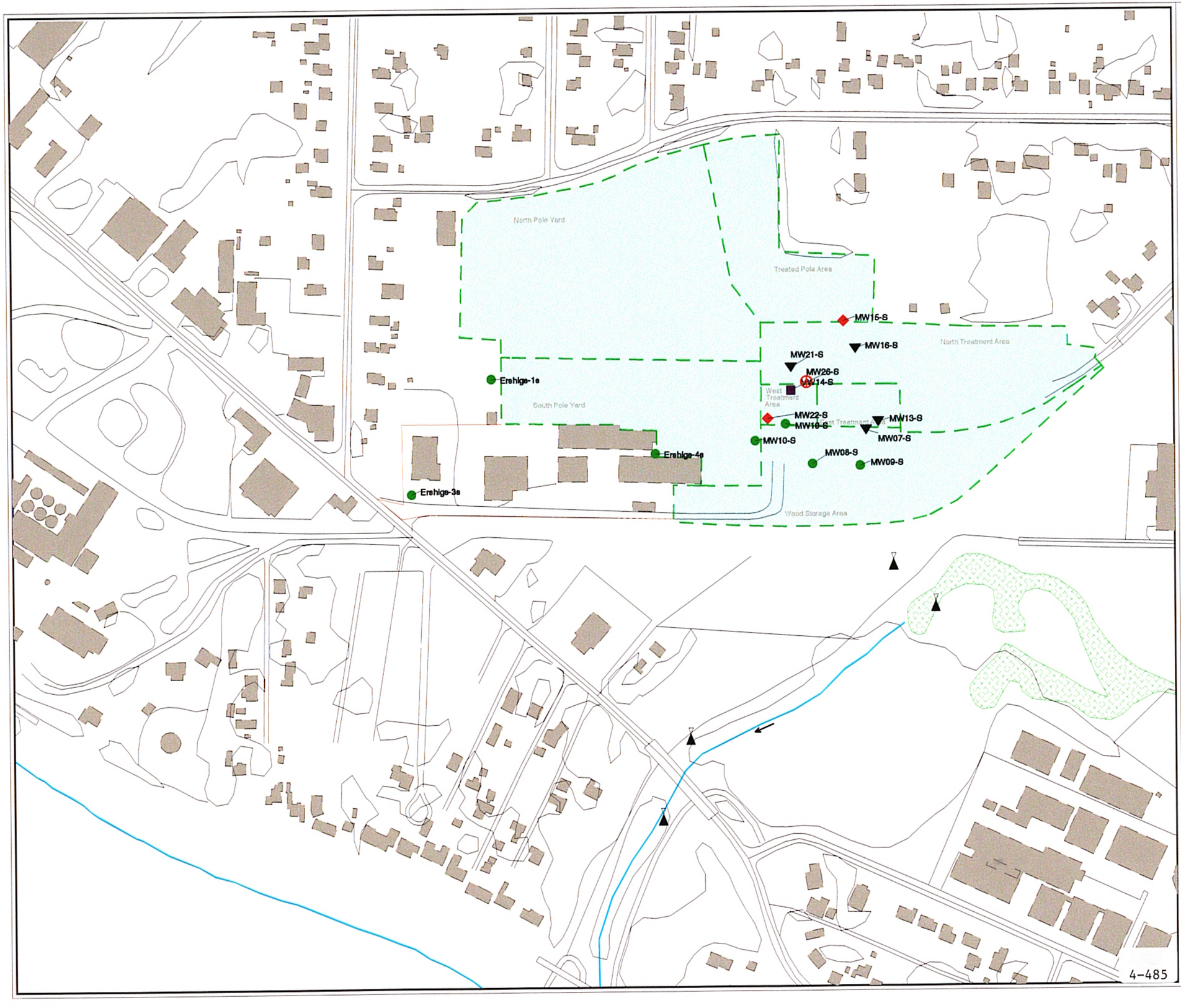

Figure 4-32

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

Total ncPAH in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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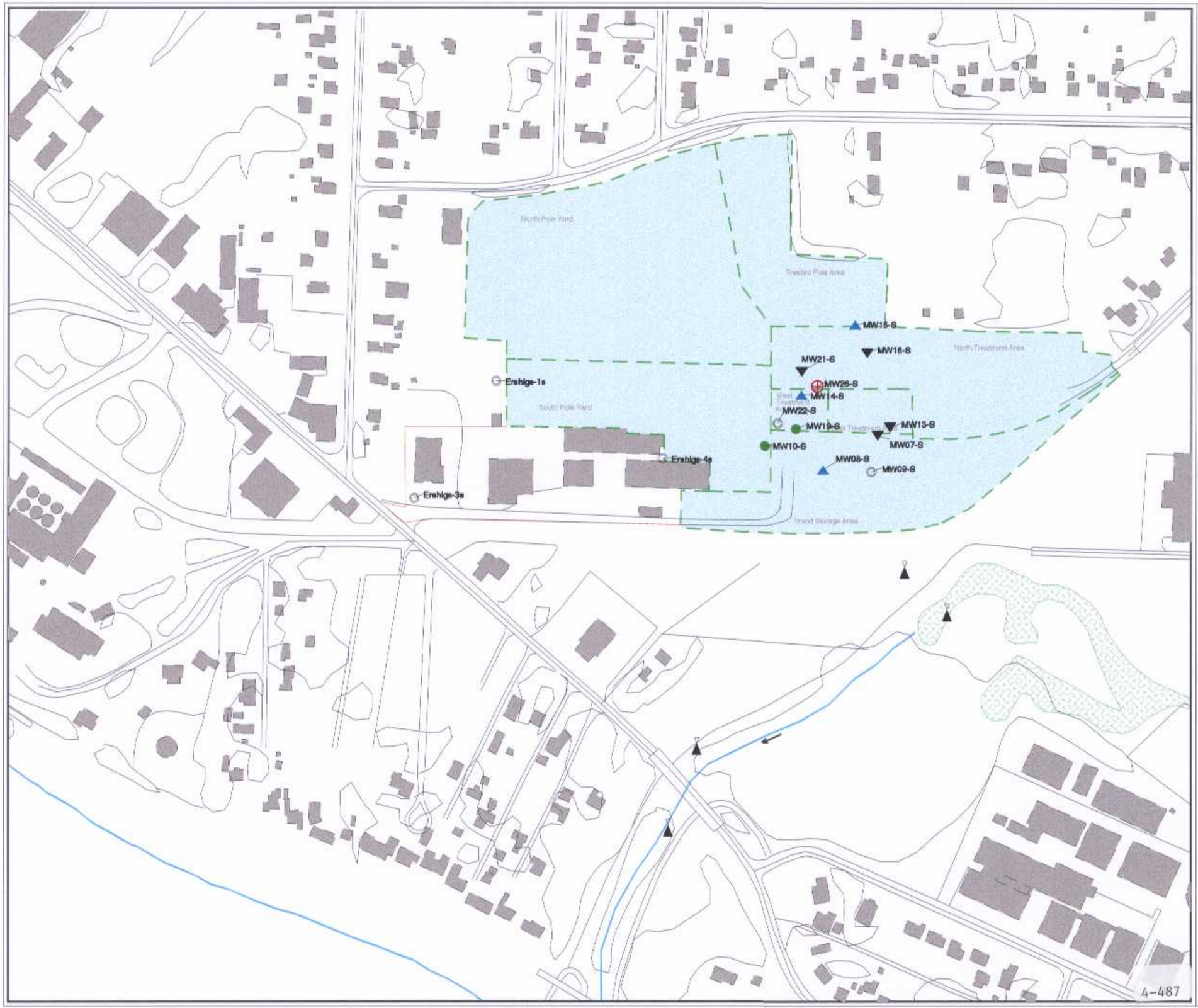

Figure 4-33

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

2,3,7,8-TCDD TEQ in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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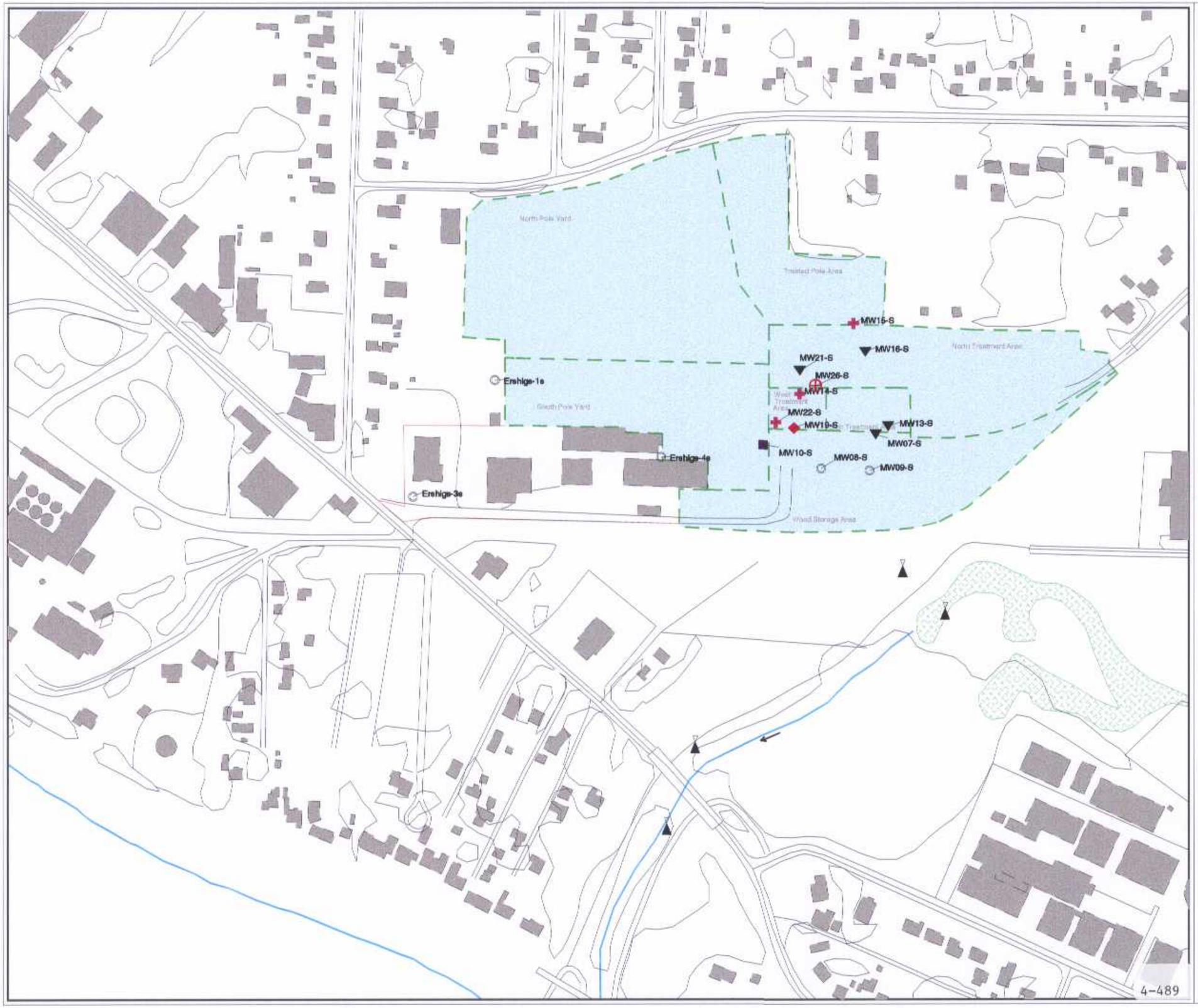

Figure 4-34

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

June 1999

Pentachlorophenol in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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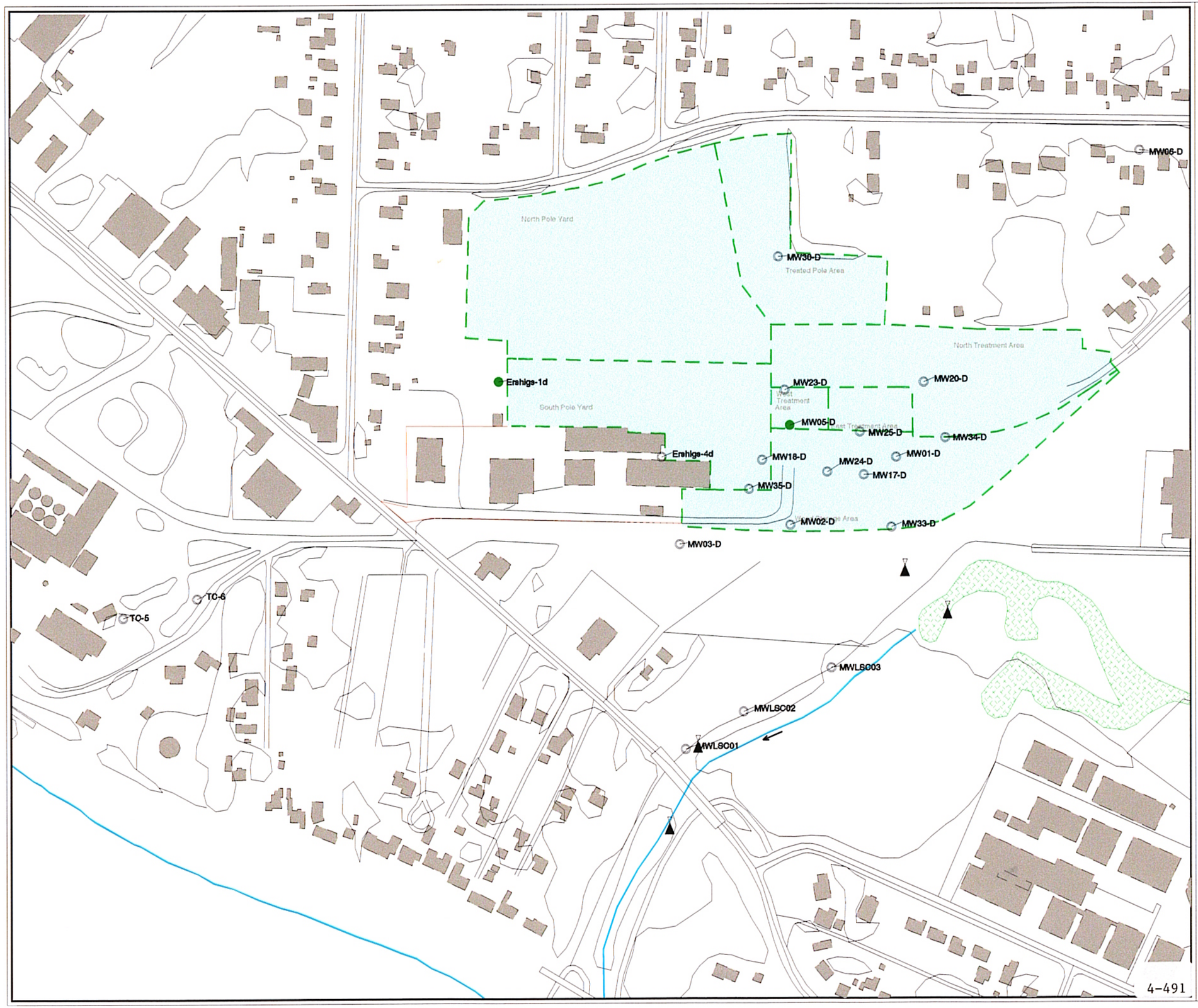

Figure 4-35

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

Total cPAH as B(a)P Equivalents in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-36

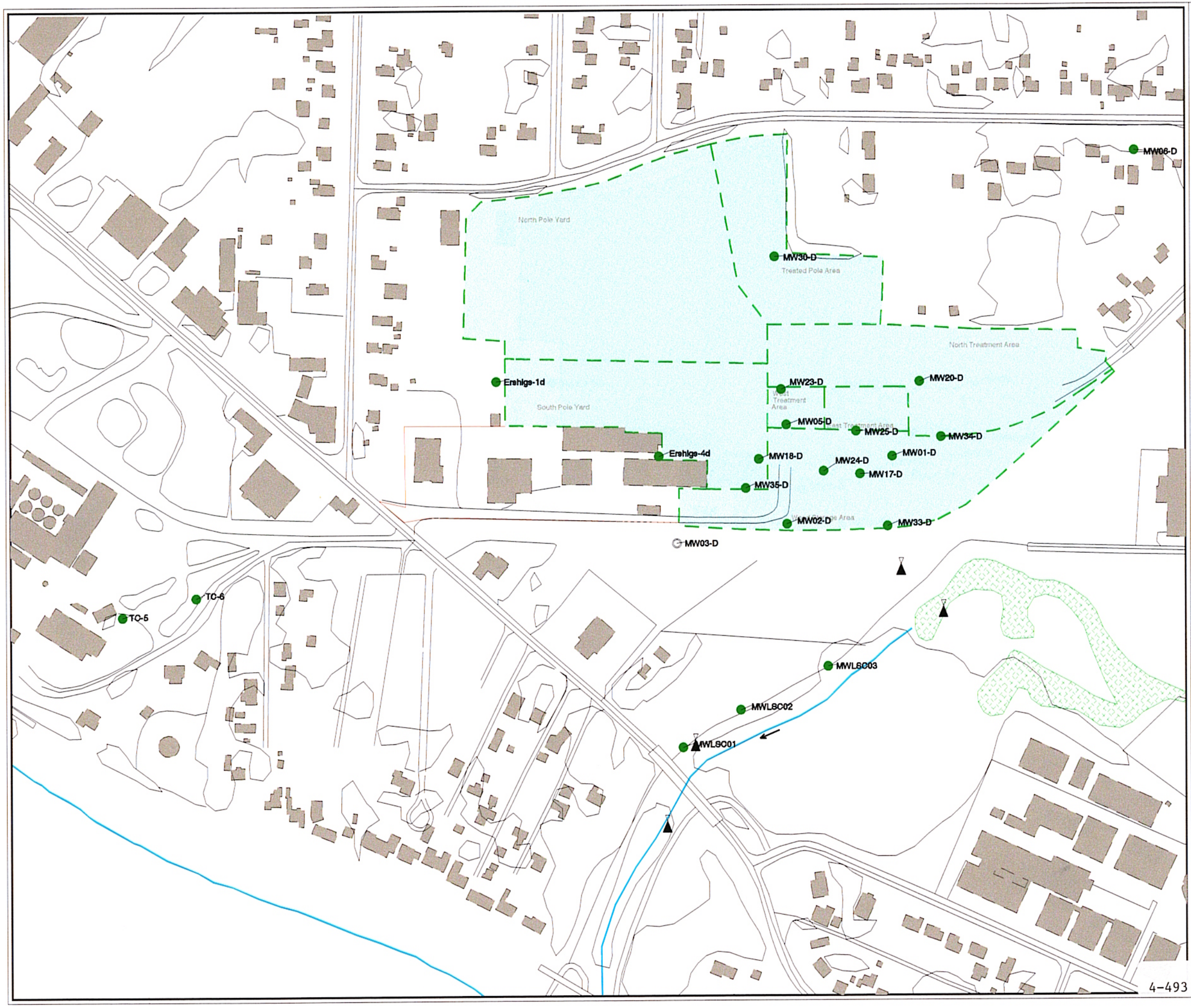
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

Total ncPAH
in Groundwater-Deep
Concentration



LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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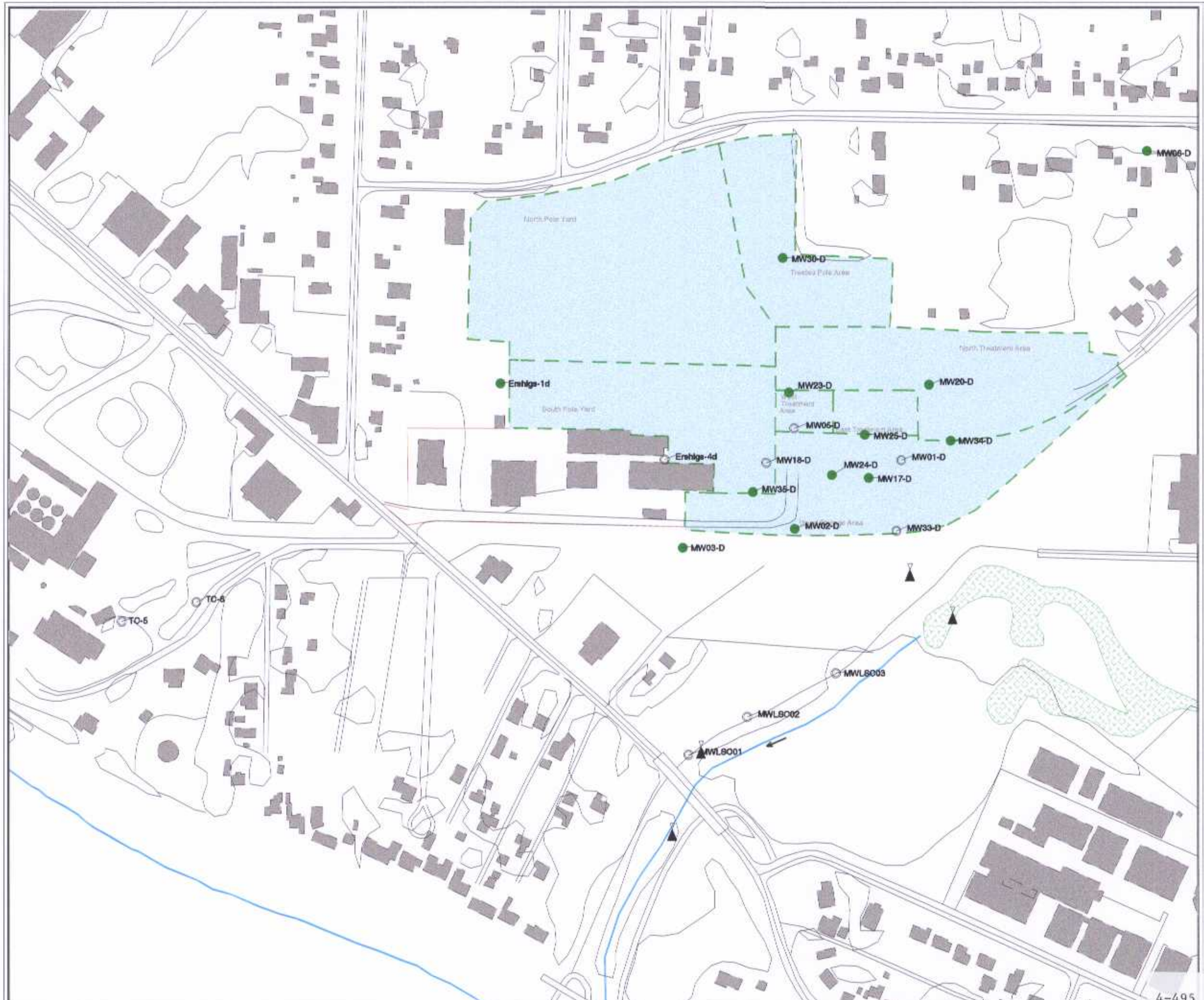

Figure 4-37

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

2,3,7,8-TCDD TEQ
in Groundwater-Deep
Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls

N
W E
S

0 100 200 300 400 600
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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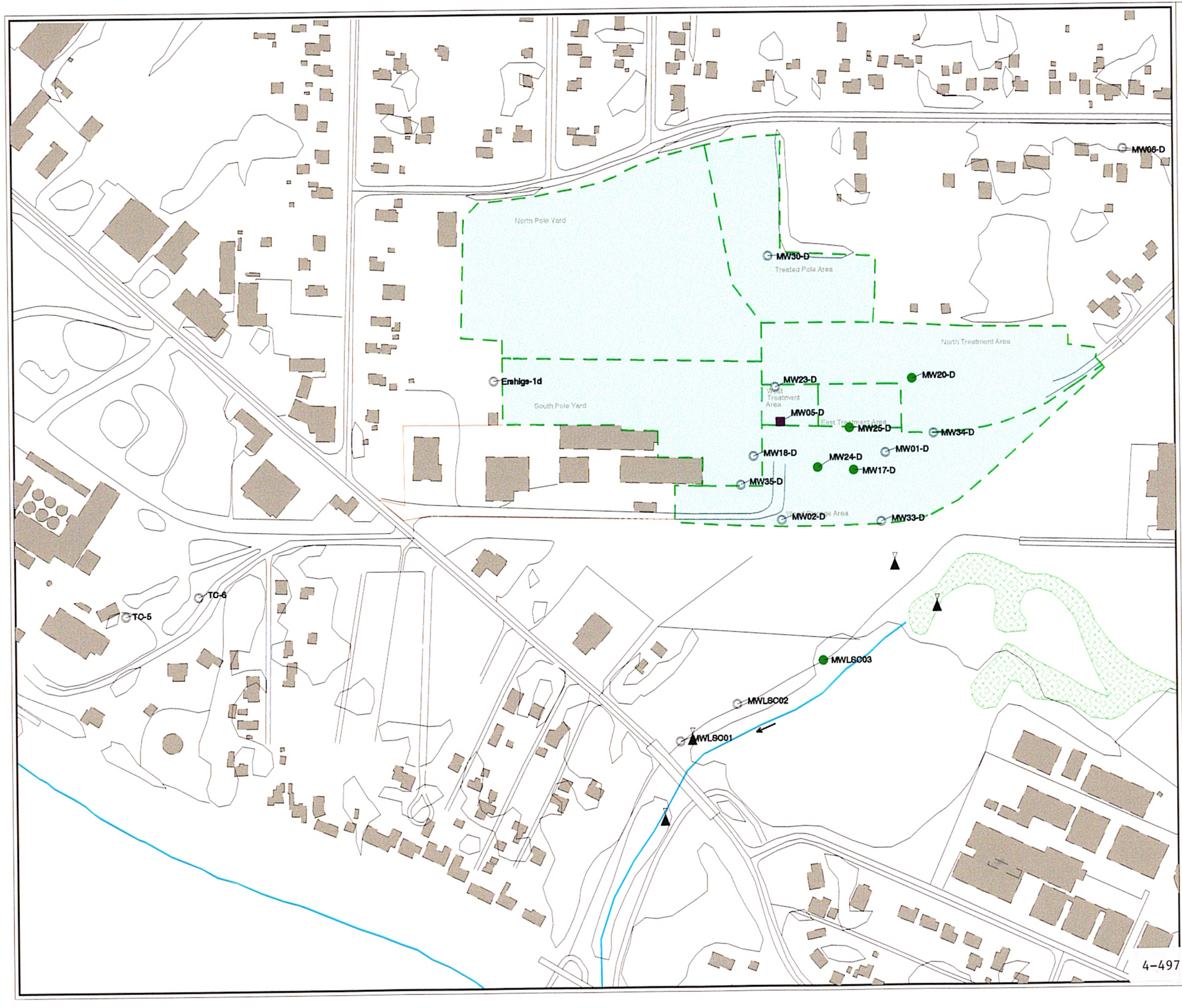

Figure 4-38

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

Pentachlorophenol in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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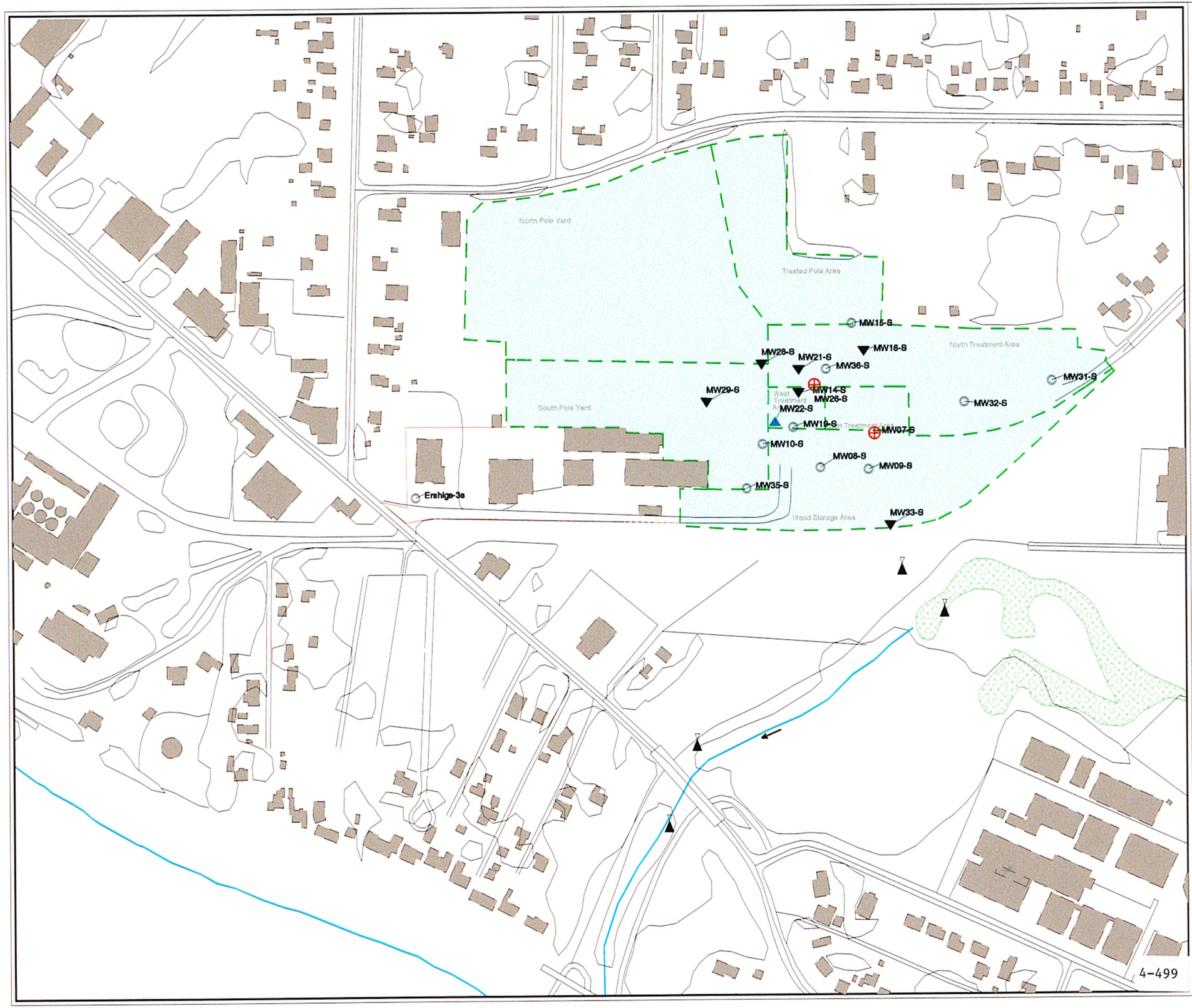

Figure 4-39

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

Total cPAH as B(a)P Equivalents in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-40

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

Total ncPAH
in Groundwater-Shallow
Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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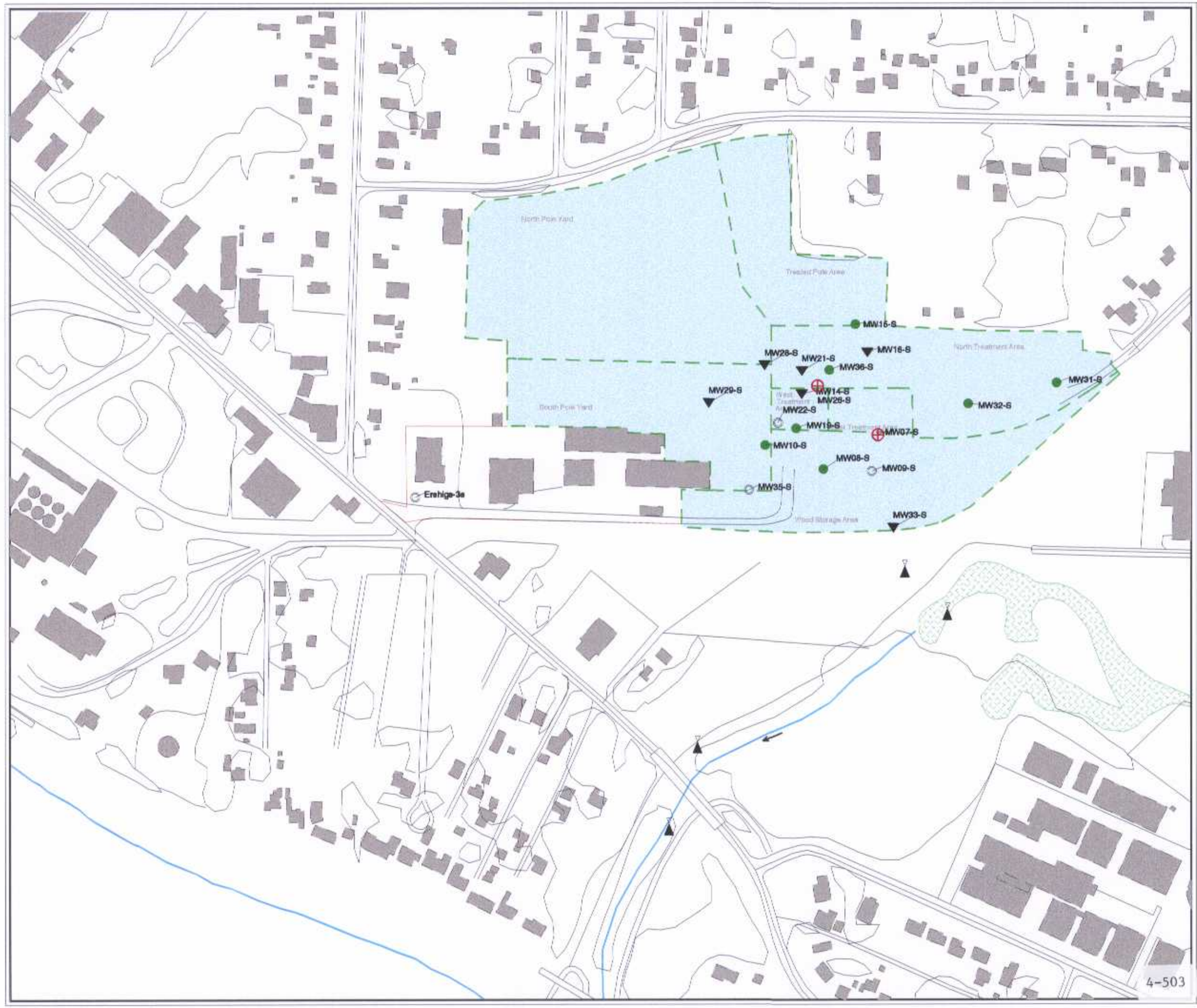

Figure 4-41

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

2,3,7,8-TCDD TEQ
in Groundwater-Shallow
Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls
- Dry Well
- LNAPL Well

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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Figure 4-42

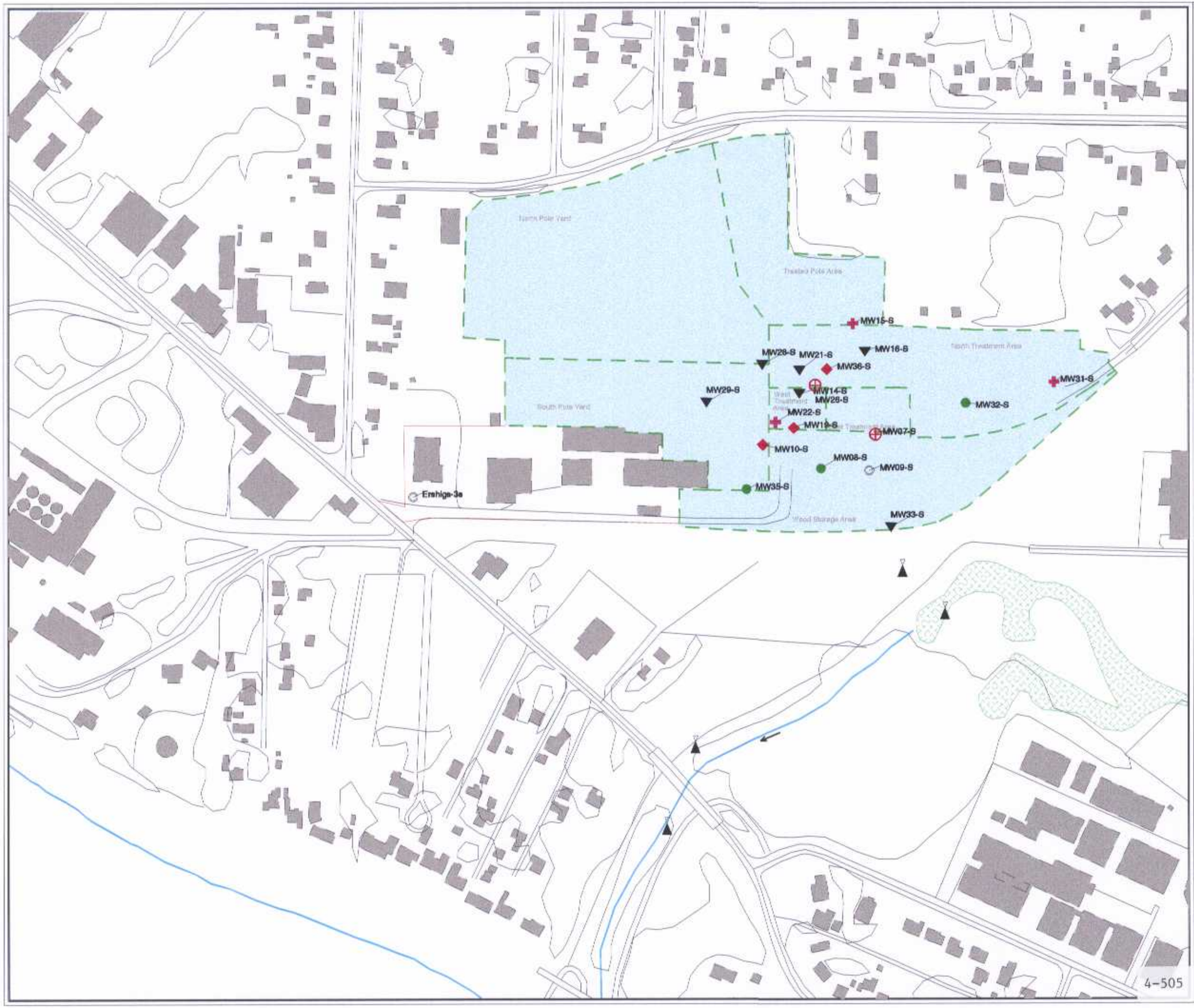
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 1999

Pentachlorophenol in Groundwater-Shallow Concentration



LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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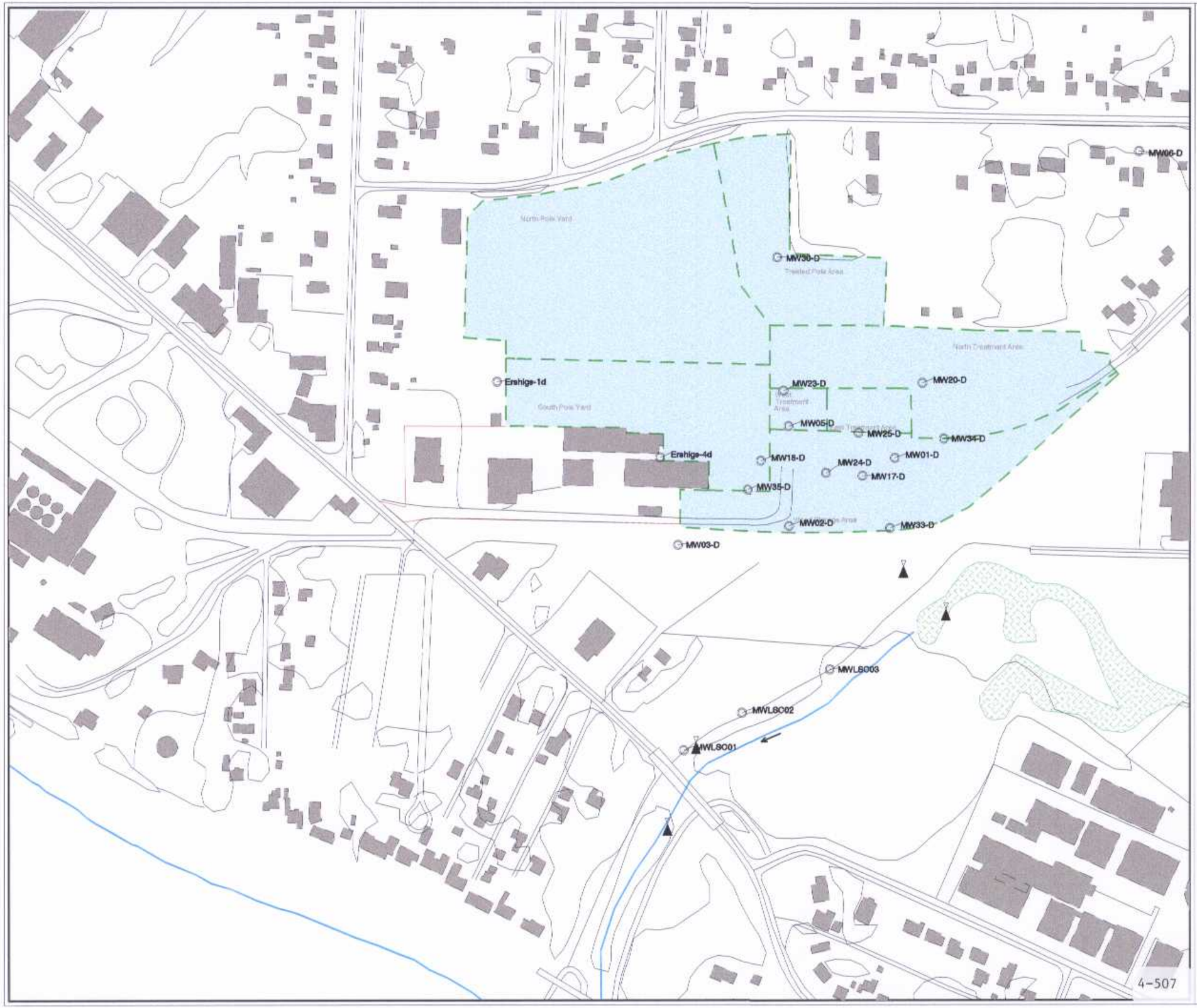

Figure 4-43

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Total cPAH as B(a)P Equivalents in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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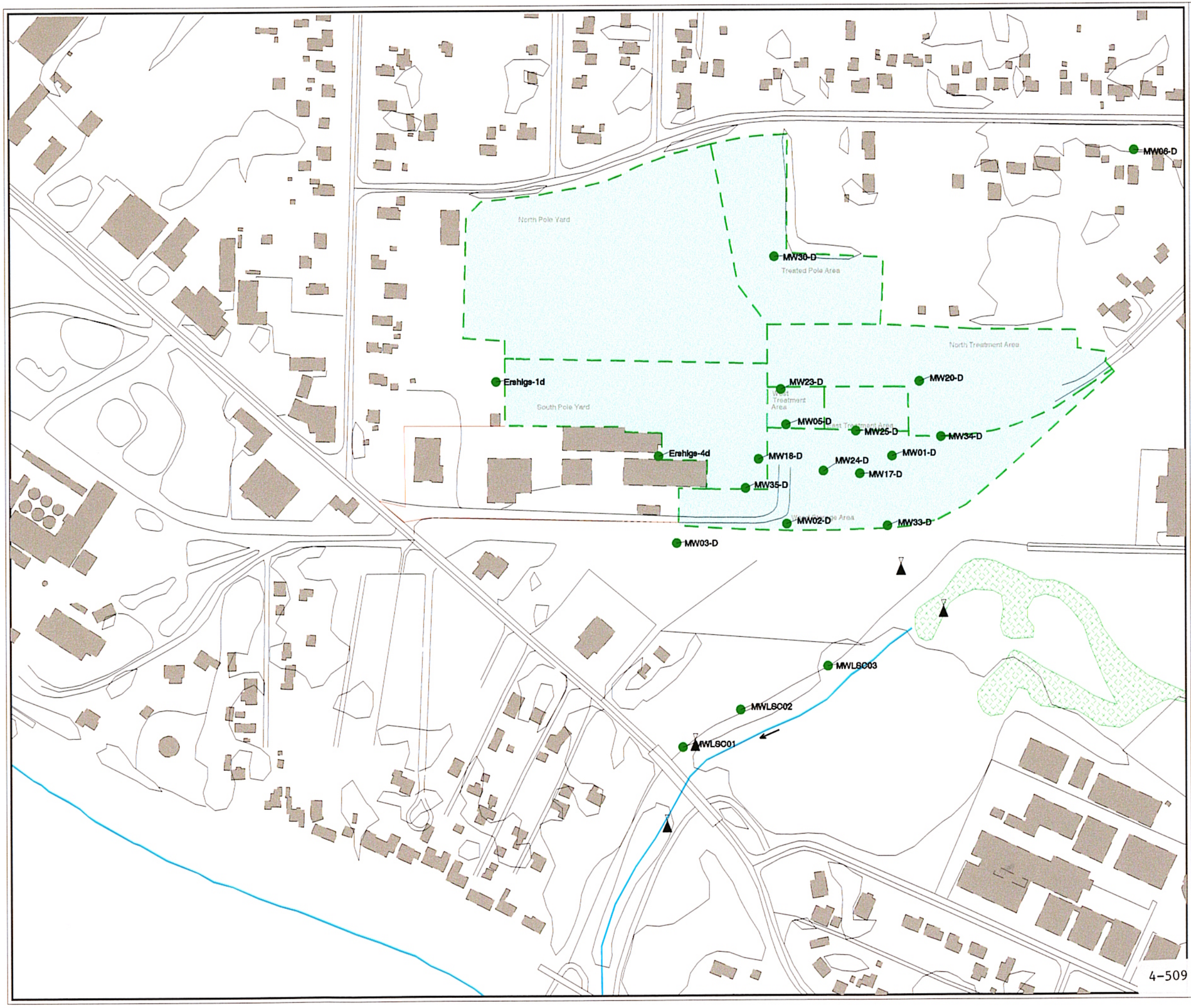

Figure 4-44

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Total ncPAH in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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Figure 4-45

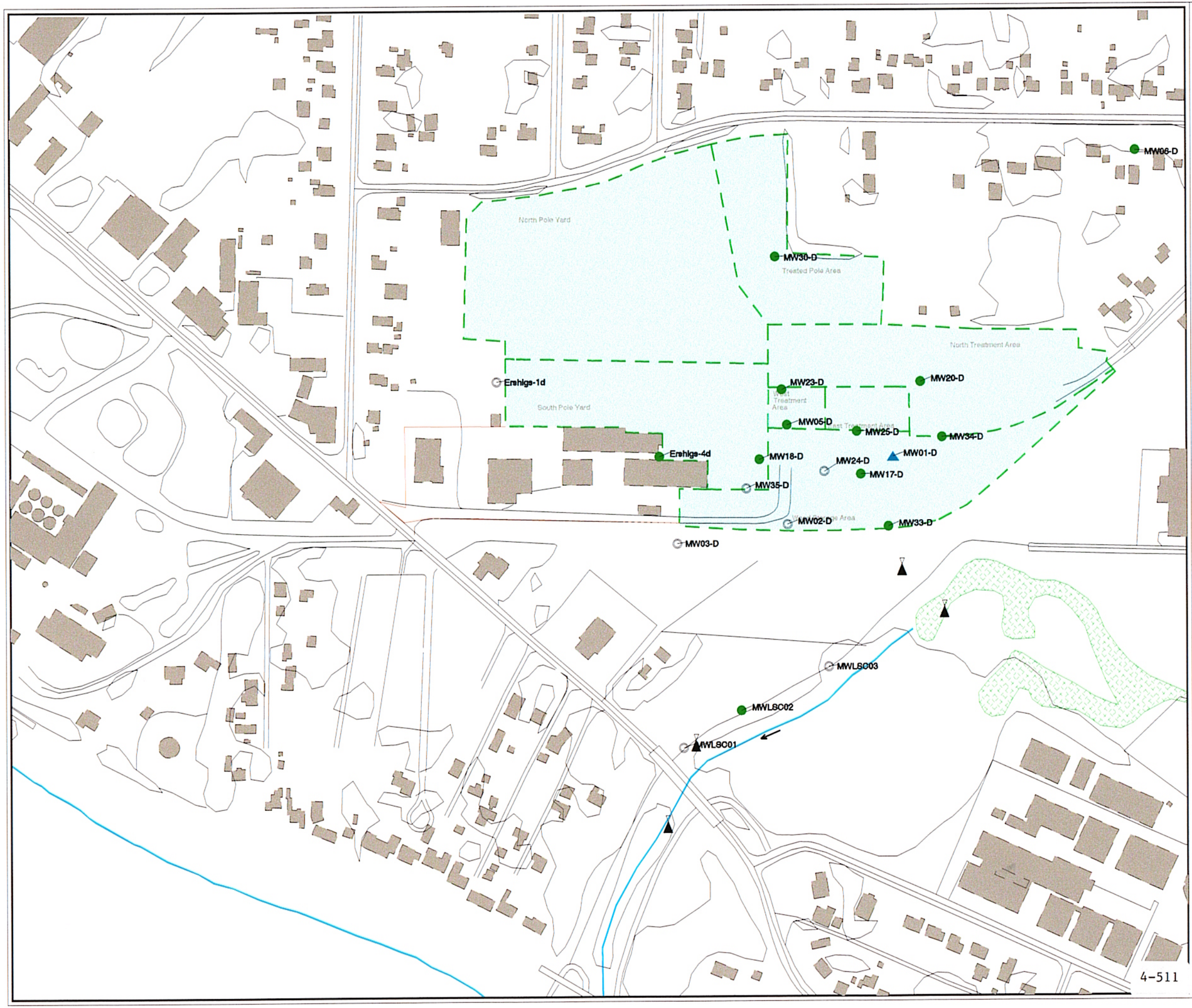
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

2,3,7,8-TCDD TEQ
in Groundwater-Deep
Concentration



LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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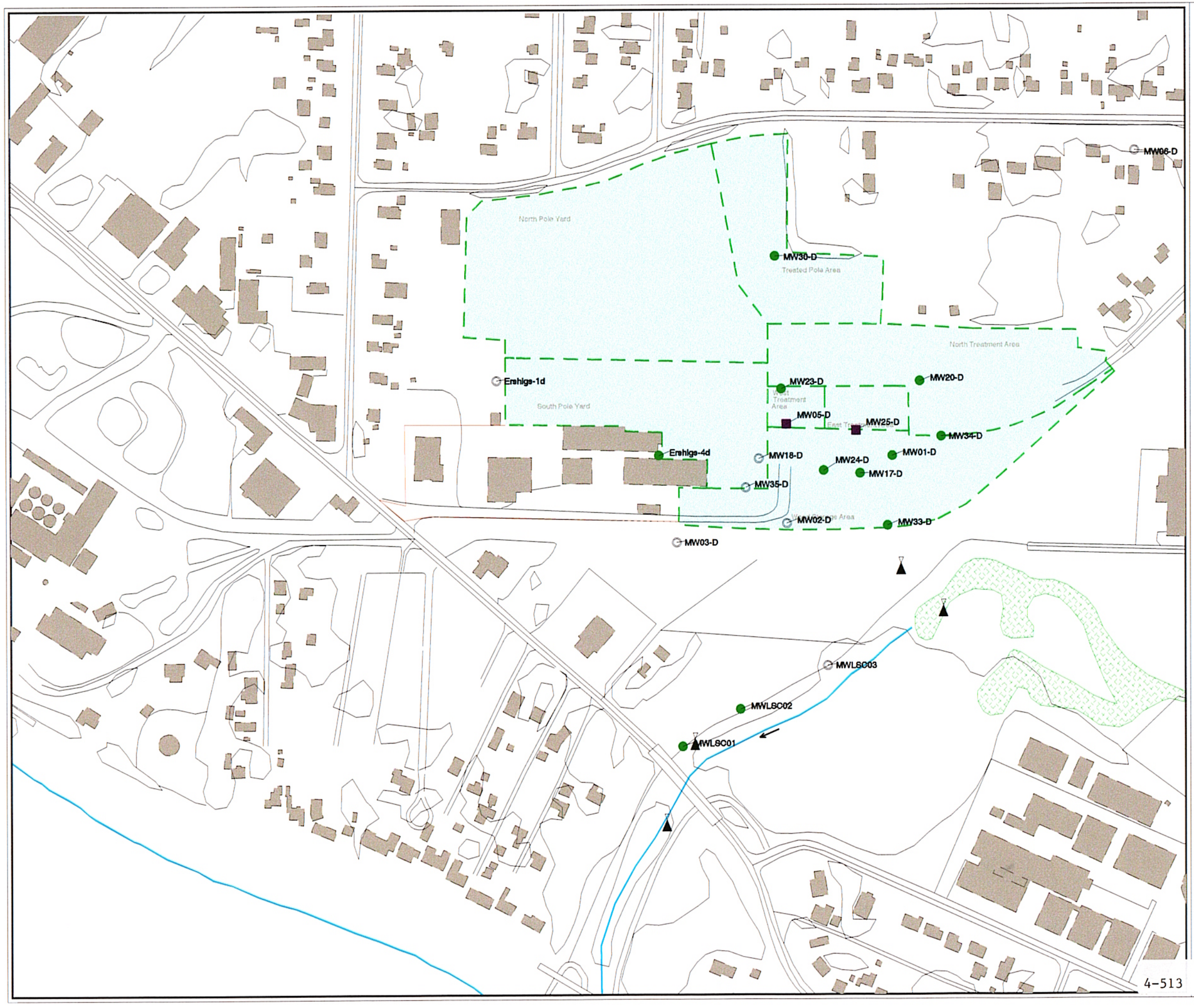

Figure 4-46

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Pentachlorophenol in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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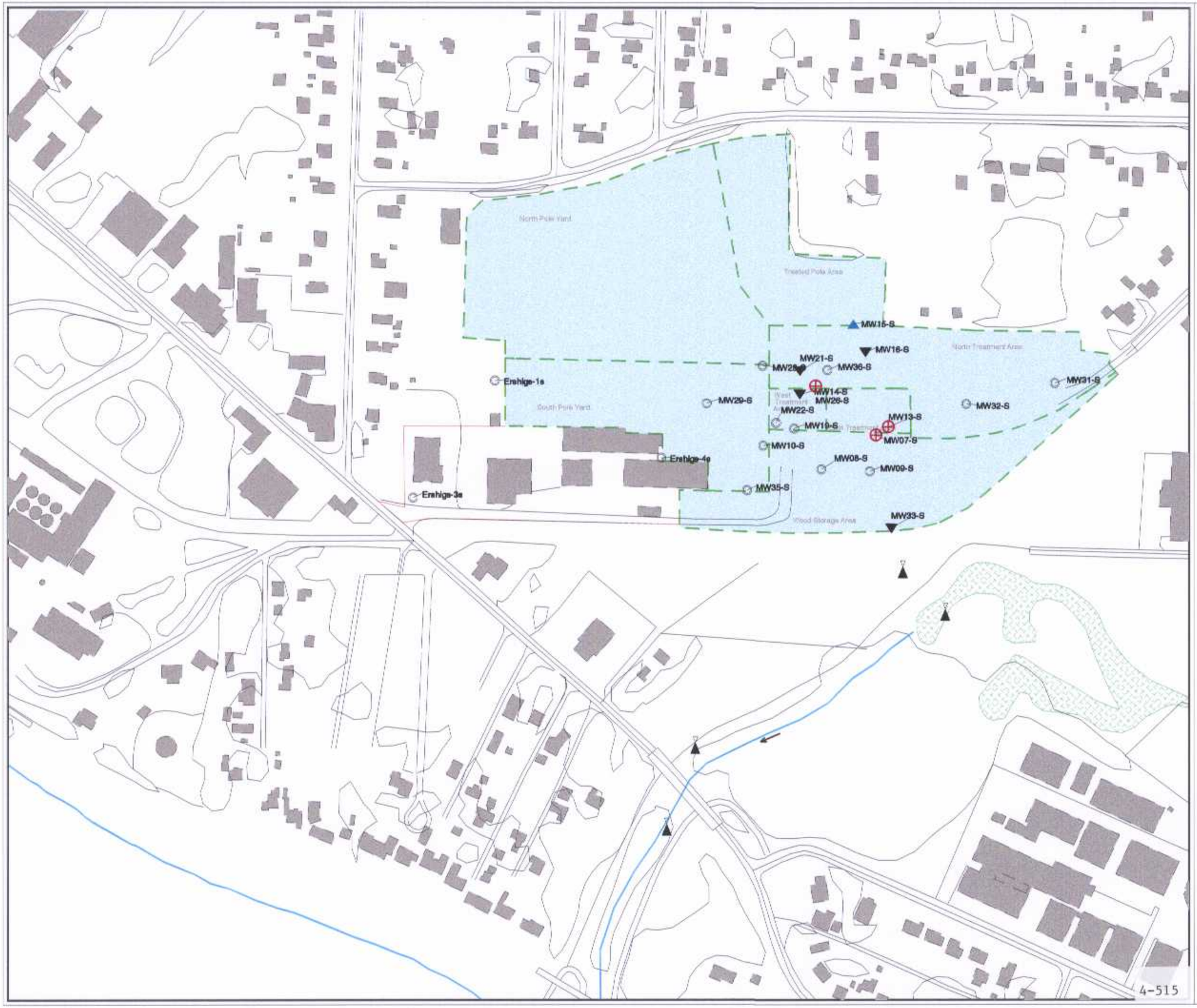

Figure 4-47

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Total cPAH as B(a)P Equivalents in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1996 EPA, Region 9, Preliminary Remediation Goals table.

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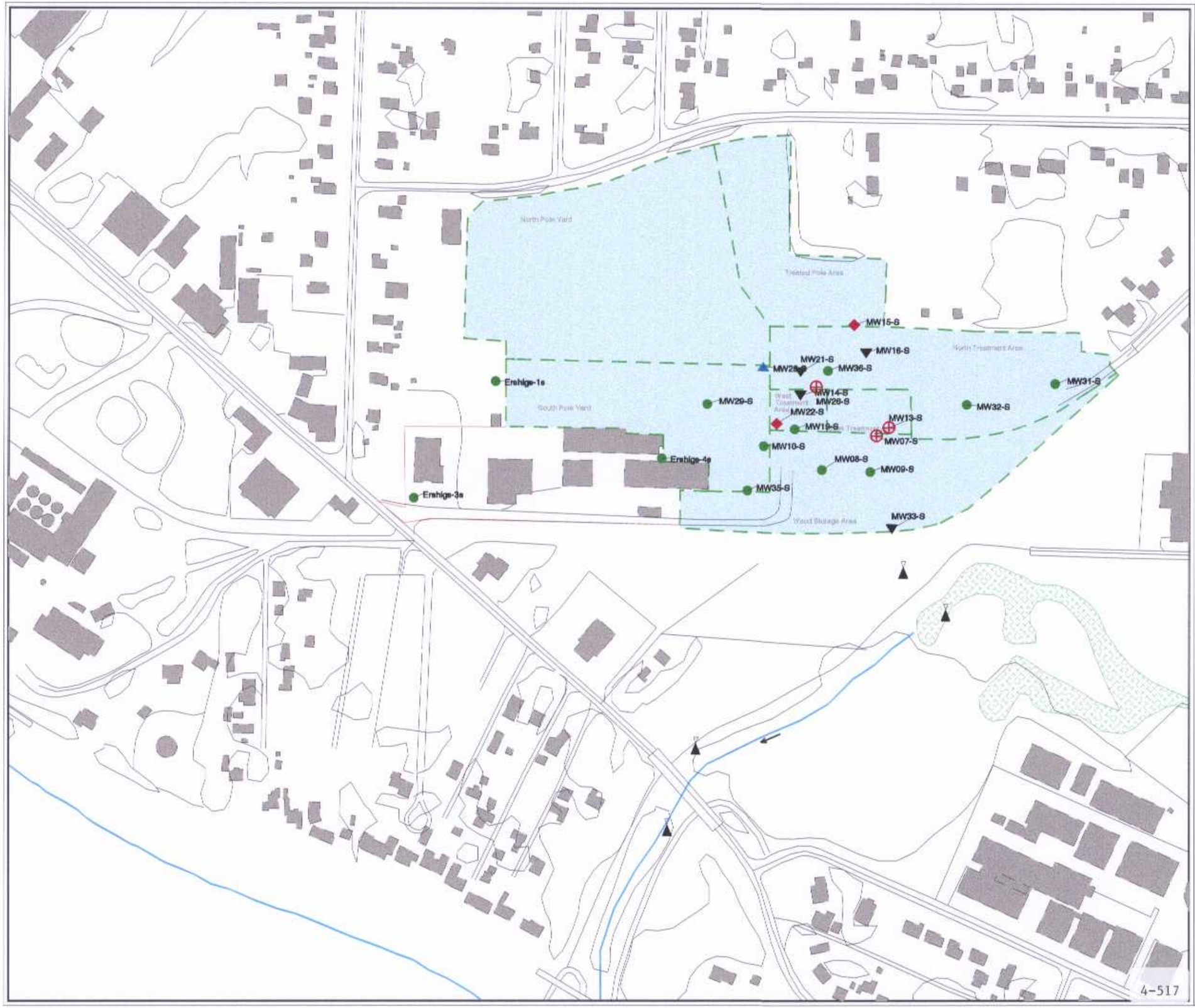

Figure 4-48

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Total ncPAH in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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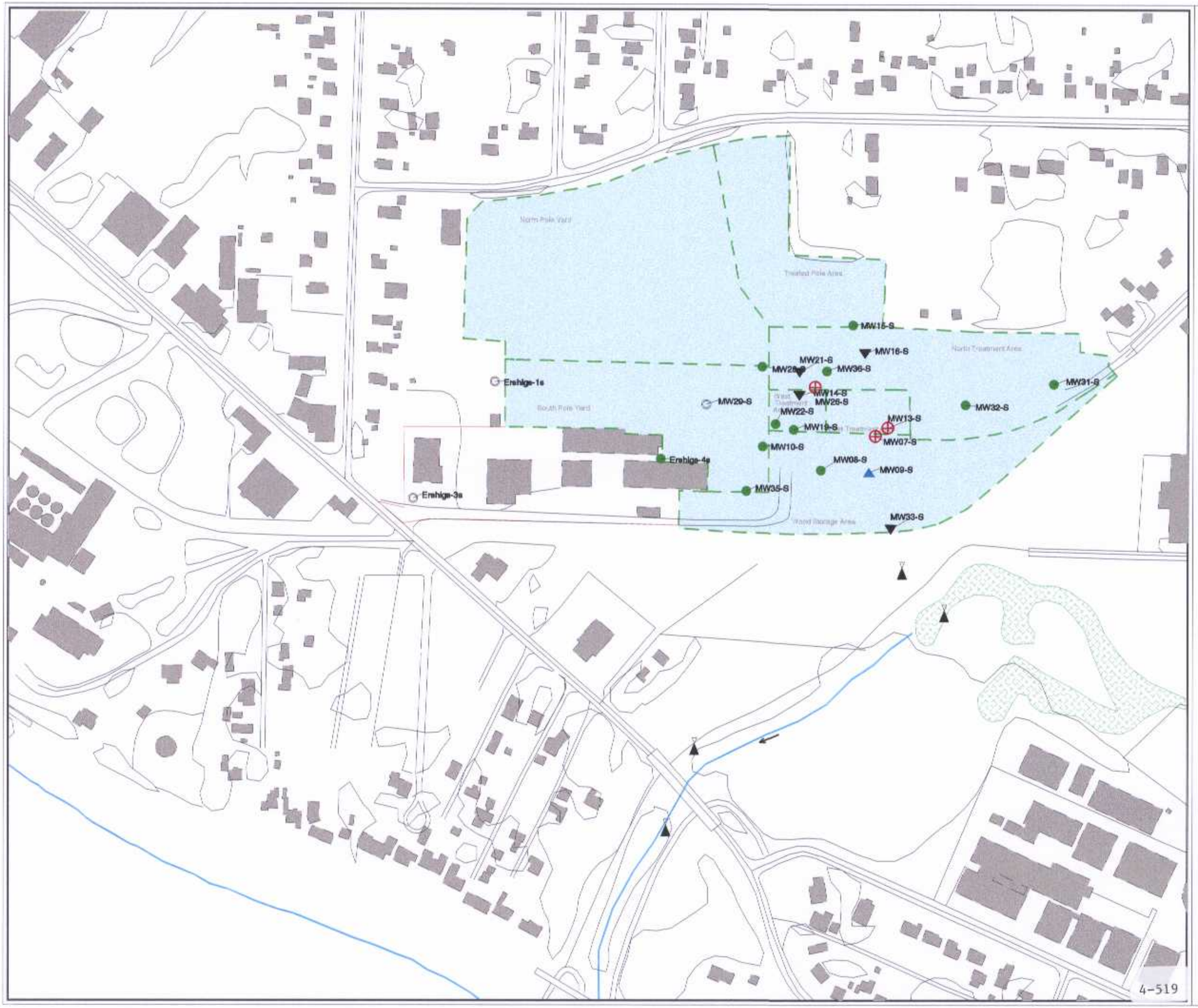

Figure 4-49

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

2,3,7,8-TCDD TEQ in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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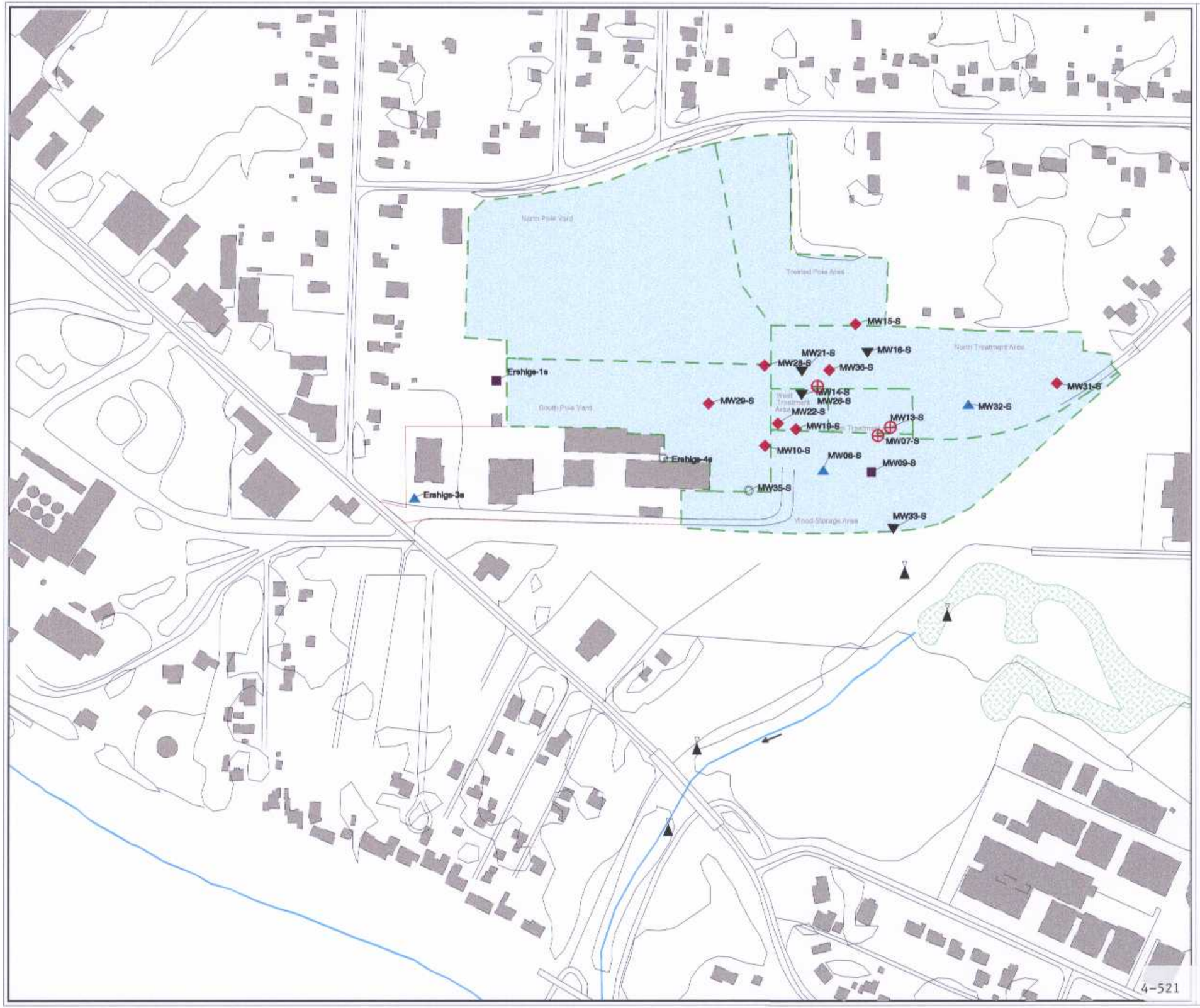

Figure 4-50

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Pentachlorophenol
in Groundwater-Shallow
Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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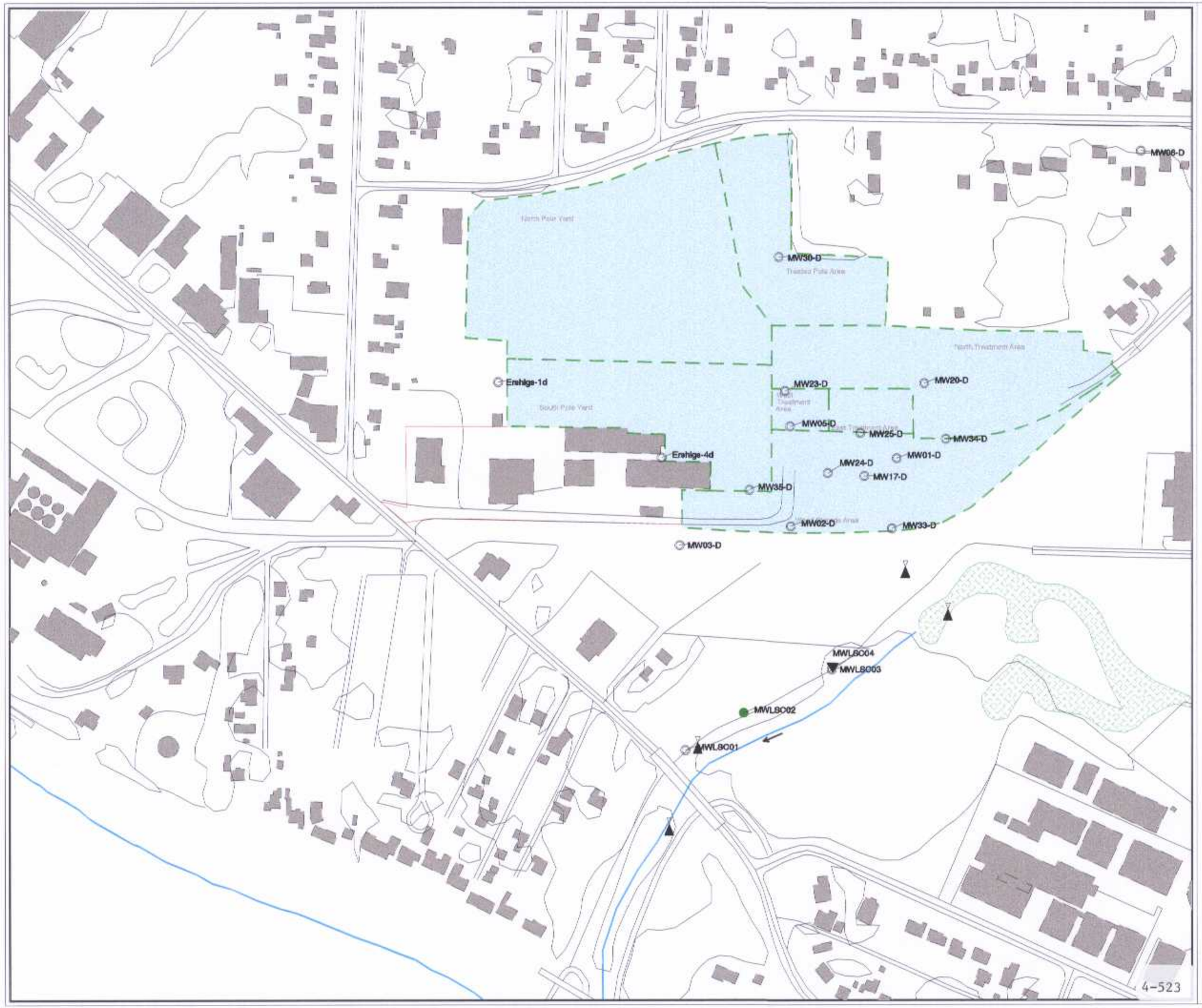

Figure 4-51

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

Total cPAH as B(a)P Equivalents in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls
- Dry Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1996 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-52

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

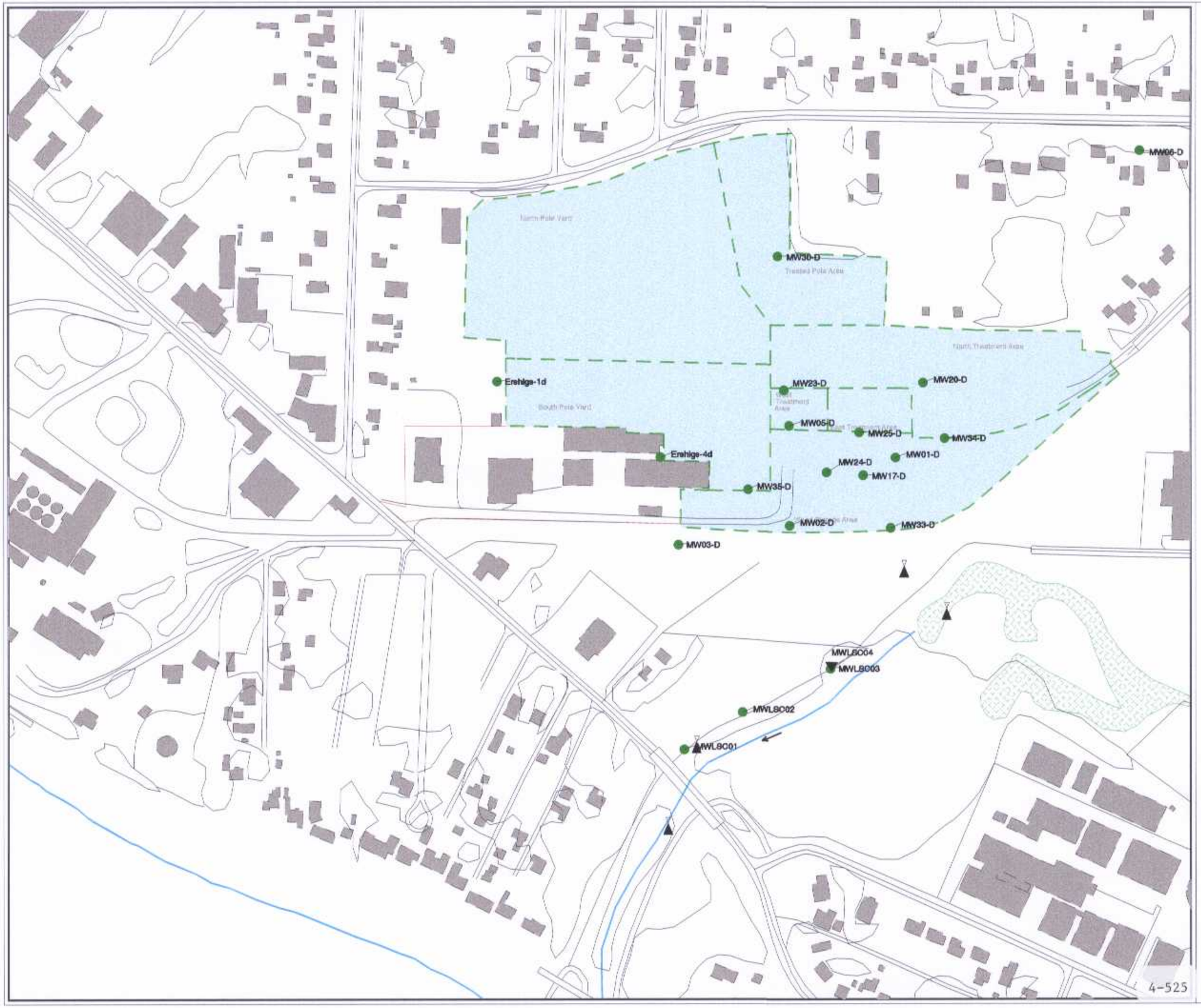
Remedial Investigation

February/March 2000

Total ncPAH
in Groundwater-Deep
Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls
- Dry Well



0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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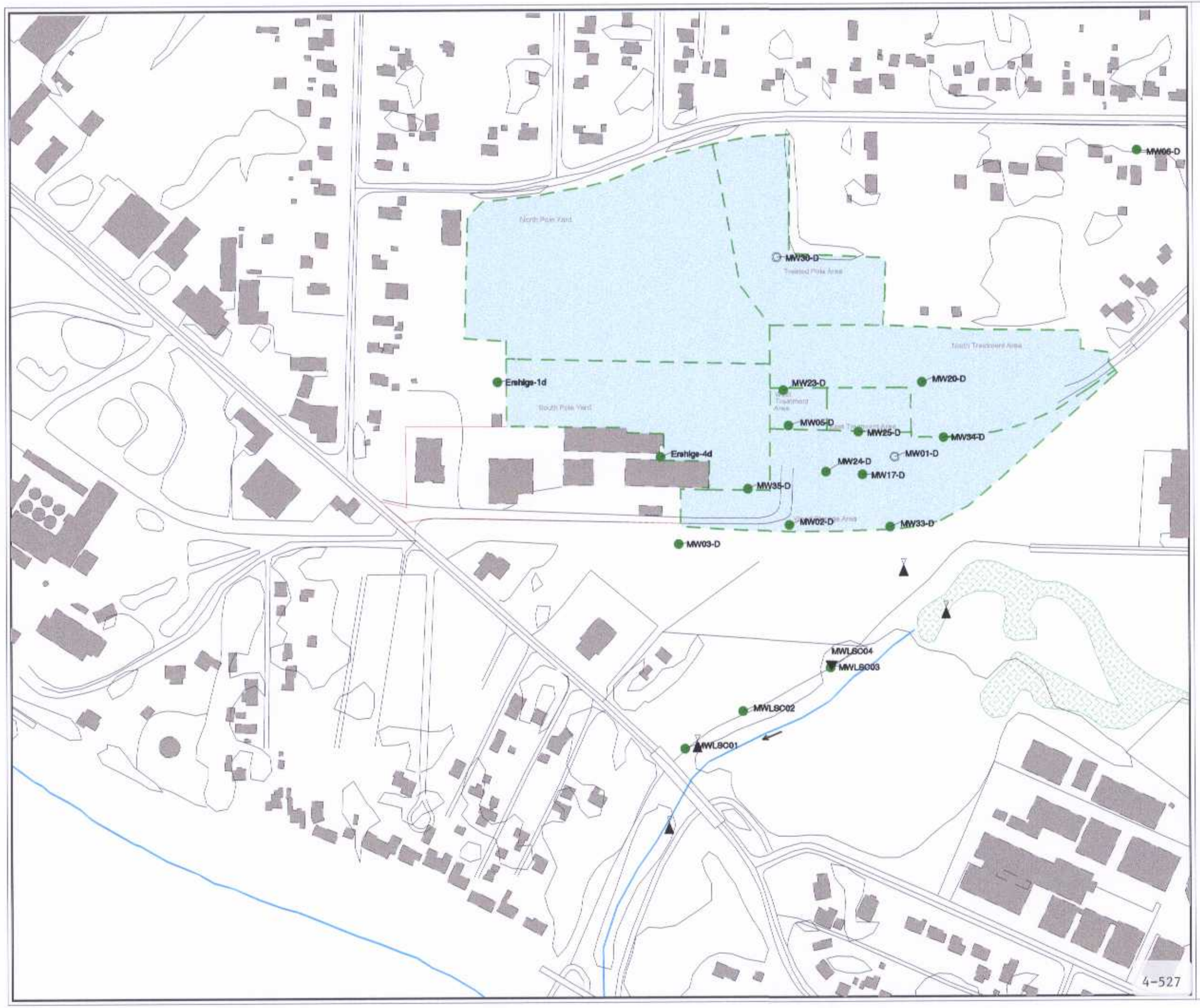

Figure 4-53

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

2,3,7,8-TCDD TEQ in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls
- Dry Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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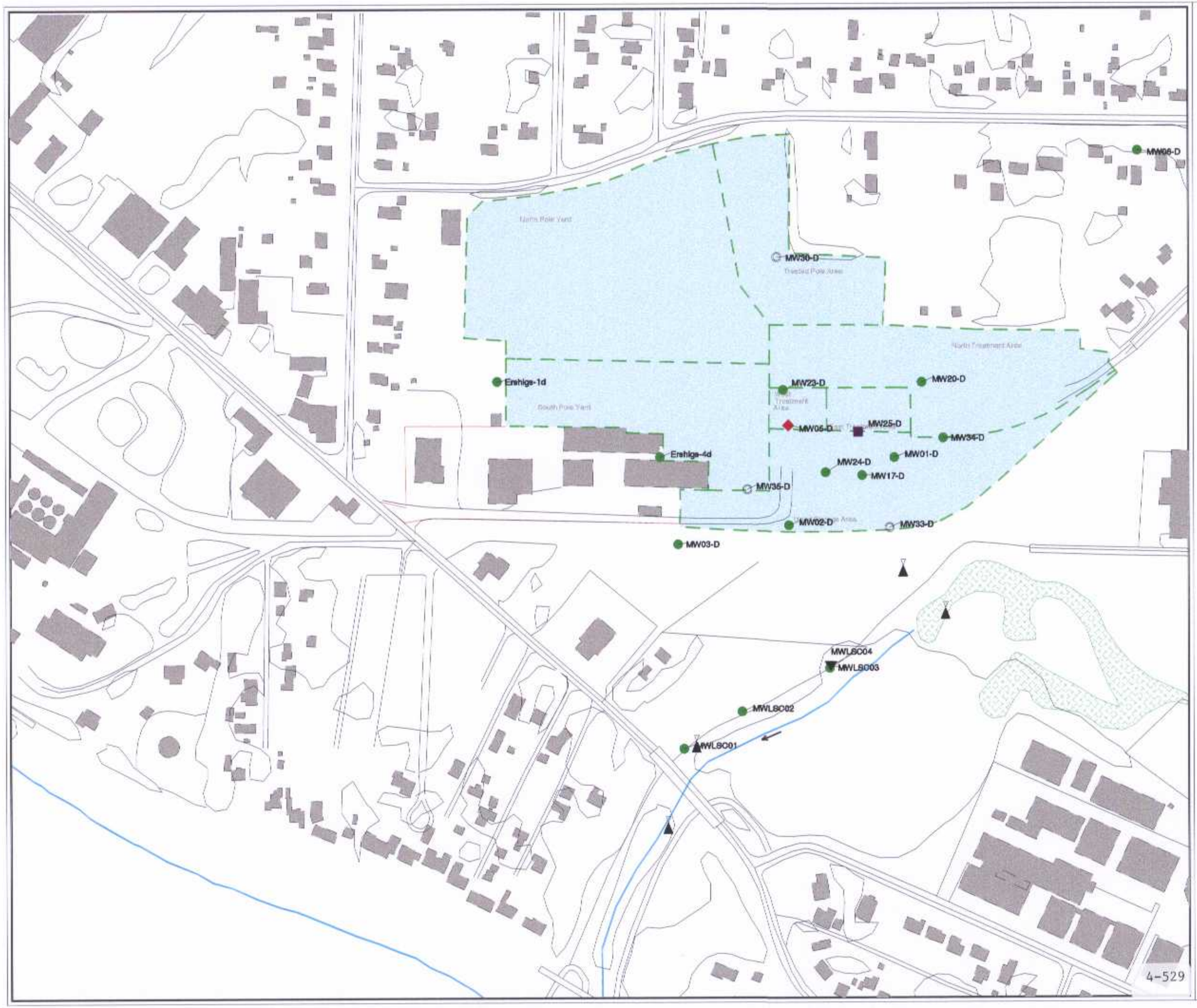

Figure 4-54

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

Pentachlorophenol in Groundwater-Deep Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls
- Dry Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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Figure 4-55

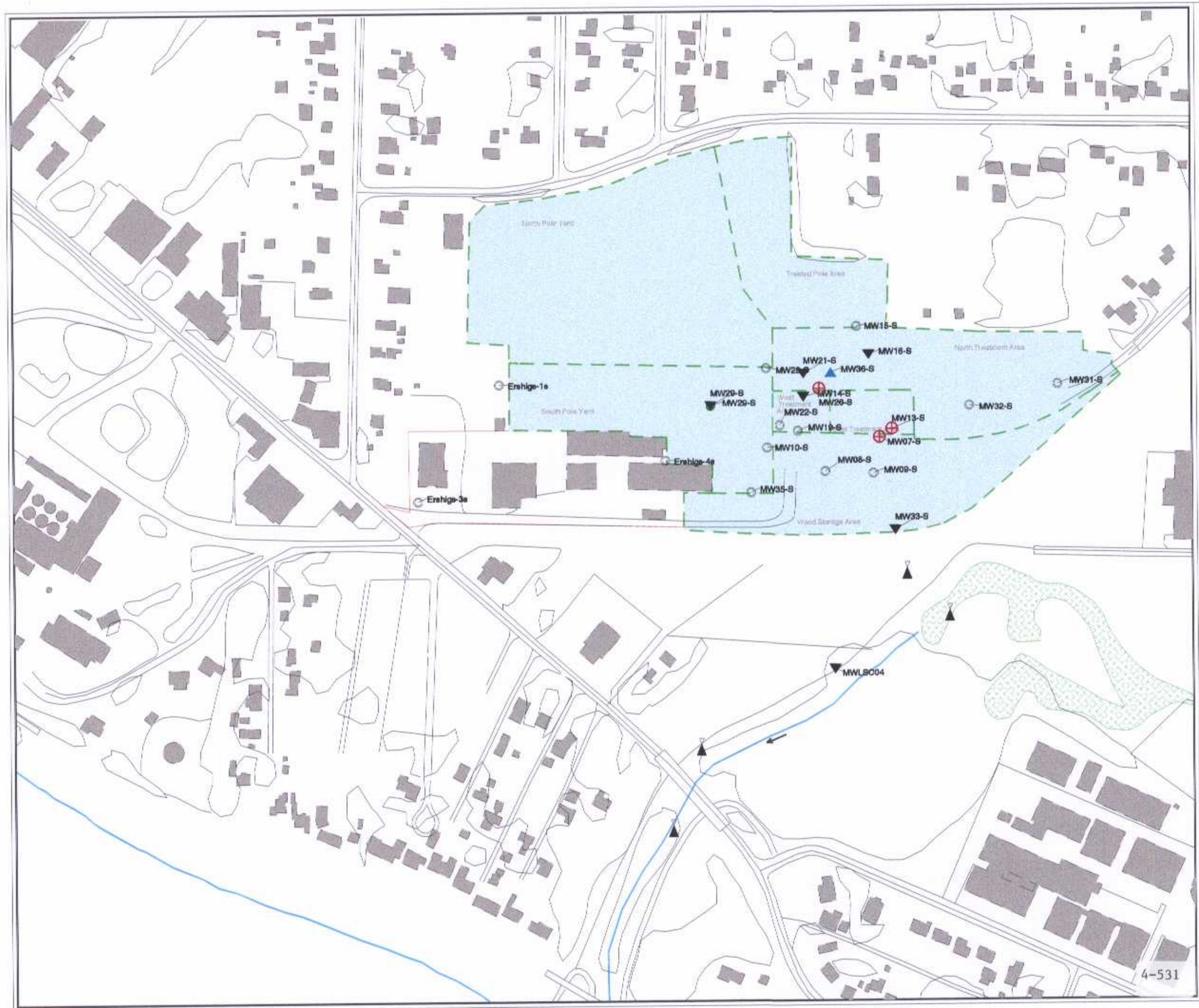
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

Total cPAH as B(a)P Equivalents in Groundwater-Shallow Concentration



LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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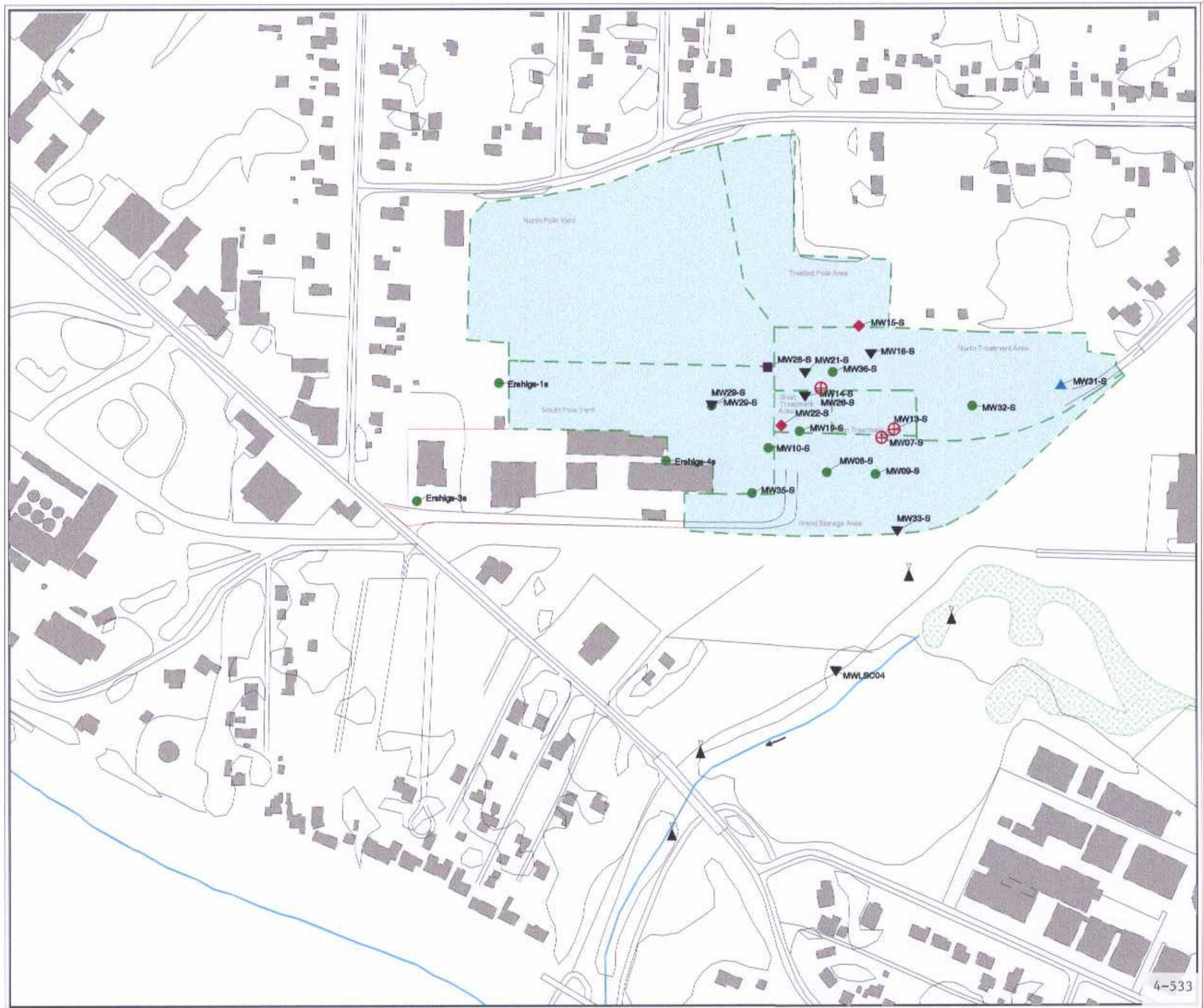

Figure 4-56

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

Total ncPAH
in Groundwater-Shallow
Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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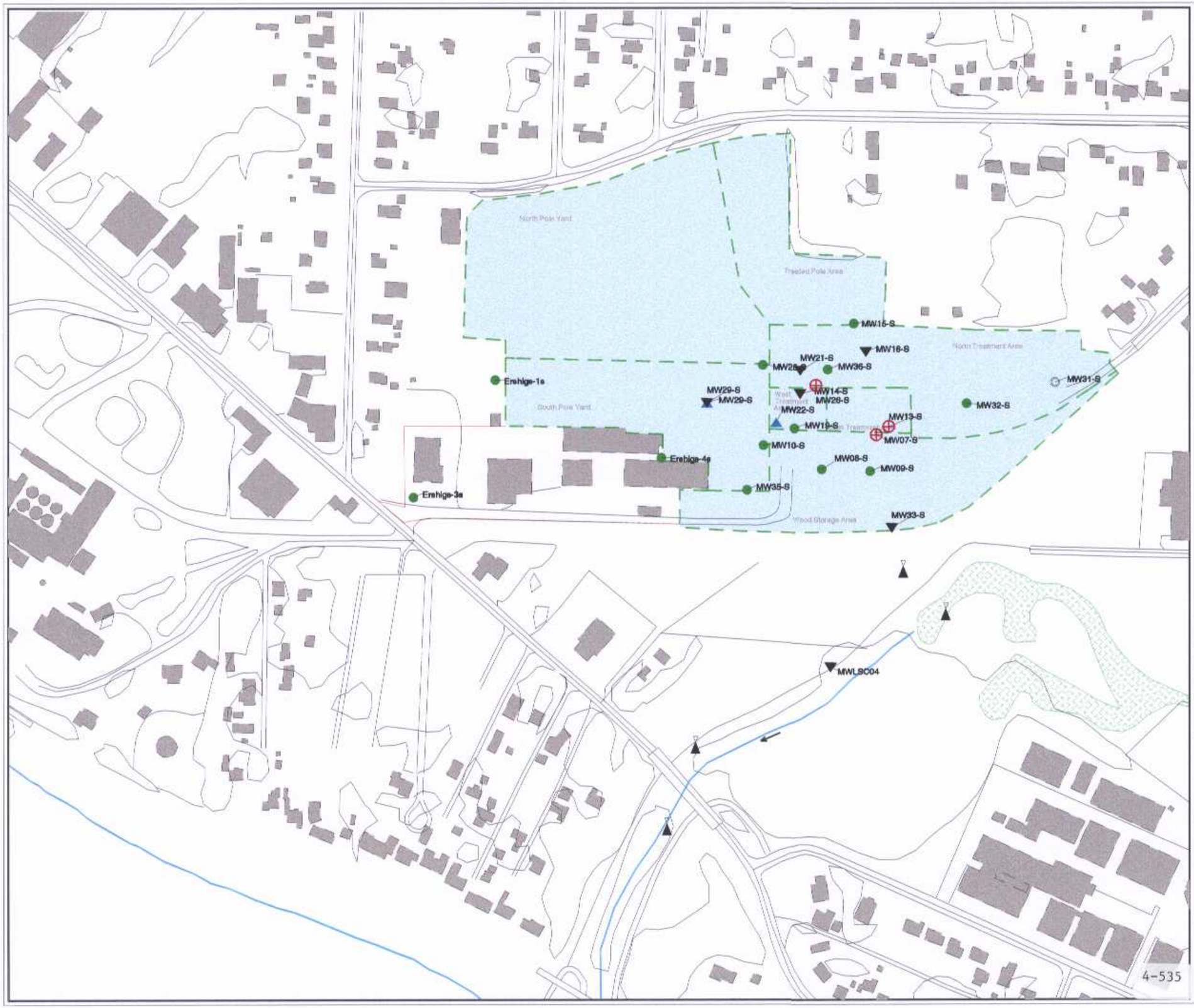

Figure 4-57

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

2,3,7,8-TCDD TEQ
in Groundwater-Shallow
Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls
- Dry Well
- LNAPL Well

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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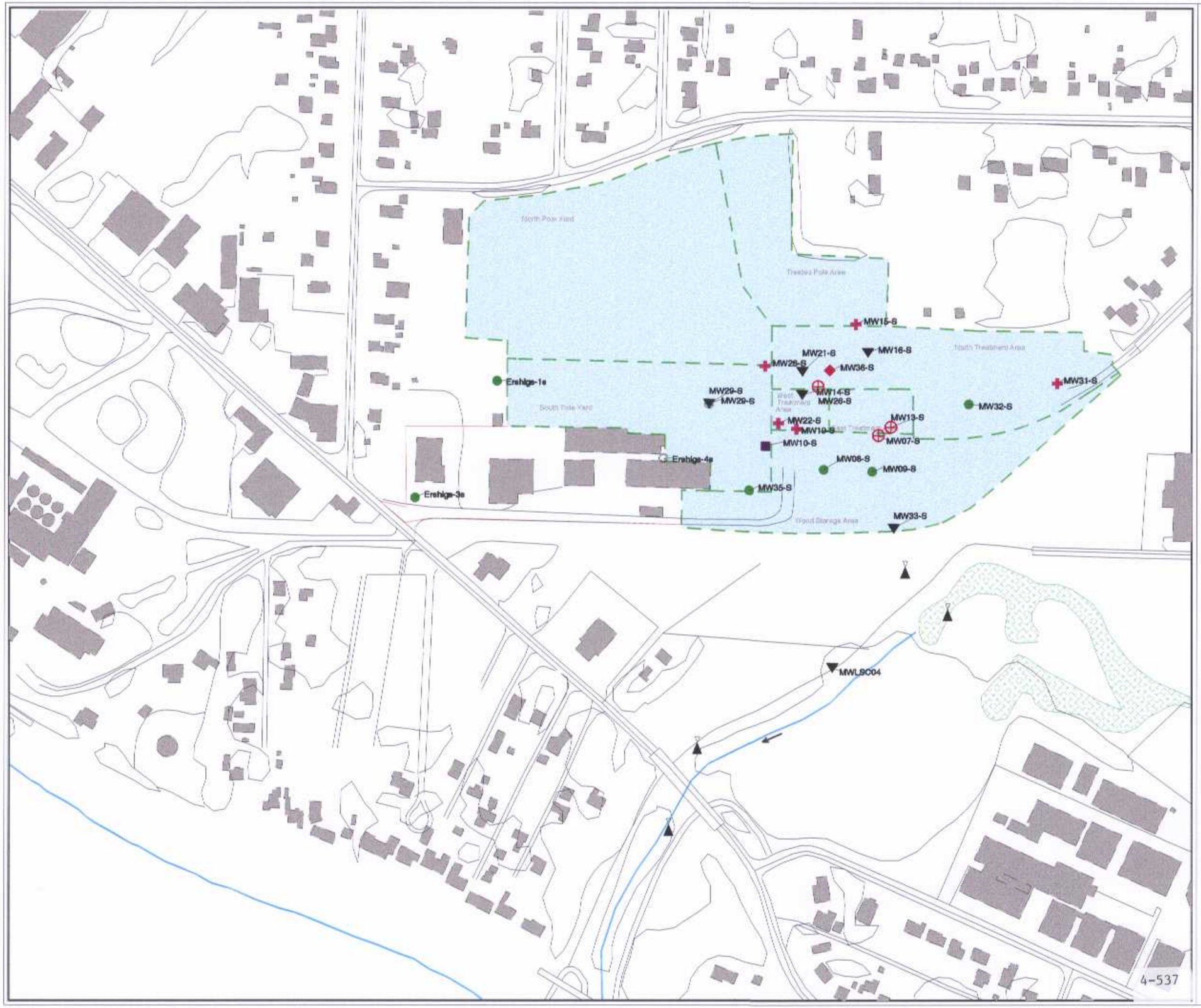

Figure 4-58

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

February/March 2000

Pentachlorophenol in Groundwater-Shallow Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls
- Dry Well
- LNAPL Well

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations and Maximum Contaminant Levels (MCLs). The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and the MCL, between the MCL and ten times the MCL, between 10 times the MCL and 100 times the MCL, and greater than 100 times the MCL, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals Table.

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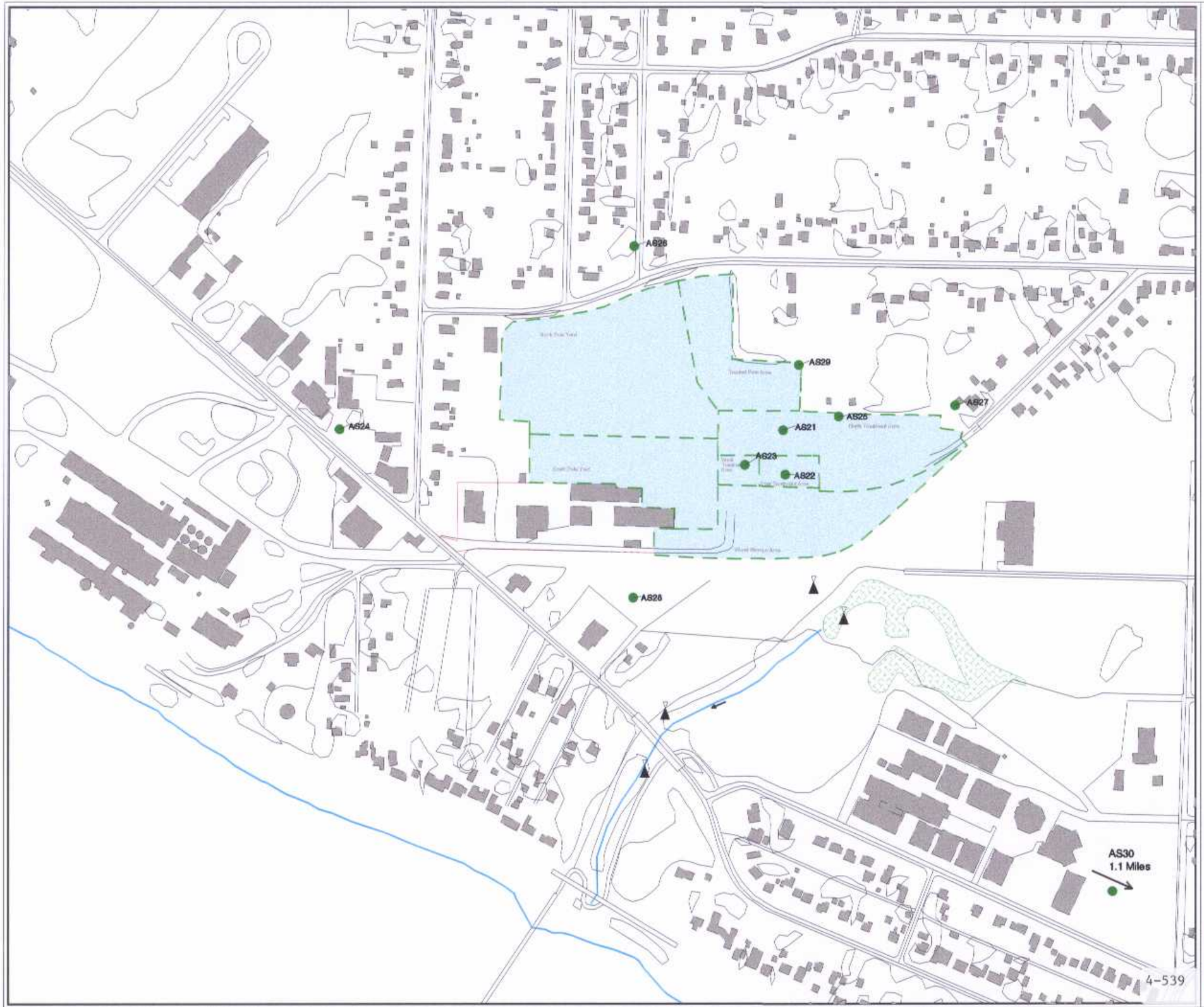

Figure 4-59

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 7-8, 1999

Total cPAH as B(a)P Equivalents in Air Concentration

LEGEND

- Not Detected
- < .0022 ug/m3
- => .0022 and < .022 ug/m3
- => .022 and < .22 ug/m3
- => .22 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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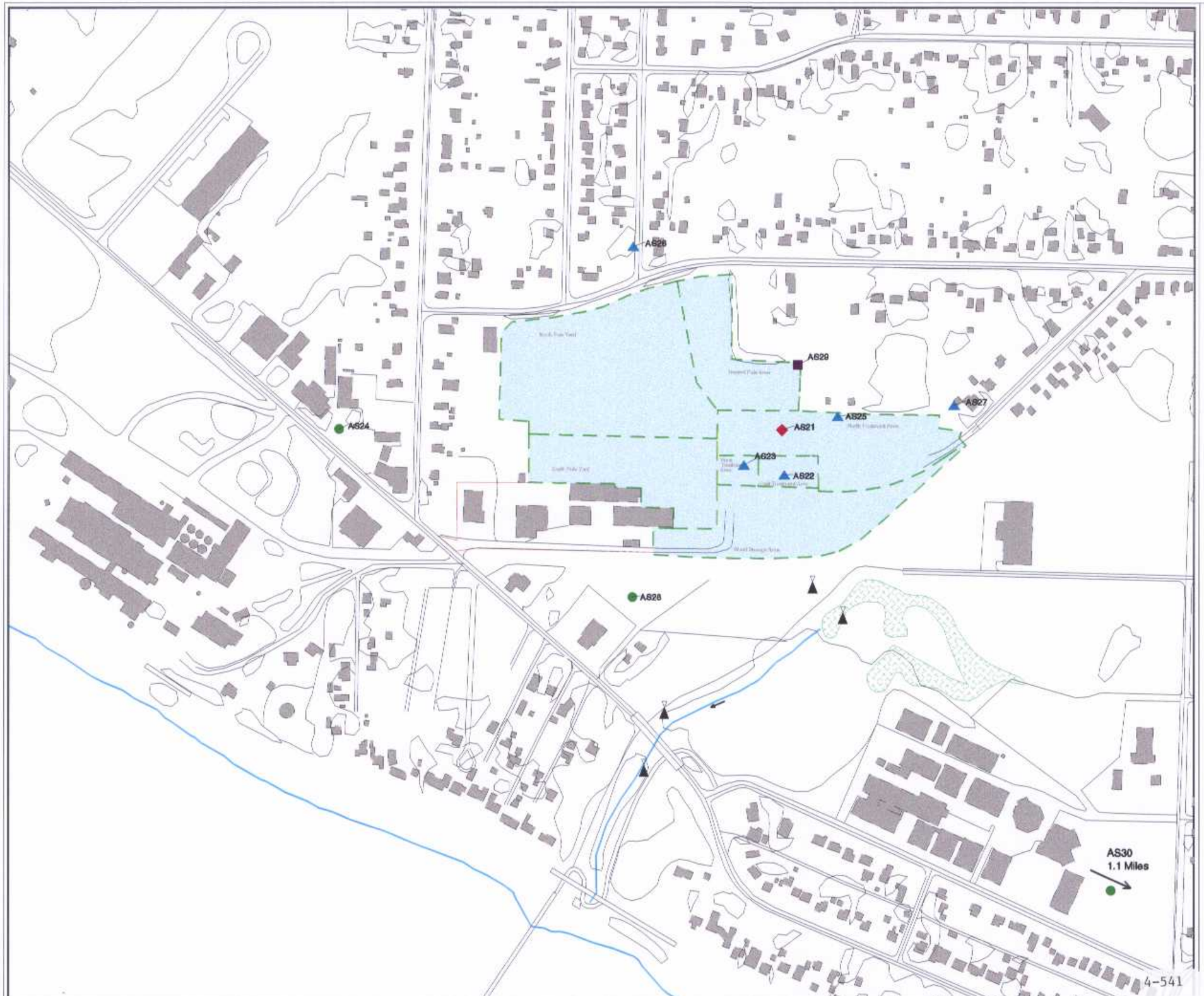

Figure 4-60

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 7-8, 1999

Total ncPAH
in Air
Concentration

LEGEND

- Not Detected
- < 0.1 ug/m3
- => .1 and < 1 ug/m3
- => 1 and < 10 ug/m3
- => 10 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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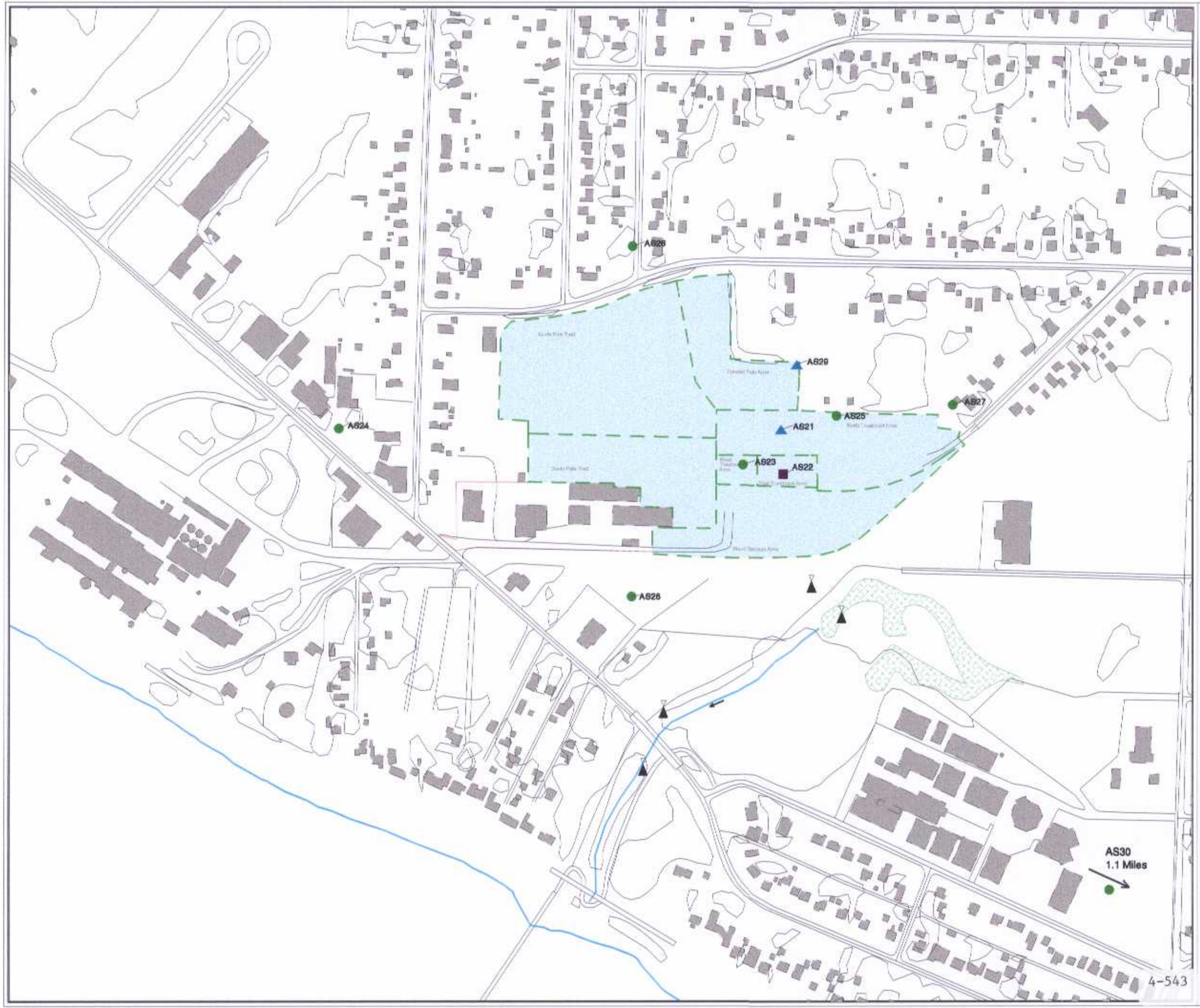

Figure 4-61

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 7-8, 1999

2,3,7,8-TCDD TEQ in Air Concentration

LEGEND

- Not Detected
- < .045 pg/m3
- => .045 and < .45 pg/m3
- => .45 and < 4.5 pg/m3
- => 4.5 pg/m3
- Outfalls

N W E S

0 100 200 300 400 600

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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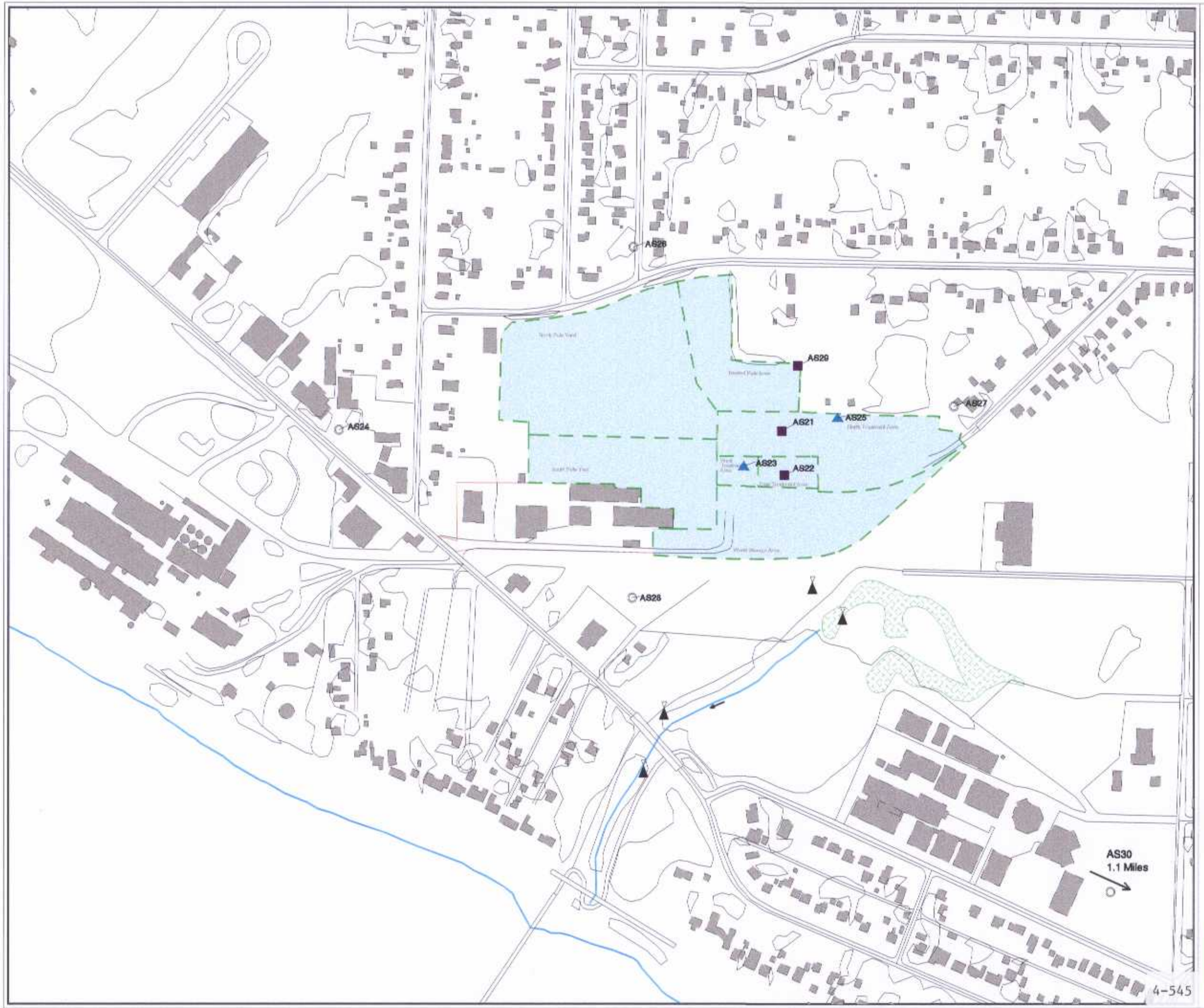

Figure 4-62

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 7-8, 1999

Pentachlorophenol in Air Concentration

LEGEND

- Not Detected
- < .056 ug/m3
- => .056 and < .56 ug/m3
- => .56 and < 5.6 ug/m3
- => 5.6 ug/m3
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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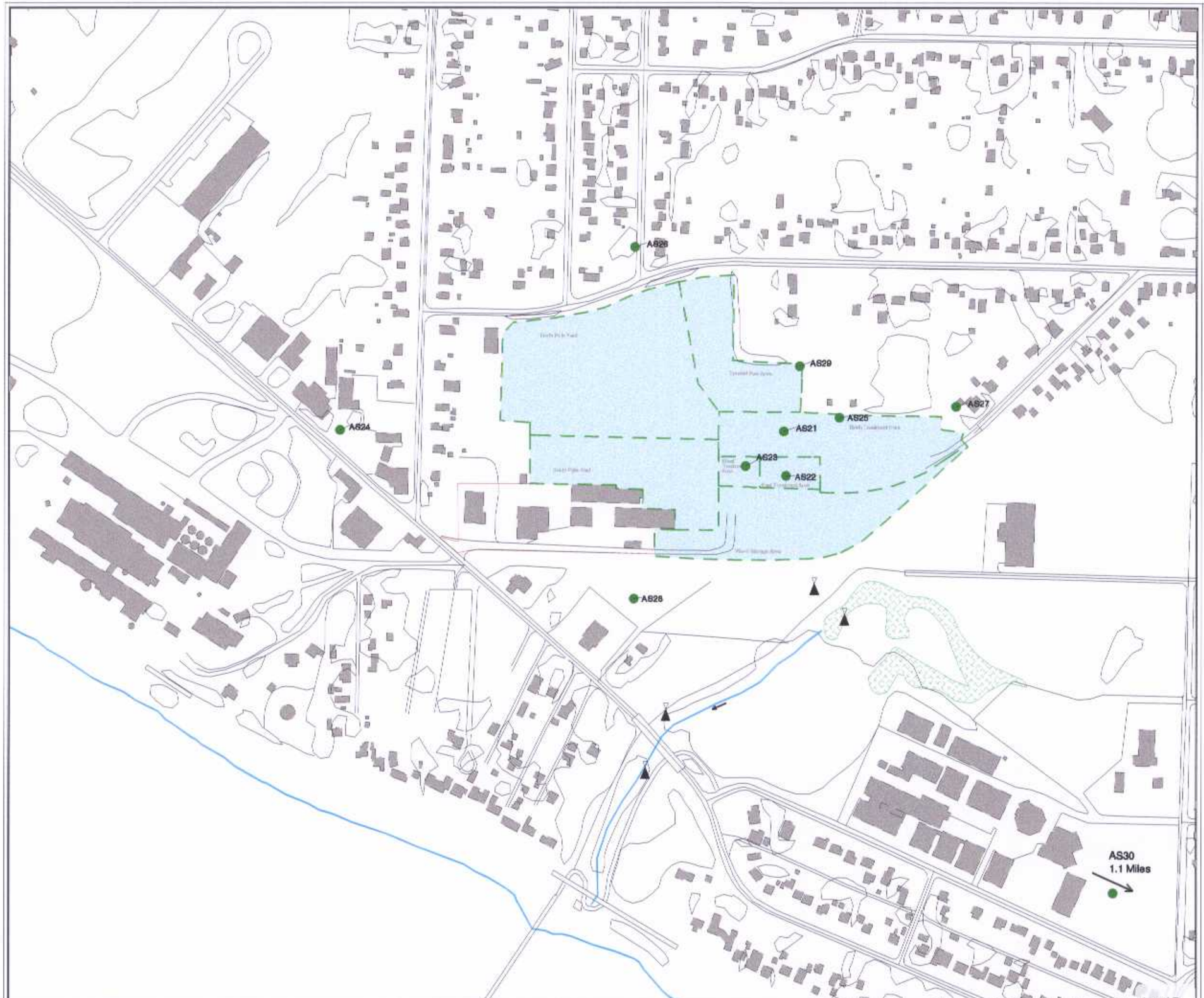

Figure 4-63

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 9-10, 1999

Total cPAH as B(a)P Equivalents in Air Concentration

LEGEND

- Not Detected
- < .0022 ug/m3
- => .0022 and < .022 ug/m3
- => .022 and < .22 ug/m3
- => .22 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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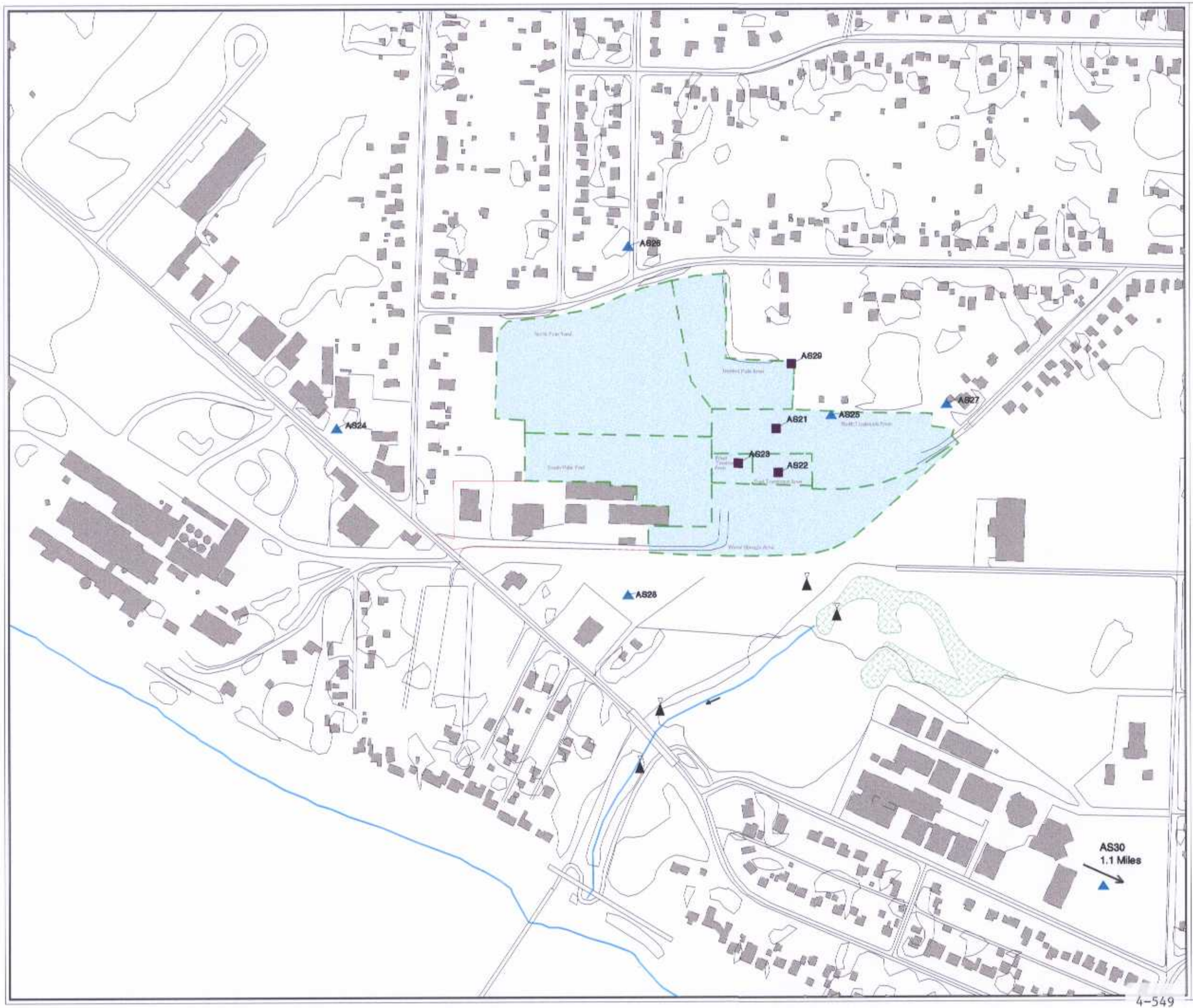

Figure 4-64

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 9-10, 1999

Total ncPAH in Air Concentration

LEGEND

- Not Detected
- < 0.1 ug/m3
- => .1 and < 1 ug/m3
- => 1 and < 10 ug/m3
- => 10 ug/m3
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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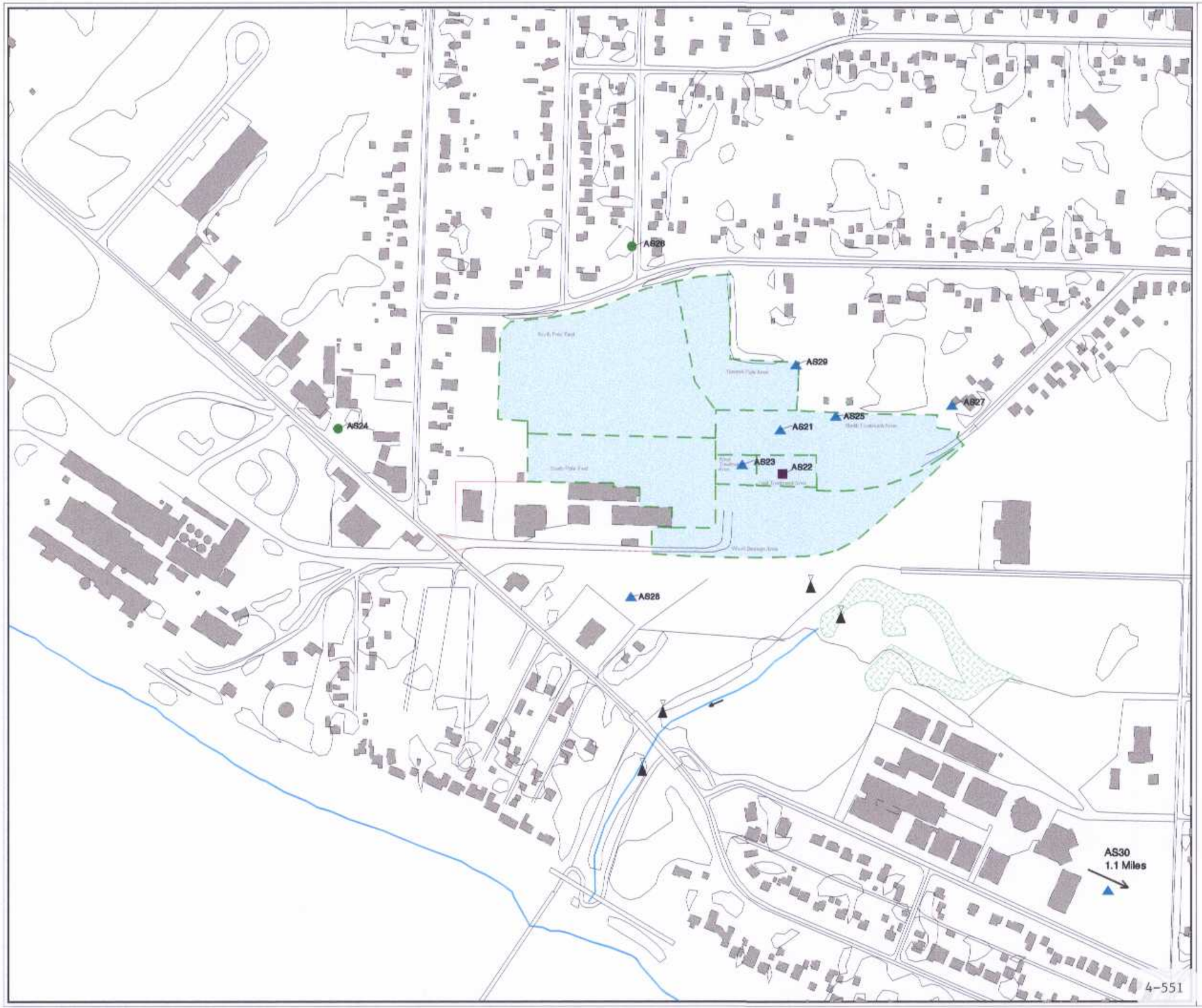

Figure 4-65

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 9-10, 1999

2,3,7,8-TCDD TEQ in Air Concentration

LEGEND

- Not Detected
- < .045 pg/m3
- => .045 and < .45 pg/m3
- => .45 and < 4.5 pg/m3
- => 4.5 pg/m3
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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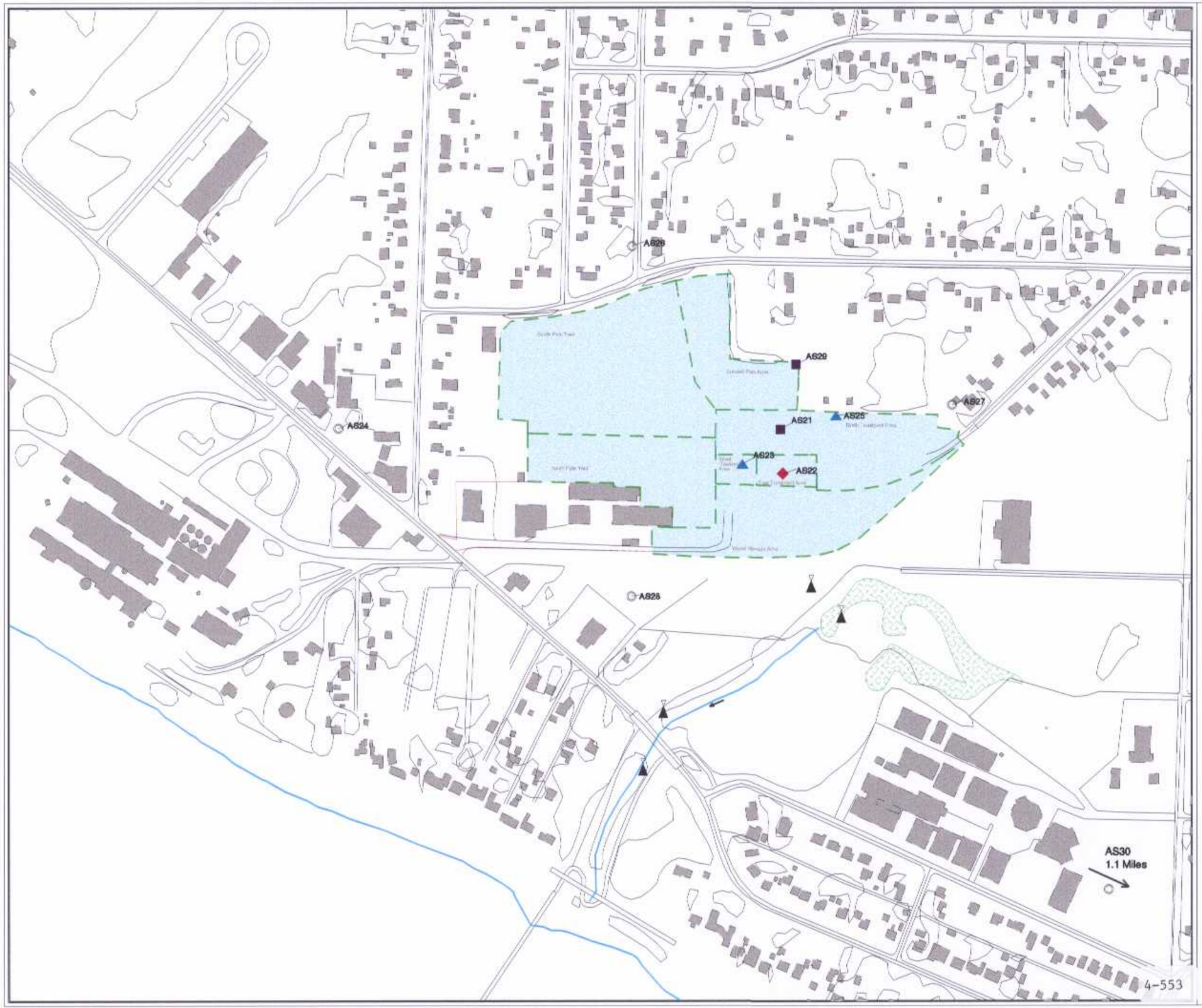

Figure 4-66

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 9-10, 1999

Pentachlorophenol in Air Concentration

LEGEND

- Not Detected
- < .056 ug/m3
- => .056 and < .56 ug/m3
- => .56 and < 5.6 ug/m3
- => 5.6 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 600
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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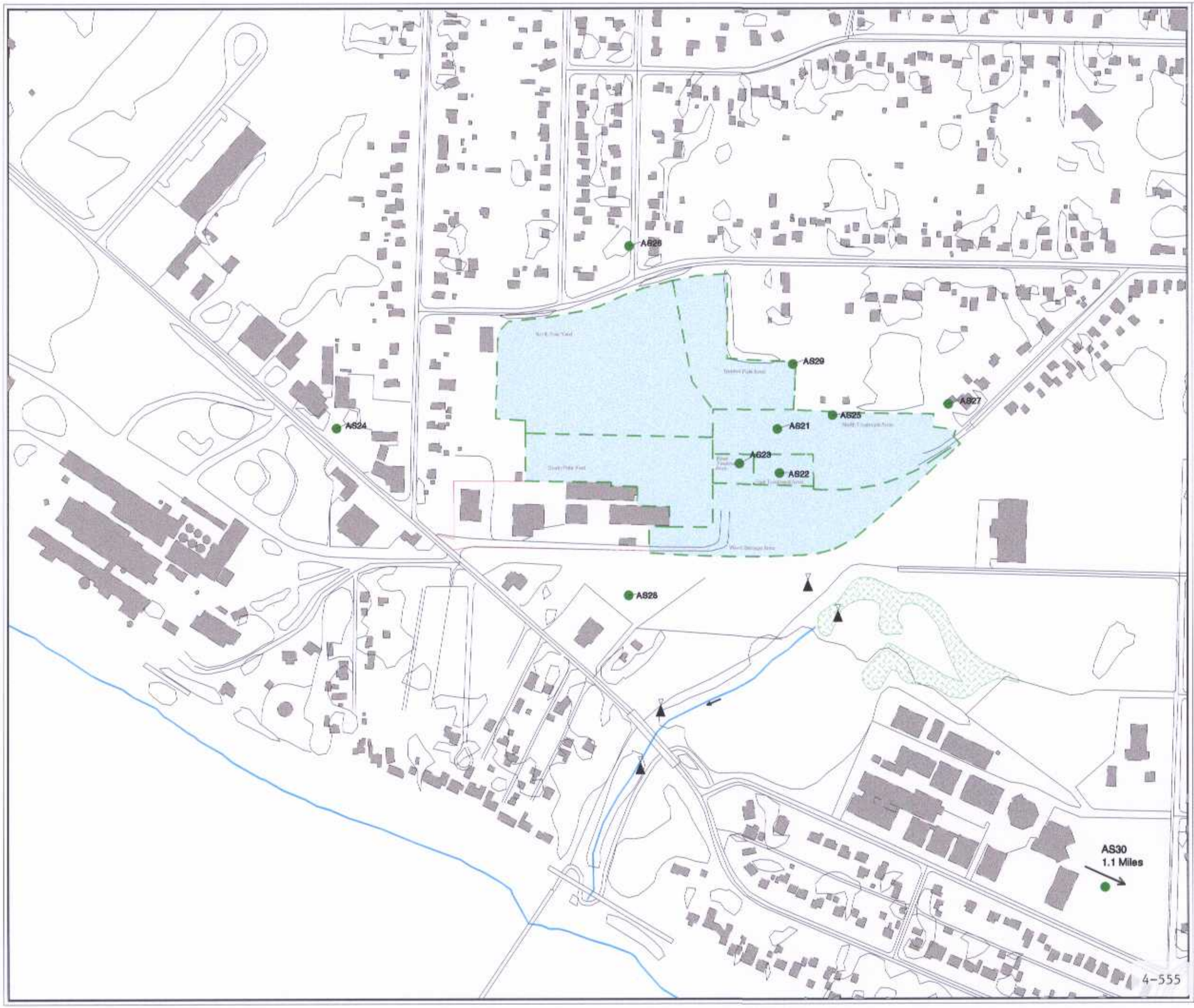

Figure 4-67

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 12-13, 1999

Total cPAH as B(a)P Equivalents in Air Concentration

LEGEND

- Not Detected
- < .0022 ug/m3
- => .0022 and < .022 ug/m3
- => .022 and < .22 ug/m3
- => .22 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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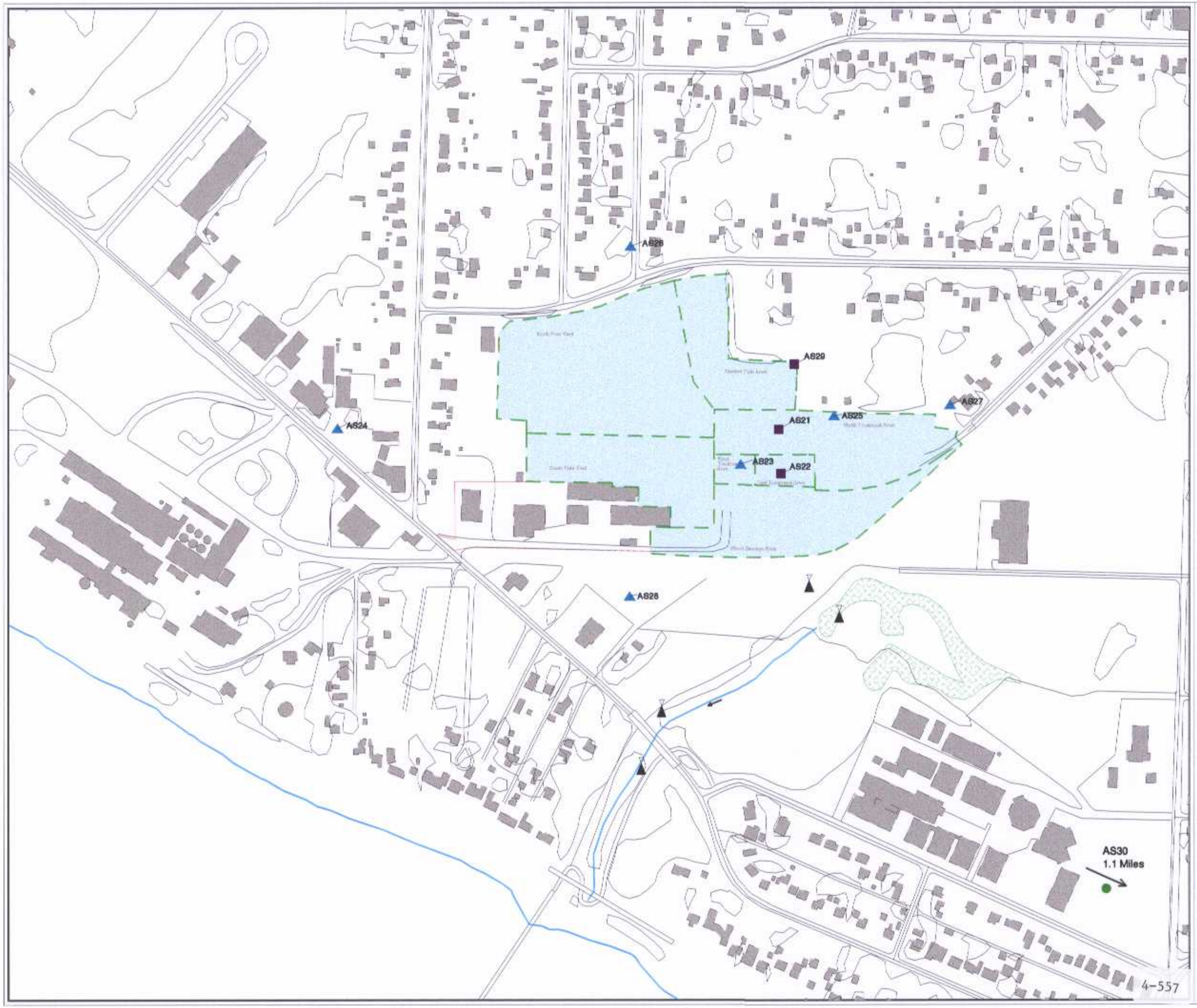

Figure 4-68

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 12-13, 1999

Total ncPAH
in Air
Concentration

LEGEND

- Not Detected
- < 0.1 ug/m3
- => .1 and < 1 ug/m3
- => 1 and < 10 ug/m3
- => 10 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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Figure 4-69

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

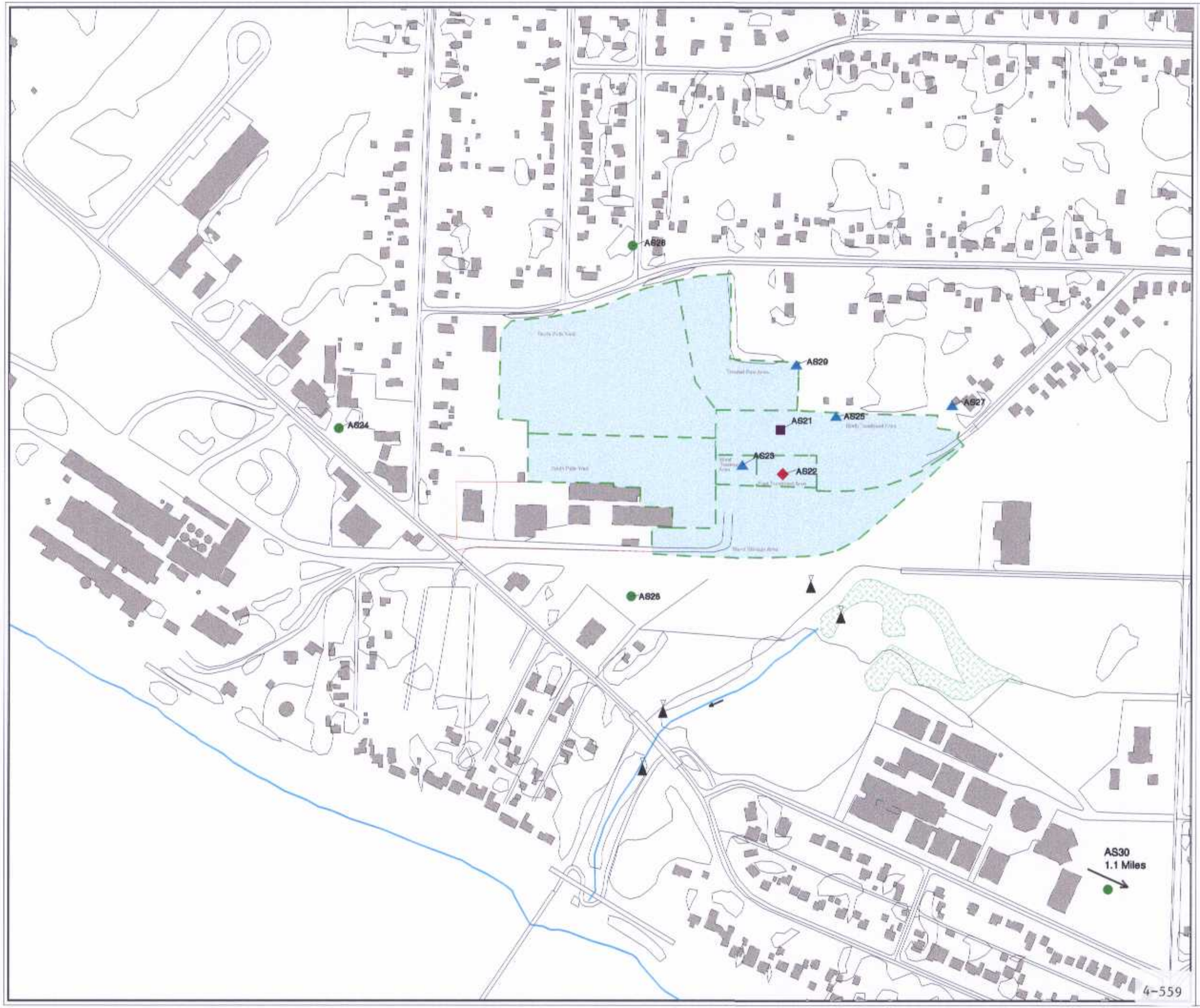
Remedial Investigation

July 12-13, 1999

2,3,7,8-TCDD TEQ
in Air
Concentration

LEGEND

- Not Detected
- < .045 pg/m3
- => .045 and < .45 pg/m3
- => .45 and < 4.5 pg/m3
- => 4.5 pg/m3
- Outfalls



Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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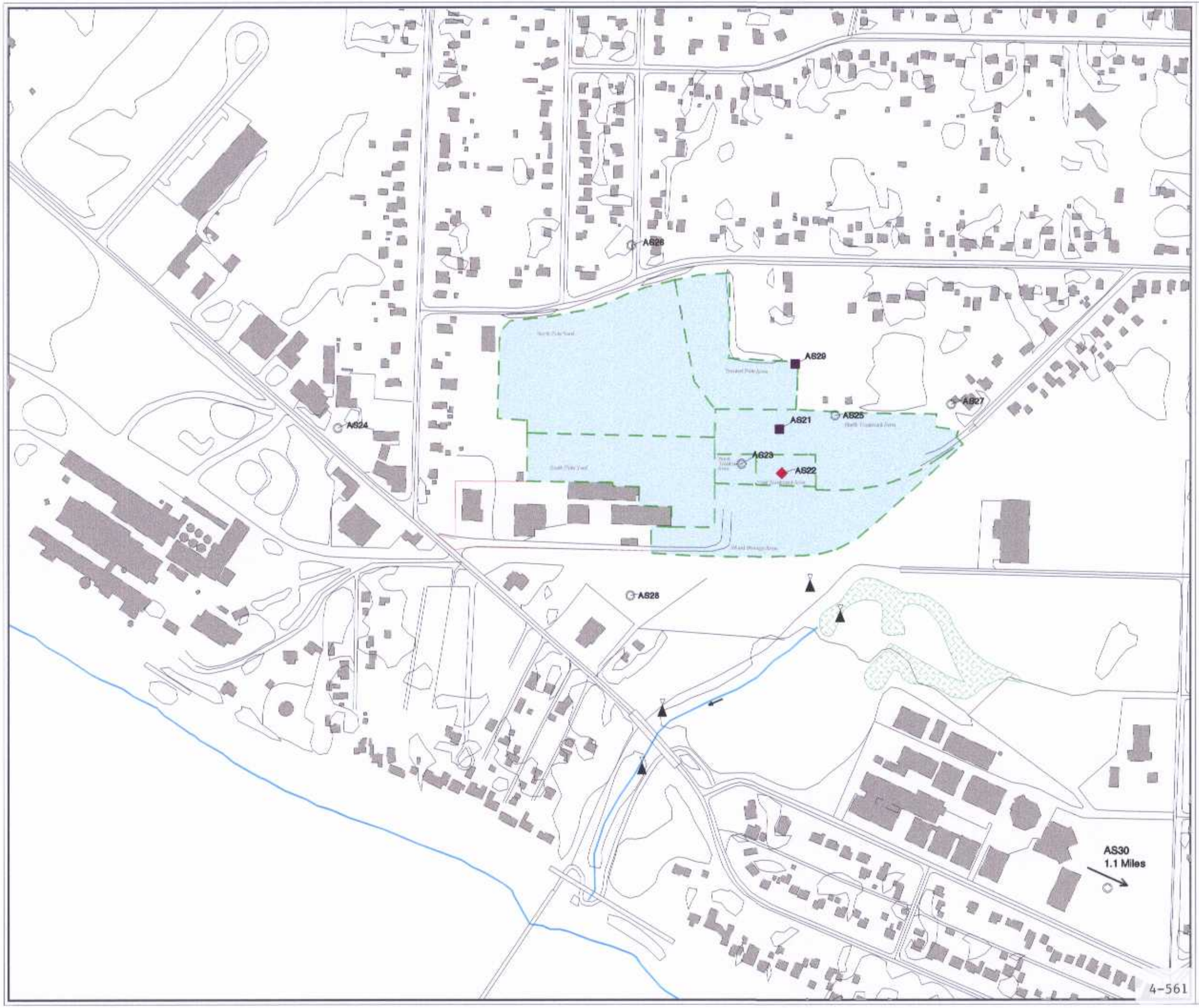

Figure 4-70

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 12-13, 1999

Pentachlorophenol
in Air
Concentration

LEGEND

- Not Detected
- < .056 ug/m3
- => .056 and < .56 ug/m3
- => .56 and < 5.6 ug/m3
- => 5.6 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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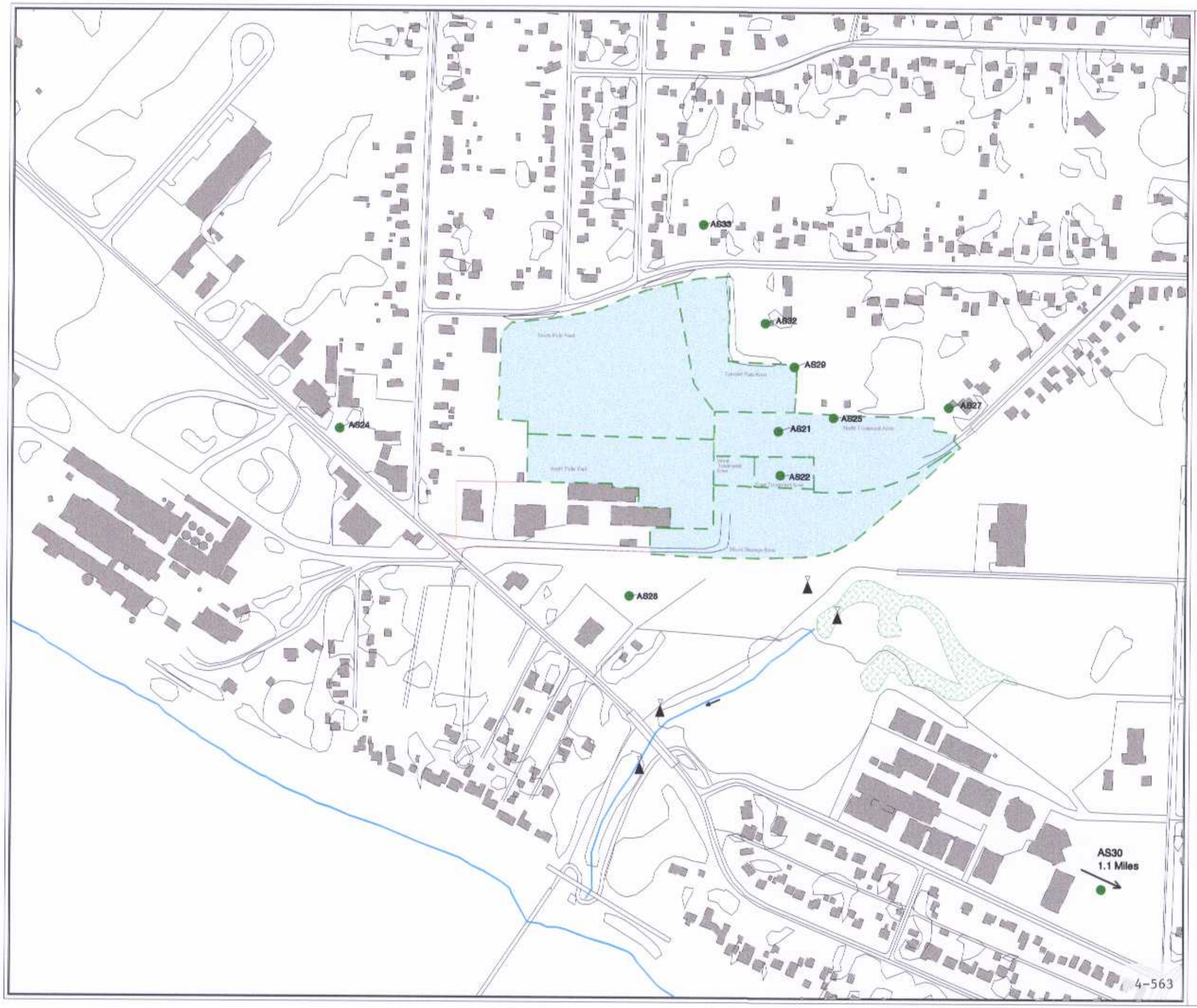

Figure 4-71

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 27-28, 1999

Total cPAH as B(a)P Equivalents in Air Concentration

LEGEND

- Not Detected
- < .0022 ug/m3
- => .0022 and < .022 ug/m3
- => .022 and < .22 ug/m3
- => .22 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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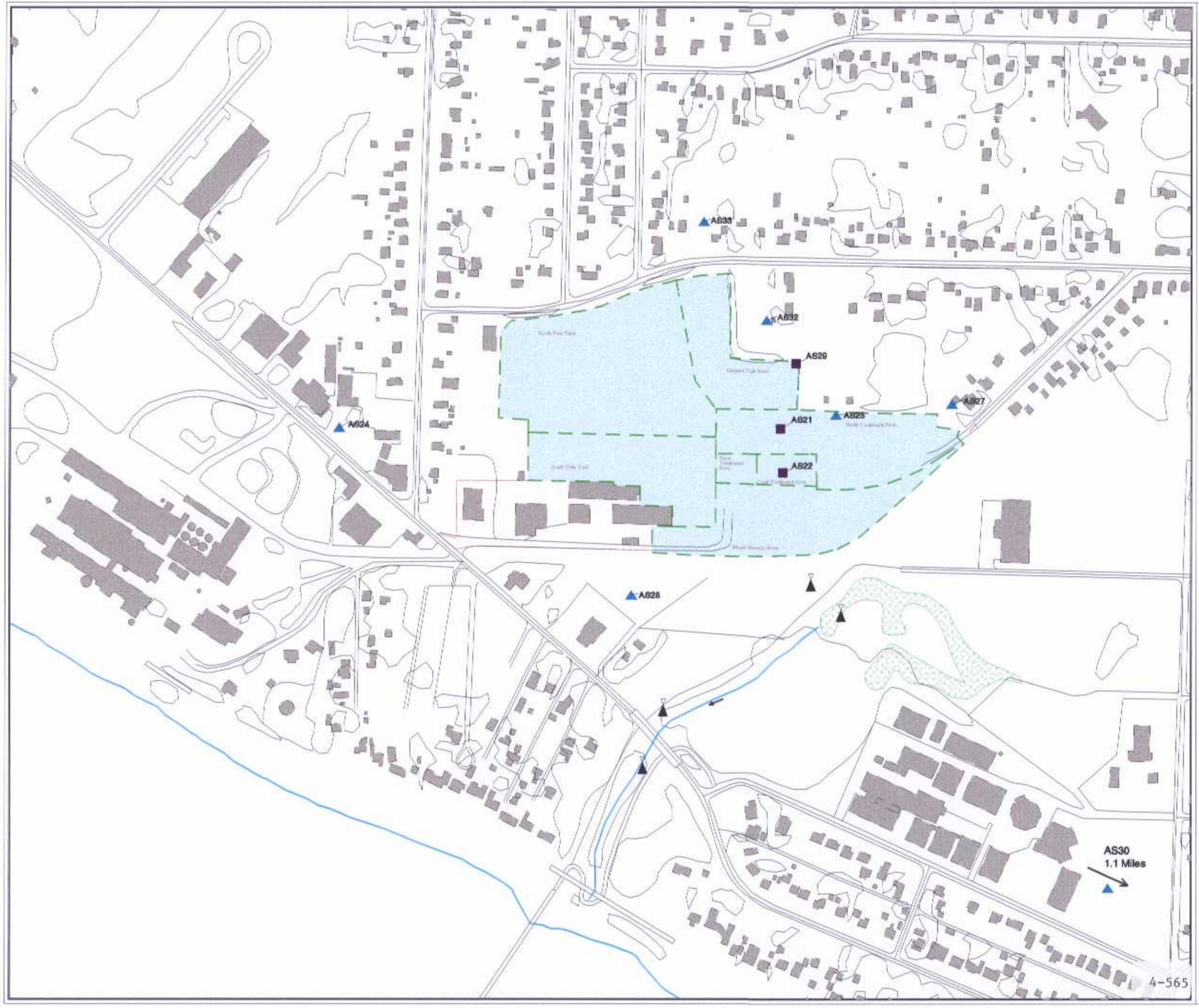

Figure 4-72

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 27-28, 1999

Total ncPAH
in Air
Concentration

LEGEND

- Not Detected
- < 0.1 ug/m3
- => .1 and < 1 ug/m3
- => 1 and < 10 ug/m3
- => 10 ug/m3
- Outfalls

N
W E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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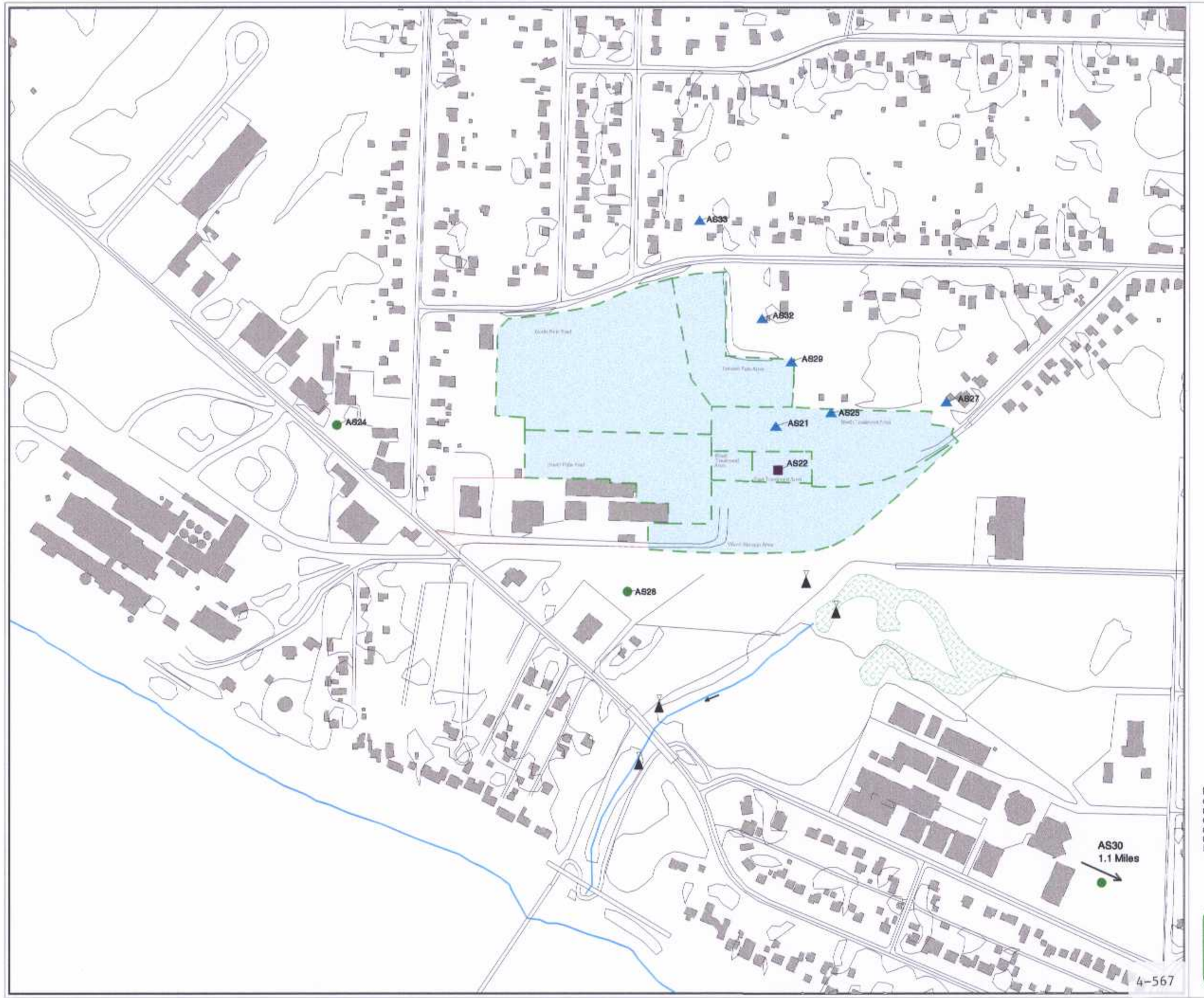

Figure 4-73

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 27-28, 1999

2,3,7,8-TCDD TEQ in Air Concentration

LEGEND

- Not Detected
- < .045 pg/m3
- => .045 and < .45 pg/m3
- => .45 and < 4.5 pg/m3
- => 4.5 pg/m3
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-74

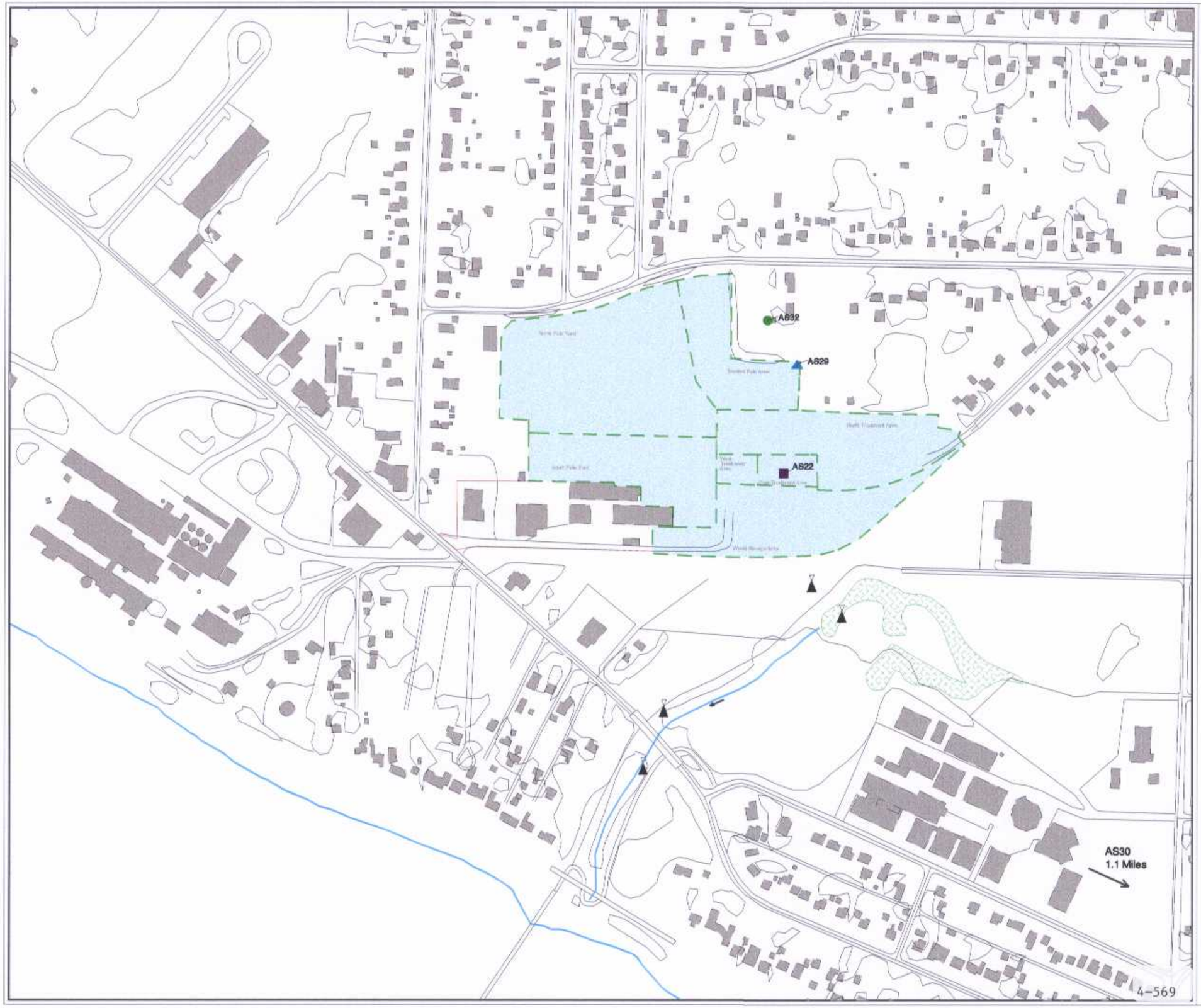
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 27-28, 1999

Pentachlorophenol
in Air
Concentration



LEGEND

- Not Detected
- < .056 ug/m3
- => .056 and < .56 ug/m3
- => .56 and < 5.6 ug/m3
- => 5.6 ug/m3
- Outfalls

N
W
E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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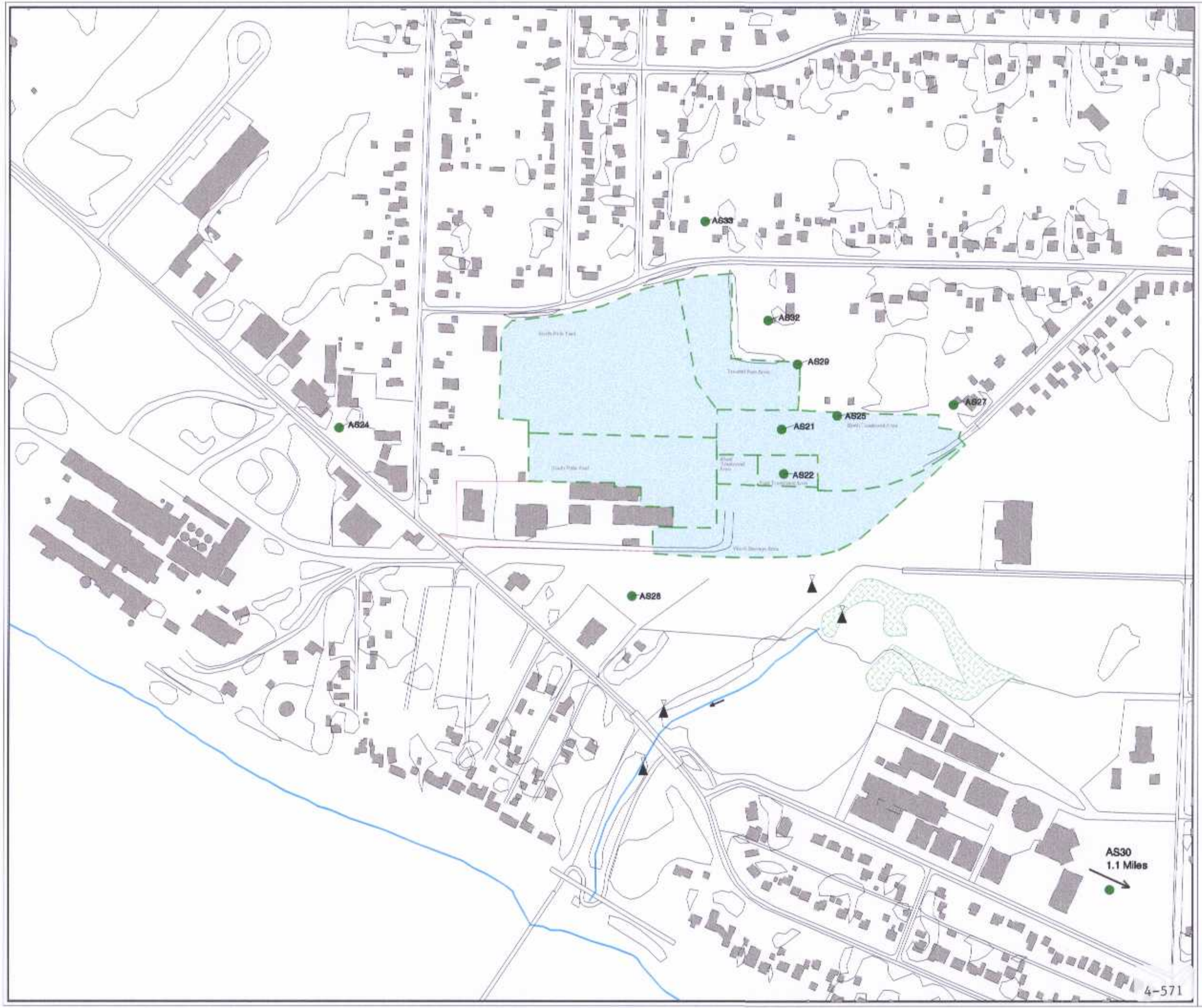

Figure 4-75

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 29-30, 1999

Total cPAH as B(a)P Equivalents in Air Concentration

LEGEND

- Not Detected
- < .0022 ug/m3
- => .0022 and < .022 ug/m3
- => .022 and < .22 ug/m3
- => .22 ug/m3
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-76

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 29-30, 1999

Total ncPAH in Air Concentration

LEGEND

- Not Detected
- < 0.1 ug/m3
- => .1 and < 1 ug/m3
- => 1 and < 10 ug/m3
- => 10 ug/m3
- Outfalls

AS33
AS32
AS29
AS25
AS27
AS24
AS21
AS22
AS28
AS30
1.1 Miles

N
W
E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

4-573

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Figure 4-77

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 29-30, 1999

2,3,7,8-TCDD TEQ in Air Concentration

LEGEND

- Not Detected
- < .045 pg/m3
- => .045 and < .45 pg/m3
- => .45 and < 4.5 pg/m3
- => 4.5 pg/m3
- Outfalls

N
W E
S

0 100 200 300 400 600
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

AS33
AS32
AS29
AS27
AS24
AS25
AS21
AS22
AS26
AS30
1.1 Miles

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Figure 4-78

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

September 29-30, 1999

Pentachlorophenol
in Air
Concentration

LEGEND

- Not Detected
- < .056 ug/m3
- => .056 and < .56 ug/m3
- => .56 and < 5.6 ug/m3
- => 5.6 ug/m3
- Outfalls

AS33
AS32
AS29
AS27
AS24
AS21
AS25
AS22
AS26
AS30
1.1 Miles

N
W
E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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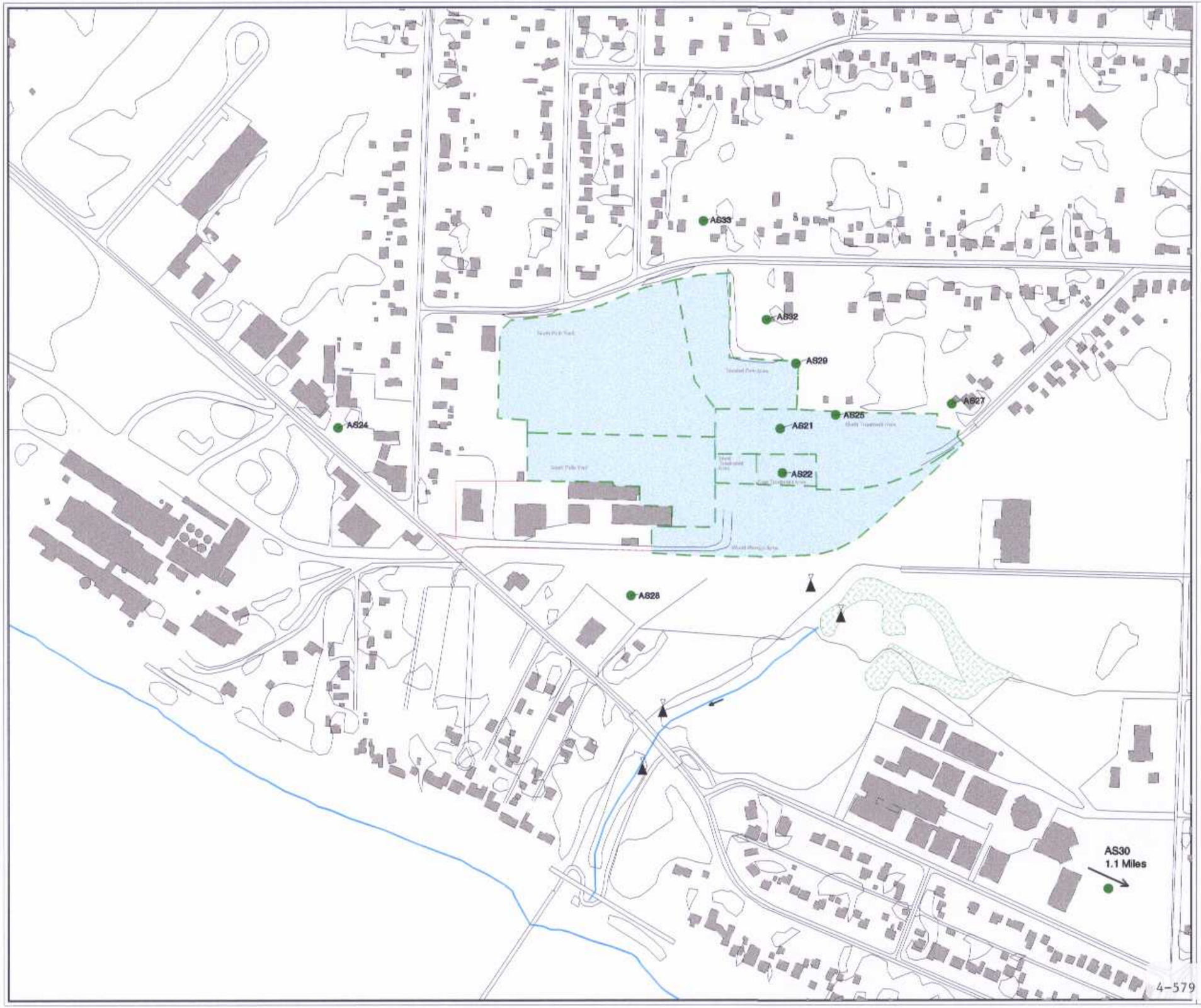

Figure 4-79

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

October 1-2, 1999

Total cPAH as B(a)P Equivalents in Air Concentration

LEGEND

- Not Detected
- < .0022 ug/m3
- => .0022 and < .022 ug/m3
- => .022 and < .22 ug/m3
- => .22 ug/m3
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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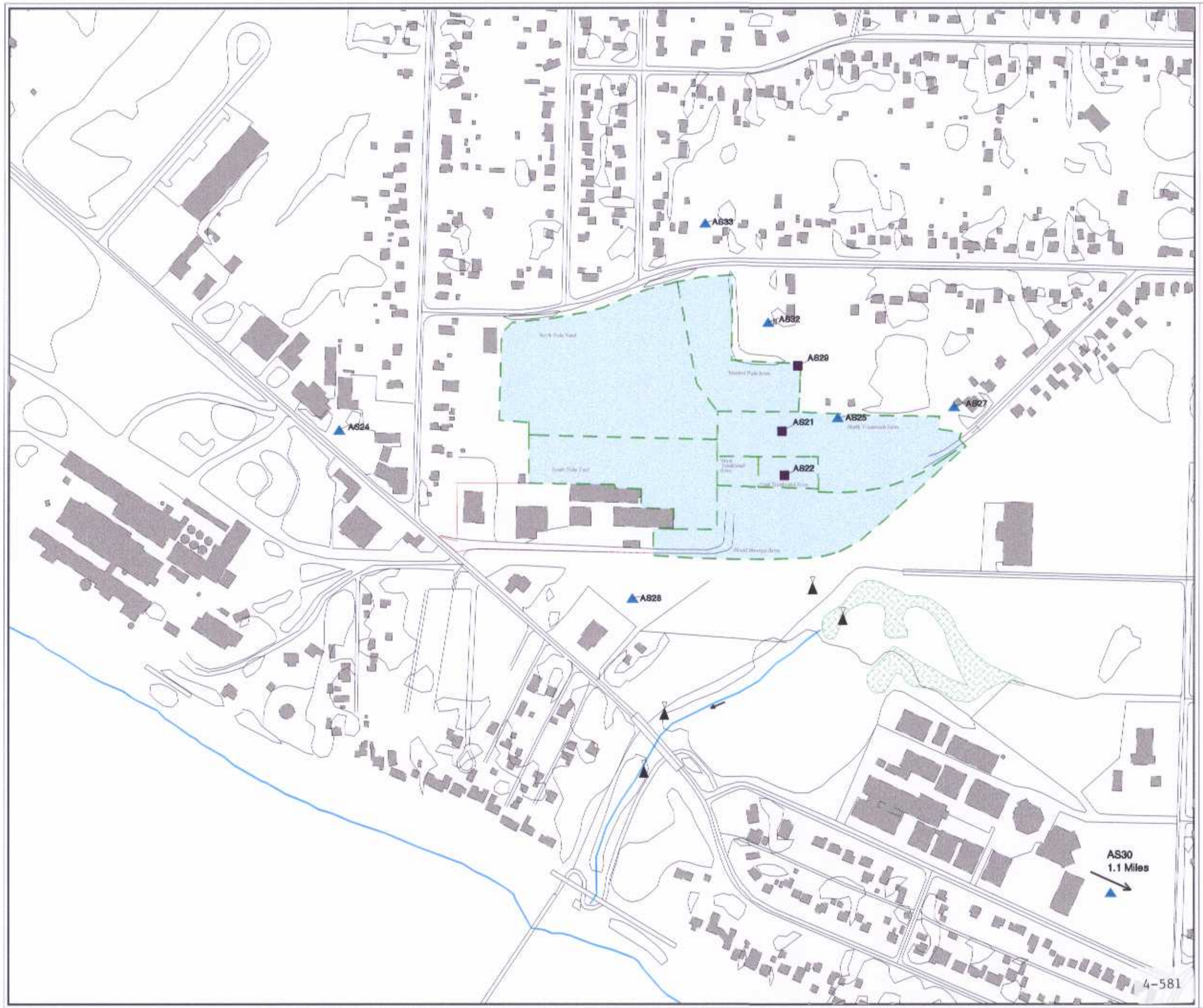

Figure 4-80

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

October 1-2, 1999

Total ncPAH in Air Concentration

LEGEND

- Not Detected
- < 0.1 ug/m3
- => .1 and < 1 ug/m3
- => 1 and < 10 ug/m3
- => 10 ug/m3
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure were selected to show distribution of contaminants only and have no regulatory or risk-based significance.

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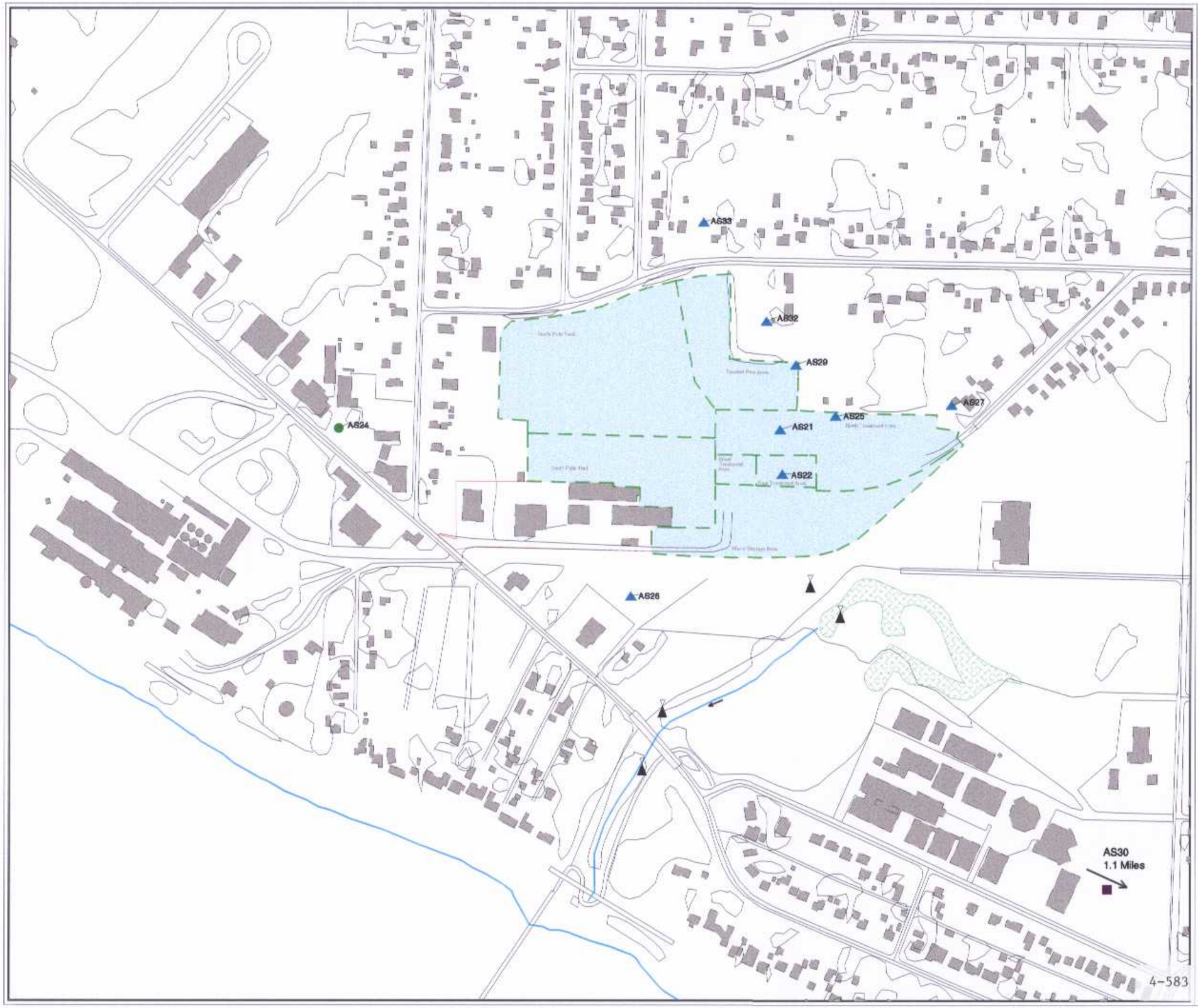

Figure 4-81

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

October 1-2, 1999

2,3,7,8-TCDD TEQ in Air Concentration

LEGEND

- Not Detected
- < .045 pg/m3
- => .045 and < .45 pg/m3
- => .45 and < 4.5 pg/m3
- => 4.5 pg/m3
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Figure 4-82

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

October 1-2, 1999

Pentachlorophenol
in Air
Concentration

LEGEND

- Not Detected
- < .056 ug/m3
- => .056 and < .56 ug/m3
- => .56 and < 5.6 ug/m3
- => 5.6 ug/m3
- Outfalls

AS33
AS32
AS29
AS27
AS25
AS21
AS22
AS24
AS28
AS30
1.1 Miles

N
W
E
S

0 100 200 300 400 500
Feet

Note: Concentration ranges shown in this figure are based on risk-based screening concentrations. The colored shapes represent concentrations associated with excess lifetime cancer risks below 10-6, between 10-6 and 10-5, between 10-5 and 10-4, and greater than 10-4, respectively, using default residential exposure assumptions as shown in the 1999 EPA, Region 9, Preliminary Remediation Goals table.

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Wood Storage Area

SW06
SW05
SW07
SW08
SW03
SW04
SW02
SW01

Figure 4-83

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

Total cPAH as B(a)P Equivalents in Surface Water/Seep/Tapped Spring Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 800

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.

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Wood Storage Area

SW06
SW05
SW07
SW03
SW04
SW02
SW01

4-589

Figure 4-84

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

Total ncPAH
in Surface Water/Seep/Tapped Spring
Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.

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Figure 4-85

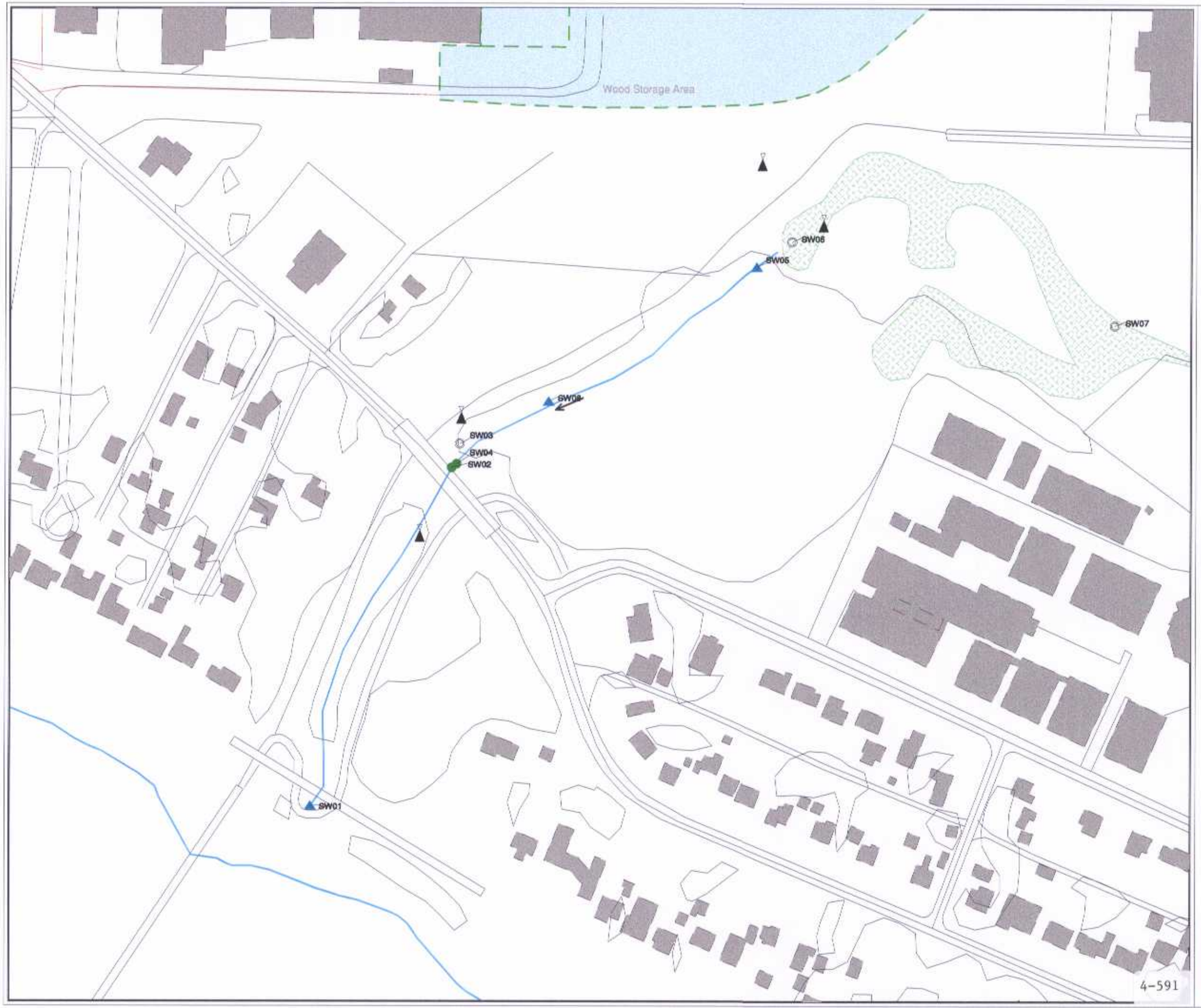
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

2,3,7,8-TCDD TEQ
in Surface Water/Seep/Tapped Spring
Concentration



LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.

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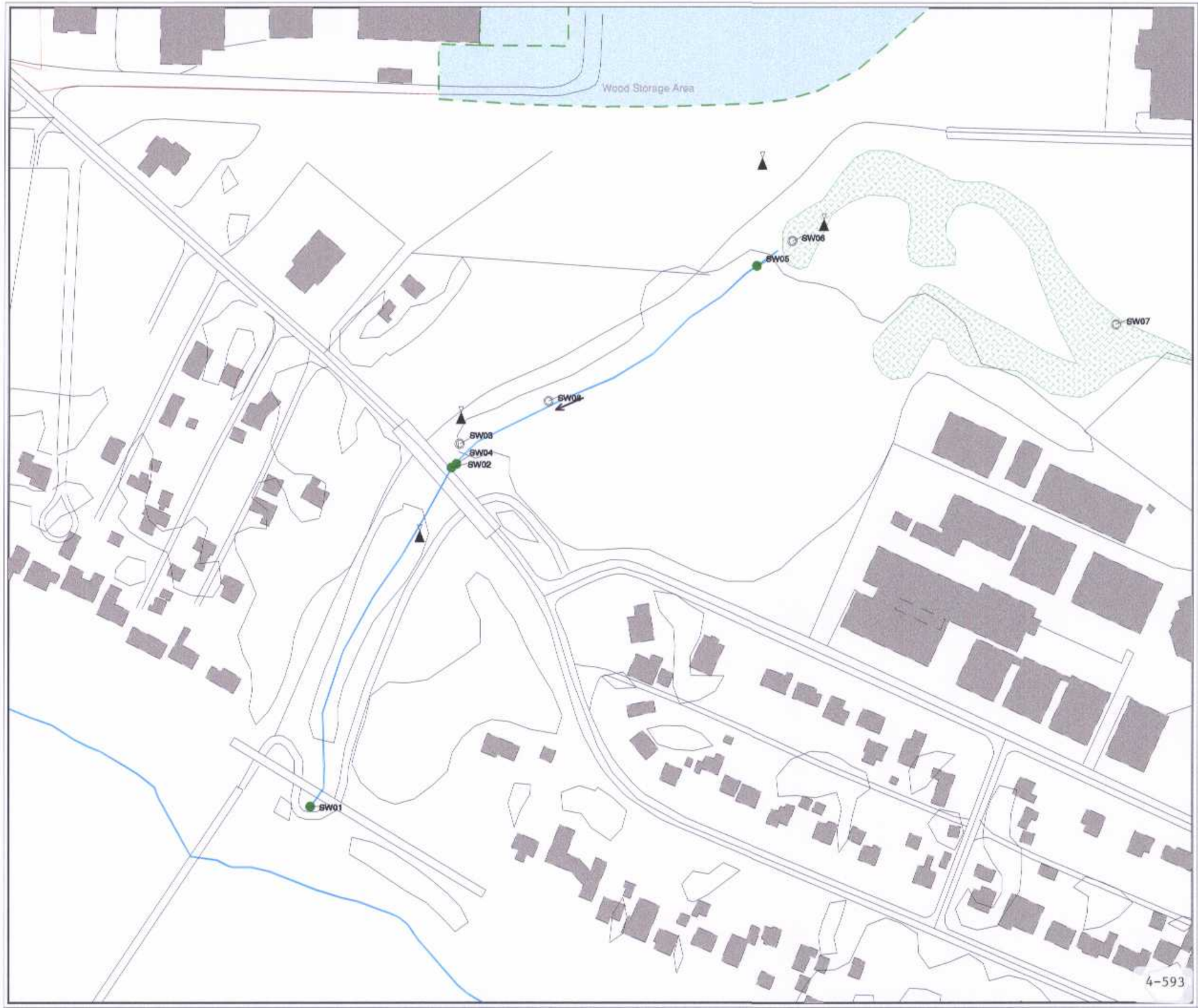

Figure 4-86

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

Pentachlorophenol
in Surface Water/Seep/Tapped Spring
Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 800

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.
Freshwater Chronic Water Quality Standard for Surface Waters of the State of Washington, for PCP (assuming a pH of ~ 7.5) is ~ 10 ug/L.

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Wood Storage Area

SW08
SW05
SW07
SW06
SW03
SW04
SW02
SW09
SW01

4-595

Figure 4-87

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Total cPAH as B(a)P Equivalents in Surface Water/Seep/Tapped Spring Concentration

LEGEND

- Not Detected
- < .0092 ug/L
- => .0092 and < .092 ug/L
- => .092 and < .92 ug/L
- => .92 ug/L
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.

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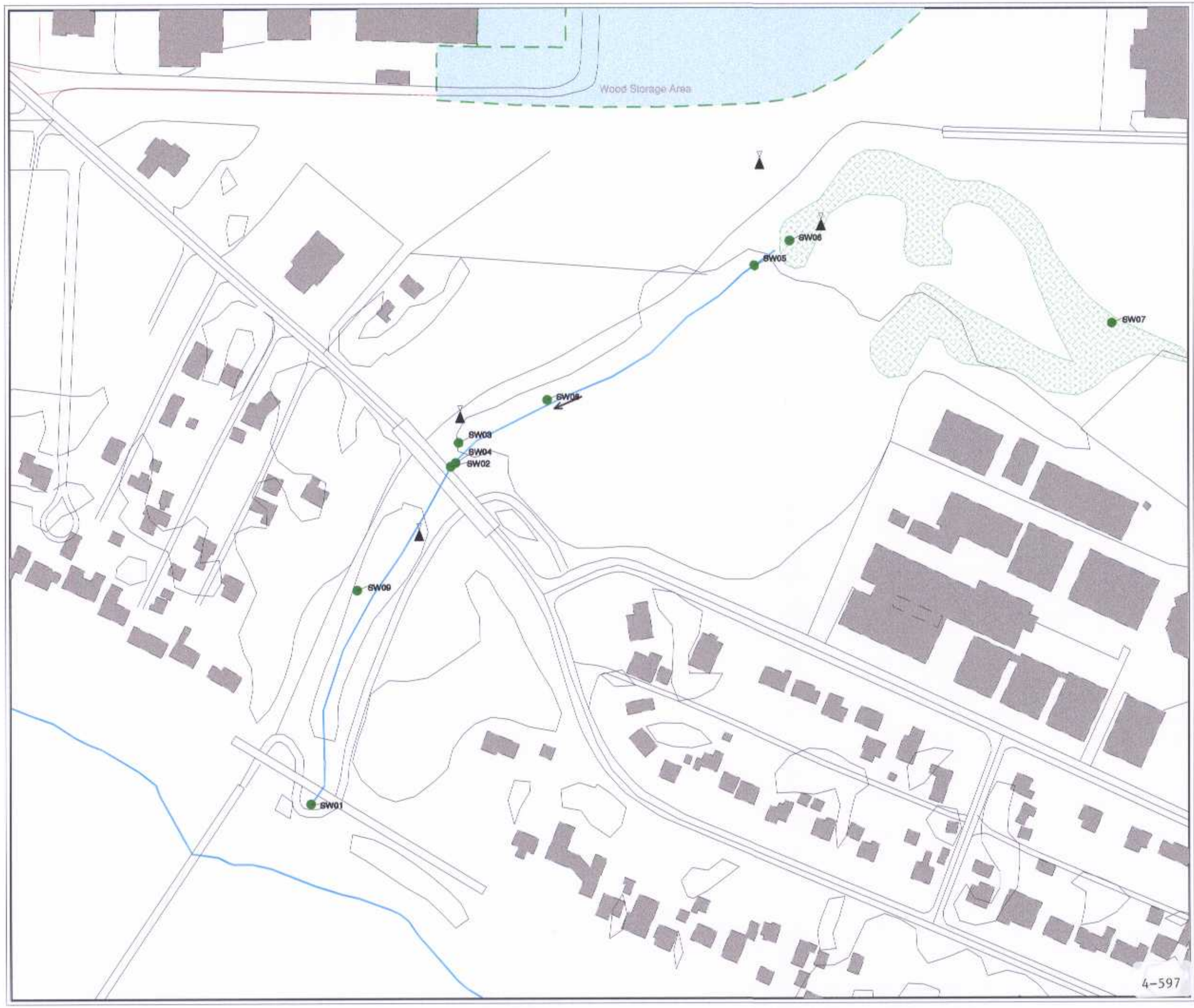

Figure 4-88

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Total ncPAH
in Surface Water/Seep/Tapped Spring
Concentration

LEGEND

- Not Detected
- < 10 ug/L
- => 10 and < 100 ug/L
- => 100 and < 1000 ug/L
- => 1000 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.

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Wood Storage Area

SW06
SW05
SW07
SW08
SW03
SW04
SW02
SW09
SW01

4-599

Figure 4-89

THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

2,3,7,8-TCDD TEQ
in Surface Water/Seep/Tapped Spring
Concentration

LEGEND

- Not Detected
- < 0.448 pg/L
- => 0.448 and < 30 pg/L
- => 30 and < 300 pg/L
- => 300 and < 3000 pg/L
- => 3000 pg/L
- Outfalls

N
W
E
S

0 100 200 300 400 600

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.

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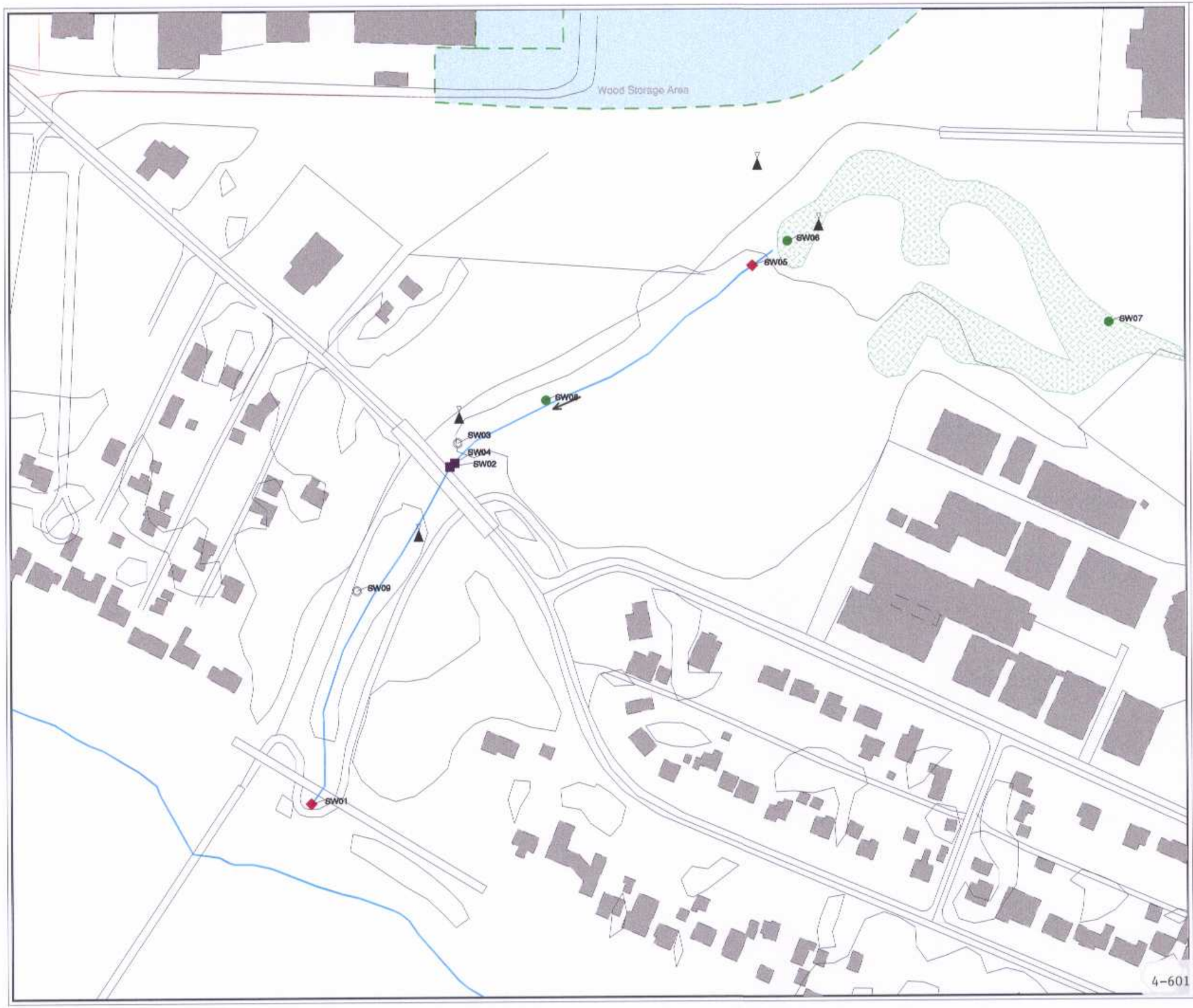

Figure 4-90

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

December 1999

Pentachlorophenol
in Surface Water/Seep/Tapped Spring
Concentration

LEGEND

- Not Detected
- < .56 ug/L
- => .56 and < 1 ug/L
- => 1 and < 10 ug/L
- => 10 and < 100 ug/L
- => 100 ug/L
- Outfalls

N
W E
S

0 100 200 300 400 500

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in groundwater samples and have no regulatory or risk-based significance.
Freshwater Chronic Water Quality Standard for Surface Waters of the State of Washington, for PCP (assuming a pH of ~ 7.5) is ~ 10 ug/L.

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Wood Storage Area

SD10
SW06
SD09
SW05
SD08
SW07
SD11
SD07
SD06
SD05
SW04
SW02
SD04
SD03
SD02
SW01
SD01

4-603

Figure 4-91

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

Total cPAH as B(a)P Equivalents
in Sediment
Concentration

LEGEND

- Not Detected
- < .062 mg/Kg
- => .062 and < .62 mg/Kg
- => .62 and < 6.2 mg/Kg
- => 6.2 mg/Kg
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: To facilitate comparisons between data, concentrations shown in this figure were selected to show the same distribution as seen in soil samples and have no regulatory or risk-based significance.

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Wood Storage Area

SD10
SW06
SD09
SW05
SW07
SD11
SD08
SD07
SD06
SD05
SW04
SW02
SD04
SD03
SD02
SW01
SD01

4-605

Figure 4-92

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

Total ncPAH
in Sediment
Concentration

LEGEND

- Not Detected
- < 1 mg/Kg
- => 1 and < 100 mg/Kg
- => 100 and < 1000 mg/Kg
- => 1000 mg/Kg
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

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Figure 4-93

THE OESER COMPANY
SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

2,3,7,8-TCDD TEQ
in Sediment
Concentration

Wood Storage Area

SD10
SW06
SD09
SW05
SD08
SW07
SD11
SD07
SD06
SD05
SW04
SW02
SD04
SD03
SD02
SW01
SD01

LEGEND

- Not Detected
- < 7.2 ng/Kg
- => 7.2 and < 72 ng/Kg
- => 72 and < 720 ng/Kg
- => 720 ng/Kg
- Outfalls

N
W
E
S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on Washington State Sediment Quality Standards for ionizable organic compounds. The colored shapes represent concentrations below the Apparent Effects Threshold (AET), between the AET and ten times the AET, between ten times the AET and one hundred times the AET, and greater than one hundred times the AET respectively.

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Figure 4-94

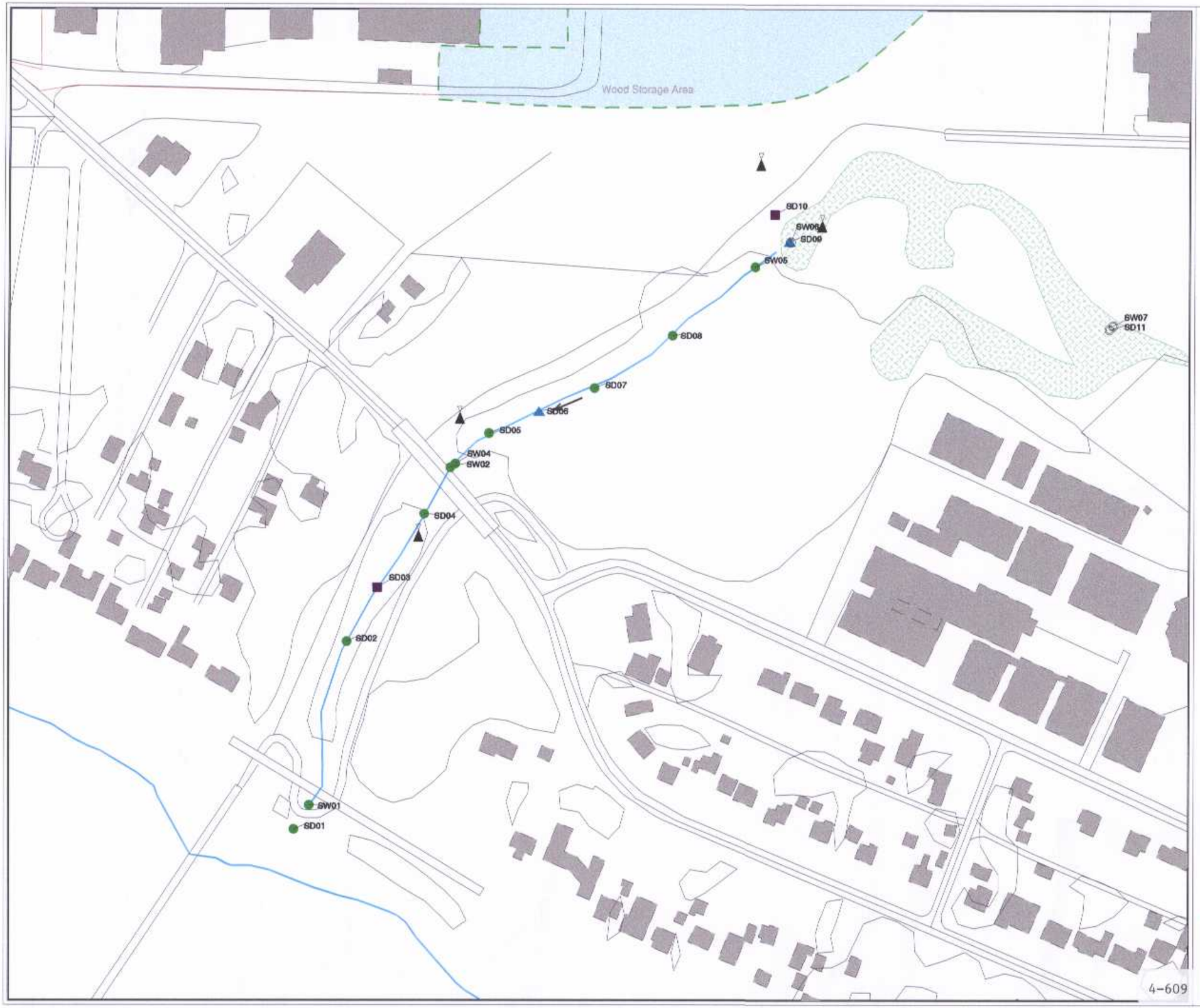
THE OESER COMPANY SUPERFUND SITE

Bellingham, Washington

Remedial Investigation

July 1999

Pentachlorophenol in Sediment Concentration



LEGEND

- Not Detected
- < 0.36 mg/Kg
- => .36 and < 1.8 mg/Kg
- => 1.8 and < 3.6 mg/Kg
- => 3.6 mg/Kg
- Outfalls

N W E S

0 100 200 300 400 500

Feet

Note: Concentration ranges shown in this figure are based on Washington State Sediment Quality Standards for ionizable organic compounds. The colored shapes represent concentrations below the Apparent Effects Threshold (AET), between the AET and five times the AET, between five times the AET and ten times the AET, and greater than ten times the AET respectively.

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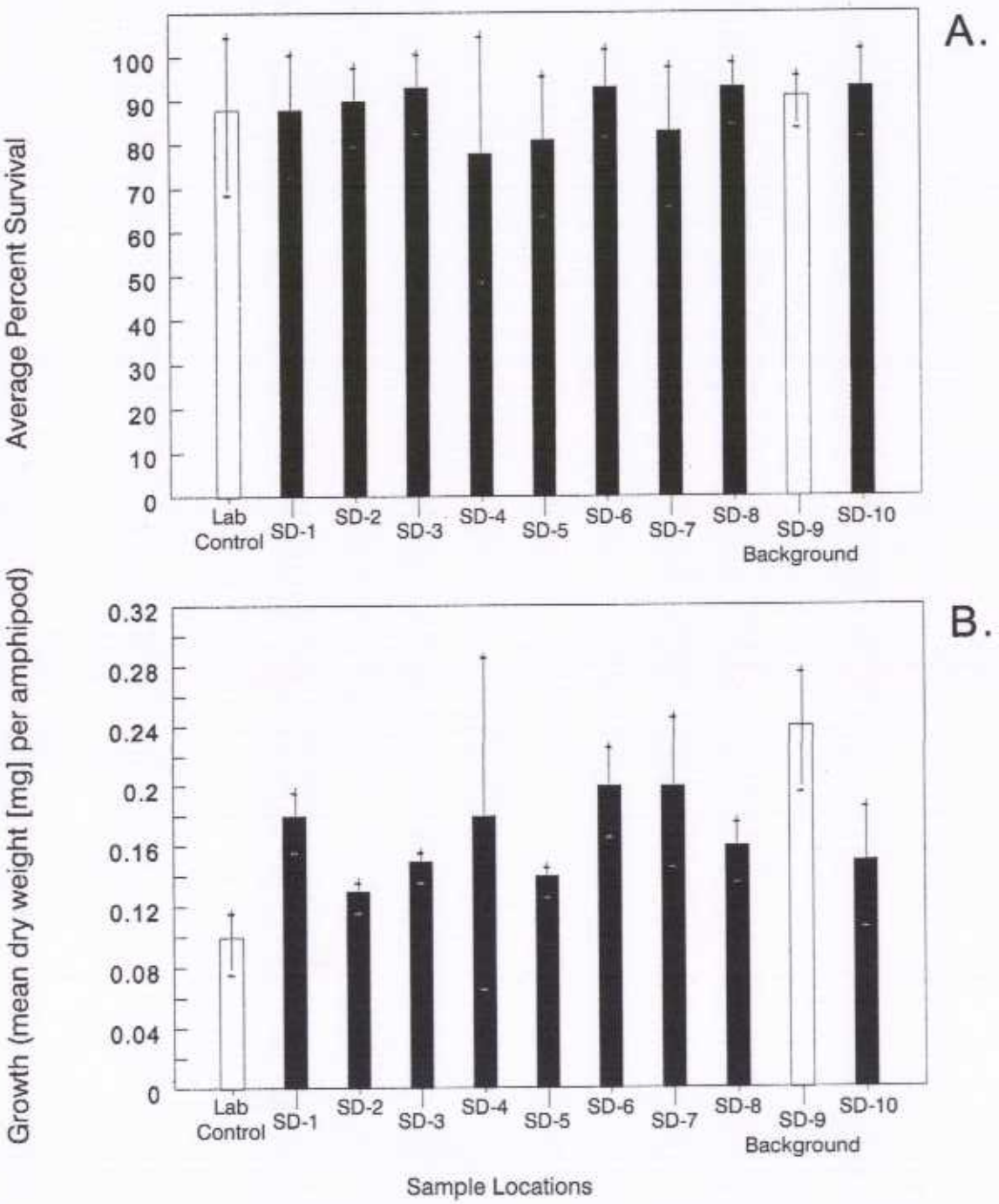

Note: Error bars represent one standard deviation.

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THE OESER COMPANY
SUPERFUND SITE
REMEDIAL INVESTIGATION
Bellingham, Washington

Figure 4-95
SURVIVAL AND GROWTH OF HYALELLA AZTECA (AMPHIPOD) EXPOSED TO SEDIMENT FROM LITTLE SQUALICUM CREEK FOR 10 DAYS

DATE:	TDD NO.	Drawn By	Dwg. No.	Pubs No.
7/20/01	01-03-0016	AES	fig 4-95	S641

5. FATE AND TRANSPORT

5.1 PHASE DISTRIBUTION OF CONTAMINANTS

Contaminants in the subsurface soil partition among one or more of the following phases: NAPLs, air, water, and solids. This partitioning commonly occurs until an equilibrium distribution has been attained.

5.1.1 Vaporization

The compounds in a NAPL oil phase will vaporize into the surrounding air until equilibrium between the NAPL and air has been reached. The vapor concentration of each compound in equilibrium with the NAPL will depend on both the vapor pressure of that compound and the composition of the NAPL. For a NAPL that consists of only one compound, the equilibrium vapor concentration is given by the pure-compound vapor pressure. For NAPLs that consist of more than one compound, Raoult's Law is used to calculate the equilibrium vapor concentrations for each component of the NAPL:

$$C_{v,i} = \frac{x_i P_i}{RT}$$

where:

$C_{v,i}$ = vapor concentration of compound i

x_i = mole fraction of i in the NAPL

P_i = vapor pressure of the pure compound at temperature T

R = Universal Gas Constant

T = temperature

It is unlikely that there is a single-compound NAPL source for each contaminant at The Oeser Company site. Therefore, the actual vapor concentrations at the site will be most accurately estimated using the above equation instead of vapor pressure alone.

5.1.2 Dissolution

The solubility of a compound describes the aqueous concentration that will exist in water that is in equilibrium with a single-component NAPL. It represents the theoretical maximum aqueous concentration for that compound, in the absence of any chemical compounds that enhance solubility (co-solvents). The actual aqueous concentration, which is also known as the effective solubility, for a compound that exists in equilibrium with a multi-component NAPL will be lower than in the single component case. The effective solubility can be approximated using the following analog to Raoult's Law:

$$S_i = x_i S^0$$

where:

S_i = effective solubility of compound i

x_i = mole fraction of i in the NAPL

S_0 = solubility of the pure compound.

As described in the previous section, it is not likely that any of the NAPL sources at The Oeser Company site consist of only one compound, which would result in effective solubilities that are lower than pure solubility. No compounds that act as co-solvents (e.g. isopropanol, methanol, or acetone) are detected at The Oeser Company site, indicating that the solubility of COPCs are not increased beyond the levels indicated by Raoult's Law.

5.1.3 Volatilization from Water

Henry's Law describes equilibrium partitioning between water and vapor. Henry's Law Constant (H_{cc}) is the ratio between the equilibrium vapor and aqueous concentrations. The volatile organic contaminants that vaporize to potentially dangerous vapor concentrations have Henry's Law Constants that range between 0.06 and 0.0011 atm@ m^3 ' mol while those listed as semivolatile compounds have Henry's Law Constants that are much lower, between $1x10^{-5}$ and $7x10^{-20}$ atm@ m^3 ' mol (Montgomery and Welkom, 1991; Pankow and Cherry, 1996).

5.1.4 Sorption

Sorption is the general term that describes the uptake of contaminants by soil, without referencing a specific mechanism. For dilute solutions of organic contaminants, the soil/water equilibrium-partitioning coefficient, which is also known as the distribution coefficient (K_d), is the ratio of concentration in the solid phase to the equilibrium concentration in the aqueous phase. The currently accepted model for the sorption of non-ionic organic contaminants is that partitioning occurs between the aqueous phase and the organic fraction of the soil. Using this model, the distribution coefficient is calculated using the formula:

$$K_d = K_{oc} f_{oc}$$

where:

K_d = distribution coefficient

K_{oc} = water/organic carbon partition coefficient

f_{oc} = fraction of organic carbon in the soil.

For similar aqueous concentrations, compounds with higher K_{oc} values will tend to have higher soil concentrations than compounds with lower K_{oc} values.

Site-specific K_d values can also be estimated directly by comparing soil and aqueous concentrations in samples that are collected from the same location.

5.2 BIOCONCENTRATION FACTORS AND THE OCTANOL-WATER PARTITION COEFFICIENT

Bioconcentration factors (BCFs) are measures of the tendency for chemical contaminants in water to accumulate in an aquatic organisms. The equilibrium concentration of a contaminant in an aquatic organism can be estimated by multiplying the concentration of the chemical in surface water, sediment, or soil by the bioconcentration factor for the chemical. This parameter is an important determinant of body burden of a COPC in aquatic organisms and mid- or upper-trophic level receptors, including humans.

The octanol-water partition coefficient (K_{ow}) is a measure of how a chemical is distributed at equilibrium between octanol and water. It is often used to estimate the extent to which an organic chemical will partition from water into fatty tissues of organisms. *Log* K_{ow} values generally range from

-2.5 to 10.5 (mol@$L_{octanol}^{-1}$/ mol@L_{water}^{-1}). Chemicals with *log* K_{ow} values less the 3 are generally considered not to concentrate in animal tissues.

5.3 DESCRIPTION OF FREQUENTLY DETECTED CONTAMINANTS AT THE OESER COMPANY SITE

5.3.1 Pentachlorophenol

PCP has a very low vapor pressure, and the vapor pressure of its salt or ionic form is expected to be significantly less. Based upon its low vapor pressure and Henry's Law constant, volatilization from aqueous systems is not considered to be a primary transport mechanism. Due to a high K_{oc} and low vapor pressure, PCP will strongly bind to soil and will volatilize only slowly from surface soil.

Schellenberg et al. (1984) demonstrated that sorption of PCP is highly dependent on the organic content of the sorbent, and reported an average Koc value of 32,900 ($mg_{adsorbed}$ @$kg_{\ organic\ carbon}^{-1}$ /$mg_{dissolved}$ @$L_{solution}^{-1}$) for the compound with lake and river sediments and aquifer solids. After organic carbon content, pH is the next most important variable controlling sorption of PCP to soil. PCP is sorbed to soils or sediment under acidic conditions, and is more mobile under neutral or alkaline conditions (Kuwatsuka and Igarashi 1975).

PCP's high *log* K_{oc} value indicates that the chemical is likely to bioaccumulate. However, the extent of bioaccumulation is dependent on the pH of the medium, since PCP dissociates to its more water-soluble anionic form at high ambient pH levels. BCFs up to 1000 have been reported in algae, aquatic invertebrates, and fish (EPA 1986). Bioconcentration in fish appears to result from direct uptake from water rather than through the food chain.

Atmospheric PCP is photolyzed; however, oxidation is not expected to be an important mechanism in this medium. Photolysis and biodegradation are believed to be the dominant transformation processes in aqueous systems. For example, Pignatello et al. (1983) demonstrated that the photolysis half-life of PCP at the water surface is 0.7 hour. However, the same author reported that photolysis was greatly reduced with increasing depth in the water column. PCP is biotransformed in aqueous systems by acclimated microorganisms. Biodegradation occurs much more rapidly under aerobic conditions than under anaerobic conditions (Liu et al. 1981); biotransformation in groundwater will likely be much less than in aerated surface waters.

Biodegradation is considered to be the major transformation mechanism for PCP in soil. As in the case for water, PCP in soil is rapidly metabolized by acclimated microorganisms (Kaufman 1978). Laboratory tests indicate that transformation is more rapid in soils with higher organic carbon content, higher moisture content, and optimum temperatures for microbial activity (Young and Carrol 1951).

5.3.2 Polycyclic Aromatic Hydrocarbons

PAHs are a class of compounds with structures consisting of two or more fused benzene rings in linear, angular, or cluster arrangements. PAHs can be formed wherever natural or synthetic organic chemicals are exposed to high temperatures. Creosote consists primarily of PAHs and related chemicals.

In general, most of the PAHs can be characterized as having very low vapor pressures, water solubilities, and Henry's Law constants, and high *log* K_{ow} and *log* K_{oc} values. High K_{oc}*s* indicate that most PAHs are strongly sorbed to organic matter in soil. That fact, combined with low water solubilities, indicate that rates of transport of most PAHs from the unsaturated zone via infiltration to the saturated zone will be slow. Low vapor pressures and low Henry's Law constants indicate that most PAHs will not readily volatilize from surface water or from surface soils.

The exceptions to this generalization are lower molecular weight PAHs with solubilities greater than 0.1 mg/L and Henry's Law constants greater than 10-5 atm@ m^3 ' mol, including acenaphthene, fluoranthene, fluorene, naphthalene, and pyrene. Although these compounds have relatively high *log* K_{oc} (3 L/kg or greater), they are mobile in comparison to other PAHs, and they may be observed in groundwater (Wilson et al.1986). The lower molecular weight PAHs will also volatilize substantially from surface soil and surface water under favorable conditions (high temperature, low depth, high wind) (Coover and Sims 1987; Southworth 1979).

In aquatic environments, PAHs are found primarily sorbed to particles that have settled to the bottom or are suspended in the water column; Eisler (1987) found that approximately two thirds of PAHs in the studied aquatic systems were associated with sediments. Lower molecular weight PAHs can recycle significantly between the water column and sediments (Baker et al. 1991).

PAHs from water, sediments, and food can bioaccumulate in aquatic organisms. Bioconcentration factors ranging from 10 to 10,000 have been reported in fish and crustaceans (Ehrlich et al. 1992). Biomagnification has not been observed, because PAHs are rapidly metabolized and eliminated by many aquatic organisms (Eisler 1987).

PAHs are transformed in the atmosphere by photolysis and oxidation processes (Baek et al. 1991). The most important transformation processes for PAHs in water are photooxidation, chemical oxidation, and biodegradation by aquatic microorganisms (Neff 1979). The relative importance of each process varies between the PAHs and depends on environmental factors such as temperature, depth, and oxygen content of the water. PAHs can be significantly metabolized by microorganisms under oxygenated conditions, but under anoxic conditions, biodegradation will be very slow (Neff 1979).

The major process for degradation of PAHs in soils is microbial biodegradation. The rates and degrees of biodegradation are influenced by environmental factors, characteristics of the microbial population, the presence of other toxic materials, and the physicochemical properties of the PAHs themselves (Wilson and Jones 1993). Important environmental factors that can affect the size and composition of the microbial population include temperature, pH, soil type, moisture and nutrient levels, oxygen concentrations, PAH concentrations (Sims and Overcash 1983).

5.3.3 Naphthalene

Naphthalene is the simplest of the low molecular weight PAHs, with a basic structure consisting of two fused benzene rings. Naphthalene is a raw material used for manufacturing dyes and synthetic resins and also is used as a moth repellent.

Naphthalene is mobile in the environment with its significant solubility and vapor pressure. Naphthalene released to surface soil will partition readily to air through volatilization, to surface water via storm water runoff, and to groundwater through infiltration and leaching. Naphthalene will volatilize from water; however, the volatilization rate is not rapid. Naphthalene is not as mobile in soils and sediments with high organic content as it is in soil with low organic content.

In air, photochemically produced hydroxyl radicals degrade naphthalene (Howard 1989). The half-life of this degradation process ranges from 3 to 30 hours (Howard 1991). The break down of naphthalene by atmospheric photolysis does occur; however, its half-life is much longer, ranging between 71 and 550 days (Howard 1991).

Naphthalene is removed from water through photolysis, biodegradation, volatilization, and sorption, with the dominant processes being biodegradation and volatilization (Howard 1989). Biodegradation occurs most rapidly in the presence of other organic pollution and in aerobic conditions (Howard 1989). Under aerobic conditions, the half-life for biodegradation in water was measured to be between 12 and 20 hours by Howard (1991). For anaerobic conditions, Howard (1991) measured half-lifes for biodegradation in water between 25 and 258 days. Naphthalene will attach to suspended solids in slow moving water and will evaporate in shallow, fast moving water (Howard 1991).

Naphthalene is removed from shallow soil primarily through volatilization, with biodegradation being a secondary process. The biodegradation of naphthalene in soil is accelerated in the presence of additional organic contaminants and under aerobic conditions (Howard 1989).

5.3.4 Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans

PCDDs and PCDFs are classes of chlorinated aromatic hydrocarbons that are structurally similar. For both classes of compounds, the basic structure consists of two benzene rings connected by a third oxygenated ring. There are 75 different PCDD congeners and 135 PCDF congeners. Neither PCDDs nor PCDFs were ever deliberately produced as commercial end products. Rather, they are trace contaminants formed during the production or chlorinated organic compounds, notably polychlorinated biphenyls and polychlorinated phenols.

As presented in Table 5-1, PCDDs and PCDFs are characterized by extremely low water solubilities and vapor pressures, low Henry's Law constants, and high *log* K_{ow} values and *log* K_{oc} values. The low vapor pressures and Henry's Law constants suggest that the rates of volatilization of PCDDs/PCDFs from soil or water will be slow. For PCDDs/PCDFs in water, volatilization is a minor loss process in comparison to particulate adsorption. Where it occurs, volatilization from soil is largely a surface phenomenon. Podoll et al. (1986) reported rapid volatilization of 2,3,7,8-TCDD at the soil/air interface with significant amount of tightly sorbed residue. In the same study, very low 2,3,7,8-TCDD volatilization was reported when the contamination was buried to a depth of a few millimeters in dry soil. Volatilization losses from surface soil may be environmentally significant in the absence of other transport/transformation processes. Freeman and Schroy (1985) estimated that 90% of the 2,3,7,8-TCDD at Times Beach had been lost through volatilization over the course of 10 years; 57% loss was estimated to have occurred in the first summer.

Given their low vapor pressures, low water solubilities, and high *log* K_{oc} values, PCDDs/PCDFs below the soil surface tend to be strongly adsorbed onto soil particles with little upward or downward vertical migration, particularly in soils with high organic carbon content (Yanders et al. 1989). According to some studies (Puri et al. 1989; 1992), binding of these compounds to soil will approach irreversibility over time due to encapsulation in soil organic and mineral matter.

The presence of organic co-solvents that can solubilize PCDDs/PCDFs will increase their mobility in soils (Podoll et al. 1986). Puri et al. (1992) showed in laboratory experiments that creosote components such as pentachlorophenol, naphthalene, and 2-methylnaphthalene readily transported PCDDs/PCDFs through soil. However, in the absence of co-solvency effects, the extent of leaching should be minimal. Generally, it is expected that rates of transport from the unsaturated zone soils to the water table via rain infiltration will be extremely low and that transport of PCDDs or PCDFs to groundwater will be strongly retarded relative to water flow due to strong sorption to soil particulates.

Since PCDDs/PCDFs are strongly adsorbed to soil particles and aqueous leaching is expected to be minimal, movement of sorbed material can be a major transport process. Most PCDDs/PCDFs entering surface water are associated with particulate matter (e.g. dry deposition of atmospheric particles and eroded surface soil) (Hallet and Brooksbank 1986). Dissolved PCDDs/PCDFs will partition to suspended solids and are likely to remain sorbed to sediments in the aquatic environment.

Based on the low water solubilities and high affinity for fatty tissues (indicated by $log\ K_{ow}$ values ranging from approximately 5.5 to 8.8) PCDDs/PCDFs are expected to bioaccumulate significantly in aquatic organisms. Although aquatic organisms have been shown to bioconcentrate PCDDs/PCDFs from water, this is not the primary route of exposure for most organisms, since only a tiny fraction of PCDDs/PCDFs in the environment are dissolved. The observed bioaccumulation is apparently food-chain based, starting with uptake by benthic organisms through ingestion of contaminated sediments and sediment pore water. Organisms consuming benthic organisms then accumulate and in turn pass the contaminants to higher organisms up the food chain (Muir et al. 1992).

The only significant degradation mechanism for PCDDs/PCDFs appears to be photodegradation of nonsorbed species in air or at the soil- or water-air interface. Laboratory studies have shown that PCDDs/PCDFs are readily degraded by photolytic dechlorination in the presence of ultraviolet light and a hydrogen donor, such as oil or an organic solvent. The major products of photolysis are lower chlorinated PCDDs/PCDFs. The half-life for the reaction of vapor phase 2,3,7,8-TCDD with photochemically produced hydroxyl radicals in air is estimated at 8.3 days (Podoll et al. 1986). Photolysis of PCDDs/PCDFs in water is relatively slow, but the rate can be increased substantially by solvents acting as hydrogen donors (Dobbs and Grant 1979; Choudry and Webster 1989). The quantities and types of suspended particulate and dissolved organic materials that are present in natural waters can retard or enhance the rate of photolysis. Photodegradation is much slower in soil. It is limited to the soil surface and is not a significant process beyond the top few millimeters of soil (Puri et al. 1989; Yanders et al. 1989).

PCDDs/PCDFs have exhibited relatively strong resistance to microbial degradation in soils (Freeman and Schroy 1985; Matsumara and Benezet 1973). Of 100 strains of microorganisms that had previously been shown to degrade persistent pesticides, only five strains exhibited some ability to degrade 2,3,7,8-TCDD (Matsumara and Benezet 1973). Although an Air Force study attributed loss of 2,3,7,8-TCDD in soil to biodegradation, subsequent data (Freeman and Schroy 1985) demonstrated that there were no significant losses and attributed the apparent biodegradation to vapor diffusion, variations in

initial loadings, and analytical problems. Laboratory studies using aquatic sediments and water also showed 2,3,7,8-TCDD to be resistant to microbial attack (Ward and Matsumura 1978).

5.3.5 Benzene and Alkylbenzenes

Benzene, which has significant water solubility, vapor pressure, and Henry's Law constant, and low K_{oc}, is mobile in the environment. Benzene released to surface soil partitions to air via volatilization, to surface water via runoff, and to groundwater via leaching. Leaching potential is influenced by the soil type and the amount of rainfall. Benzene shows some tendency to adsorb to soil, particularly soil with high organic carbon content (Uchrin and Mangels 1987), which slows subsurface migration. Most benzene released to surface water is expected to be lost through volatilization, with little partitioning to sediments. Based on its relatively low K_{ow}, benzene is not expected to bioconcentrate or bioaccumulate to any great extent in aquatic organisms.

Compared to benzene, the alkylbenzenes have lower water solubilities and vapor pressures, and higher *log* K_{oc} values, which indicates that they will be considerably less mobile than benzene in the environment. Little migration in soil is expected, given the sorption tendencies and low aqueous solubilities. However, based on the relatively high Henry's Law constants, volatilization of alkylbenzenes from moist soil surfaces and from surface water may be substantial. Adsorption to suspended solids and sediments may attenuate volatilization from surface waters. The *log* K_{ow} values and measured bioconcentration factors for these chemicals suggest that they are moderately bioaccumulative.

Benzene and alkylbenzenes are rapidly degraded in the atmosphere via reaction with photochemically produced hydroxyl radicals (Lyman 1982).

Benzene is biodegradable in soil, surface water, and groundwater. Aerobic biodegradation is expected to be the primary degradation mechanism (McAllister and Chiang 1994). Aerobic biodegradation of benzene is influenced by many factors including the microbial population, dissolved oxygen and nutrient levels, temperature, pH, and the presence of other aromatic hydrocarbons. Laboratory studies of microbial degradation of benzene in gasoline-contaminated groundwater show that nitrogen and oxygen concentrations are the major controlling factors (Karlson and Frankenberger 1989).

Although high concentrations of the alkylbenzenes can be toxic to microorganisms, aerobic biodegradation may also be an important fate process for these chemicals in soil, groundwater, and aquatic systems (HSDB 2000).

5.3.6 Petroleum Hydrocarbons

Petroleum products including gasoline and diesel fuel, measured for this project as TPH, are derived from crude oil. TPH may consist of short, light, straight-chain hydrocarbons to heavy, long, branched-chain hydrocarbons to aromatic hydrocarbon rings. The constituents and physical properties of petroleum fuels vary according to refining processes and the origin of the crude oil. Based on their molecular structure and solubility in water, most constituents of petroleum can be divided into one of the following groups:

- Those that preferentially adsorb to soil particles;
- Those that volatilize rapidly;
- Those that tend to migrate through soil to groundwater as a solute; and
- Those for which multiple pathways exist.

The published literature addresses the wide spectrum of physical and chemical reactions that can occur between soil and petroleum products that affect the migration of bulk hydrocarbons in soil, the migration and degradation of hydrocarbons dissolved in groundwater, the migration of petroleum and its products in soil air and the biodegradation of petroleum and its products in soil and groundwater (Calabrese and Kostecki 1989-1990; Dragun 1988).

Gasoline petroleum products are composed of lighter hydrocarbon chains as well as aromatic constituents. Although gasoline remains a distinct and separate liquid when in contact with water, the lighter components, such as benzene have substantial water solubility. Some constituents of gasoline are highly volatile, such as benzene, while others are less volatile, leading to an average Henry's Law constant slightly above 10-4 atm@ m^3 ' mol (USAF 1989). These values indicate that some constituents in gasoline may volatilize readily from water or soil, while some constituents will sorb to soil.

5.4 CONTAMINANT MIGRATION AND PERSISTENCE IN THE NAPL PHASE

Contaminants may be present as NAPL throughout much of the upper sandy zone at The Oeser Company site, evidenced by petroleum product floating in shallow wells MW-26S, MW13-S and MW07-S. CPT-LIF-ROST results also indicate the presence of diesel, gasoline, creosote, and diesel/creosote mixed. Both the vapor and free (NAPL) phases of aromatic hydrocarbons fluoresce (the dissolved phase does not), and are therefore identified by the CPT-LIF-ROST method. The contaminant occurrences shown in Figures 4-18 through 4-25 could therefore be either vapor or NAPL; some of both

phases are likely being detected. The discontinuous distribution of the contaminants among the silt and clay layers, coupled with the dominant vertical extent of some plumes (e.g. Figures 4-20, 4-21, and 4-24) indicate that at least some free phase NAPL is present. Vapor will not sink in saturated zones (and would therefore not spread vertically among the saturated low permeability layers), and would be expected to occur in the sand as well as the clay/silt lenses.

Given the abundance of low permeability lenses in the upper sandy zone, it is reasonable to assume that most of the NAPL exists as pools perched on top of these lenses. The potential for the oil phase to continue migrating downward toward the gravelly zone and the continuous water table therein primarily depends on the likelihood that the NAPL will either penetrate the low permeability clay and silt lenses, spread past the horizontal extent of the individual lenses and continue to finger downward, or both. The density difference between denser-than-water non-aqueous phase liquids (DNAPLs) and water filling the low permeability pores is not sufficient for the DNAPL to displace the water. A pressure head is required (i.e., an accumulation of DNAPL on the top of the lens); the smaller the grain size of the lens, the larger the pressure head required for the DNAPL to penetrate it. LNAPLs will not likely displace pore water in aquitards, and will therefore not infiltrate the water-saturated low permeability layers common in the upper sandy zone. The thickness of DNAPL that must accumulate on a water-saturated fine-grained layer to initiate penetration is given by the equation (Cohen and Mercer, 1993)

$$Z_n = \frac{2s\ \cos f}{rg\left(r_n - r_w\right)}$$

where:

Z_n = thickness of the DNAPL pool necessary to induce penetration of the low permeability lens

σ = interfacial tension between the DNAPL and water

θ = wetting contact angle

r = pore radius

g = gravitational acceleration

ρ_n = DNAPL density

ρ_w = density of water.

Approximations of the compound-specific variables in the above equation (ρ_n = 1.3 g/cm^{-3}, σ = 0.04 N/m, (θ = 35°) suggest that a residual DNAPL height on the order of tens of meters is necessary to

produce pressure heads sufficient to cause DNAPL to break through clay/silt lenses. Thus, the fine-grained lenses at The Oeser Company site will likely restrict migration of the DNAPL to the deep aquifer, provided that the DNAPL pool does not accumulate to such a height that the pool spills beyond the horizontal extent of the lens. As the NAPL pools are not expected to grow (the system is likely at or close to steady state), additional fingering will probably not be a pathway for contamination of the deep aquifer.

Immobile residual NAPL in the vadose zone above the pools could be remobilized if conditions at the site are altered, for example by pumping or the addition of co-solvents or heat.

The mass of NAPL in the vadose zone will be decreased by vaporization of the NAPL and dissolution by infiltrating water. In water-saturated areas, NAPL mass will be depleted as the NAPL dissolves into the surrounding groundwater. The surface-area-averaged mass transfer rate (M_a) in $gm^{-2}day^{-1}$ from NAPL pools to dissolution in water is described by the equation (Johnson and Pankow, 1992),

$$M_a = C_w n \sqrt{\frac{4 D_v n}{p L_p}}$$

where:

M_a = surface-area-averaged mass transfer rate

C_w = saturated water concentration

n = porosity

D_v = vertical dispersion

v = ground water velocity

L_p = length of the DNAPL pool in the direction of groundwater flow

Because groundwater is less dense than DNAPL, water typically flows horizontally across DNAPL pools, indicating that the appropriate dimension of pool length is the horizontal extent. The horizontal flow of water over DNAPL pools also supports the use of the vertical component of dispersion from the pools. Estimating parameters in the above equation and applying them to the DNAPL pools (or an approximation of the pools) in the upper sandy zone at The Oeser Company site will give an estimate of the dissolved contaminant concentration in the local groundwater. If these concentrations exceed

sorption capacity, contaminants may persist through the gravelly zone to the deep water table. The number of years necessary to completely dissolve a pool and thereby remove it as a source of dissolved contamination is given by the equation,

$$t = \frac{0.01 L_p n r}{365 M_a}$$

where:

J = time in years

L_p = length of the DNAPL pool in the direction of groundwater flow

n = porosity

D = the density of the solvent

M_a = surface-area-averaged mass transfer rate

Since no co-solvents are present at The Oeser Company site, water is the solvent. The number of years necessary to remove DNAPL pools can be shortened by increasing the ground water velocity through pumping, as long as the equilibrium assumption of the equation is not violated by high groundwater velocities.

5.5 CONTAMINANT MIGRATION AND PERSISTENCE IN THE VAPOR PHASE

Vapor plumes will exist in the unsaturated zone around any NAPL source and will spread as a result of molecular diffusion and gradients that exist in the gas phase. No quantitative measurements of vapors or pressure gradients in the vadose zone were conducted for this RI, but some qualitative observations were made. Creosote odor (likely the result of naphthalene, the odor associated with moth balls) was detected during the coring of bores O7 and M21 (between 4' and 15' in O7 and from the surface to 28' in M21). Diesel and creosote odor were both detected in the top foot of boring J2. A slight odor was also noted in the top foot of sediment during drilling of well MW31-S, with the odor increasing in strength down to eight feet. These observations indicate that some volatilization is occurring in the subsurface, at least within naphthalene and diesel spills. Though naphthalene and diesel have higher vapor pressures than some of the other contaminants on the site, the possibility exists that other

contaminants are also present as a vapor phase. Atmospheric pressure changes will result in pressure gradients within the vadose zone and vapors will tend to migrate in response to these pressure gradients.

Currently, approximately half the site is paved, reducing the release of organic vapors to the surface. However, vapors could be released at locations where paving is damaged or non-existent. Vapors will accumulate in excavations. Contaminants in the vapor phase can be transported to groundwater by infiltrating precipitation. Since part of the site is paved (prohibiting infiltration), and the dissolved concentration produced by water that does infiltrate through vapors is likely to be much more dilute than that of the oil phase, vapors are unlikely to pose a significant threat to the deep groundwater aquifer.

5.6 CONTAMINANT MIGRATION AND PERSISTENCE IN THE AQUEOUS PHASE

5.6.1 Migration of Dissolved Constituents

5.6.1.1 Advection in the Upper Sandy Zone

The dominant transport mechanism in the subsurface is advective transport by flowing groundwater. In the absence of chemical interactions and dispersion (mixing), dissolved constituents will move through the subsurface at average linear groundwater velocities. However, most organic contaminants will sorb to the soils they encounter, which will cause the dissolved constituents to advance at rates lower than the average linear groundwater velocity. To estimate the rate at which a sorbing dissolved contaminant will move through an aquifer, the average linear groundwater velocity is divided by the retardation factor (R) for that compound. The retardation factor is calculated using the formula,

$$R = 1 + \frac{K_d \, r_b}{n}$$

where:

R = retardation factor

K_d = distribution coefficient

D_b = dry bulk density of the aquifer material

n = porosity of the aquifer

Neither the fraction organic carbon nor the K_d were measured for this RI, prohibiting the quantification of retardation. However, the COCs at this site will advance slower than the average

groundwater flow rate, and for most of the COCs, much slower. Sorption may be a primary mechanism for reducing or preventing contamination of the water table in the gravelly zone at The Oeser Company site.

5.6.1.2 Dispersion

Dispersion is the process of small scale mixing caused by groundwater moving at slightly different rates in adjacent pore spaces. With a steady state and large source, dispersion has little effect on the maximum concentration in the center of the plume. However, it does cause spreading of sharp contaminant fronts both parallel and normal to flow directions. Dispersion therefore causes the first arrival of a contaminant to occur before the time predicted by the average linear seepage velocity. Dispersion effects can be calculated using the equation,

$$D = D^{*} + \alpha v$$

where:

D = dispersion

D* = effective molecular diffusion accounting for tortuosity and porosity (on the order of 10^{-9} m^2/s)

" = dispersivity (a function of the aquifer solids)

v = groundwater velocity

When the product "*v* is less than 0.1 m/day, diffusion dominates dispersion (Johnson and Pankow, 1992); the resulting dispersion is very low, and very little contamination will reach the deep aquifer ahead of an advective front. In the upper sandy zone at The Oeser Company site, saturation exists primarily as perched water on top of low permeability zones. In these zones, ground water moves primarily in the horizontal direction, as the vertical extent of saturation is not extensive. Thus, the effects of dispersion on migration towards the deep aquifer is likely small.

5.6.1.3 Diffusion into the Silt

Because flow rates in the upper sandy zone are not high, it is possible that molecular diffusion is a significant mechanism for transporting contaminants into the silt and clay lenses. Diffusion of contaminants into fine-grained lenses should not be confused with penetration of oil phase into the lens. The following formula can be used to calculate concentration profiles that result from diffusive transport,

$$\frac{C}{C_o} = erfc\left(\frac{x}{2\sqrt{D^* t}}\right)$$

where:

C = concentration at position x

C_o = concentration at the top of a lens

x = distance into the lens

D* = effective diffusion coefficient

t = elapsed time

After 15 years, diffusion will have advanced $C/C_o = 0.5$ approximately 20 cm (~8 inches) into the silt lenses. Since not all of the lenses are eight inches thick, the possibility exists that diffusion alone will allow contamination to fully penetrate low permeability lenses. However, the actual concentration profiles in the silt will vary depending on the retardation factor of each compound.

5.6.2 Fate of Dissolved Constituents

Dissolved constituents will move with groundwater, volatilize into the vadose zone, and sorb to soils. As contaminants are transported with flowing groundwater, dispersion will cause the contaminant plumes to spread. If contaminant sources (i.e., NAPL pools) are removed, dispersion will result in a lowering of maximum concentrations within the plume, due to conservation of mass. However, if sources are not removed and processes to destroy the contaminants are not present, the plumes will increase in size without a corresponding decrease in concentrations.

Two destructive processes are oxidation and biodegradation. Oxidation of hydrocarbons is a commonly observed phenomenon under the aerobic conditions present in the soil at The Oeser Company site. Biodegradation may also be transforming contaminants of concern in the groundwater. The extent of bioattenuation is difficult to directly assess, though measurable indicators include bacterial numbers and metabolic activity, amount CO_2, inorganic carbon isotope ratios (to determine how much of the CO_2 present is respiration by-product), oxygen uptake, and redox conditions. Given that suitable organisms, temperature, and nutrients exist in the sediment, bioattenuation may be another mechanism capable of

preventing downward migration of contaminants to the water table in the gravelly zone at The Oeser Company site.

5.6.3 Contaminant Migration and Persistence in the Sorbed Phase

Because subsurface soils are stationary, sorbed contaminants are immobile in the subsurface as long as the soils are not moved. However, along with sorbing to soils, most contaminants will desorb from soils when the aqueous concentrations decrease. Sorbed contaminants can therefore act as a secondary source of contamination after NAPL sources have been removed. There is also some evidence that sorbed contaminants are not available for biodegradation (Pankow and Cherry, 1996). Therefore, sorption can hinder the natural degradation of some contaminants.

5.7 TRANSPORT AND FATE OF CONTAMINANTS ABOVE GROUND

5.7.1 Air Transport

Ambient air samples on and around The Oeser Company facility were sampled for phenols, PAHs, dioxins, and VOCs. VOC concentrations in samples collected on the facility (primarily from sources in the treatment area) exceeded PRGs, though benzene appeared to be the only VOC migrating off-facility at exceedence concentrations. No evidence supporting The Oeser Company site as the source of cPAHs was found, though the facility is the likely source of off-site PCP, dioxin, and ncPAH.

5.7.2 Mechanical Transport

Mechanical transport of contaminants typically occurs through entrainment on surfaces of vehicles, equipment or, to a lesser degree, clothing. The site is partially paved, but it is possible that contaminants will migrate from the site by this pathway under existing site conditions.

5.7.3 Future Conditions

In the event that site remedial activities invade the subsurface, emissions can be expected to increase dramatically. Volatilization and mechanical transport will play increasing roles in contaminant transport. Controls may be required for air emissions and equipment decontamination. These issues will be addressed in the Feasibility Study and Cleanup Action Plan.

5.8 CONCLUSIONS

Dominant factors affecting the nature and extent of contamination at The Oeser Company site include the following:

- NAPL pools serving as continuing sources
- Soil contamination throughout the upper sandy zone
- Retarded advection with slowly moving groundwater in the upper sandy zone
- Possible degradation of organic compounds via oxidation and/or bioattenuation
- Diffusion into fine-grained lenses
- Possible migration of vapor plumes

There is strong evidence that NAPLs still may exist at The Oeser Company site, as documented by previous observation in wells and CPT-LIF-ROST results. Of the four contaminant phases present in the subsurface, these pools pose the greatest threat to contamination of the deep aquifer. However, the possibility exists that even if no effort is made to remove the pools, contamination of the underlying aquifer will not increase significantly from its present concentrations. The primary barriers preventing contamination from reaching the aquifer are sorption and biodegradation.

Table 5-1

PHYSICAL, CHEMICAL, AND FATE DATA FOR CHEMICALS OF CONCERN
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Compound	Water Solubility (mg/L)	Source	Vapor Pressure (mm Hg)	Source	Henry's Law Constant (atm-m3/mol)	Source	Log Koc	Source	Log Kow	Source	Bioconcentration Factor	Source
Benzene	1790 at 25 C	A	94.8 at 25 C	A	5.6E-03	A	1.93	A	2.13	A	1.1-20	A
sec-Butylbenzene	17	D	--	--	1.9E-02	D	3.33	D	--	--	--	--
n-Propylbenzene	23.4 at 25 C	A	3.42 at 25 C	A	1.1E-02	A	2.86	A	3.69	A	38	A
1,2,4-Trimethylbenzene	57 at 25 C	A	2.1 at 25 C	A	6.2E-03	A	2.86	A	3.78	A	31-275	A
1,3,5-Trimethylbenzene	48.2 at 25 C	A	2.48 at 25 C	A	8.8E-03	A	2.82	A	3.42	A	23-342	A
Total Petroleum Hydrocarbons:												
Gasoline	insoluble	E	NA		4.8E-04	E	1.81 - 4.56	E	2.13 - 4.87	E	NA	
Diesel	5 at 25 C	E	NA		5.9E-5 - 7.4	E	3 - 6.7	E	3.3 - 7.06	E	NA	
Acenaphthene	3.9 at 25 C	A	2.50E-03	B	7.9E-05	B	3.51	A	3.92	A	387	A
Benzo(a)anthracene	0.0094 at 25 C	A	1.9E-06 at 25 C	A	8.0E-06	A	5.74	A	5.79	A	560-18000	A
Benzo(a)pyrene	0.0016 at 25 C	A	5.5E-09 at 25 C	A	4.57E-07	A	6.28	A	5.97	A	8.7-100000	A
Benzo(b)fluoranthene	0.0012	A	5.0E-07 at 20 C	A	5.0E-07	A	6.7	A	6.6	A	2800	A
Benzo(j)fluoranthene	0.00676 at 25 C	B	2.6E-08 at 25 C	A	2.0E-07	A	4.7	A	6.1	A	26000	A
Benzo(k)fluoranthene	0.00076 at 25 C	A	9.70E-10 at 25 C	A	5.8E-07	A	5.9	A	6.84	A	27000-310000	A
Chrysene	0.00189 at 25 C	A	6.23E-09 at 25 C	A	9.9E-07	A	4.5	A	5.73	A	8.2-100000	A
Dibenz(a,e)pyrene	--	--	7.03E-11 at 25 C	A	1.4E-08	A	5.34	A	7.28	A	201000	A
Dibenz(a,h)anthracene	0.0005 at 25 C	A	1.0E-10 at 20 C	A	1.2E-07	A	6.3	A	6.5	A	10-10000	A
Dibenz(a,h)pyrene	--	--	6.40E-12 at 25 C	A	1.4E-08	A	5.34	A	7.3	A	200000	A
Dibenz(a,i)pyrene	--	--	1.80E-11 at 25 C	A	1.4E-08	A	5.34	A	7.3	A	200000	A
Dibenz(a,l)pyrene	--	--	4.81E-10 at 25 C	A	1.41E-08	A	5.57	A	7.71	A	426000	A
7,10-Dimethylbenz(a)anthracene	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.26	B	9.22E-06 at 25 C	A	9.45E-06	A	5.05	A	5.16	A	380-6110	A
Fluorene	1.97	B	3.2E-04 at 20 C	A	1.0E-04	A	4.21	A	4.18	B	1000-2200	A
Indeno(1,2,3-cd)pyrene	0.062 at 20 C	A	1.3E-10 at 25 C	A	3.48E-07	A	6.80	A	6.7	A	10000	A
2-Methylnaphthalene	25 at 25 C	A	6.81E-02 at 25 C	A	5.18E-04	A	3.93	A			30-300	A
Naphthalene	30	A	8.7E-02	A	4.6E-04	B	3.0	B	3.3	A	40-1000	A
Phenanthrene	1.29 at 25 C	A	6.8E-05 at 25 C	A	1.2E-04	A	4.15	B	4.57	A		
Pyrene	0.135 at 25 C	A	8.9E-05 at 25 C	A	1.2E-05	A	4.81	A	4.88	A	72-970	A
Carbazole	1.8 at 25 C	A	1.37E-06 at 25 C	A	8.65E-08	A	2.8	A	3.72	A	50-500	A
Dibenz(a,h)acridine	--	--	7.93E-10 at 25 C	A	1.9E-09	A	4.74	A	5.6	A	100-3500	A
Dibenz(a,j)acridine	--	--	1.05E-09 at 25 C	A	1.9E-09	A	4.46	A	5.67	A	12000	A
7H-Dibenzo(c,g)carbazole	0.063	A	3.4E-09 at 25 C	A	2.45E-09	A	6.18	A	5.58	A	10000	A
Dibenzofuran	4.22 at 25 C	A	0.00248 at 25 C	A	1.3E-04	A	4.0	A	4.12	A	1300	A
Pentachlorophenol	14 at 20 C	A	1.1E-04 at 25 C	A	2.5E-08	A	4.4	A	5.01	B	100-1000	A
2,3,7,8-Tetrachlorodibenzodioxin	1.93E-05 at 22 C	C	7.40E-10 at 25 C	C	1.6E-05	C	6.4	C	6.64	C	1600-29200	A
1,2,3,7,8-Pentachlorodibenzodioxin	1.2E-04 at 20 C	C	9.48E-10 at 25 C	C	2.6E-06	C	5.7	C	6.64	C	--	--
1,2,3,4,7,8-Hexachlorodibenzodioxin	4.4E-06 at 20 C	C	1.01E-10 at 25 C	C	1.2E-05	C	5.92	C	7.79	C	--	--
1,2,3,6,7,8-Hexachlorodibenzodioxin	4.4E-06 at 20 C	C	3.6E-11 at 25 C	C	1.2E-05	C	5.9	C	7.3	C	--	--

Table 5-1

PHYSICAL, CHEMICAL, AND FATE DATA FOR CHEMICALS OF CONCERN
THE OESER COMPANY REMEDIAL INVESTIGATION
BELLINGHAM, WASHINGTON

Compound	Water Solubility (mg/L)	Source	Vapor Pressure (mm Hg)	Source	Henry's Law Constant (atm-m3/mol)	Source	Log Koc	Source	Log Kow	Source	Bioconcentration Factor	Source
1,2,3,7,8,9-Hexachlorodibenzodioxin	4.4E-06 at 20 C	C	4.9E-11 at 25 C	C	1.2E-05	C	5.9	C	7.3	C	--	--
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	2.4E-06 at 20 C	C	3.21E-11 at 25 C	C	7.5E-06	C	--	--	8.2	C	--	--
Octachlorodibenzodioxin	7.4E-08 at 25 C	C	8.25E-13 at 25 C	C	7.0E-09	C	--	--	7.59	C	--	--
2,3,7,8-Tetrachlorodibenzofuran	4.19E-04 at 22.7 C	C	8.96E-09 at 25 C	C	8.6E-06	C	4.93	A	6.53	C	2040-4470	A
1,2,3,7,8-Pentachlorodibenzofuran	2.40E-04 at 22.7 C	C	2.72E-09 at 25 C	C	6.2E-06	C	--	--	6.79	C	--	--
2,3,4,7,8-Pentachlorodibenzofuran	2.36E-04 at 22.7 C	C	3.29E-09 at 25 C	C	6.2E-06	C	--	--	6.92	C	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	8.25E-06 at 22.7 C	C	2.4E-10 at 25 C	C	1.4E-05	C	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	1.77E-05 at 22.7 C	C	2.2E-10 at 25 C	C	6.1E-06	C	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	1.30E-05 at 22.7 C	C	2.8E-10 at 25 C	C	1.0E-05	C	--	--	--	--	--	--
2,3,4,6,7,8,-Hexachlorodibenzofuran	1.30E-05 at 22.7 C	C	2.0E-10 at 25 C	C	1.0E-05	C	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.35E-06 at 22.7 C	C	1.33E-10 at 25 C	C	5.3E-05	C	--	--	7.92	C	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.40E-06 at 22.7 C	C	1.07E-10 at 25 C	C	5.3E-05	C	--	--	--	--	--	--
Octachlorodibenzofuran	1.20E-06 at 25 C	C	3.75E-12 at 25 C	C	1.9E-06	C	--	--	8.78	C	--	--

Key:

NA= Not available.

A = Hazardous Substance Data Bank, online at http://toxnet.nlm.nih.gov/

B = Agency for Toxic Subtances Disease Registry Toxicological Profile.

C = Estimating Exposure to Dioxin-Like Compounds, EPA/600/6-88/005Cb, June 1994, External Review Draft, EPA Office of Research and Development, Washington DC

D = Region 9 Preliminary Remediation Goals, spreadsheet available at http://www.epa.gov/region09/waste/sfund/prg/.

E = US Air Force, 1989, The Installation Restoration Program Toxicology Guide, Volume 4, Wright-Patterson Air Force Base, OH.

6. ASSESSMENT OF SITE RISKS

6.1 HHRA SUMMARY AND CONCLUSIONS

The Oeser Company is an active wood-treating facility located in Bellingham, Washington, that has used organic treating solutions of creosote and PCP to preserve utility poles and pilings. The primary objective of the baseline HHRA was to evaluate potential adverse health effects attributable to site-related contaminants in the absence of remedial action. Contaminants from wood-treating wastes (PAHs [most compounds that make up creosote], PCP, and dioxins/furans [contaminants found in PCP treating solutions]) were the primary COPCs in surface and subsurface soil, groundwater, air, surface water, and sediment.

Current and future exposure scenarios were evaluated for on-site workers, on- and off-site residents, and off-site recreational visitors. Exposure to COPCs derived from facility surface soil was evaluated for the current on-site worker. For the current off-site residents, exposure to COPCs in off-site surface soil and air was evaluated. Exposure to COPCs derived from off-site 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 COPCs derived from on-site surface and subsurface soil and groundwater was evaluated for on-site workers and on-site residents. For the future on-site resident, exposure to COPCs derived from soil was evaluated. Exposure to COPCs derived from surface and subsurface soil and Little Squalicum Creek surface water and sediment was evaluated for the future recreational visitor. The potential excess lifetime cancer risks and potential noncarcinogenic HIs for the reasonable maximum exposure (RME) case are summarized below. The HHRA is provided in Appendix M of this RI report.

6.1.1 HHRA Current Exposure Scenario

For the current exposure scenario, potential excess lifetime cancer risks and potential noncarcinogenic HIs were determined for the on-site worker, off-site resident, and off-site recreational visitor.

The potential RME excess lifetime cancer risks for the on-facility worker (1E-03 to 5E-04) associated with exposure to currently exposed surface soils exceeded EPA and MTCA levels of concern.

Dioxins/furans were the main contributors to the risks. Noncancer HIs were below the EPA's and MTCA's acceptable level of 1. Most of the site is capped with either gravel or asphalt; therefore, exposure to surface soil under current conditions is limited to a few uncapped areas.

For the off-facility residents, RME potential excess lifetime cancer risks associated exposure to surface soil were less than 1E-04 for all but one location (OPEN-RES-53, estimated cancer risk of 2E-04). However, this location is not a current residence; rather, it is an industrial property east of the site. Several residential locations exceeded the MTCA ceiling level of 1E-05 for exposure to multiple carcinogens, including Residence 3 (2E-05), Residence 5 (2E-05), Residence 6 (2E-05), Residence 11 (2E-05), Residence 17 (2E-05), Residence 18 (2E-05), Residence 22 (3E-05), Residence 26 (4E-05), and Residence 34 (3E-05). Also, several locations that exceeded the MTCA ceiling and were noted as "residential" currently are undeveloped or are developed for commercial uses. These include Residence 42A (8E-05), Residence 43 (3E-05), Residence 50 (7E-05), Residence 53 (2E-04), and Residence 54 (7E-05). The COPCs contributing most to risk estimates were B(a)P equivalents and dioxin TEQ. In many cases, use of one-half of the DLs for B(a)P equivalents and dioxin congeners contributed to the overall risk. One-half of the detection limits were used when a compound was not detected at or above the detection limit.

By comparison, the biased residential background sample met the MTCA ceiling level of 1E-05 and the open residential background sample was below the ceiling level, with an excess lifetime cancer risk of 7E-06. In addition, MTCA states that cleanup levels should be set so that individual carcinogens do not exceed an excess lifetime cancer risk of 1E-06. However, the open residential background and biased residential background samples also exceed this ceiling level.

For the off-site recreational visitor, potential excess lifetime cancer risks associated with exposure to surface soil exceeded the MTCA level of concern only for the spoils piles (4E-05) located adjacent to Little Squalicum Creek. The elevated risk with exposure to the spoils piles is due primarily to TPH. The only noncancer HI (0.5) associated with exposure to surface soil is less than the EPA and MTCA acceptable levels for the recreational visitor. This estimate is for potential exposures at the spoils piles and is primarily due to TPH. The extent to which recreational visitors spend a significant percentage of their time at the spoils piles is uncertain, but this exposure probably is limited; consequently, these hazard estimates based on the RME scenario likely overestimate actual hazards.

The potential excess lifetime cancer risks and potential noncancer HIs associated with exposure to sediment in Little Squalicum Creek were less than EPA and MTCA acceptable levels for the recreational visitor.

The potential excess lifetime cancer risks associated with dermal exposure of the recreational visitor to the surface water of Little Squalicum Creek is 5E-04. The risk was attributed mainly to dioxins/furans, but B(a)P and PCP also contributed to risk. The risk associated with the background surface water location was 1E-04; however, this risk is based on one-half DLs for nondetected compounds. Considerable uncertainty is involved in determining dermal absorption of dioxins/furans, B(a)P equivalents, and PCP; therefore, the risk estimate for the recreational user is likely overestimated and is not quantitatively reliable. Potential noncancer effects associated with exposure to surface water were less than EPA and MTCA acceptable levels.

The potential excess lifetime cancer risks associated with inhalation of COPCs in air were within the EPA's acceptable range, but exceeded the MTCA ceiling level and the background risk level at one sampling location, AS29 (3E-05), for the off-site resident. The main COPC that contributed to the risk was PCP. Penta-, hexa-, and hepta-chlorinated dioxin congeners and benzene were detected at this sampling location, but at similar concentrations as those detected at the background location. PCP was not detected at the background sampling location. Therefore, the estimated excess lifetime cancer risks at AS29 probably are attributable to operations of The Oeser Company. Noncancer HIs exceeded the EPA's and MTCA's acceptable level of 1 at sampling locations AS25 and AS29. These locations had HIs of 3 and 5, respectively, slightly above the background location HI of 2. The main COPC contributing to the elevated HI in AS25 was 1,2,4-trimethylbenzene. Increased concentrations of 1,2,4-trimethylbenzene; 2-methylnaphthalene; PCP; and dibenzofurans were the main contributors to the increased HIs at sampling location AS29. 1,2,4-Trimethylbenzene; 1,3,5-trimethylbenzene; and benzene were COPCs at the background sampling location that contributed to the elevated HI of 2. The increased HI associated with compounds detected at AS29 probably is due to facility operations. Sampling stations AS29 and AS25 were located at The Oeser Company's northeast fence line, which is located directly downwind of the facility. In addition, air concentration data derived from the air monitoring stations may not represent steady-state concentrations. These concentrations can vary greatly depending on local atmospheric conditions such as wind speed, wind direction, and precipitation. Facility operations also may greatly influence contaminant concentrations. The increased potential excess lifetime cancer risks and HIs attributed to detected air concentrations may be overestimated or underestimated, depending on how close these values are to the actual average long-term (i.e., 30-year) air concentrations to which the off-site residents potentially would be exposed.

Potential excess lifetime cancer risks and HIs were within acceptable levels for air exposures for the recreational visitor.

The total cancer risk across all COPCs for the Tilbury Cement Company groundwater wells exceeded the MTCA cieling of 1E-05 and EPA criteria for the current worker scenario. Dermal exposure to groundwater while showering contributed the greatest risk at TC-5 (4E-04) and TC-6 (2E-4). However, no COPCs were detected in these wells; the estimated excess lifetime cancer risks for on-facility worker exposure to groundwater is based solely on the use of one-half DLs for nondetected compounds. Consequently, actual risks to on-facility workers may be even less. No noncarcinogenic COPCs were identified.

6.1.2 HHRA Future Exposure Scenario

For the future exposure scenario, potential excess lifetime cancer risks and potential noncarcinogenic HIs were determined for the on-site worker, on-site resident, and off-site recreational visitor.

The potential excess lifetime cancer risks associated with surface soils exceeded EPA criteria for the on-facility resident (2E-03 to 7E-03) and the on-facility worker (6E-04 to 2E-03). The risks were attributed primarily to detected dioxins/furans. Noncancer HIs were below the EPA's and MTCA's acceptable level of 1. For this exposure scenario, it was assumed that all soil caps were removed; therefore, all surface soil samples were evaluated.

The potential excess lifetime cancer risks for the future on-site resident associated with exposure to subsurface soil exceeded EPA criteria for every subarea and multiple depth intervals. The upper depth intervals greatly exceeded EPA and MTCA acceptable levels, with decreasing risks at lower depth intervals; however, the risks attributed to the subsurface soil of the East and West Treatment areas and the North Treatment Area exceeded EPA and MTCA acceptable levels at every depth interval. In most cases, cPAHs and/or dioxins/furans were the main chemicals contributing to the risk, but PCP and TPH also were detected throughout the subsurface soil. HIs for all subarea subsurface soils for the future on-site resident generally increased with depth, with the highest HIs found in the 6- to 12-foot interval for all areas except the East and West Treatment Areas and the North Treatment Area. HIs for all subareas exceeded 1 within this depth interval, except the Wood Storage Area. HIs for the East and West Treatment areas and the North Treatment Area exceeded 1 in all subsurface soil intervals. The increased HIs were attributed to naphthalene and 2-methylnaphthalene.

Similar to the on-site future resident, the potential excess lifetime cancer risks for the on-site future worker exceeded the EPA's acceptable risk range throughout subsurface depth intervals. Excess lifetime cancer risks exceeded the MTCA ceiling in all subareas across multiple depth intervals. The HIs

for the on-site future worker generally increased with depth for each subarea, with the highest HIs across all areas found in the 6- to 12-foot interval, with the exception of the East and West Treatment Areas and North Treatment Area. All subareas exceeded 1 within this depth interval, except the North Pole Yard and the Wood Storage Area. HIs for the East and West Treatment areas and the North Treatment Area exceeded 1 in all subsurface soil intervals.

The potential excess lifetime cancer risks for the potential future on-site resident exceeded both EPA and MTCA acceptable levels for all deep water groundwater wells and the background well. The COPCs that have contributed to risks for each well are the 2,3,7,8-TCDD TEQ and B(a)P equivalents. However, the concentrations of individual dioxin/furan congeners and cPAHs did not exceed their respective screening toxicity values, and the calculation of the 2,3,7,8-TCDD TEQ and B(a)P equivalents is based largely on the use of one-half DLs for nondetected compounds. Given that the risk levels in the background well exceed EPA and MTCA acceptable risk levels and that primary COPC concentrations were calculated based on one-half DLs, the risks associated with use of groundwater likely are overestimated. HIs for the on-facility resident were less than 1.

Potential excess lifetime cancer risks and HIs for the future on-site worker were below EPA criteria for exposure to groundwater. Excess lifetime cancer risks ranges from 6E-06 to 1E-05 for on-site wells, while the excess lifetime cancer risk for the background well is 8E-06. At least one dioxin congener was detected in each well, however, the majority of risk calculated for groundwater exposure is due to use of one-half of the detection limits for dioxin congeners and PAHs.

6.2 ERA SUMMARY

Numerous investigations conducted at the Oeser Company facility during the 1980s and 1990s identified facility-related chemicals, such as PAHs and PCP, in environmental media on the Oeser facility and in nearby off-facility areas. The RI/FS work plan (E & E 1999b) for the site presented a screening-level problem formulation and ecological effects evaluation based on existing site information. 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 facility-related chemicals in creek sediment exceeded benchmarks for the protection of benthic life, and (2) insufficient data were available to evaluate risks to wildlife from facility-related chemicals. Specifically, no dioxin/furan data were available for Little Squalicum Creek and no data for dioxins/furans, PAHs, and PCP were available for the south slope terrestrial area. These data gaps and others were addressed by sampling conducted for the RI.

The specific investigations conducted to further evaluate ecological risks at the Oeser Company site were: (1) analysis of creek sediment and water for facility-related chemicals; (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 facility-related chemicals by benthic organisms; and (4) analysis of surface soil from the south slope and creek area for facility-related chemicals. The RI data demonstrated that facility-related chemicals 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.

The full ERA is provided in Appendix N of this report. In summary, the baseline ecological risk assessment concluded the following regarding the assessment endpoints for the site:

Creek Aquatic Community -- The effects of sediment contamination on benthic life in Little Squalicum Creek were evaluated directly using 10-day sediment toxicity tests with *Hyalella azteca*, a freshwater amphipod. The 28-day amphipod/polychaete test was not available when the RI fieldwork was conducted; however, the 10-day amphipod toxicity test is an adequate measure of adverse effects in benthic organisms. The test results suggest that current levels of sediment contamination in the creek do not pose a threat to benthic life. Test organism survival in sediment from the creek was high (78 to 93%) and no different than control survival. In addition, test organism growth was not impaired. Potential adverse effects from facility-related chemicals in surface water were evaluated by comparing measured water concentrations (from July and December 1999) and to chronic water quality criteria or other chronic benchmarks. In July 1999, no chemicals in surface water were present in excess of the criteria or benchmarks. In December 1999, the criteria for PCP and dioxins/furans were marginally exceeded at selected locations, a result that is not surprising given that flow in the creek is largely comprised of stormwater during the rainy season. However, even in the absence of chemical contamination from the Oeser facility and City of Bellingham stormwater outfalls, it seems unlikely that the creek would support a diverse community of aquatic organisms given its shallow depth and current flow regime. Overall, facility-related chemicals do not appear to pose a serious threat to the community of aquatic organisms in Little Squalicum Creek.

Plant and Soil-Fauna Communities -- No risks to plants or soil fauna from PCP were identified for the south slope terrestrial area or creek area. For PAHs, potential risks to plants and soil fauna appear to be restricted to a single sample location on the north bank of the creek, where the total PAHs concentration was approximately 960 mg/kg. 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. Overall, facility-related chemicals do not appear to pose a widespread threat to plant and soil-fauna communities in the area of the creek and south slope.

Small Mammal and Songbird Populations -- Risks were calculated for the American robin, short-tailed shrew, and barn swallow, three receptor that could derive a large portion of their food and habitat needs from the south slope and creek area. These receptors were also selected because they feed extensively on soil invertebrates (robin, shrew) and/or aquatic insects (swallow), which potentially could accumulate facility-related chemicals. Exposure estimates were calculated based on the sum of exposures from incidental ingestion of soil or sediment and consumption of contaminated prey (100% earthworms conservatively assumed for the robin and shrew; 100% aquatic insects [post-emergence] conservatively assumed for the swallow). Hazard quotients (HQs) were calculated based on both the "no observed adverse effect level" (NOAEL) and "lowest observed adverse effect level" (LOAEL). For the swallow, only the NOAEL-based HQ for dioxins/furans exceeded the benchmark level of 1; however, the exceedence was minor (HQ = 1.2). Overall, it appears that risks to receptors such as the barn swallow, which feed on invertebrates from the creek, are minimal. For the robin, the NOAEL-based HQs for PAHs and dioxins/furans exceeded the benchmark level of 1, but the LOAEL-based HQs did not. The risk estimates were greatest for the shrew. For this receptor, the LOAEL-based HQs for PAHs and dioxins/furans exceeded the benchmark level of 1, and the NOAEL-based HQ for PCP exceeded 1. However, for dioxins/furans and particularly for PAHs, the level of soil contamination at a single sample location contributed most to the estimated risks for the shrew and robin. Consequently, because the soil contamination is restricted to a small area, it is unlikely to pose a threat to the populations of small mammals and songbirds feeding on soil invertebrates in the creek area and south slope, although a few individuals possibly could be affected if they were to forage only in the most contaminated area (a situation that seems unlikely). For PCP, the risk estimate for the shrew was influenced by the use of one-half the detection limit in several samples with elevated detection limits. Consequently, risks from PCP to small mammals that consume soil invertebrates, such as the shrew, likely are overestimated. Overall,

facility-related chemicals do not appear to pose a serious threat to the populations of small mammals and songbirds that use the creek area and south slope.

7. RECOMMENDATIONS

This section discusses recommendations for additional work and summarizes RAOs.

7.1 RECOMMENDATIONS FOR ADDITIONAL SAMPLING AND EARLY ACTIONS

Based on RI work thus far, as documented in this report, the DQOs identified in the RI work plan have been met. Although contaminants were identified above PSLs in several media, results of the HHRA and ERA indicate that early action does not appear warranted for protection of human health and the environment. Remediation following the FS should be adequate to protect the public.

7.2 RECOMMENDED REMEDIAL ACTION OBJECTIVES

The recommended RAOs are summarized below:

- RAO 1: Prevent ingestion, inhalation, and dermal contact with soil contaminants above industrial cleanup levels and prevent migration of soil contaminants that would result in deep groundwater contamination exceeding groundwater cleanup levels.
- RAO 2: Prevent ingestion and dermal contact with shallow groundwater, and prevent migration of contaminants from shallow groundwater that would result in deep groundwater contamination exceeding groundwater cleanup levels.
- RAO 3: Prevent ingestion and dermal contact with deep groundwater containing contaminants above groundwater cleanup levels.

These RAOs are discussed further in the FS report.

8. REFERENCES

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