STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

In the Matter of Remedial Action by:

Charles Vineyard 15437 SE Fairwood Boulevard Renton, WA 98058	)	
Texaco 10602 NE 38th Pl. PO Box 2969 Kirkland, WA 98083-2969	)	AGREED ORDER No. DE00 TCPSR-299
Bob and Sheri Smith Cowlitz B.P. 101 Mulford Road Toledo, WA 98591	)	

TO: Charles Frank Vineyard
15437 SE Fairwood Boulevard
Renton, WA 98058

I.

Jurisdiction

This Agreed Order ("Order") is issued pursuant to the authority of Revised Code of Washington (RCW) 70.105D.050(1).

II.

Findings of Fact

The Department of Ecology (Ecology) makes the following Findings of Fact, without admission of such facts by Charles Frank Vineyard (Vineyard), the property owner; Bob and Sheri Smith (Smiths) the owners of the improvements at the active station and leasees of the property at the active station; or Texaco former leasees of the active station. Hereinafter collectively these parties are referred to as the Potentially Liable Parties (PLPs).

1. The active Cowlitz B.P. station, hereinafter referred to as the active station, and a former gasoline service station, hereinafter referred to as the former station, are located on property owned by Mr. Charles Vineyard, which has been defined as the Cowlitz B.P. Site (Site).

2. In April 1977, a leak in the product delivery line at the active station (currently leased by the Smiths) was repaired. It was estimated that this leak resulted in a loss of approximately 2,296 gallons of gasoline. The retailer was later reimbursed by Texaco for the loss of gasoline due to the leaky pipe.

3. During the removal of Underground Storage Tanks (USTs) in March 1990 at the active station, petroleum contaminated soil in excess of MTCA Method A cleanup standards was discovered.

4. In April 1991, Ecology issued Enforcement Order No. DE 91-S123 to Mr. Frank Vineyard to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the active station. During this investigation, groundwater samples collected confirmed contamination in excess of MTCA Method A cleanup standards for total petroleum hydrocarbons as gasoline (TPH-G), and benzene, ethylbenzene, toluene, and xylene (BTEX). In the process of completing the Order, petroleum contamination of groundwater and soil was discovered at a former gasoline station, hereinafter referred to as the former station, located across Mulford Road from the active station, on property also owned by Mr. Frank Vineyard. The Order specified that if contamination was discovered at this location, it would be included as part of the Cowlitz B.P. Site. These groundwater data were collected in January 1992.

5. In May 1994, Ecology solicited a 30-day public comment and review on a draft Cleanup Action Plan (CAP) for the site.

6. In September 1994, during a site visit conducted by Ecology, current site activities at the former station were investigated. It was discovered that the ground surface had been graded, a septic tank and underground utility lines had been installed, and "model" single family homes had been erected in the area where the approved CAP had outlined a groundwater pump and treat system to be located. Monitoring wells installed in this area as part of the RI/FS could not be located. Because Ecology had no prior knowledge of these activities,

there was concern that the integrity of the monitoring wells had been compromised by this activity. In addition, since no recent groundwater monitoring data existed, there was also concern that the remedy chosen in the CAP may no longer be appropriate for the site.

7. In May 1995, Ecology issued Agreed Order Nos. DE94 S361, S362, and S368 to the PLPs. This Order required the PLPs to conduct quarterly groundwater monitoring and allowed them to re-evaluate the cleanup option chosen for the site.

8. Equiva presented the PLPs recommendations for a cleanup alternative for the Site. This cleanup alternative was described in a Draft Cleanup Action Plan prepared by SECOR International Incorporated dated August 12, 1999.

III.

Ecology Determinations

1. Charles . Vineyard is an "owner or operator" as defined in RCW 70.105D.020 (6) of a facility (ies)" as defined in RCW 70.105D.020(3).

2. The active station and a former station are identified as the Cowlitz B.P. Site which is located at 101 Mulford Road, Toledo, Washington. The site extends both vertically and laterally to any area where hazardous substances have come to be located.

3. The substances found at the facility(ies) as described above are hazardous substances as defined at RCW70.105D.020(5).

4. Based on the presence of these hazardous substances at the facility and all factors known to Ecology, there is a release or threatened release of hazardous substances from the facility , as defined at RCW 70.105D.020(10).

5. By a letter dated November 16, 1990, Ecology notified Frank . Vineyard of his status as a "potentially liable person" under RCW70.105D.040 after notice and opportunity for comment.

6. Pursuant to RCW 70.105D.030(1) and 70.105D.050, Ecology may require potentially liable persons to investigate or conduct other remedial actions with respect to the release or threatened release of hazardous substances, whenever it believes such action to be in the public interest.

7. Based on the foregoing facts, Ecology believes the remedial action required by this Order is in the public interest.

IV.

Work to be Performed

Based on the foregoing Facts and Determinations, it is hereby ordered that the PLPs implement the attached Cleanup Action Plan (CAP) (Exhibit A) and that these actions be conducted in accordance with Chapter 173-340 Washington Administrative Code (WAC) unless otherwise specifically provided for herein.

1. Prepare a work plan addressing the actions outlined in the CAP for Ecology comment and approval. This work plan shall be due to Ecology within four (4) weeks after the effective date of this Order.

2. Submit a revised work plan within three (3) weeks following receiving Ecology's comments on the draft work plan.

3. Implement the Ecology approved work plan.

V.

Terms and Conditions of Order

1. Definitions

Unless otherwise specified, the definitions set forth in Ch. 70.105D RCW and Ch. 173-340 WAC shall control the meanings of the terms used in this Order.

2. Public Notices

RCW 70.105D.030(2)(a) requires that, at a minimum, this Order be subject to concurrent public notice. Ecology shall be responsible for providing such public notice and reserves the right to modify or withdraw any provisions of this Order should public comment disclose facts or considerations which indicate to Ecology that the Order is inadequate or improper in any respect.

3. Remedial Action Costs

The PLPs shall pay to Ecology costs incurred by Ecology pursuant to this Order. These costs shall include work performed by Ecology or its contractors for investigations, remedial actions, and Order preparation, oversight and administration. Ecology costs shall include costs of direct activities and support costs of direct activities as defined in WAC 173-340-550(2). The PLPs shall pay the required amount within 90 days of receiving from Ecology an itemized statement of costs that includes a summary of costs incurred, an identification of involved staff, and the amount of time spent by involved staff members on the project. A general description of work performed will be provided upon request. Itemized statements shall be prepared quarterly. Failure to pay Ecology's costs within 90 days of receipt of the itemized statement of costs will result in interest charges.

4. Designated Project Coordinators. The project coordinator for Ecology is:

Martha Maggi
Department of Ecology
Southwest Regional Office
PO Box 4775
Olympia, WA 98504-7775

The project coordinator for PLPs is:

Tony Palagyi
Texaco
10602 NE 38th Pl
PO Box 2969
Kirkland, WA 98083-2969

The project coordinator(s) shall be responsible for overseeing the implementation of this Order. To the maximum extent possible, communications between Ecology and PLPs and all documents, including reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed through the project coordinator(s). Should Ecology or PLPs change project coordinator(s), written notification shall be provided to Ecology by the PLPs at least ten (10) calendar days prior to the change.

5. Performance

All work performed pursuant to this Order shall be under the direction and supervision, as necessary, of a professional engineer or hydrogeologist, or similar expert, with appropriate training, experience and expertise in hazardous waste site investigation and cleanup. The PLPs shall notify Ecology as to the identity of such engineer(s) or hydrogeologist(s), and of any contractors and subcontractors to be used in carrying out the terms of this Order, in advance of their involvement at the Site. The PLPs shall provide a copy of this Order to all agents, contractors and subcontractors retained to perform work required by this Order and shall ensure that all work undertaken by such agents, contractors and subcontractors will be in compliance with this Order.

Except where necessary to abate an emergency situation, the PLPs shall not perform any remedial actions at the Cowlitz B.P. outside that required by this Order unless Ecology concurs, in writing, with such additional remedial actions. WAC 173-340-400(7)(b)(i) requires that "construction" performed on the Site must be under the supervision of a professional engineer registered in Washington.

6. Access

Ecology or any Ecology authorized representative shall have the authority to enter and freely move about the Site at all reasonable times for the purposes of, inter alia: inspecting records,

operation logs, and contracts related to the work being performed pursuant to this Order; reviewing the progress in carrying out the terms of this Order; conducting such tests or collecting samples as Ecology or the project coordinator may deem necessary; using a camera, sound recording, or other documentary type equipment to record work done pursuant to this Order; and verifying the data submitted to Ecology by the PLPs. By signing this Agreed Order, the PLPs agree that this Order constitutes reasonable notice of access, and agrees to allow access to the Site at all reasonable times for purposes of overseeing work performed under this Order. Ecology shall allow split or replicate samples to be taken by the PLPs during an inspection unless doing so interferes with Ecology's sampling. The PLPs shall allow split or replicate samples to be taken by Ecology and shall provide seven (7) days notice before any sampling activity.

7. Retention of Records

The PLPs shall preserve in a readily retrievable fashion, during the pendency of this Order and for ten (10) years from the date of completion of the work performed pursuant to this Order, all records, reports, documents, and underlying data in its possession relevant to this Order. Should any portion of the work performed hereunder be undertaken through contractors or agents of the PLPs, then the PLPs agree to include in their contract with such contracts or agents a record retention requirement meeting the terms of this paragraph.

8. Dispute Resolution

The PLPs may request Ecology to resolve disputes which may arise during the implementation of this Order. Such request shall be in writing and directed to the signatory, or his/her successor(s), to this Order. Ecology resolution of the dispute shall be binding and final. The PLPs are not relieved of any requirement of this Order during the pendency of the dispute and remains responsible for timely compliance with the terms of the Order unless otherwise provided by Ecology in writing.

9. Reservation of Rights/No Settlement

This Agreed Order is not a settlement under Ch. 70.105D RCW. Ecology's signature on this Order in no way constitutes a covenant not to sue or a compromise of any Ecology rights or authority. Ecology will not, however, bring an action against the PLPs to recover remedial action costs paid to and received by Ecology under this Agreed Order. In addition, Ecology will not take additional enforcement actions against the PLPs to require those remedial actions required by this Agreed Order, provided the PLPs comply with this Agreed Order. Ecology reserves the right, however, to require additional remedial actions at the Site should it deem such actions necessary.

Ecology also reserves all rights regarding the injury to, destruction of, or loss of natural resources resulting from the releases or threatened releases of hazardous substances from the Cowlitz B.P. site.

In the event Ecology determines that conditions at the Site are creating or have the potential to create a danger to the health or welfare of the people on the Site or in the surrounding area or to the environment, Ecology may order the PLPs to stop further implementation of this Order for such period of time as needed to abate the danger.

10. Transference of Property

No voluntary or involuntary conveyance or relinquishment of title, easement, leasehold, or other interest in any portion of the Site shall be consummated by the PLPs without provision for continued implementation of all requirements of this Order and implementation of any remedial actions found to be necessary as a result of this Order.

Prior to transfer of any legal or equitable interest the PLPs may have in the site or any portions thereof, the PLPs shall serve a copy of this Order upon any prospective purchaser, lessee, transferee, assignee, or other successor in such interest. At least thirty (30) days prior to finalization of any transfer, the PLPs shall notify Ecology of the contemplated transfer.

11. Compliance with Other Applicable Laws

A. All actions carried out by the PLPs pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in paragraph B of this section.

B. Pursuant to RCW 70.105D.090(l), the substantive requirements of chapters 70.94, 70.95, 70.105, 75.20, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals for the remedial action under this Order that are known to be applicable at the time of issuance of the Order have been included in Exhibit A and enforceable requirements of the Order.

The PLPs have a continuing obligation to determine whether additional permits or approvals addressed in RCW 70.105D.090(l) would otherwise be required for the remedial action under this Order. In the event the PLPs determine that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify Ecology of this determination. Ecology shall determine whether Ecology or the PLPs shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, the PLPs shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by the PLPs and on how the PLPs must meet those requirements. Ecology shall inform the PLPs in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. The PLPs shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

Ecology shall ensure that notice and opportunity for comment is provided to the public and appropriate agencies prior to establishing the substantive requirements under this section.

C. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws referenced in RCW 70.105D.090(l) would result in the loss of approval from a federal agency which is necessary for the State to administer any federal law, the exemption shall not apply and [PLP shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(l), including any requirements to obtain permits.

VI.

Satisfaction of this Order

The provisions of this Order shall be deemed satisfied upon the PLPs receipt of written notification from Ecology that the PLPs have completed the remedial activity required by this Order, as amended by any modifications, and that all other provisions of this Agreed Order have been complied with.

VII.

Enforcement

1. Pursuant to RCW 70.105D.050, this Order may be enforced as follows:

A. The Attorney General may bring an action to enforce this Order in a state or federal court.

B. The Attorney General may seek, by filing an action, if necessary, to recover amounts spent by Ecology for investigative and remedial actions and orders related to the Site.

C. In the event the PLPs refuse, without sufficient cause, to comply with any term of this Order, the PLPs will be liable for:

(1) up to three times the amount of any costs incurred by the state of Washington as a result of its refusal to comply; and

(2) civil penalties of up to $25,000 per day for each day it refuses to comply.

D. This Order is not appealable to the Washington Pollution Control Hearings Board. This Order may be reviewed only as provided under Section 6 of Ch. 70.105D RCW.

Effective date of this Order: 4/17/01

CHARLES VINEYARD

By C. F. Vineyard

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

By Rebecca S. Lawson

EXHIBIT A

CLEANUP ACTION PLAN
COWLITZ BP
TOLEDO, WASHINGTON

This Cleanup Action Plan (CAP) has been prepared to present the selected alternative for remediation at the Cowlitz BP site (also referred to as "the site") located in Lewis County, Washington, near the city of Toledo. This CAP has been prepared to satisfy the requirements of the Model Toxics Control Act (MTCA) (Ch 70.105D RCW). The purposes of this CAP are to: (1) briefly describe the cleanup alternatives considered and evaluated in the Remedial Investigation and Feasibility Study (RI/FS), and (2) identify the selected alternative. Information is also presented to provide background information regarding site activities and monitoring, including a description of the site and the nature and extent of contaminants.

The initial RI/FS activities at the site were conducted pursuant to Enforcement Order No. DE 91-S123, and following completion of these activities, a Draft CAP was completed by the Washington State Department of Ecology (Ecology) and issued for public comment in May of 1994. Additional Potential Liable Parties (PLPs) were subsequently identified. Because site conditions will allow application of several remedial options, Ecology elected to allow the new PLPs the flexibility to select another remedial option that would satisfy MTCA requirements, if they desired. In addition, since a considerable amount of time had lapsed since the completion of both the RI/FS and the previous Draft CAP, additional groundwater monitoring data were necessary to verify site conditions.

The additional work was completed under Agreed Order No. DE94-S368 issued to the PLPs by Ecology. The additional work performed under the Agreed Order has resulted in the selection of a preferred cleanup alternative. This CAP summarizes four alternatives that were considered, including the previously selected cleanup action, and presents the information supporting the selection of the preferred cleanup alternative.

SITE BACKGROUND

The Cowlitz BP site is located on the east side of Interstate 5 at the Vader-Ryderwood exit (Exit 59) in Lewis County, Washington (Figure 1). The site includes two potential sources of petroleum hydrocarbon contamination, an active BP service station located on the northeast corner of Cowlitz Ridge Road and Mulford Road (active station), and a former service station (former station) located south of the active station, across Mulford Road. Both stations and the surrounding areas impacted with petroleum hydrocarbons were defined by Ecology as the Cowlitz BP site (Figure 2). The two service stations were combined into one site because of common property ownership and indications that groundwater contaminant plumes from the sites may be commingled.

Mr. Frank Vineyard purchased both properties as one tax lot in early 1947 and conducted farming operations there for eight years. In 1955, the property was divided into separate lots and leased.

The former station property was originally leased to General Petroleum Corporation on May 5, 1955. In 1978, the property was leased by Olson Brothers Garage, Inc. and was occupied by a Mobil service station and a small restaurant until 1984. Following 1984, the station was no longer in operation and was subsequently destroyed. The former station property has been redeveloped as a sales lot for manufactured homes.

In 1955, the active station property was leased to Texaco, who constructed the building and installed the original underground storage tanks (USTs) and piping. Ownership interest in the improvements passed from Texaco to Olson Brothers in 1980, then to West Coast Oil Company in 1985. Bob and Sheri Smith, the current service station operators, purchased the improvements from West Coast Oil in 1986. In March 1990, three 6,000 gallon USTs and one 4,000 gallon UST and associated piping were removed at the active station. Approximately 1,000 cubic yards of petroleum hydrocarbon impacted soil were removed from the excavation and treated by aeration east of the station. Soil samples collected from the excavation sidewalls indicated that some impacted soil remained. New fiberglass USTs were installed in the excavation.

During February 1991, four groundwater monitoring wells were installed at the active station. Groundwater samples collected from the wells contained gasoline range total petroleum hydrocarbons (TPH-G) and benzene, toluene, ethylbenzene, and xylenes (BTEX) at concentrations above cleanup levels. Soil samples collected from the borings did not contain hydrocarbons at concentrations exceeding MTCA Method A cleanup levels.

In April 1991, Enforcement Order No. DE91-S123 was issued to Frank Vineyard. The Order required Vineyard to conduct an RI/FS. Because of the concern that contamination, if present, at the inactive station, would have a negative impact on any remediation conducted at the active station, the Order further specified that USTs at the former station property be removed as part of the RI/FS.

In January 1992, the remaining USTs were removed from the former station. Two 6,000-gallon gasoline USTs and one 300-gallon used oil UST were removed. Approximately 300 cubic yards of hydrocarbon-impacted soil were removed from the excavation and stockpiled on site. TPH-G and total petroleum hydrocarbons as diesel (TPH-D) were identified at concentrations above cleanup levels in soil samples from the gasoline UST excavation.

During February and March 1992, the remedial investigation was conducted at the site. A total of five soil borings and nine groundwater monitoring wells were installed to assess the extent of soil impacts at the active station site and groundwater impacts throughout the site. None of the soil samples contained hydrocarbon compounds at concentrations above cleanup levels. The groundwater samples indicated the presence of TPH-G and BTEX in the vicinity of both the active and former stations.

The feasibility study concluded that the most appropriate soil cleanup approach was to excavate remaining contaminated soil and conduct on-site treatment using bioremediation technology. The proposed remedy for impacted groundwater was groundwater extraction using three extraction wells and treatment by air stripping and granular activated carbon technology. The treated groundwater would be re-injected through two infiltration trenches. Based on the results of the RI/FS, a draft CAP was prepared and issued for public comment in May 1994.

Between May 1994 and September 1994, activities occurred at the site that were not authorized by Ecology. The ground surface in the area of the inactive station was graded, a septic tank and underground utility lines were installed, and "model" homes were constructed in the area where the approved CAP identified the remediation system to be located. In addition, some monitoring wells could not be located. Ecology contacted Mr. Vineyard regarding this activity. Mr. Vineyard expressed his concern regarding the cost of remediation and requested that additional PLPs be named. Information was provided to Ecology, and in October 1994, Texaco and the Smiths were named as PLPs.

The PLPs were given the opportunity to conduct additional remedial investigation activities and re-evaluate the selected cleanup approach. It also was necessary to collect more current groundwater monitoring data, since a considerable amount of time had lapsed since the completion of both the RI/FS and the previous Draft CAP and Ecology was concerned that site conditions might have changed. These additional activities were conducted under Agreed Order No. DE94-S368.

GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

Geologic interpretations of the project site vicinity developed by the United States Geological Survey (USGS) indicate that quaternary alluvial deposits of silt, sand, and gravel associated with the Cowlitz River are characteristic of the area. The alluvial deposits are bounded by outwash deposits of sand and gravel interbedded with silt and clay associated with the Frasier glaciation of the Cascade Mountains. Shallow groundwater within these deposits generally discharges into the Cowlitz River

Information gathered during site investigation activities at the site are consistent with the USGS interpretation of the regional geology. In general, the site exhibits the characteristics of gravelly alluvial material with interbedded layers of sand and silt. Data collected during drilling indicates that the site is underlain by sandy gravel and gravelly sand with varying percentages of silt. The upper horizon varies in thickness from approximately 10 feet to at least 18.5 feet and serves as an aquifer. A clay layer of an undetermined thickness was identified beneath the sands and gravels in most of the soil borings drilled at the site.

The shallow water table aquifer beneath the site is productive and serves as a source of drinking water. Depth to groundwater within the gravelly horizon ranges from 6.5 feet to 8 feet below the surface. Groundwater flow is to the east-southeast in the direction of the Cowlitz River at a gradient of 0.003 or approximately 16 feet per mile. Time lag permeability (slug) tests of select wells demonstrate the localized variability in the alluvial material indicating variable ground

water flow conditions. The direction of groundwater flow is the general direction of the Cowlitz River. In all areas of the site, the rate of groundwater elevation varies seasonally by approximately 2 feet (Figure 3).

A total of four private groundwater wells are located within a one-half mile radius from the site. The nearest well is the supply well for the operating station at the Cowlitz BP site and is up-gradient (north) from the contaminant plume. Two wells are located cross gradient on a river terrace, 500 feet southeast of the site. This terrace is approximately 15 feet lower in elevation than the site, and groundwater discharges through springs and seeps along the bank above the terrace. A small stream draining a series of beaver ponds, flows along the eastern site boundary and empties into the Cowlitz River. No water supply wells are located down gradient from the site.

NATURE AND EXTENT OF CONTAMINATION

Subsurface soil

Hydrocarbon impacts were identified in soil during UST removal excavations at both the active and former stations. At the active site, concentrations of gasoline-range hydrocarbons as high as 6,300 milligrams per kilogram (mg/kg) were reportedly left in place. At the former service station, soil samples collected from the tank pit following the UST removal confirmed concentrations of diesel and gasoline as high as 6,000 and 2,900 mg/kg, respectively. BTEX concentrations were below Method A cleanup levels.

The depth the excavation samples were collected reflects impacts within the capillary fringe or saturated zone, rather than the vadose zone. Kaldveer Associates estimated that approximately 500 cubic yards of contaminated soil remained in place near the tank excavation at the former site. However, Kaldveer acknowledged that most of this soil was located below the water table.

No vadose zone (unsaturated) soil impacts were identified during subsequent investigations (drilling) at the site. Given that the previously identified soil impacts are primarily within the capillary fringe or saturated zone, it is believed that the extent of vadose soil impacts is very limited. This understanding is consistent with the very coarse-grained soils at the site which would allow contaminants to migrate vertically until reaching groundwater.

Groundwater

Recent groundwater monitoring results have shown that MTCA Method A groundwater cleanup levels were exceeded at B-3, B-4, MW-110, and MW-111, located at the active station; and at MW-101, located at the former station (Figure 4).

At the active station, wells B-3, B-4, MW-110, and MW-111 are located in the vicinity and downgradient of the former UST basin. All four wells also show a generally declining trend of concentrations of TPH-G and benzene. Analytical data is summarized in Table 1. Although

concentrations in some wells appear to be unstable, the size and shape of the contaminant plume has remained relatively constant.

In addition to the decrease in contaminant concentrations, biological degradation monitoring was completed in the area of impacted groundwater. Monitoring results within the area of the highest groundwater impacts show that concentrations of dissolved oxygen and nitrate are depleted, and concentrations of methane are elevated, relative to the concentrations measured in background areas of the aquifer. This information suggests that biodegradation and attenuation of hydrocarbons has occurred and is being limited by the availability of dissolved oxygen.

MTCA CLEANUP STANDARDS

This section presents the cleanup standards to be achieved by the selected cleanup alternative. Development of cleanup standards includes selection of constituents of concern, identification of applicable state and federal laws, determination of cleanup levels, and establishment of points of compliance.

Constituents of Concern

The potential constituents of concern at the site are those hazardous substances that have been historically used at the site, based on a review of past site operations. Sampling data from soil and groundwater investigations at the site have confirmed the presence of the following constituents of concern:

- Gasoline-range total petroleum hydrocarbons
- Diesel-range total petroleum hydrocarbons
- Benzene
- Toluene
- Ethylbenzene
- Xylenes

These constituents of concern have been identified in both soil and groundwater at the site.

Applicable or Relevant and Appropriate Requirements

Cleanup levels developed under MTCA must "comply with applicable state and federal laws." These include legally applicable requirements and those requirements that are considered relevant and appropriate. This section identifies chemical and media specific laws and regulations potentially applicable to the development of cleanup levels at the site. MTCA also requires that cleanup standards include consideration of additional regulatory requirements that may apply to a cleanup because of the type of action or location of the site.

There are federal and state laws and implementing regulations, other than MTCA, that are potentially applicable to the establishment of cleanup levels or selection of a cleanup action at the site. These potentially applicable laws and implementing regulations are:

- Safe Drinking Water Act
- Clean Water Act
- Clean Air Act
- State of Washington Water Pollution Control Act.

Cleanup Standards

Under MTCA, site specific cleanup levels take into account the current and anticipated future land use of the site. The regulation specifies three "methods" for use in establishing site cleanup levels for specific environmental media. Briefly, these are:

- **Method A** cleanup levels are set by the state of Washington and are delineated in the regulation for a specific subset of chemicals for environmental media. These values can be used as cleanup levels during "routine" site cleanups (e.g., few contaminants at the site and all contaminants have Method A cleanup levels).

- **Method B** is the standard method for site cleanups under MTCA. Method B cleanup levels involve calculation of media specific values for a given chemical from specified formulae provided in the regulation. The formulae require input of chemical-specific toxicological parameters, as well as physiological and exposure-based parameters. Parameter values and sources are explicitly stated in the regulation.

- **Method C** is the conditional method for site cleanups under MTCA. MTCA Method C levels involve calculations similar to Method B, with some modification of specific parameter values to meet special conditions associated with the site (i.e., industrial sites).

Currently, Ecology does not allow calculation of TPH cleanup levels for groundwater by Method B or Method C. Methods B and C can be used to establish cleanup levels for TPH in soils under Ecology's Interim TPH Policy. Given the groundwater impacts at the site, Method A cleanup levels for soil and groundwater are the most clearly defined cleanup levels currently available for the site. These cleanup levels represent the most conservative regulatory limit at this time. A summary of the proposed cleanup levels follows:

Method A Soil Cleanup Levels

TPH Diesel	200 mg/Kg
TPH Gasoline	100 mg/Kg
Benzene	0.5 mg/Kg
Toluene	40 mg/Kg
Ethylbenzene	20 mg/Kg
Xylenes	20 mg/Kg

Method A Groundwater Cleanup Levels

TPH Gasoline	1.0 mg/L
Benzene	0.005 mg/L
Toluene	0.040 mg/L
Ethylbenzene	0.030 mg/L
Xylenes	0.020 mg/L

Proposed Point of Compliance

The points of compliance are the locations where cleanup levels are to be attained. The points of compliance for the site will be defined as throughout the site. The site shall be defined as the parcels of property owned by Frank Vineyard, where the Cowlitz BP station and the inactive station are located, which were impacted by the gasoline release(s).

CLEANUP ACTION ALTERNATIVES

Four cleanup alternatives were evaluated for the site. They include the following alternatives:

Alternative 1 Excavation and treatment of hydrocarbon impacted soil for soil cleanup and groundwater extraction and treatment for groundwater cleanup.

Alternative 2 In-situ soil vapor extraction for soil cleanup and air sparging for groundwater cleanup.

Alternative 3 Enhanced in-situ biodegradation for soil and groundwater cleanup.

Alternative 4 Natural attenuation for soil and groundwater cleanup.

A detailed description of each alternative is presented below.

Alternative 1: Soil Excavation and Groundwater Extraction

The objective of soil excavation, followed by groundwater extraction and treatment, is to remove the source of groundwater contamination and remove the residual contaminant mass by pumping. The site characterization data indicates that the contaminant mass in soils is located in saturated soils. Hydrocarbon contaminants in soils do not migrate vertically downward below the water table and are therefore most prevalent in the capillary fringe and the upper few feet of the saturated zone. Approximately 6 to 8 feet of clean overburden soils must be removed prior to excavation of contaminated soils.

An estimated 1,000 cubic yards of clean overburden would need to be excavated in order to remove the contaminated soil. An estimated 500 cubic yards of contaminated soil would be removed for off site disposal. The excavation would extend to a depth of approximately 15 feet. The overburden materials and the capillary fringe soils consist of sandy gravel and gravelly sand with varying percentages of silt. Excavation of this material would require substantial sloping of excavation sidewalls or sheeting or shoring. Upon completion of soil removal, confirmation

samples would be collected from each wall of the excavation and from the floor of the excavation. The excavated soil would be taken off site for treatment and disposal.

Groundwater extraction would be accomplished using vertical extraction wells. Three extraction wells and two infiltration trenches would be needed to implement the groundwater remediation. During the system design, locations of the wells and infiltration trenches would be evaluated using computer analytical modeling to assure that the contaminant plume would be captured sufficiently and that the locations of the infiltration trenches would not interfere with the plume capture.

The extraction wells would be 4 to 6 inches in diameter and drilled to a depth of at least 20 feet below the water table. The water bearing zone would be screened, and a submersible pump would be installed. Standard percolation testing would be completed at each proposed trench location to assess the vertical permeability in order to design the trenches to accommodate the total discharge from the extraction wells.

Groundwater treatment would be accomplished by using an air stripper with off gas treatment by activated carbon. Treated groundwater would be discharged into an infiltration trench. The restoration time frame for groundwater treatment by air stripping would most likely be two to five years. All treated groundwater would be sampled and discharged in accordance with a state waste discharge permits.

Upon completion of the groundwater remediation activities, one year of post remediation monitoring would be completed. At the completion of monitoring, the groundwater system, including the extraction and reinjection wells and the monitoring wells, would be abandoned in accordance with state of Washington requirements.

Estimated costs were developed to complete the scope of work as described in Alternative 1. The estimate includes costs for laboratory analyses of soil samples, soil excavation and removal, off site treatment and disposal, backfilling, site restoration, groundwater treatment system design, permitting, installation, and operation and maintenance for an estimated three year restoration time frame, including costs for system monitoring. The total estimated cost to complete this task is $310,000.

For completing Alternative 1, an excavation and grading permit from Cowlitz County would be required prior to conducting the soil excavation activities, and a State Waste Discharge Permit from Ecology would be required prior to discharge of treated groundwater.

Alternative 2: Air sparging and Soil Vapor Extraction

The objective of air sparging with soil vapor extraction is to actively remove volatile hydrocarbon contaminants in soils and groundwater through in-situ air stripping and to passively destroy or detoxify contaminants by increasing oxygen levels which will promote biodegradation.

The air sparging system would consist of vertical wells that serve as air injection points. Within a radius of 5 to 20 feet of the air sparging well points, volatile hydrocarbon contaminants would be removed from the aqueous phase into the gaseous phase along the air/water interface. In addition, oxygen would be transferred from the gaseous phase to the liquid phase. An estimated 25 to 35 air sparging points would be installed within the area of the existing groundwater plume.

Soil vapors containing gaseous hydrocarbons would be removed by vertical vapor extraction wells. The vapor extraction wells would be placed at locations to eliminate stagnation points and maximize vapor extraction. An estimated 20 to 30 vapor extraction points would be installed within the area of the existing groundwater plume.

Air would be injected with oil-less air compressors into the air sparging wells at a rate of 5 to 10 cubic feet per minute (cfm). Vapor extraction piping would be connected to a blower system to extract hydrocarbon vapors at a rate of 50 to 100 cfm. The vapors would be treated by activated carbon prior to discharge to the atmosphere. The system would be monitored monthly and adjusted to optimize contaminant removal as the project progressed.

The restoration time frame for the site with air sparging and vapor extraction would be two to three years. Upon completion of the soil and groundwater remediation activities, one year of post remediation monitoring would be completed. At the completion of monitoring, the air sparging and vapor extraction system, including air injection and extraction wells and the monitoring wells, would be abandoned in accordance with state of Washington requirements.

Estimated costs were developed to complete the scope of work as described in Alternative 2. The estimate includes costs for system design and permitting, well installation, system installation, and operation and maintenance for an estimated three year restoration time frame, including costs for system monitoring and one year of post remediation monitoring. The total estimated cost to complete this task is $280,000.

For completing Alternative 2, an air contaminant discharge permit would be required from the Southwest Air Pollution Control Authority (SWAPCA) for the discharge of extracted vapors to the atmosphere.

Alternative 3: Enhanced Biodegradation

The objective of enhanced biodegradation is to increase the rate of natural destruction of hydrocarbon compounds by indigenous microorganisms. The cleanup technology consists of increasing dissolved oxygen concentrations within groundwater. A study of various parameters that affect the rate of biodegradation of hydrocarbons at the site indicated that dissolved oxygen is the primary limiting factor. In areas where petroleum hydrocarbon concentrations are elevated in groundwater, aerobic degradation has depleted the available dissolved oxygen. Feasibility testing during the RI/FS indicated that an increase in dissolved oxygen in groundwater would result in an increased biodegradation rate.

Alternative 3 proposes introducing oxygen to groundwater using Oxygen Release Compound (ORC), which is introduced into groundwater via direct contact through the entire thickness of the saturated zone. ORC is a commercial product that can be mixed with grout to backfill soil borings within the saturated zone. ORC contains magnesium peroxide in a powder form. The ORC slowly dissolves as it mixes with groundwater and releases a continual source of oxygen. The molecular oxygen is transported within the saturated zone by diffusion, dispersion, and advection. The time release rate of oxygen from the ORC mixture results in continuous release of oxygen for a period of 8 to 12 months. At the completion of this time period, all oxygen within the ORC mixture has been released, and the boring is left with an inert grout mixture.

The ORC will be installed in two phases. The initial phase consists of installing the entire quantity of ORC in 50 soil borings calculated to be necessary to reduce petroleum hydrocarbon contaminant levels in groundwater. It is possible that site remediation will be complete after Phase 1. Phase 2 is a contingency for additional ORC in areas with elevated levels of petroleum hydrocarbons remaining after Phase 1.

Phase 1 ORC installation will add approximately 140 pounds of dissolved oxygen to the groundwater. The quantity of oxygen required to enhance biodegradation to achieve Method A cleanup levels was calculated using a conservative estimate of the quantity of hydrocarbons remaining in the subsurface and the amount of oxygen necessary to support the metabolism of the hydrocarbon mass. A conservative multiplier, to account for other chemical and biological oxygen demand that may also utilize oxygen, was also factored into the equation. The installation of twenty additional 2-inch borings during Phase 2, in year 2 or year 3, would be based on the success of Phase 1. These borings would add an additional 35 pounds of dissolved oxygen to the groundwater and represent a factor of safety of 25%.

The distribution of dissolved oxygen within groundwater will occur through advective groundwater transport concentration gradient diffusion. Based on the results of the RI/FS, groundwater velocities throughout the site are somewhat variable due to the alluvial nature of the soils within the saturated zone. The heterogeneity of the saturated zone has been accounted for in the preliminary design and would be detailed in the final design.

The preliminary locations of the borings for Phase 1 are illustrated in Figure 5. Phase 1 would consist of ten 4-inch diameter boreholes and forty 2-inch diameter boreholes. A 10-foot section of ORC will be placed to cover the interval from 5 to 15 feet below grade. Phase 2 will consist of 20 borings. The borings will be placed in areas where dissolved oxygen distribution is limited, based on monitoring data. If Phase 2 is not needed, the estimated restoration time frame for enhanced biodegradation will be one to two years. If the contingency boreholes are needed, the estimated restoration time frame for enhanced biodegradation is three to four years.

Quarterly groundwater monitoring will evaluate the effectiveness of the ORC using existing well locations.

Estimated costs were developed to complete the scope of work as described in Alternative 3. The estimate includes costs for design of the ORC installation grid, permitting, drilling and ORC

installation, and monitoring for a four-year period. The total estimated cost to complete this task is $170,000.

For completing Alternative 3, approval would be required by Ecology for installation of the ORC. No permits are required for implementation of Alternative 3.

Alternative 4: Natural Attenuation

Natural attenuation reduces the concentration of contaminants in the subsurface by a combination of destructive and nondestructive mechanisms. Biodegradation by indigenous microorganisms is the primary mechanism for contaminant destruction. Nondestructive processes that also reduce contaminant concentrations include adsorption/desorption, advection, dispersion, diffusion, dilution, and volatilization. Natural attenuation is already occurring at the site, as evidenced by the groundwater monitoring data indicating that concentrations are decreasing.

Natural attenuation would not involve any measures to accelerate the natural cleanup process. Groundwater monitoring would be conducted as part of this alternative to confirm that the contaminated groundwater plume is not moving or expanding and to demonstrate that concentrations are decreasing over time.

Natural attenuation results in the destruction of contaminants rather than transfer to an alternate media. Furthermore, the alternative is easy and cost effective to implement. The estimated restoration time frame for natural attenuation at the site is seven to ten years.

Estimated costs were developed to complete the scope of work as described in Alternative 4. The estimate includes quarterly groundwater monitoring for a period of 10 years. The total estimated cost to complete this task is $80,000.

No permits are required to implement the proposed actions for completing Alternative 4.

ANALYSIS OF CLEANUP ACTION ALTERNATIVES

The evaluation of cleanup action alternatives under MTCA requires that cleanup actions comply with the threshold requirements established in WAC 173-340-360(2). The cleanup actions shall protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for compliance monitoring. Additionally, the cleanup actions shall use permanent solutions to the maximum extent practicable, provide a reasonable restoration time frame, and consider public concerns and comments. MTCA also provides a hierarchy of preferred treatment technologies. Each of the cleanup alternatives was evaluated with regard to these requirements.

1. Protection of Human Health and the Environment

All alternatives are equally protective of human health and the environment; however, time frames for achieving protectiveness varies.

2. Compliance with Cleanup Standards

All alternatives are expected to comply with the appropriate cleanup standards.

3. Compliance with Applicable or Relevant and Appropriate Requirements

All alternatives would comply with the state and federal ARARs. These would include, but not be limited to, permitting and compliance with the SWAPCA for air emissions and issuance of a State Waste Discharge permit for discharge of treated groundwater.

4. Restoration Time Frame

The restoration time frames for the various cleanup alternatives would range from approximately three to ten years. Specifically, the estimated restoration time frames for each of the alternatives are:

Alternative 1 - 3 years
Alternative 2 - 3 years
Alternative 3 - 3 to 4 years
Alternative 4 - 7 to 10 years

5. Short-Term Effectiveness

All alternatives are equally and fully protective in the short term, since there is currently no exposure to contaminated soils or groundwater at the site. Alternatives 1, 2, and 3 address groundwater more aggressively in the short term than does Alternative 4.

6. Long-Term Effectiveness

All methods are anticipated to be equally effective in the long term (five to ten years).

7. Reduction of Toxicity, Mobility, and Volume

Alternatives 1 and 2 involve technologies that remove contaminants from the site; however, some of the contaminants would be transferred to another media and not destroyed. Alternatives 3 and 4 involve a treatment technology that ultimately destroys or detoxifies the contaminants. Alternative 3 enhances the process of biological degradation, while Alternative 4 relies entirely on natural biological processes without the addition of supplemental oxygen or nutrients to destroy the contaminants.

8. Implementability

All alternatives are executable. Alternatives 3 and 4 do not require treatment of hydrocarbon vapor emissions or specialized equipment to remediate soil and groundwater, which makes these alternatives easier to implement.

9. Cleanup Cost

Although the cost for the cleanup action cannot be considered when determining the cleanup standard, it may be considered when choosing a cleanup action [WAC 173-340-700(7)(f)]. The estimated cost for Alternatives 1, 2, 3, and 4 are $310,000, $280,000, $170,000, and $80,000, respectively.

10. Community Concerns

Community concerns will be solicited during a 30 day public review period.

PROPOSED CLEANUP ACTION

Alternative 3, consisting of enhanced in situ biodegradation for soil and groundwater cleanup, is the selected cleanup action for the site. ORC would be installed in soil borings located throughout the area of impacted groundwater (Figure 5). The ORC would be installed in the borings in two phases. The initial phase would consist of the installation of ORC in ten 4-inch diameter borings and forty 2-inch diameter borings. The ORC would be placed at the interval of 5 to 15 feet below grade. This initial phase would add 140 pounds of dissolved oxygen to the groundwater.

The second phase, if necessary, would consist of the installation of up to twenty 2-inch soil borings to be placed in locations dependent upon monitoring results of Phase 1. Phase 2 is anticipated to be completed one to two years after Phase 1., and Phase 2 would add up to 35 pounds of dissolved oxygen.

The estimated quantity of oxygen required to enhance biodegradation to achieve Method A cleanup levels was calculated using the amount of oxygen necessary to support the metabolism of the remaining hydrocarbons. The total quantity of oxygen required to reduce the contaminant concentrations to the proposed cleanup levels would be installed in Phase 1. The installation of Phase 2 ORC would be based on the success of Phase 1. Phase 2, if installed, would consist of twenty 2-inch borings, or 35 pounds of dissolved oxygen. Phase 2 ORC would be installed in year 2 or 3, based on the initial monitoring results. The additional borings would add 35 pounds of dissolved oxygen to the groundwater and represent a factor of safety of 25%.

Throughout the proposed cleanup action, groundwater would be monitored to provide an ongoing assessment of groundwater quality and cleanup action progress. A performance monitoring plan is presented in Appendix A, which also includes a table summarizing the proposed monitoring plan schedule and frequency. A complete compliance monitoring plan that also addresses protection monitoring and confirmational monitoring will be prepared as part of the work plan for implementing this CAP.

JUSTIFICATION FOR SELECTED CLEANUP ACTION

The selected cleanup action complies with MTCA threshold requirements, including protection of human health and the environment, compliance with cleanup standards, compliance with applicable state and federal laws, and provision for compliance monitoring. This cleanup action effectively protects human health and the environment by destroying remaining hydrocarbon compounds in-situ, while minimizing potential exposure to the contaminants during the cleanup.

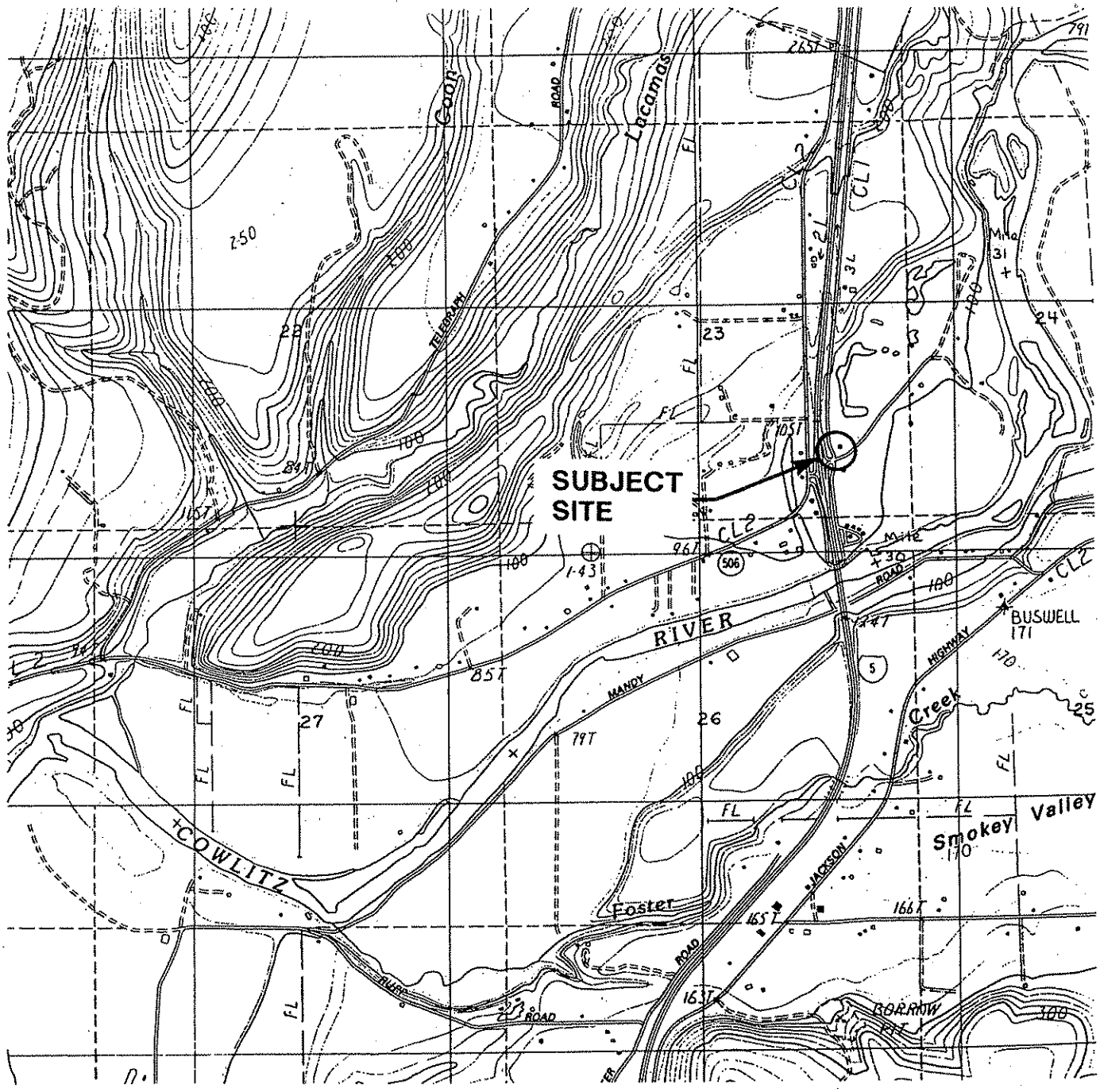
This cleanup action implements a permanent destruction of contaminants of concern. The addition of oxygen, through ORC installation, will accelerate the destruction of hydrocarbons in the subsurface. The cleanup action destroys the contaminants and provides a reasonable restoration time frame.

REFERENCES

Quarterly Groundwater Monitoring Report; First Quarter 2000, Cowlitz BP Site, 101 Mulford Road, Toledo, Washington; SECOR International Incorporated, May, 22, 2000.

Cleanup Action Plan, Cowlitz BP Site, 101 Mulford Road, Lewis County, Washington, SECOR International Incorporated, May 1999.

Remedial Investigation/Feasibility Study; Interstate 5 at the Vader-Ryderwood Exit, Lewis County, Washington, October 1993; Kaldveer Associates, October 1993.



REFERENCE: USGS 7.5 MINUTE QUADRANGLE; WINLOCK, WA; 1985.

SECOR
International Incorporated

SITE LOCATION MAP

COWLITZ BP SITE
101 MULFORD ROAD
TOLEDO, WASHINGTON

FIGURE: **1**

JOB #: 00111-118-03 APPR: RSM DWN: DJM DATE: 8/26/98

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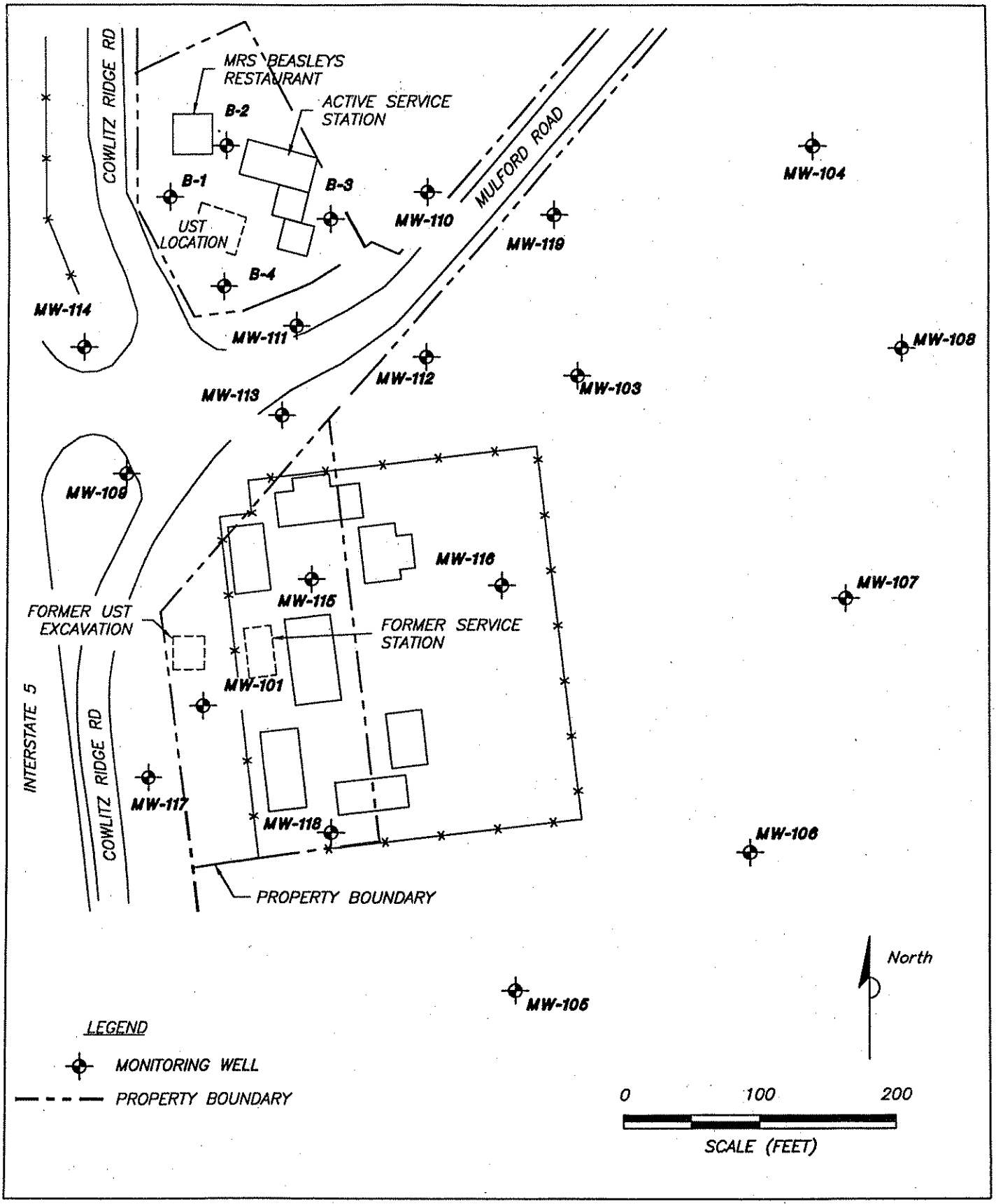

SECOR
International Incorporated

SITE PLAN

COWLITZ BP SITE
101 MULFORD ROAD
TOLEDO, WASHINGTON

FIGURE: **2**

JOB#: 00111-118-03 APPR: RSM DWN: DJM DATE: 8/26/98

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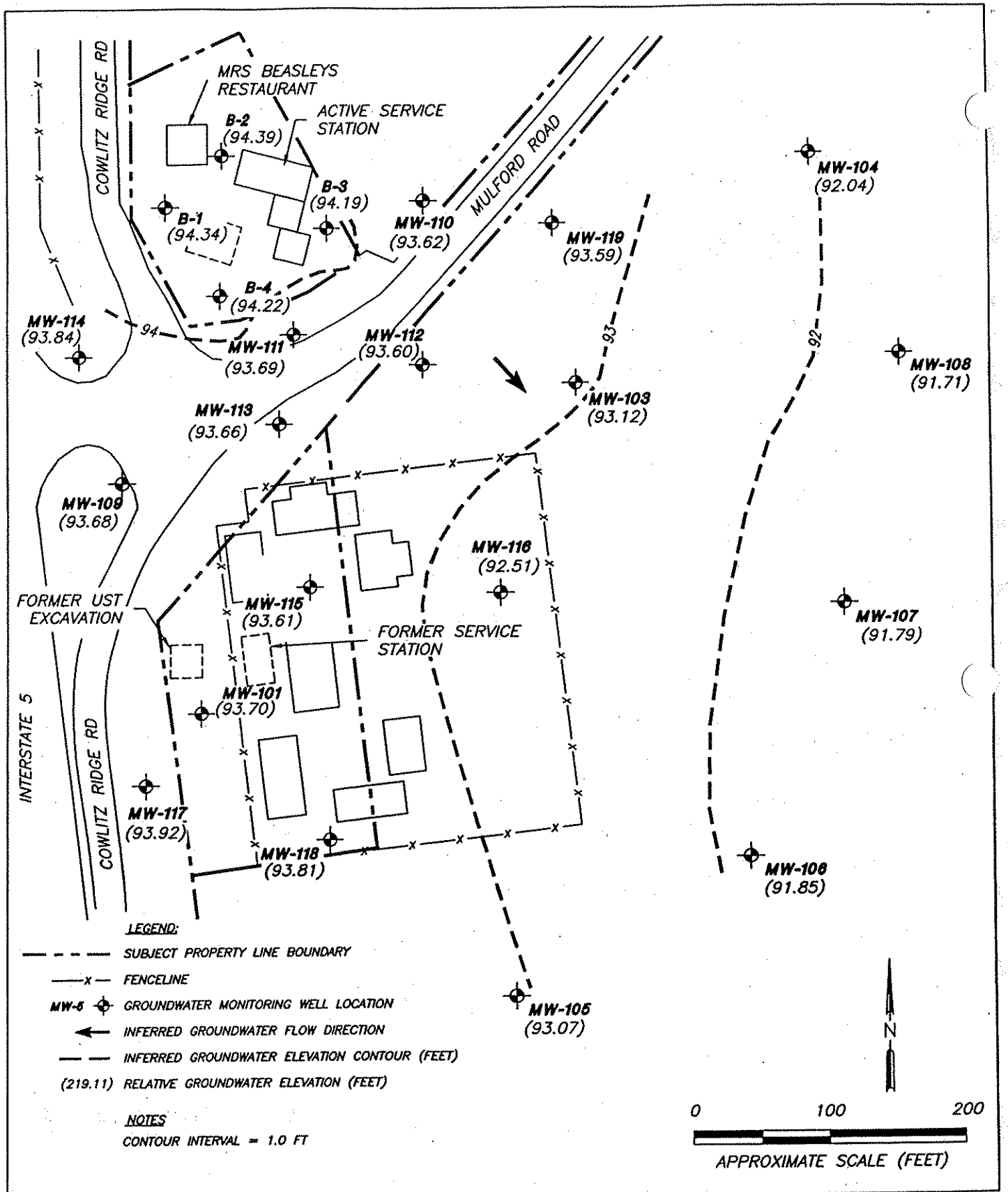

SECOR International Incorporated
015

GROUNDWATER ELEVATIONS CONTOUR MAP (11/18/99)
COWLITZ BP SITE SAP 128201
101 MULFORD ROAD
TOLEDO, WASHINGTON

FIGURE: 3

JOB#: 015.08302.500 APPR: BJP DWN: KPM DATE: 1/3/2000

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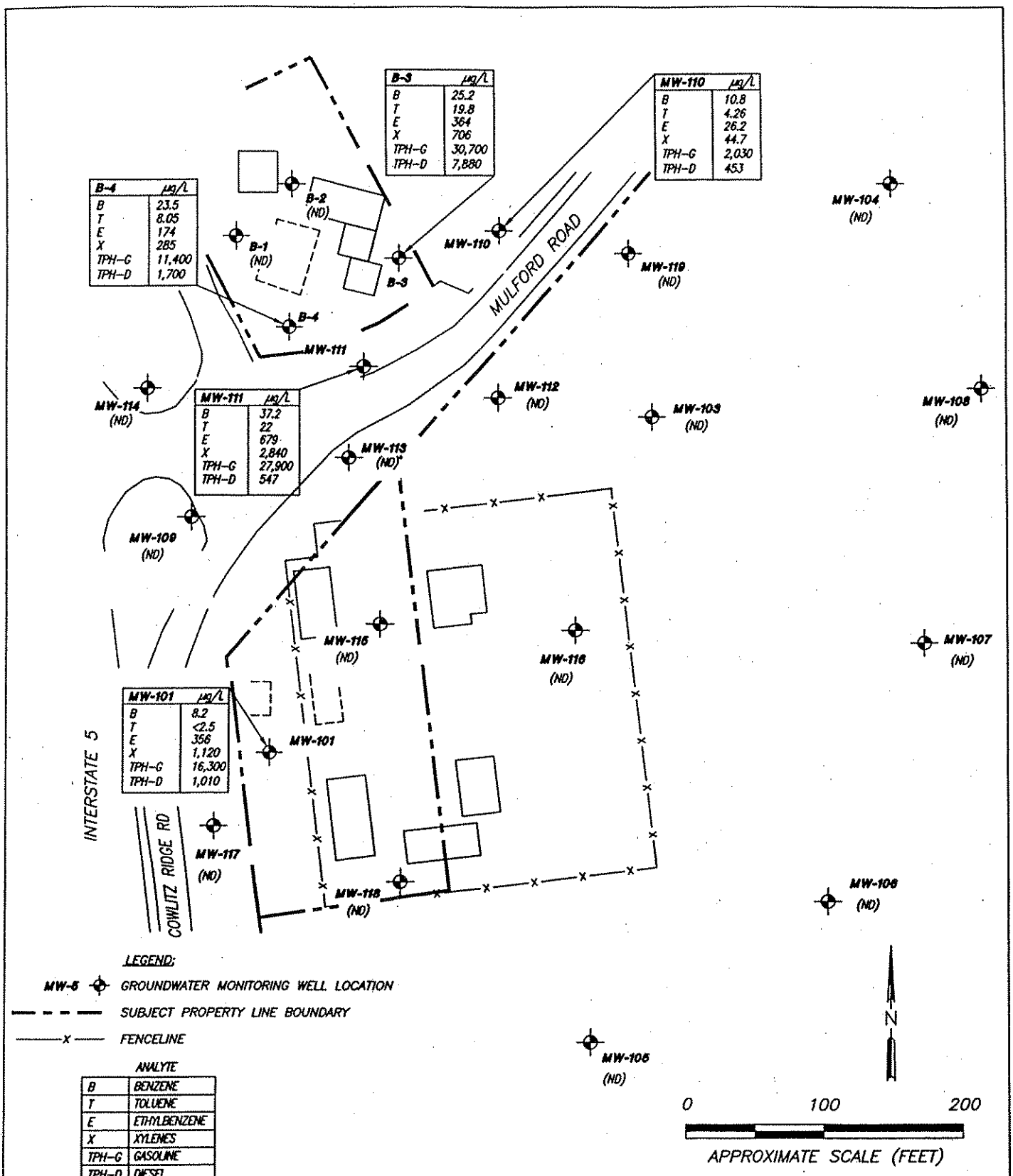

SECOR International Incorporated
015

GROUNDWATER HYDROCARBON ANALYTICAL RESULTS (11/18/99)
COWLITZ BP SITE SAP 128201
101 MULFORD ROAD
TOLEDO, WASHINGTON

FIGURE: **4**

JOB#: 015.08302.500 APPR: DWN: KPM DATE: 1/3/2000

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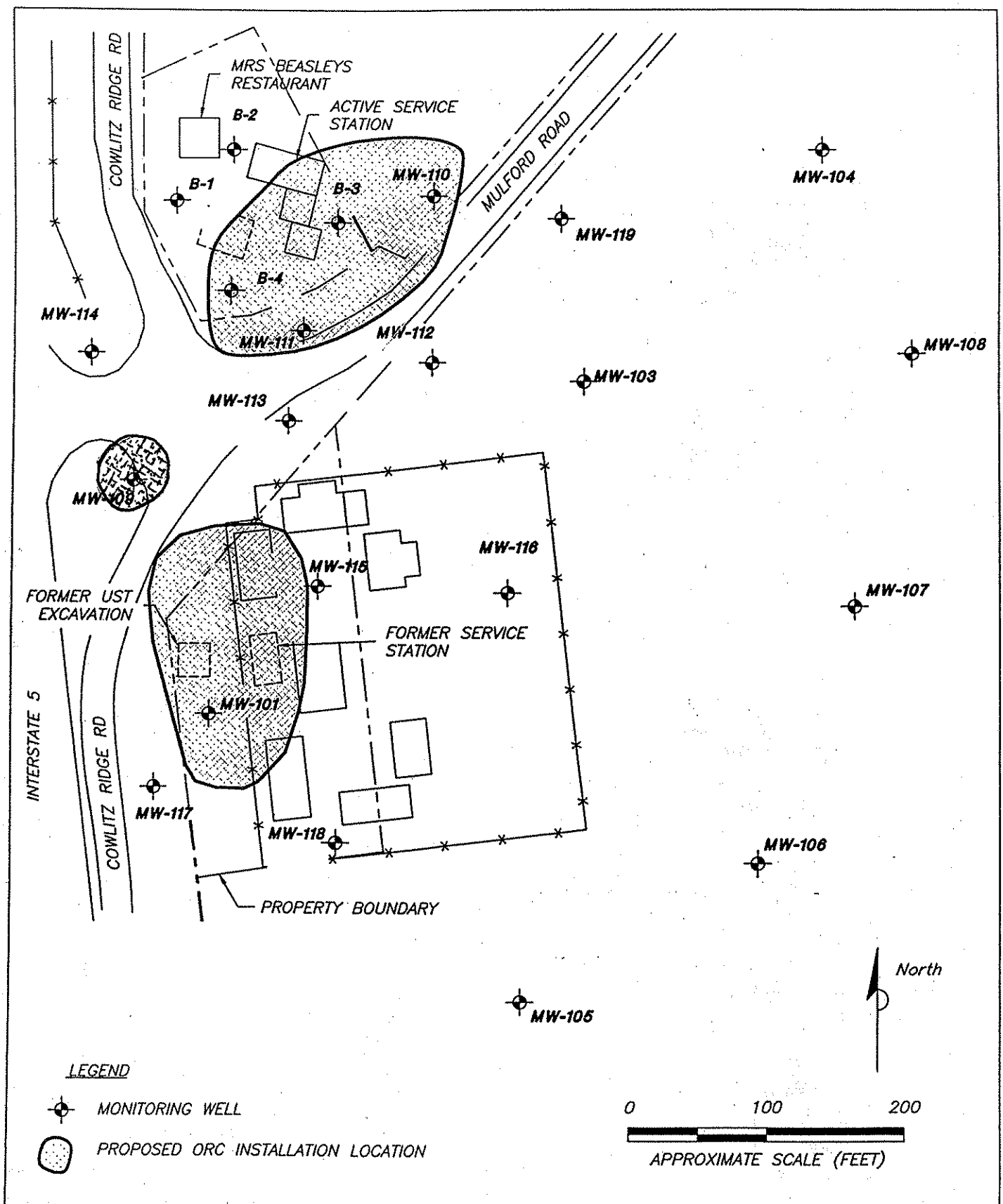

SECOR International Incorporated

PROPOSED ORC INSTALLATION LOCATION

COWLITZ BP SITE
101 MULFORD ROAD
TOLEDO, WASHINGTON

FIGURE: **5**

JOB#: 00111-118-03 APPR: DWN: RSP DATE: 11/11/98

DWG: TE11854a

Table 1. Cumulative Summary of Groundwater Sample Analytical Results
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
B-1	02/14/91	24	62	98	640	5,100	< 250	--	--	--
	03/13/92	<0.50	<0.50	<0.50	<0.50	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	33	--
	11/28/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	03/11/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	7.5
	06/26/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/09/96	<0.50	9.15	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	300	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<1,450	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
B-2	02/14/91	1.8	2.5	2.1	13	180	<250	--	--	--
	08/22/95	<0.50	0.82	<0.50	<1.0	<50	<250	<750	14	--
	11/27/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	03/12/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/27/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/10/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	5.41	<1.0
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<1,600	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	0.55	<0.50	<1.0	<80	<250	<500	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
B-3	02/14/91	1,100	2,300	1,700	14,000	98,000	<250	--	--	--
	03/13/92	650	310	1,200	7,600	28,000	31,000	--	53	--
	03/03/94	57.2	65	417	2,080	43,000	3,940	<750	--	--
	08/22/95	150	65	840	2,200	46,000	2,600	<750	46	--
	11/28/95	26	30	540	3,200	63,000	1,500	<750	--	17
	03/12/96	77	76	940	3,900	42,000	900	<750	--	24
	06/27/96	152	85.9	821	2,470	37,900	1,510	1,080	--	27.6
	10/10/96	84.0	51.1	649	1,420	16,200	729	<750	--	2.98
	02/12/97	34.0	32.6	573	1,940	35,200	4,060	986	--	12.4
	04/22/97	13.4	15.1	339	1,290	31,900	3,980	767	--	17.8
	08/05/97	70.8	68.3	736	1,680	20,400	3,370	1,270	--	34.2
	11/11/97	38.0	35.3	544	1,860	28,400	3,230	777	--	19.0
	02/11/98	29.3	15.7	430	1,460	28,400	3,240	1,460	--	14.2
	05/28/98	<50	<50	595	1,780	34,600	3,360	<750	29.5	19.6
	08/20/98	50.8	69	997	2,250	32,900	2,150	<750	1.89	15.3
	11/19/98	22.1	10.4	390	1,160	23,800	6,650	<3,750	--	27.5
	03/11/99	<5.0	<5.0	132	338	17,000	2,920	<5,000	--	11.8
	05/25/99	18.2	55	788	1,770	30,500	1,850	--	--	--
	08/17/99	12.7	29.3	820	1,600	29,900	2,570	711	--	35.5
	11/19/99	25.2	19.8	364	706	30,700	7,880	--	--	42.7
	03/09/00	6.35	3.67	66	149	10,400	<250	<500	--	12.8
	06/13/00	16.7	27.6	637	1,190	23,000	<250	<500	--	25.9
B-4	02/14/91	310	1,600	990	11,000	33,000	<250	--	--	--
	03/13/92	97	430	1,200	5,000	21,000	--	--	--	--
	03/03/94	12.6	22	400	1,090	15,800	1,040	1,250	--	--
	08/22/95	31	11	670	1,100	22,000	840	820	4.0	--
	11/28/95	18	8.5	480	1,200	22,000	1,900	990	--	3.1
	03/12/96	3.3	2.6	130	400	11,000	3,200	2,500	--	4.7
	06/26/96	91.1	16.7	378	965	16,100	757	<750	--	2.83
	10/09/96	21.2	6.56	220	428	10,200	543	<750	--	4.13
	02/12/97	15.8	5.15	184	439	12,200	4,710	4,830	--	2.82
	04/22/97	11.0	2.56	167	482	15,500	5,840	1,910	--	4.18
	08/05/97	<0.50	<0.50	25.5	36.9	15,800	2,560	3,160	--	6.26
	11/11/97	32.4	21.8	265	721	31,100	2,080	1,040	--	4.75
	02/11/98	7.24	2.57	15.2	74.8	3,750	1,340	1,630	--	<2.0
	05/28/98	<5.0	<2.0	6.58	23.1	2,510	3,180	1,250	58.5	4.69
	08/20/98	14.2	<5.0	118	131	7,240	1,460	1,240	1.8	1.17
	11/19/98	4.61	<2.5	13.2	34.7	1,880	2,470	<3,750	--	<1.0
	03/11/99	<5.0	35.2	222	510	11,900	1,130	585	--	3.54
	05/25/99	<2.5	<2.5	113	143	5,380	<1,450	--	--	--
	08/17/99	5.31	2.86	66.9	22.5	2,700	670	868	--	2.3
	11/19/99	23.5	8.05	174	285	11,400	1,700	--	--	17.5
	03/09/00	77	102	319	520	105,000	<1,250	2,830	--	10.9
	06/13/00	3.96	68.7	128	142	8,810	<250	943	--	6.92

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-101	03/12/92	38	160	2,900	15,000	45,000	33,000	--	19	--
	03/03/94	18	88	2,120	11,000	73,000	1,730	<750	--	--
	08/22/95	9.5	4.6	420	450	12,000	1,300	<750	11	--
	11/28/95	<20	20	1,500	5,900	49,000	1,400	<750	--	24
	03/12/96	<20	27	1,500	700	43,000	760	<750	--	9.3
	06/27/96	10.2	15.3	765	2,080	22,000	656	<750	--	8.22
	10/10/96	2.88	3.10	354	530	5,800	309	<750	--	4.24
	02/12/97	4.55	11.2	1,050	3,600	33,900	1,090	<750	--	7.04
	04/22/97	<0.50	<0.50	508	2,600	21,500	1,870	977	--	7.41
	08/05/97	10.5	8.48	284	643	9,150	1,160	1,060	--	4.48
	11/11/97	<0.50	<0.50	832	3,070	23,400	952	<750	--	11.3
	02/11/98	11.2	<10	818	2,990	28,400	793	<750	--	6.51
	05/28/98	<10	<10	456	953	11,900	798	<750	6.65	4.71
	08/20/98	3.64	<2.5	201	284	4,400	414	<750	2.15	1.6
	11/19/98	5.45	<2.5	112	323	5,820	714	<750	--	1.7
	03/11/99	<10	<10	704	3,790	38,500	1,200	<500	--	6.82
	05/25/99	<5.0	9.16	609	1,730	18,000	<1,450	--	--	--
	08/17/99	<0.50	<0.50	90.5	138	2,940	810	750	--	2.9
	11/19/99	8.2	<2.5	356	1,120	16,300	1,010	--	--	15.4
	03/09/00	<5.0	5.63	434	1,350	15,800	<250	<500	--	13
	06/13/00	<1.0	<1.0	105	181	4,870	<250	<500	--	4.3
MW-102	03/12/92	6.1	<0.50	0.74	4.3	150	--	--	--	--
		Well believed destroyed during development of property, prior to 8/95.								
MW-103	03/12/92	3.3	<0.50	<0.50	0.53	<50	--	--	--	--
	03/03/94	<0.50	<1	<1	<1.0	<50	<250	920	--	--
	06/13/95	<0.50	<0.50	<0.50	<1.0	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	13	--
	11/28/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	03/11/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	3.0
	06/27/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/09/96	<0.50	1.18	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	1.17	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	110	257	1,230	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	942	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	2.84
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/10/99	<0.50	<0.50	<0.50	<1.0	190	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	89	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	96.5	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-104	03/12/92	<0.50	<0.50	<0.50	<0.50	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<2.0	--
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	3.69	9.54
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/10/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
MW-105	03/12/92	<0.50	<0.50	<0.50	<0.50	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	900	10	--
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	16.8	6.62
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	4.1	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/10/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	0.89	4.86	<80	<250	<500	--	<1.0
MW-106	03/12/92	<0.50	<0.50	<0.50	<0.50	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<2.0	--
	03/12/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/27/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/10/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	2.16
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	9.66	4.53
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/10/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	1.11
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-107	03/12/92	<0.50	<0.50	<0.50	<0.50	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<2.0	--
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	809	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	351	754	--	<2.0
	05/28/98	1.35	<0.50	1.53	3.53	<50	<250	<750	<1.0	87
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/10/99	<0.50	<0.50	<0.50	<1.0	<80	539	<500	--	<1.0
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
MW-108	03/12/92	<0.50	<0.50	<0.50	0.84	<50	--	--	--	--
	08/22/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	7.8	--
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	825	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	873	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	4.27
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/10/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-109	03/13/92	5.5	<0.50	2.8	2.4	<50	--	--	--	--
	03/03/94	18.3	65	161	915	4,900	900	1,550	--	--
	08/22/95	<0.50	9.5	<0.50	<1.0	<50	2,900	2,400	550	--
	11/28/95	<0.50	<0.50	1.1	3.2	72	480	1,900	--	<2.0
	03/12/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/27/96	<0.50	<0.50	<0.50	<1.0	<50	554	<750	--	<2.0
	10/09/96	<0.50	<0.50	<0.50	<1.0	<50	405	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	393	1,290	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	356	1,270	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	560	1,690	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	269	780	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	387	1,700	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	332	920	21.9	2.25
	08/20/98	<0.50	3.55	<0.50	<1.0	<50	520	1,450	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	409	1,130	--	1.3
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	539	2,000	--	<1.0
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	916	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	1,520	7,770	--	<1.0
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
MW-110	08/23/95	<2.0	2.7	99	470	11,000	400	<750	9.6	--
	11/28/95	<1.0	1.8	73	110	6,000	540	<750	--	14
	03/12/96	<0.50	1.3	42	130	3,600	340	<750	--	14
	06/26/96	22.6	<0.50	3.93	28.5	2,750	274	<750	--	8.14
	10/09/96	<0.50	0.799	11.6	23.0	1,160	<250	<750	--	5.96
	02/12/97	3.34	0.831	14.3	37.3	1,830	393	<750	--	11.7
	04/22/97	4.93	0.897	15.3	27.8	1,950	371	<750	--	7.27
	08/05/97	12.1	<0.50	8.90	19.3	1,480	282	<750	--	3.16
	11/11/97	19.6	<0.50	40.4	86.3	2,330	659	<750	--	22.9
	02/11/98	19.5	2.73	21.9	45.5	2,040	390	<750	--	15.3
	05/28/98	<15	<2.0	13.7	19.7	1,350	324	<750	6.62	15.5
	08/20/98	7.07	<1.5	7.24	6.81	812	<250	<750	2.45	1.55
	11/19/98	5.85	0.989	6.40	7.30	637	258	<750	--	7.27
	03/11/99	9.78	2.09	45.7	136	2,350	486	<500	--	11
	05/25/99	<2.5	<2.5	40.7	24.5	2,950	<250	--	--	--
	08/17/99	15.6	<0.50	6.09	<1.0	749	<250	<500	--	2.2
	11/19/99	10.8	4.26	26.2	44.7	2,030	453	--	--	32.4
	03/09/00	3.74	37.4	38.2	65.7	3,780	<250	<500	--	9.59
	06/13/00	12.3	2.8	10.8	8.84	2,330	<250	<500	--	5.45

Table 4. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-111	08/23/95	73	92	910	4,400	33,000	360	<750	15	--
	11/28/95	42	25	520	1,400	17,000	640	<750	--	10
	03/12/96	47	25	450	1,000	11,000	290	<750	--	7.6
	06/27/96	86.8	24.0	361	491	7,690	479	<750	--	4.78
	10/10/96	25.6	8.23	103	152	3,560	256	<750	--	4.66
	02/12/97	42.0	39.3	509	1,410	17,200	631	<750	--	8.72
	04/22/97	28.0	29.3	439	1,590	13,800	920	<750	--	5.28
	08/05/97	0.750	13.3	97.5	213	4,290	444	<750	--	3.50
	11/11/97	40.0	31.1	531	1,890	14,300	770	<750	--	12.4
	02/11/98	32.9	29.7	469	1,480	13,600	587	<750	--	8.27
	05/28/98	<40	26.5	380	1,330	11,200	526	<750	11.5	16.6
	08/20/98	17.5	8.51	132	454	5,950	637	<750	2.2	1.7
	11/19/98	<5,000	<5,000	78,500	470,000	1.06E+07	3,890	<750	--	2.22
	01/22/99	22.7	28.5	724	2,340	19,000	--	--	--	--
	03/11/99	14.1	6.5	272	718	6,910	611	<500	--	6.34
	05/25/99	7.0	<2.5	229	706	8,500	388	--	--	4.2
	08/17/99	21.5	<5.0	330	1,310	17,600	547	<500	--	3.0
	11/19/99	37.2	22	679	2,840	27,900	547	--	--	14.4
	03/09/00	18.5	20.6	520	1,900	20,800	12,400	646	--	11.8
	06/13/00	19.2	25.8	759	2,640	29,600	7,670	<500	--	12.8
MW-112	08/23/95	2.6	0.53	4.9	<1.0	480	<250	<750	5.4	--
	11/27/95	1.2	<0.50	1.7	<1.0	150	<250	<750	--	5.8
	03/11/96	2.3	<0.50	9.1	<1.0	250	<250	<750	--	<2.0
	06/27/96	1.96	<0.50	<0.50	<1.0	63.8	<250	<750	--	<2.0
	10/09/96	0.910	2.02	<0.50	1.80	93.1	<250	<750	--	2.62
	02/12/97	13.2	4.61	43.2	56.4	1,250	322	<750	--	2.99
	04/22/97	4.05	1.11	3.63	5.62	323	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	124	<250	<750	--	<2.0
	11/11/97	2.14	<0.50	<0.50	<1.0	112	<250	<750	--	<2.0
	02/11/98	5.35	1.27	3.10	1.55	658	<250	<750	--	<2.0
	05/28/98	<8.0	<2.0	<0.50	<2.0	713	315	<750	27.3	10.4
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	1.34	<1.0
	11/19/98	5.82	<1.0	<1.0	<2.0	367	<250	<750	--	<1.0
	03/10/99	3.2	0.533	58.9	40.5	1,370	<250	<500	--	1.42
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	106	<250	<500	--	1.6
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	2.85	10.3	0.69	<1.0	824	<250	<500	--	2.14

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-113	08/23/95	18	3.8	260	21	3,100	320	<750	5.1	--
	11/28/95	1.2	<0.50	0.91	<1.0	180	<250	<750	--	<2.0
	03/12/96	4.4	1.9	83	34	750	<250	<750	--	<2.0
	06/26/96	10.7	1.72	94.0	4.50	809	<250	<750	--	2.43
	10/10/96	8.12	<0.50	13.2	<1.0	494	<250	<750	--	2.95
	02/12/97	4.36	3.01	65.7	111	1,600	<250	<750	--	<2.0
	04/22/97	1.93	0.939	44.4	40.0	748	291	<750	--	<2.0
	08/05/97	9.96	0.579	89.1	2.43	876	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	2.84	<1.0	<50	<250	<750	--	<2.0
	02/11/98	0.513	<0.50	7.52	<1.0	76.1	<250	<750	--	<2.0
	05/28/98	<2.0	<0.50	1.03	<1.0	116	<250	<750	1.21	6.26
	08/20/98	3.7	<0.60	<0.50	<1.0	235	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	12.8	2.18	162	<250	<500	--	<1.0
	05/25/99	1.25	<0.50	9.29	<1.0	321	<250	--	--	--
	08/17/99	2.83	<0.50	<0.50	<1.0	265	<250	<500	--	1.2
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	3.65	<1.0	96.7	<250	<500	--	<1.0
	06/13/00	<0.50	1.3	<0.50	<1.0	154	<250	<500	--	<1.0
MW-114	08/23/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<2.0	--
	11/28/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	03/11/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/26/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/09/96	<0.50	2.36	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	1,410	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	3.47	5.91
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	1.47	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/24/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	<250	607	--	<1.0
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-115	08/23/95	28	3.1	4.0	6.8	1,800	<250	<750	3.3	--
	11/28/95	1.7	0.57	3.5	2.1	460	<250	<750	--	<2.0
	03/12/96	<0.50	<0.50	17	25	630	<250	<750	--	<2.0
	06/26/96	29.3	1.67	20.3	2.19	706	<250	<750	--	<2.0
	10/10/96	15.6	0.898	<0.50	<1.0	722	<250	<750	--	2.54
	02/12/97	<0.50	<0.50	2.01	<1.0	58.0	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	12.9	0.522	5.06	16.0	611	<250	<750	--	2.00
	11/11/97	1.00	<0.50	<0.50	<1.0	57.0	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	0.722	1.22	89.5	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	1.11	8.08
	08/20/98	1.99	<0.50	<0.50	<1.0	155	<250	<750	1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	163	<250	<500	--	1.4
	11/19/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	1.73	<0.50	0.748	<1.0	103	<250	<500	--	<1.0
	06/13/00	<0.50	<0.50	<0.50	<1.0	<80	--	--	--	<1.0
MW-116	08/23/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	5.5	--
	11/28/95	--	--	--	--	--	--	--	--	--
	03/12/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/26/96	--	--	--	--	--	--	--	--	--
	10/10/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	5.26	4.66
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	<0.50	<0.50	<1.0	<80	--	--	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-117	08/23/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<2.0	--
	11/27/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	03/11/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/26/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/09/96	<0.50	2.40	<0.50	<1.0	<50	<250	<750	--	7.10
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	2.68
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
MW-118	08/23/95	<0.50	<0.50	<0.50	<1.0	<50	470	<750	7.3	--
	11/28/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	03/11/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	06/27/96	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	10/09/96	<0.50	1.47	<0.50	<1.0	50.1	<250	<750	--	<2.0
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	7.48	2.84
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<1.0
	03/11/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/17/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/09/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/12/00	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0

Table 1. Cumulative Summary of Groundwater Sample Analytical Results (Continued)
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Number	Sample Date	BTEX (µg/L)				TPH-G (µg/L)	TPH-D (µg/L)	TPH-O (µg/L)	Total Lead (µg/L)	Dissolved Lead (µg/L)
		Benzene	Toluene	Ethyl-benzene	Total Xylenes					
MW-119	08/23/95	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	21	--
	11/28/95	<0.50	<0.50	<0.50	<1.0	100	<250	<750	--	<2.0
	03/11/96	2.9	<0.50	6.0	<1.0	240	<250	<750	--	2.2
	06/26/96	3.57	0.729	<0.50	<1.0	174	<250	<750	--	<2.0
	10/09/96	<0.50	1.27	<0.50	<1.0	78.4	<250	<750	--	2.16
	02/12/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	04/22/97	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	08/05/97	<0.50	<0.50	<0.50	<1.0	53.6	<250	<750	--	<2.0
	11/11/97	<0.50	<0.50	<0.50	<1.0	<50	264	<750	--	<2.0
	02/11/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	--	<2.0
	05/28/98	<2.0	<0.50	<0.50	<1.0	102	<250	<750	2.83	3.33
	08/20/98	<0.50	<0.50	<0.50	<1.0	<50	<250	<750	<1.0	<1.0
	11/19/98	1.36	<0.50	<0.50	<1.0	78.5	<250	<750	--	1.82
	03/10/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	05/25/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	--
	08/16/99	<0.50	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	11/18/99	<0.50	<0.50	<0.50	<1.0	<80	<250	--	--	<1.0
	03/08/00	0.907	<0.50	<0.50	<1.0	<80	<250	<500	--	<1.0
	06/13/00	0.52	9.19	<0.50	<1.0	413	<250	<500	--	2.64
Current Quarter Quality Assurance/Quality Control Samples										
MW-110 (Duplicate)		1.94	29.8	12.3	10.5	2,150	--	--	--	--
Trip Blank		<0.50	<0.50	<0.50	<1.0	<80	--	--	--	--

-- = Not sampled or not analyzed.

Benzene, toluene, ethylbenzene, and total xylene (BTEX) analysis by EPA Method 8020/8020A/8021B.
Total petroleum hydrocarbons in the gasoline range (TPH-G) (toluene to dodecane) analysis by Ecology Method WTPH-G/NWTPH-Gx
Total petroleum hydrocarbons in the diesel range (TPH-D) (C_{12} to C_{24}) analysis by Ecology Method WTPH-Dx/WTPH-D/NWTPH-Dx.
Total petroleum hydrocarbons in the oil range (TPH-O) (greater than C_{24}) analysis by Ecology Method WTPH-Dx/NWTPH-Dx.
Total/Dissolved lead analysis by EPA 6000/7000 Series Methods.

Note: Results in micrograms per liter (µg/L), or approximately parts per billion (ppb).

APPENDIX A
PERFORMANCE MONITORING PLAN

GROUNDWATER MONITORING AND SAMPLING PROCEDURES

Static water levels will be measured in the monitoring wells. The water level will be measured in each of the wells using a Solinst water level indicator, which will be decontaminated between wells.

Water level measurements will be obtained by slowly lowering the water level indicator into the well until the instrument indicates that the groundwater surface has been encountered. The measurement will be made from a location permanently marked on the top of the casing to within the nearest 0.01 foot. Each water level measurement will repeated at least once to verify the accuracy of the initial measurement. All measurements will be recorded on SECOR field sampling forms, and copies of the completed field forms will be included in the groundwater monitoring report.

After groundwater measurements are recorded, groundwater samples will be collected from scheduled monitoring wells. Prior to collecting groundwater samples, each monitoring well will be purged of at least three casing volumes of water. Some of the monitoring wells will be purged using a centrifugal pump at the surface. The pump will be attached to dedicated disposable polyethylene tubing and incorporates a backflow valve to prevent back-siphoning. Purging of the remaining monitoring wells will be accomplished using a clean, unused disposable bailer and new nylon cord. Prior to sampling, the wells will be allowed to recover to approximately 80% or more of static water level.

After purging each monitoring well, groundwater samples will collected using new disposable bailers. The water samples will be placed in laboratory-prepared containers provided by North Creek Analytical (NCA) of Bothell, Washington. Each sample will be appropriately labeled so as to identify the sample number, project name, the date and time of sample collection, and the sampler's name. Each sample will be immediately placed in a chilled cooler for storage, and strict chain-of-custody protocols will be followed through delivery to the analytical laboratory. In addition to the sampled collected from the scheduled wells, duplicate samples and a trip blank will be collected for quality assurance purposes.

All purge water and decontamination water collected during sampling will be placed directly into a trailer-mounted tank. At the conclusion of field activities at the site, the purge water trailer will be removed from the site and transported to an appropriate disposal facility.

DISSOLVED OXYGEN COLLECTION PROCEDURES

Dissolved oxygen (DO) analysis will be done in the field. There will be no other analyses performed with the DO groundwater sample. Contact with air will be minimized, and DO measurements will be made using a direct-reading meter on groundwater samples collected before, during, and after well purging. Each of these readings will be recorded.

New disposable bailers will be used for DO sampling. The bailer will be gently lowered in the well to prevent mixing. The drain tube will be placed at the bottom of the bailer, and the bailer will be slowly drained. Enough water will be placed in the sample jar to allow some overflow of the container with an immersed DO probe. There should be no headspace or bubbles in the sample jar. The sample will be monitored immediately with a probe, and the probe readings will be immediately recorded.

Groundwater Monitoring Plan
Cowlitz BP Site
101 Mulford Road, Toledo, Washington

Well Location	BTEX	TPH-G	TPH-D	TPH-O	Lead	DO
B-1	A	A	A	A	A	--
B-2	A	A	A	A	A	--
B-3	Q	Q	Q	Q	Q	Q
B-4	Q	Q	Q	Q	Q	Q
MW-101	Q	Q	Q	Q	Q	Q
MW-103	Q	Q	Q	Q	Q	A
MW-104	A	A	A	A	A	--
MW-105	A	A	A	A	A	--
MW-106	A	A	A	A	A	--
MW-107	A	A	A	A	A	--
MW-108	A	A	A	A	A	-
MW-109	A	A	A	A	A	-
MW-110	Q	Q	Q	Q	Q	Q
MW-111	Q	Q	Q	Q	Q	Q
MW-112	Q	Q	Q	Q	Q	A
MW-113	Q	Q	Q	Q	Q	A
MW-114	A	A	A	A	A	--
MW-115	A	A	A	A	A	--
MW-116	Q	Q	Q	Q	Q	A
MW-117	A	A	A	A	A	--
MW-118	Q	Q	Q	Q	Q	A
MW-119	A	A	A	A	A	A

BTEX = Benzene, toluene, ethylbenzene, and total xylenes
TPH-G = Gasoline-range total petroleum hydrocarbons
TPH-D = Diesel-range total petroleum hydrocarbons
DO = Dissolved oxygen
A = Annual Groundwater Monitoring
Q = Quarterly Groundwater Monitoring
-- = No Monitoring