CLEANUP ACTION PLAN

Tiger Oil Facility
2312 West Nob Hill Boulevard
Yakima, Washington

Prepared by

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1.0 Introduction

1.1 Purpose

The purpose of this Cleanup Action Plan (CAP) is to identify the cleanup actions selected by the Department of Ecology (Ecology) for the remediation and monitoring of contaminated groundwater and soils at the Tiger Oil Site (Site), located at 2312 West Nob Hill Boulevard, Yakima, Washington. This CAP has been developed in accordance with the Model Toxics Control Act, RCW 70.105D (MTCA), and Chapter 173-340 of the Washington Administrative Code (WAC).[1] In accordance with WAC 173-340-360(2)(a), the selected cleanup actions meet the threshold requirements at the defined points of compliance; are protective of human health and the environment; comply with remedial action levels; comply with applicable state and federal laws; and provide for compliance monitoring.

This CAP outlines the cleanup action alternatives presented in the following documents:

- *Draft Revised Remedial Investigation/Feasibility Study, Tiger Oil Facility,* Kleinfelder, 1994.
- *Feasibility Study Addendum, Tiger Oil Facility*, Clearwater Group, Inc., 1997.
- *Draft Cleanup Action Plan, Tiger Oil Facility*, Foster Wheeler Environmental Corporation, 1998.
- *Draft Proposal for Remediation of Contamination at Tiger Oil Facility,* Foster Wheeler Environmental Corporation, 2001.

This CAP specifies the cleanup actions to take place at the Site. These cleanup actions include:

- Removal of all underground storage tanks (USTs), associated lines, and dispensers.
- Removal of petroleum contaminated soils (PCS).
- Installation of a soil vapor extraction (SVE) system.
- Use of hydrogen peroxide to enhance aerobic degradation.
- Continuing to operate and maintain the current interim remediation system.

In accordance with WAC 173-340-360, Ecology has selected the above cleanup actions based upon site-specific data provided in the following documents, which are on file at the Washington State Department of Ecology, Central Regional Office. These documents have been used either directly or by reference in the writing of the CAP:

Draft Revised Remedial Investigation/Feasibility Study, Tiger Oil Facility, Kleinfelder, 1994.

Revised Interim Remedial Action Plan, Clearwater Group, Inc., 1994.

Work Plan for Interim Remedial Action, Clearwater Group, Inc., 1994.

System Operation and Maintenance Plan, Clearwater Group, Inc., 1995.

Remedial System Installation, Startup and Monitoring Report, *Tiger Oil Facility*, Clearwater Group, Inc., 1996.

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[1] This Cleanup Action Plan is based on the revised WAC 173-340, which became effective on August 15, 2001.

Feasibility Study Addendum, Tiger Oil Facility, Clearwater Group, Inc., 1997.

Draft Cleanup Action Plan, Tiger Oil Facility, Foster Wheeler Environmental Corporation, 1998.

Quarterly Monitoring Reports, Clearwater Group, Inc., QUEST, Foster Wheeler Environmental Corporation, 1997, 1998, 1999, 2000, 2001.

Tiger Oil Corporation's Draft Proposal For Remediation of Contamination at Tiger Oil Facility, 24th and West Nob Hill Blvd., Foster Wheeler Environmental Corporation, 2001.

All of the above mentioned firms are environmental consulting businesses hired by one or more of the potentially liable persons (PLPs) at the Site.

To review or obtain copies of the above documents, contact Roger Johnson (Public Disclosure Coordinator) at Ecology's Central Regional Office in Yakima, Washington, at (509) 454-7658.

1.2 Cleanup Action Ownership

Responsible parties for overall implementation and maintenance of the cleanup action are Tiger Oil Corporation, Tiger Oil Company, Federated Service Insurance Company, and M & E Company. Based upon credible evidence, these companies have been named as potentially liable parties (PLPs) at the Tiger Oil Site as per RCW 70.105D.040.

2.0 Background

2.1 Site Location and Description

The Tiger Oil Site (Site) is located in Yakima, Washington, at the southeast corner of the intersection of West Nob Hill Boulevard and South 24th Avenue within the NW ¼, SE ¼ of Section 26, Township 13 North, Range 18 E.W.M. In this CAP, the terms "Site" and "Facility" are used interchangeably. According to WAC 173-340-200, "Facility" means any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well,…; or any site or area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located. The Site is comprised of the Tiger Mart retail gasoline store and its underground storage tank system, monitoring wells and recovery wells, and any other areas where hazardous substances have come to be located, including, but not limited to, the soil, groundwater, and petroleum-contaminated surface water/captured groundwater in the Yakima County Drainage Improvement District storm drain line #4 (DID line #4). This includes the Safeway Shopping Center parking lot located in the eastern and southeastern portions of the Site, the Ted Brown Music Co. property, located to the south of the Tiger Mart property, and the Skipper's restaurant property located to the east of the Tiger Mart property. Figure 1, attached, shows a map of the Site.

2.2 Hydrogeology/Geology

Depth to groundwater fluctuates from 5 to 15 feet below ground surface (b.g.s.) depending on the time of year. Higher water levels occur in the spring and summer; these correspond with an influx of water due to local and regional irrigation practices. The estimated rate of groundwater flow is 0.08 ft/day to 0.6 ft/day (Kleinfelder, 1994). Geology of the Site consists of silty/clayey to silty/sandy sediments coarsening downward to sandy/gravelly sediments that begin at about 15-25 feet b.g.s., depending on site location. More detailed hydrogeologic and geologic information is located in the RI/FS (Kleinfelder, 1994).

2.3 Site History

Petroleum products have been released from the underground storage tank system at the Site. These phase separated petroleum products have contaminated the soil, groundwater, surface water/captured groundwater in DID line #4, and, in the early 1980s, the surface waters in Wide Hollow Creek, where the DID line discharges.

In April 1981, an explosion occurred in the DID line near the Site, injuring two City of Yakima workers. The explosion likely resulted from the presence of explosive levels of gasoline vapors in the line, caused by the presence of gasoline in and around the DID line. Initial investigations of the Site were conducted by Ecology and the City of Yakima between December 1980 and September 1982. These investigations resulted in locating a release of hazardous substances (petroleum products) from the Tiger Mart retail facility. On October 7, 1982, Ecology issued Enforcement Order No. DE 82-517 to Tiger Oil Company that required recovery of floating petroleum product and other remedial activities.

In a letter to Ecology dated May 18, 1983, Zaremba Claims, an independent claims adjuster, estimated that approximately 18,772 gallons of petroleum product had been released at the Site in 1982. Known additional releases of 2,000 gallons (Zaremba Claims) and 50 gallons (Kleinfelder, 1994) of petroleum product occurred in 1983 and 1984, respectively.

Federated Mutual Insurance Company contracted with Crowley Environmental (September 1982 to March 1983), Fuel Recovery Company (April 1983 to May 1985), and Soil Exploration Company (May 1985 to September 1985) for further investigation and petroleum product recovery.

In February 1989, staff from Riebe Well Drilling notified Ecology that they had discovered free petroleum product in monitoring wells at the Site. In July 1989, during an Ecology investigation, free petroleum product was found in monitoring wells MW-9, MW-11, MW-13, and MW-15. In March 1990, Ecology issued Enforcement Order No. DE 90-C140, pursuant to MTCA, to the Tiger Oil Corporation, who had purchased the gas station from the Tiger Oil Company in October 1987. The order required site stabilization and a Remedial Investigation/Feasibility Study (RI/FS). Subsequently, Enforcement Order No. DE 90-C140 was amended to include Tiger Oil Corporation and Federated Insurance.

In November 1990, Tiger Oil Corporation began recovery of free product through bailing. In September 1994, Ecology issued Enforcement Order No. DE 94TC-C432 to Tiger Oil Corporation, Tiger Oil Company, Federated Insurance, and M & E Company requiring installation of a free product recovery system designed to collect product, contaminated groundwater, contaminated soil vapors, and prevent contaminant migration into the DID line offsite. An interim remedial system consisting of a soil vapor extraction (SVE) and groundwater extraction (GWE) system commenced operation in August 1995. Additional information on the interim action is addressed later in this report.

In September 1998, Ecology issued Enforcement Order No. DE 98TC-C166 to all PLPs requiring the planning and implementation of a final cleanup action at the Site. On October 30, 1998, Foster Wheeler Environmental Corporation (Foster Wheeler) submitted a draft Cleanup Action Plan to Ecology for the Tiger Oil Site on behalf of the Tiger Oil Corporation. This draft CAP focused on remediation through the used of hydrogen peroxide at the site, and did not adequately address removal of free product on site, and was therefore not accepted by Ecology.

2.4 Interim Remedial Action

Commencement of an interim remediation system occurred in August 1995. Clearwater Group, Inc. (Clearwater) oversaw design, installation and operation of the system until May 1997 when Tiger Oil Corporation hired QUEST, who oversaw system operation until April 1998. Since September 1998, Foster Wheeler has been in charge of overseeing operation of the interim remediation system. Periodically, the system has been shut down for repairs or due to the weather.

The interim remediation system was installed as a method of preventing off-site migration of separate phase hydrocarbons (SPH). The system consists of two trenches fitted with vacuum equipment designed to extract groundwater (groundwater extraction, GWE) and soil vapors (soil vapor extraction, SVE) from the subsurface and transport them to an on-site treatment facility. The treated water is discharged into the municipal sanitary sewer system, and vapors are passed through an air filter before being vented to the atmosphere. For a more detailed description of the interim treatment process, refer to the *Remedial System Installation Startup and Monitoring Report* (Clearwater, 1996).

In the *Remedial System Installation, Startup and Monitoring Report* (1996) submitted to Ecology, Clearwater stated that the interim remediation system was effective at removing contaminants from the subsurface and limiting contaminant migration into the DID line. In the *Groundwater Monitoring and Remediation System Report for 2nd Quarter, 1997*, Clearwater presented data indicating that approximately 1843 lbs. of hydrocarbons, 42 lbs. of which were benzene, had been extracted from the subsurface by the combined GWE/SVE system. In the same report, Clearwater recommended that the combined GWE/SVE system remain in operation to protect the DID line from contaminants.

Although the interim remediation system has been effective, it is limited in its scope. The location of the interim remediation system is presented in Figure 1. The radius of influence was calculated by Clearwater (1996) to be approximately 75 feet for the GWE system and

approximately 50 feet for the SVE system. Whereas the system may be adequate for remediating the subsurface of portions of the Safeway parking lot, it does not target the areas where free product is present on the Tiger Oil property. According to WAC 173-340-450 (4)," ...the UST owner or UST operator shall: Conduct free product removal to the maximum extent practicable and in a manner that minimizes the spread of hazardous substances, by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site. The objective of free product removal system must be, at a minimum, to stop the free product migration." The interim remediation system does not adequately address free product removal onsite. Therefore, the interim remediation system was not approved as a final cleanup action.

3.0 Cleanup Alternatives

3.1 Cleanup Action Alternatives

The following is a brief description of the cleanup action alternatives presented in the RI/FS submitted by Kleinfelder (1994), which can be referred to for more detailed information.

K1) *Surface Capping/Compliance Monitoring*: This alternative consists of capping the Site with asphalt pavement and monitoring the Site. Restrictions would be placed on actions requiring soil excavation and groundwater removal from the Site.

K2) *In Situ Soil Vapor Extraction*: For this alternative, steps listed in K1 would be completed. In addition, an in situ soil-vapor extraction system would be installed in conjunction with a vacuum system to remove volatile vapors from the subsurface and transport them to an on-site treatment facility for processing. Oxygen would be injected into the subsurface in order to enhance aerobic biodegradation at the Site.

K3) *Air Sparging*: This alternative combines steps taken in alternatives K1 and K2 with installation of an air sparging system. This process involves injecting air into the subsurface below the water table. As air bubbles move upward through the groundwater, contaminants in the groundwater are volatilized and transported from the subsurface, through vacuum, to an on-site treatment facility.

The following additional alternatives were proposed in the FS Addendum presented by Clearwater Group, Inc. (1997), which can be referred to for more detailed information.

C1) *Vacuum Enhanced Total Fluids Recovery/Soil Vapor Extraction and Bioventing Wells*: This cleanup action consists of the installation of two horizontal slotted SVE wells and eight passive bioventing wells. A vacuum is used to draw SPH, contaminated groundwater, and vapors out of the subsurface where they are directed to an on-site treatment facility and passed through an air/water separator. The groundwater mixture is passed through a coalescing oil/water separator and an air stripper for treatment before being discharged into the sanitary sewer system. Vapors are passed through an air filter before they are vented to the atmosphere. Bioventing wells would be installed to enhance the movement of air through soil and also allow for introduction of oxygen into the subsurface to enhance naturally occurring aerobic degradation. In addition, this alternative proposes that ORC

(oxygen release compound) be injected in selective wells in order to enhance aerobic degradation.

C2) *Removal and Treatment or Disposal of Petroleum Contaminated Soils*: This alternative consists of excavating approximately 33,349 cubic yards of soil in the area of the dispenser islands at the Tiger Mart gas station extending out into the Safeway parking lot to the DID line. An estimated 27,088 cubic yards of this is contaminated soil that would be treated by thermal desorption or disposal in a landfill. Any water encountered during soil excavation at the Site would be treated to remove contaminants.

C3) *Air Sparging/Soil Vapor Extraction*: This alternative is similar to alternative K3. It calls for modifications to be made on the existing interim remediation system and for ORC injections into selected areas of the subsurface to enhance aerobic degradation.

The following additional alternative was proposed in the draft Cleanup Action Plan presented by Foster Wheeler (1998), which can be referred to for more detailed information.

F1) *Hydrogen Peroxide Injection and Monitoring*: This alternative consists of injecting hydrogen peroxide into the subsurface to enhance aerobic degradation of contaminants at the Site. This would be done in conjunction with monitoring groundwater at the Site.

In addition to the above cleanup action alternatives, Tiger Oil Corporation presented a Draft Proposal for Remediation of Contamination at the Tiger Oil Facility (Foster Wheeler) to Ecology on June 1, 2001. The cleanup actions proposed in this document were:

- Removal of underground storage tanks (USTs), lines, and dispensers.
- Removal of petroleum contaminated soil (PCS) from the tank pit only.
- Free product investigation through trenching or digging test pits.
- Free product removal.
- Installation of vertical risers.
- Design and installation of a SVE system, with additional excavation and disposal of PCS offsite, if necessary.
- Use of hydrogen peroxide to enhance degradation in areas that remain contaminated.

3.2 Selected Cleanup Actions

Ecology has selected the following cleanup actions for the Site. The cleanup actions selected by Ecology are a combination of selected parts of alternatives C1, C2, C3 and F1, in addition to the selected alternatives presented in the *Draft Proposal for Remediation of Contamination at the Tiger Oil Facility* (Foster Wheeler, 2001).

3.2.1 UST Removal

All USTs, associated lines, and dispensers will be removed from the Site. UST removal shall be conducted in accordance with the Underground Storage Tank Regulations (WAC 173-360). A Site Assessment shall be conducted accordance with guidelines set forth in *Guidance for Site Checks and Site Assessments for Underground Storage Tanks*, Washington State Department of Ecology Underground Storage Tank Program Publication 90-52, February, 1991 (revised October, 1992).

3.2.2 Removal of PCS

PCS encountered during UST, line, and dispenser removal will be excavated, stockpiled, sampled, and managed according to Table 1. Existing Site utility services will be disconnected, removed, and/or rerouted.

Excavation of PCS will continue as long as the soils exhibit any one or more of the following characteristics:

- Visible free product is present.
- Soil is visibly stained.
- Soil PID (Photo Ionization Detector) or FID (Flame Ionization Detector) readings, using a headspace analysis technique, are greater than 100 ppm.

The following are limits placed on the PCS excavation:

- The excavation will not extend beyond the Tiger Oil property boundary.
- The excavation will not endanger the stability of buildings and roads adjacent to the Tiger Oil property.
- The excavation will not extend below the existing groundwater table.

During PCS removal, soil samples from the excavated area and stockpiled soil will be taken in accordance with guidelines set forth in *Guidance for Remediation of Petroleum Contaminated Soils*, Washington State Department of Ecology Toxics Cleanup Program Publication 91-30, November, 1995 and *Guidance for Site Checks and Site Assessments for Underground Storage Tanks,* as listed in section 3.2.1. Ecology and any member of the PLP Group may take split samples at the site during UST, associated piping, and PCS removal activities, in addition to other sampling activities that may take place at the Site.

Table 1. Tiger Oil Site PCS End Use Criteria

		Soil Concentration (ppm)	
Analyte	**Method**	**Backfill***	**Treatment required**
heavy fuel	WTPH- 418.1 mod. or NWTPH-Dx	≤2000	> 2000
diesel	WTPH-D or NWTPH-Dx	≤2000	> 2000
gasoline	WTPH-G or NWTPH-Gx	≤30	> 30
benzene	8020 or 8021	≤0.03	> 0.03
ethylbenzene	8020 or 8021	≤6	> 6
toluene	8020 or 8021	≤7	> 7
xylene	8020 or 8021	≤9	> 9

*Backfill: Used for backfill on the Tiger Oil Property.

Values in this table were obtained from Table V in *Guidance for Remediation of Petroleum Contaminated Soils*, Washington State Department of Ecology Toxics Cleanup Program Publication 91-30.

3.2.3 Soil Vapor Extraction (SVE) System

A Soil Vapor Extraction (SVE) system will be installed to address remaining residual soil contamination and free product located onsite after UST excavation and PCS removal. The SVE system shall be designed to remediate the subsurface area below the ground surface and above the water table on the Tiger Oil property, the Ted Brown Music Co. property, the Skipper's property, and the M&E property to the west and north of the interim remedial system. The SVE system may be connected to and become part of the vapor extraction system currently being used in the current interim remediation system.

3.2.4 Hydrogen Peroxide Injection

Hydrogen peroxide may be added to the UST area, test pits, and trenches to enhance degradation of contaminants. Hydrogen peroxide will also be injected/placed into the subsurface down-gradient of the source area, as a way of enhancing biodegradation of contaminants. The PLPs shall submit a plan for use of hydrogen peroxide to Ecology for review and approval. Existing monitoring wells specified for monthly sampling may not be used as hydrogen peroxide injection wells.

The above cleanup actions are to be used in conjunction with the existing interim remediation system and institutional controls.

3.3 Monitoring Wells

Any monitoring wells removed during the remediation activities listed above that are listed as wells to be sampled in section 9.2.2 of this CAP, shall be replaced.

4.0 Exposure Assessment

4.1 Chemicals of Concern

Chemicals of concern in the groundwater and soil at the Site include total petroleum hydrocarbons as gasoline (TPH-G), and benzene, toluene, ethylbenzene, and xylenes (BTEX). These compounds are present above the Method A cleanup levels for groundwater found in Table 720-1, WAC 173-340-900 (*Results of Groundwater Monitoring (September 2001) at Tiger Oil Corp. Facility, 2312 West Nob Hill Boulevard, Yakima, Washington*, Foster Wheeler, November 2001). Currently, there is a diesel tank located onsite. If soil samples taken in conjunction with tank removal indicate the presence of diesel range contaminants at concentrations above MTCA Method A levels, then total petroleum hydrocarbons as diesel (TPH-D) will be added to the list of chemicals of concern for the Site. In addition, a recent study by Ecology (October 2000, Publication No. 00-09-054) has found that MTBE may be present at sites with gasoline contamination. It is possible that MTBE is a chemical of concern at the Site. Sampling for MTBE will confirm if this is the case or not. Table 830-1, WAC 173-340-900 specifies the minimum testing requirements for petroleum contaminated sites.

4.2 Exposure Pathways

There is potential for humans to be exposed to contaminants at the Site through exposure to contaminated subsurface soil, groundwater, and vapors.

Subsurface soil: Activities that involve soil excavation may lead to contaminant exposure to humans through inhalation, ingestion, and dermal contact. The most likely population to be affected by this exposure pathway is utility workers and those participating in the installation of wells and remedial measures.

Groundwater: There is potential for humans to come into contact with groundwater during excavations at the Site. The most likely population to be affected by this exposure pathway is utility workers and those participating in the installation of wells and remedial measures. There is also the potential for contaminants dissolved in the groundwater to be transported offsite via the DID line that runs through the Site and discharges into surface water (Wide Hollow Creek). Contamination has impacted the shallow unconfined aquifer at the Site. Although residential wells in the area are not used for drinking water purposes, humans may come into contact with contaminants dissolved in the groundwater when using water from these wells for other purposes.

Vapors: There is potential for humans to come into contact with hazardous vapors that volatilize from soil and groundwater during excavation of soil at the Site. In addition, contaminant vapors can pose a threat to human health and the environment when they are present at concentrations in

confined spaces that exceed NIOSH (National Institute for Occupational Safety and Health) and/or OSHA (Occupational Safety and Health Administration) permissible exposure limits, or at high enough concentrations to create conditions that may lead to explosions. The most likely population to be affected by this exposure pathway is utility workers and those participating in the installation of wells and remedial measures.

During any Site activities, steps should be taken to minimize the risk to workers and the public. These steps will be outlined in the Safety and Health Plan.

5.0 Terrestrial Ecological Evaluation

This site is excluded from a terrestrial ecological evaluation based on WAC 173-340-7491(1)(b), which states, "All soil contaminated with hazardous substances is, or will be, covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. To qualify for this exclusion, an institutional control shall be required by the department under WAC 173-340-440." This site will have appropriate institutional controls. Institutional controls are described in section 7.

6.0 Cleanup Standards

6.1 Cleanup Level

Method A cleanup levels for groundwater and soil, as described in sections 720 and 740 of WAC 173-340, were selected for the Site. Table 2 lists Method A cleanup levels for groundwater and soil for chemicals of concern at the Site.

Table 2. Method A cleanup levels for groundwater (WAC 173-340-900, table 720-1) and soil (WAC 173-340-900, table 740-1).

	Groundwater (µg/L)	Soil (mg/kg)
Benzene	5	0.03
Toluene	1000	7
Ethylbenzene	700	6
Xylenes	1000	9
TPH-G	800	30

Reasons for using Method A levels for groundwater and soil at the Site are as follows:

WAC 173-340-720(1)(a) states, "Ground water cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site conditions." Due to private wells in the area, and the fact that groundwater discharges into the DID line and impacts surface water in Wide Hollow Creek, there is potential in the future for groundwater at the Site to be used for ingestion or other

domestic uses. There is also potential for humans to be exposed to this groundwater. Therefore, Method A cleanup levels were chosen for the Site.

WAC 173-340-704(1) states, "Method A may be used to establish cleanup levels at sites that have few hazardous substances and that meet one of the following criteria: (a) Sites undergoing a routine cleanup action as defined in WAC 173-340-200; or (b) Sites where numerical standards are available in this chapter or applicable state and federal laws for all indicator hazardous substances in the media for which Method A cleanup levels are used."

6.1.1 Routine Cleanup Action

This site fulfills the requirements for undergoing a routine cleanup action, as defined in WAC 173-340-200. Following are a list of criteria to determine if a site is undergoing a "routine cleanup action," and how the cleanup actions for the Tiger Oil Site fulfill those criteria.

- *Cleanup standards for each hazardous substance addressed by the cleanup are obvious and undisputed, and allow for an adequate margin of safety for protection of human health and the environment.* – The cleanup standards for each hazardous substance at the Site are Method A cleanup levels, which allow for an adequate margin of safety for protection of human health and the environment.

- *It involves an obvious and limited choice among cleanup alternatives and uses an alternative that is reliable, has proven capable of accomplishing cleanup standards, and with which the department has experience.* – The selected cleanup actions, UST removal, PCS removal, SVE, and hydrogen peroxide injection, have all been proven to be successful at remediating sites. Specifically, SVE has already been implemented at the Site as part of the interim remediation system, and has proven successful at reducing contaminant concentrations in the groundwater.

- *The cleanup action does not require preparation of an environmental impact statement; and the site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or if the site qualifies for a simplified ecological evaluation, the evaluation is ended under WAC 173-340-7492(2) or the values in Table 749-2 are used.* – This cleanup action does not require preparation of an environmental impact statement. The site qualifies under WAC 173-340-7491(1)(b) for an exclusion from conducting a site-specific terrestrial ecological evaluation.

6.1.2 Numerical Standards

This site also fulfills requirement WAC 173-340-704(b)(1) because numerical standards are available in Tables 720-1 and 740-1, WAC 173-340-900, for all indicator hazardous substances in the media for which Method A cleanup levels are used.

6.2 Clean Site Determination

The Site shall be considered clean when Method A cleanup levels, as defined in WAC 173-340-720 (groundwater) and WAC 173-340-740 (soil), are met at the Site at all points of compliance.

6.3 Point of Compliance

6.3.1 Groundwater

WAC 173-340-720(8)(a) states, "For ground water, the point or points where the ground water cleanup levels established under subsection (3), (4), (5), or (6) of this section must be attained for a site to be in compliance with the cleanup standards. Ground water cleanup levels shall be attained in all ground waters from the point of compliance to the outer boundary of the hazardous plume." Specific points of compliance for the Site include, but are not limited to, existing wells onsite, any wells installed onsite in the future, and the waters in DID line #4.

6.3.2 Soil

WAC 173-340-740(6)(b) states, "For soil cleanup levels based on the protection of ground water, the point of compliance shall be established in the soils throughout the site." Points of compliance for the Site included all areas where contaminants have come to be located.

To ensure that soils and groundwater in the contaminant plume are reaching the established MTCA Method A cleanup levels, monitoring wells specified in section 9.2.1 will be sampled quarterly (every 3 months). If TPH-G and BTEX concentrations in groundwater exceed MTCA Method A levels in any of the following wells, DID #14, DID #15, KMW-11, KMW-14, KMW-18, MGW-2, and S-1, the sampling frequency must increase to monthly for a three-month period. If contaminant concentrations continue to increase, the PLPs shall submit a report on how to modify the current remediation system. If, after three months of monthly sampling, contaminant concentrations decrease so that they are at or below MTCA Method A levels for groundwater, the sampling frequency may be reduced to quarterly monitoring.

7.0 Institutional Controls

Institutional Controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at the Site (WAC 173-340-440(1)).

7.1 Types of Institutional Controls

Institutional controls that shall be implemented for the Site include installation of physical measures such as fences, signs, and locks to prevent tampering with on-site wells, monitoring, and remediation equipment. In addition, the site will be covered in asphalt to contain contaminated soils onsite. Regular inspections of implemented institutional controls will be conducted and repairs made if necessary. Education of employees and the public about site contamination and ways to limit exposure are also forms of institutional controls to be conducted

at the Site. A restrictive covenant pursuant to the requirements of WAC 173-340-440(9) and approved by Ecology shall be recorded for this Site.

7.2 Placement of Institutional Controls

Institutional controls will be in place on all areas of the Site where cleanup levels have not been attained for soil and groundwater. If it is determined that cleanup levels for soil and groundwater have been attained in a portion of the site that is delineated by property boundaries, institutional controls may be removed from that property with the following limitations:

- Institutional controls will remain in place to prevent tampering with monitoring wells
- Institutional controls will remain in place to prevent tampering with any equipment associated with the cleanup actions at the site.

8.0 Cleanup Actions

8.1 Selected Cleanup Actions

The cleanup actions selected for the Site shall fulfill the threshold requirements put forth in WAC 173-340-360(2)(a), which include protecting human health and the environment, complying with cleanup standards, and complying with applicable state and federal laws. Other requirements in WAC 173-340-360(2)(b) state the selected action shall use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time frame, and consider public concerns.

The cleanup actions selected for the Site include removal of Underground Storage Tanks (USTs), removal of petroleum contaminated soils (PCS), installation of a SVE system, and use of hydrogen peroxide to enhance aerobic degradation. These cleanup actions are to be used in conjunction with the current interim remedial system and institutional controls.

8.2 Justification for Selected Cleanup Action

Justification for the selected cleanup actions is provided in the following sections that detail how the cleanup actions fulfill the requirements for a cleanup action set forth in WAC 173-340-360.

8.2.1 Threshold requirements – WAC 173-340-360(2)(a)

- *Protection of Human Health and the Environment*
  The selected cleanup actions address removal of free product, contaminants in groundwater, and contaminants in the vapor phase from the subsurface. These actions will help to reduce the risk posed to humans and the environment at the Site.
- *Compliance with Cleanup Standards*
  The purpose of the selected cleanup actions is to reduce contaminant concentrations in the groundwater and soil at the Site to at or below Method A cleanup levels put forth in WAC 173-340-720 and WAC 173-340-740.

- *Compliance with Applicable State and Federal Laws*
  The selected cleanup actions comply with all applicable state and federal laws.

- *Compliance Monitoring*
  A Site Safety and Heath Plan (see section 9.4) will be used as guidance to protect workers and the public prior to, during, and after installation of the proposed cleanup system. Groundwater samples will be taken and analyzed to monitor contaminant concentrations in the subsurface to confirm that the new system is effective at reducing contaminant concentrations. Air and groundwater passing through the treatment system will be monitored to assure that discharges to the atmosphere and sanitary sewer, respectively, are in compliance with applicable state and federal laws.

8.2.2 Other requirements – WAC 173-340-360(2)(b)

- *Permanent Solution*
  WAC 173-340-360(3) outlines the requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable. Section 8.4, *Evaluation Criteria*, details how the selected cleanup actions are permanent to the maximum extent practicable.

- *Reasonable Restoration Time Frame*
  The cleanup actions described in this CAP provide for a reasonable restoration time frame, as is outlined in WAC 173-340-360 (4). According to the FS Addendum (Clearwater, 1997), the estimated restoration time frame using alternative C1 is 2 to 4 years; the estimated restoration time frame using alternative C3 is approximately 5+ years. The cleanup actions selected by Ecology are similar to C1 and C3 (see section 8.2.3 for a more detailed description), and these alternatives provide for a reasonable restoration time frame. UST and PCS removal activities at the site, as outlined in section 3.2, are estimated to take no more than one month. PCS removal in conjunction with SVE will provide for a quicker restoration time frame than would SVE alone.

- *Public Concern*
  Public comments received during the comment period for this CAP will be considered and addressed by Ecology.

8.2.3 Disproportionate Cost Analysis

In selecting appropriate cleanup actions for the Tiger Oil Site, Ecology chose portions of each Cleanup Action Alternative (CAA) presented in the FS Addendum (Clearwater, 1997) to be included in the CAP for the Site. Ecology did not select one specific Cleanup Action Alternative from the FS Addendum, but rather a combination of actions from each alternative. Thus, in completing the disproportionate cost analysis portion of this CAP, Ecology used cost estimates for specific actions and tasks provided in the FS Addendum to estimate the cost of Ecology's proposed cleanup action plan (Appendix A) in relation to the cost of each CAA presented in the

FS Addendum. The Cleanup Action Alternatives presented in the FS Addendum are summarized in section 3.1 of this CAP; the alternatives are identified as C1, C2, and C3.

WAC 173-340-360(3)(e) describes the procedures for conducting a disproportionate cost analysis. The most protective cleanup alternatives listed in the FS Addendum are alternatives C1 and C3. Both of these alternatives propose the use of SVE and ORC as cleanup actions for the Site. The difference between the two alternatives is that alternative C1 suggests the use of a groundwater pump and treat system in addition to SVE and ORC. C3 proposes the use of air sparging in conjunction with SVE and ORC. Alternatives C1 and C3 use treatment technologies that remove contaminants from the groundwater and soil vapors in the subsurface, which serves to help permanently reduce the toxicity, mobility, or volume of hazardous substances at the Site (WAC 173-340-360 (3)(f)(ii)) and improve the overall environmental quality at the Site (WAC 173-340-360 (3)(f)(i)). Both alternatives propose cleanup actions that are protective of the environment and use treatment technologies that involve destruction or detoxification, which provide for long-term effectiveness at the Site.

Alternatives C1 and C3 are favored over alternative C2 for the following reasons. Alternative C2 relies mainly on PCS removal and off-site disposal and treatment of PCS. Off-site disposal is considered a less desirable form of remediation in the long-term than destruction or detoxification. Alternatives C1 and C3 are more easily technically and administratively implemented than alternative C2. Alternative C2 suggests that PCS be removed from the "dispenser islands at the Tiger Corp. gas station, to the DID storm sewer line in the Safeway parking lot" (Clearwater, 1997). An estimated 33,349 cubic yards of soil would have to be removed from the Site. Buildings located onsite and businesses adjacent to the Site would be impacted. Alternative C2 does not address removing soil contamination from beneath the buildings located onsite, so contamination would be left onsite. Leaving contaminants onsite, possibly in the form of free product, would not be considered a permanent or protective solution. The estimated cost of alternative C2 is $1,412,595 (Clearwater, 1997). Ecology has determined that the costs to alternative C2 outweigh the benefits, considering that PCS, and possibly free product, would remain underneath buildings onsite. The costs of alternatives C1 and C3 are comparable ($285,175 and $335,274, respectively, from Clearwater, 1997).

Although Ecology has not selected one specific CAA outlined in the FS Addendum, Ecology has selected portions of each plan to incorporate into the CAP. Ecology has determined that the following cleanup actions provide the most practicable permanent cleanup solution for the Site. These actions are a combination and/or modification of cleanup actions detailed in the FS Addendum (Clearwater, 1997), in addition to UST removal, which was not addressed in the FS Addendum . The cleanup actions include:

- Removal of all underground storage tanks (USTs), associated lines and dispensers.
- Removal of petroleum contaminated soils (PCS).
- Installation of a soil vapor extraction (SVE) system.
- Use of hydrogen peroxide to enhance aerobic degradation.

The selected cleanup actions are most like the ones outlined in C1 and C3, where use of SVE and ORC is proposed. In addition, however, Ecology proposes a limited amount of PCS removal

take place at the Site. Removing the grossly contaminated soil will serve to increase the speed at which the rest of the area is remediated by SVE. The cost of Ecology's proposal is comparable to the cost of alternatives C1 and C3 (see Appendix A).

Ecology has estimated the cost differential between alternatives C1, C3 and Ecology's selected cleanup actions (E1). The cost of each of these cleanup scenarios is similar, therefore not disproportionate. Ecology has selected the alternative that addresses source removal, vapor removal through SVE, and hydrogen peroxide injections (comparable to ORC injections mentioned in C1 and C3). The cleanup actions selected by Ecology are more protective, permanent, and provide for a quicker restoration time frame, due to the fact that PCS will be removed from the Site, than alternatives C1 and C3.

8.3 Expectations for Cleanup Action Alternatives

Expectations for cleanup actions are listed in WAC 173-340-370. These expectations include, but are not limited to, the following:

- Emphasis on treatment technologies;
- Destruction, detoxification, and/or removal of hazardous substances;
- Use of engineering controls;
- Minimization of migration of hazardous substances;
- Consolidation, to the maximum extent practicable, of hazardous substances remaining onsite;
- Taking active measures to prevent/minimize the release of contaminants to surface water.

8.4 Evaluation Criteria

WAC 173-340-360(3)(f) puts forth the criteria for determining whether a cleanup action is "permanent to the maximum extent practicable." Following is a list of these criteria and a discussion of how the selected cleanup actions fulfill each of them.

8.4.1 Protectiveness– WAC 173-340-360(3)(f)(i)

The selected cleanup actions address the removal and treatment of contaminants as free product, dissolved in groundwater, and present in subsurface vapors. PCS removal serves to remove free product and contaminants sorbed to soil particles, which will reduce leaching of contaminants to the groundwater; SVE addresses removal of contaminants in the vapor phase, and, in turn, contaminants sorbed to soil and contained in pore water. Hydrogen peroxide injections will serve to enhance biodegradation of contaminants in the groundwater. These actions will help to reduce contaminant concentrations to Method A cleanup levels for groundwater defined in WAC 173-340-720. These actions also serve to reduce the risk of contaminant exposure to human health and the environment. The on-site risks resulting from implementing the alternative include the risk of exposure to contaminants as free product, in the groundwater and soil, and in the vapor phase during UST excavation, PCS excavation, and installation of the SVE system(s). Implementation of appropriate safety measures and institutional controls will minimize the risk to human health and the environment. The selected alternative will improve the overall

environmental quality of the Site by reducing contaminant concentrations in the groundwater, soil gas, and removing SPH from the subsurface.

8.4.2 Permanence – WAC 173-340-360 (3)(f)(ii)

The selected cleanup alternative will serve to permanently remove contaminants from the subsurface, and to reduce the volume and mobility of any contaminants remaining in the subsurface. The cleanup alternative will be effective in destroying the hazardous substances at the Site by removal from the subsurface and processing in the treatment facility. PCS removal, SVE, and hydrogen peroxide injections will serve to reduce contaminant concentrations in the subsurface. UST removal serves as a method of prevention of future releases at the Site and eliminates the possibility of additional hazardous substance releases.

8.4.3 Cost – WAC 173-340-360 (3)(f)(iii)

The cleanup action selected is not considered to be substantial and disproportionate to the incremental degree of protection it would achieve over a lower preference cleanup action. See section 8.2.3 *Disproportionate Cost Analysis*, for further explanation.

8.4.4 Effectiveness over the long-term – WAC 173-340-360(3)(f)(iv)

The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness:

- Reuse or recycling;
- Destruction or detoxification;
- Immobilization or solidification;
- On-site or off-site disposal in an engineered, lined, and monitored facility;
- On-site isolation or containment with attendant engineering controls;
- Institutional monitoring.

The cleanup alternatives selected involve installation of a system similar to the current interim remediation system. To date, the interim remediation system has been effective. The main limitation of the interim remediation system is that it doesn't target the area of highest contamination at the Site. The new system will target the area of highest contamination. With proper maintenance, the system has the potential for long-term reliability.

8.4.5 Management of short-term risks – WAC 173-340-360(3)(f)(v)

Steps will be taken to minimize exposure to contaminated soil and groundwater during installation of the system. A Safety and Health Plan will be followed at the Site. Once the system is installed, there is little risk to human health and the environment prior to the attainment of cleanup standards because the area will be paved over. Institutional controls will be in place to prevent tampering with existing wells and the treatment system.

8.4.6 Technical and administrative implementability – WAC 173-340-360(3)(f)(vi)

The proposed cleanup alternatives are technically possible to implement at the Site. PCS removal will take place in conjunction with UST removal. The SVE system is similar to the interim remediation system, which was shown to be effective and technically possible to implement at the Site. All necessary services are available and the new SVE system can be integrated into the current treatment system in place at the Site.

8.4.7 Consideration of public concerns – WAC 173-340-360(3)(f)(vii)

Ample opportunity will be given to the community to comment on the CAP.

9.0 Additional Requirements

9.1 Compliance Monitoring

Requirements of Compliance Monitoring as stated in WAC 173-340-410 include:

a) Protection monitoring. Confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action as described in the safety and health plan;
b) Performance monitoring. Confirm that the interim action or cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws;
c) Confirmational monitoring. Confirm the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, other performance standards have been attained.

According to WAC 173-340-410 (3), a Compliance Monitoring Plan shall be prepared for all cleanup actions and shall include:

a) A sampling and analysis plan meeting the requirements of WAC 173-340-820 which shall explain in the statement of objectives how the purposes of WAC 173-340-410(1) are met;
b) Data analysis and evaluation procedures used, to demonstrate and confirm compliance and justification for these procedures, including:
    i) A description of any statistical method to be employed; or
    ii) If sufficient data is not available prior to writing the plan to propose a reliable statistical method to demonstrate and confirm compliance, a contingency plan proposing one or more reliable statistical methods to demonstrate and confirm compliance, and the conditions under which the methods would be used at the facility; and
c) Other information as required by the department.

9.2 Sampling and Analysis Plan

The Sampling and Analysis Plan shall specify procedures that ensure that sample collection, handling, and analysis will result in data of sufficient quality to plan and evaluate remedial actions at the Site. The Sampling and Analysis Plan shall be prepared by the implementers of this CAP. As defined in WAC 173-340-820, the Sampling and Analysis Plan shall include the following:

a) A statement on the purpose and objectives of the data collection, including quality assurance and quality control requirements;
b) Organization and responsibilities for the sampling and analysis activities;
c) Requirements for sampling activities including:
   i) Project schedule;
   ii) Identification and justification of location and frequency of sampling;
   iii) Identification and justification of parameters to be sampled and analyzed;
   iv) Procedures for installation of sampling devices;
   v) Procedures for sample collection and handling, including procedures for personnel and equipment decontamination;
   vi) Procedures for the management of waste materials generated by sampling activities; including installation of monitoring devices, in a manner that is protective of human health and the environment;
   vii) Description and number of quality assurance and quality control samples, including blanks and spikes;
   viii) Protocols for sample labeling and chain of custody; and
   ix) Provisions for splitting samples where appropriate.
d) Procedures for analysis of samples and reporting of results, including:
   i) Detection or quantification limits;
   ii) Analytical techniques and procedures;
   iii) Quality assurance and quality control procedures; and
   iv) Data reporting procedures, and where appropriate, validation procedures.

9.2.1 Tasks To Be Completed During Each Sampling Event

1) Obtaining water level measurements in each well accurate to one one-hundredth of a foot (.01 foot).
2) Obtaining the following field parameters: pH, dissolved oxygen, temperature, and TDS.
3) Evaluating each well to determine the integrity of the well seal and cap to ensure no contamination will enter the well from the surface.
4) Utilizing an oil water interface meter or patch to determine if free petroleum products are present in the well.
5) Testing for TPH-G as gasoline using method WTPH-G, and BTEX compounds. Reporting limits will be the analytical method detection limits.
6) Testing for MTBE in groundwater. The reporting limit will be the analytical method detection limit.

7) If TPH-D is determined to be a chemical of concern for the Site, based on soil samples obtained during UST removal, testing for TPH-D in groundwater will occur. The reporting limit will be the analytical method detection limit.
8) Table 830-1, WAC 173-340-900 lists the minimum testing requirements for petroleum contaminated sites and will provide guidance as to what additional compounds must be tested for at the site. The reporting limit for any additional compound will be the analytical method detection limit.
9) Reporting analytical results in micrograms per liter (µg/L) in tables and in graphical form with concentration over time.
10) Preparing and submitting groundwater elevations and flow directions after each sampling event, with data presented in table and map form.
11) Preparing and submitting contaminant contour maps with benzene and TPH-G concentrations.

9.2.2 Wells To Be Sampled/Frequency of Sampling

Wells MW-7, MW-8, MW-9, MW-11, MW-13, MW-15, KMW-7, KMW-9, KMW-20 do contain or have contained measurable free floating petroleum product (separate phase hydrocarbons or SPH). These wells will be inspected for SPH. If measurable SPH are present, the SPH thickness will be determined. If measurable SPH are not detected in the wells listed above, groundwater will be sampled and measured for chemical constituents listed in section 9.2.1.

The following wells will be sampled for all chemical constituents listed in section 9.2.1: KMW-6, KMW-11, KMW-13, KMW-14, KMW-16, KMW-17, KMW-18, KMW-22, KMW-24, MWG-2, S-1, S-2, DID #14, and DID #15. Although measurable SPH have not been encountered in these wells in the most recent sampling events, they should be inspected for SPH. If measurable SPH are encountered in these wells, SPH thickness should be noted. *SPH encountered in any wells onsite shall be bailed from said wells and disposed of properly.*

Sampling procedure of all wells shall include measuring and recording water levels in sampled wells. All of the wells to be sampled shall be sampled once every three months (quarterly). Months in which sampling shall take place are: March, June, September, and December. If, after five years of sampling and review, contaminant concentrations in all monitored wells have decreased to at or below MTCA Method A cleanup levels for groundwater, Ecology may consider reducing the frequency of sampling.

Wells that are not listed in the CAP as wells to be sampled may be abandoned.

9.3 Reporting Requirements

All analytical results shall be reported in the following manner:
a) Copies of all data sheets received from the laboratory shall be submitted to Ecology. This includes all chromatographs, and data showing any QA/QC analysis run by the laboratory, and chain of custody forms.
b) All data will be presented in tables and graphically showing concentration over time.

c) The most recent sampling and analysis shall be presented as received from the lab as stand alone documents.
d) A brief report explaining the procedures used, anything unusual noted during sampling, the condition of each well, and discussion of the data will be submitted within 45 days of each sampling event.
e) All wells shall be surveyed. The survey will obtain northing and easting coordinates for each monitoring well in the Washington State Plane, South Zone NAD 29 Datum. The surveying data will be provided on an electronic map with latitude and longitude (in degree/minute/ second) consistent with Ecology format. Elevations of each well will be measured, to the nearest 0.01-foot, at the top of casing in NAD 29 Datum, 1947 adjustment. The state plane coordinates and elevations will be based on the City of Yakima's GPS control points with elevations and coordinates being provided by the City of Yakima.
f) The Ecology Site Manager shall be notified within five (5) working days if free liquid petroleum products are discovered in any of the monitoring wells.

9.4 Worker Safety Plan

Section 810(2) of WAC 173-340 outlines the requirements for a Safety and Health Plan. A Safety and Health Plan shall be prepared by the PLPs and submitted to the Ecology Site Manger for review and comment. The plan must include all Applicable and Relevant or Appropriate Requirements (ARARs).

9.5 Public Participation Plan

Section 600(9) of WAC 173-340 outlines the requirements for the Public Participation Plan. A Public Participation Plan shall be prepared by the PLPs and submitted to the Ecology Site Manager for review and approval. The plan must include all ARARs.

9.6 Work Plan

WAC 173-340-400(6) outlines the requirements for plans describing the cleanup action, which will be referred to as the "Work Plan." The Work Plan shall include an Engineering Design Report, per WAC 173-340-400(4)(a), Construction Plans and Specifications per WAC 173-340-400(4)(b), and an Operation and Maintenance Plan per WAC 173-340-400(4)(c).

9.7 Applicable, Relevant and Appropriate Requirements

WAC 173-340-700(4)(a) states, "In addition to establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for performing cleanup actions." The PLPs shall be responsible for determining and implementing ARARs (applicable, relevant and appropriate requirements) for the Site.

10.0 Schedule

10.1 Removal of USTs, associated piping, and PCS on the Tiger Oil property

Within 15 calendar days of the effective date of the Enforcement Order issued to implement the CAP, the PLP Group shall submit to Ecology a schedule for removal of USTs, associated piping, and PCS on the Tiger Oil property, and a signed contract from a licensed tank removal/site assessor for work to be completed at the Site. Tank removal and site assessment will commence no later than 45 days after the effective date of the Enforcement Order.

Within 30 calendar days of the effective date of the Enforcement Order, the PLP Group shall submit to Ecology, for review and approval, a draft Sampling and Analysis Plan for removal of USTs, associated piping, and PCS on the Tiger Oil property, per WAC 173-340-820, and a draft Public Participation Plan per WAC 173-340-600.

Within 15 calendar days of receiving Ecology's comments on the draft Sampling and Analysis Plan for removal of USTs, associated piping, and PCS on the Tiger Oil property, and the draft Public Participation Plan, the PLP Group shall submit, for review and approval, a final Sampling and Analysis Plan for removal of USTs, associated piping, and PCS on the Tiger Oil property, and a final Public Participation Plan. The final Sampling and Analysis Plan and Public Participation Plan shall address and incorporate Ecology's comments.

Within 30 calendar days of the effective date of the Enforcement Order, the PLP Group shall submit to Ecology, for review and comment, a Safety and Health Plan for UST, associated piping, and PCS removal activities. The Safety and Health Plan must be submitted to Ecology prior to the commencement of tank removal activities at the Site.

Within 30 days of completion of UST removal, associated piping removal, PCS removal, and Site Assessment, the PLP Group shall submit, to Ecology, a Site Assessment Report, an UST Closure and Site Assessment Notice, and an UST Site Check/Site Assessment Checklist. PCS removal, as described in section 3.2.2 of the CAP, will be conducted in conjunction with removal of USTs and associated piping on the Tiger Oil property.

10.2 Soil vapor extraction (SVE) and hydrogen peroxide use

Within 60 calendar days of the effective date of the Enforcement Order, the PLP Group shall submit to Ecology, for review and approval, a draft Work Plan, draft Engineering Design Report, draft Construction Plans and Specifications per WAC 173-340-400, draft Operation and Maintenance Plan per WAC 173-340-400, draft Compliance Monitoring Plan per WAC 173-340-410, and draft Sampling and Analysis Plan per WAC 173-340-820 for the SVE system.

Within 60 calendar days of the effective date of the Enforcement Order, the PLP Group shall submit to Ecology, for review and comment, a Safety and Health Plan for activities associated with the SVE system and use of hydrogen peroxide.

Within 15 calendar days of receiving Ecology's comments on the draft Work Plan, draft Engineering Design Report, draft Construction Plans and Specifications, draft Operation and Maintenance Plan, draft Compliance Monitoring Plan, and draft Sampling and Analysis Plan for the SVE system, the PLP Group shall submit to Ecology, for review and approval, the final Work Plan, final Engineering Design Report, final Construction Plans and Specifications, final Operation and Maintenance Plan, final Compliance Monitoring Plan, and final Sampling and Analysis Plan for the SVE system. The final Work Plan, final Engineering Design Report, final Construction Plans and Specifications, final Operation and Maintenance Plan, final Compliance Monitoring Plan, and final Sampling and Analysis Plan for the SVE system shall address and incorporate Ecology's comments.

Within 15 calendar days of Ecology's approval of the Construction Plans and Specifications, Operation and Maintenance Plan, and Compliance Monitoring Plan, construction of the SVE system shall begin.

Within 30 calendar days after construction of the SVE system is complete, the PLP Group shall submit, to Ecology, As-Built Diagrams, per WAC 173-340-400(6)(b)(ii).

Within 90 calendar days of the effective date of the Enforcement Order, the PLP Group shall submit to Ecology, for review and approval, a draft Work Plan, draft Engineering Design Report, draft Construction Plans and Specifications, draft Operation and Maintenance Plan, draft Compliance Monitoring Plan, and draft Sampling and Analysis Plan for hydrogen peroxide use.

Within 15 calendar days of receiving Ecology's comments on the draft Work Plan, draft Engineering Design Report, draft Construction Plans and Specifications, draft Operation and Maintenance Plan, draft Compliance Monitoring Plan, and draft Sampling and Analysis Plan, the PLP Group shall submit to Ecology, for review and approval, the final Work Plan, final Engineering Design Report, final Construction Plans and Specifications, final Operation and Maintenance Plan, final Compliance Monitoring Plan, and final Sampling and Analysis Plan for hydrogen peroxide use. The final Work Plan, final Engineering Design Report, final Construction Plans and Specifications, final Operation and Maintenance Plan, final Compliance Monitoring Plan, and final Sampling and Analysis Plan for hydrogen peroxide use shall address and incorporate Ecology's comments.

Within 15 days of Ecology's approval of the Construction Plans and Specifications, Operation and Maintenance Plan, Compliance Monitoring Plan, and Sampling and Analysis Plan for hydrogen peroxide use, the use of hydrogen peroxide shall begin.

Figure 1

APPENDIX A
Tiger Oil Feasibility Cost Analysis

Spreadsheet – Tiger Oil Feasibility Cost Analysis

Appendix A

Tiger Oil Feasibility Cost Analysis
Hybridized Approach using Feasibility Study Addendum, Clearwater Group, March 26, 1997

Ecology has estimated the cost of PCS removal, in addition to SVE at the Tiger Oil Site. Ecology considered four different PCS removal scenarios. The first scenario consists of limited removal of soil in areas A1, A2, and B1. (See Figure A-1, taken from the Feasibility Study Addendum, Clearwater Group, Inc., 1997.) The second scenario adds more soil removal from B1. Scenario 3 involves complete PCS removal in areas A1, A2, and A3, in addition to removing the pump island. Scenario four involves complete removal of soil and buildings in A1, A2, B1, and D1.

All scenarios take into account the following assumptions:

- Groundwater is located at 15' b.g.s.
- The top 5' of soil is clean.

The cost of SVE (based on 1997 FS addendum estimates) adds an additional $250,000 to all four scenarios.

15 ft to gw.

Figure A-1