



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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December 2, 2014

Mr. Scott Wagner
9007 S 19th St
Tacoma WA 98466

Re: Further Action at the following Site:

- **Site Name:** Narrows Marina
- **Site Address:** 9007 South 19th Street, Tacoma, Washington
- **Facility/Site No.:** 99977353
- **Cleanup Site No.:** 11373
- **VCP Project No.:** SW1416

Dear Mr. Wagner:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your independent cleanup of the Narrows Marina facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

Issue Presented and Opinion

Is further remedial action necessary to clean up contamination at the Site?

YES. Ecology has determined that further remedial action is necessary to clean up contamination at the Site.

This opinion is based on an analysis of whether the remedial action meets the substantive requirements of MTCA, Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC (collectively "substantive requirements of MTCA"). The analysis is provided below.

Description of the Site

This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following release:

- Petroleum into the soil and potentially groundwater.

Please note the parcel(s) of real property associated with this Site are also located within the projected boundaries of the Tacoma Smelter Plume facility (#89267963). At this time, we have no information that those parcel(s) are actually affected. This opinion does not apply to any contamination associated with the Narrow Marina facility.

A handwritten signature in black ink, appearing to be "Vick".

Basis for the Opinion

This opinion is based on the information contained in the following documents:

Final Hydrocarbon Contaminated Soil Remediation, Applied Geotechnology Inc., August 8, 1989.

These documents are kept in the Central Files of the Southwest Regional Office of Ecology (SWRO) for review by appointment only. You can make an appointment by calling the SWRO resource contact at (360) 407-6365.

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that **further remedial action** is necessary to clean up contamination at the Site. That conclusion is based on the following analysis:

1. Characterization of the Site.

Ecology has determined your characterization of the Site is not sufficient to establish cleanup standards and select a cleanup action.

The Site, located at 9007 South 19th Street, Tacoma, Pierce County, Washington, is an active marina facility. The Site is 12.78 acres surrounded by Puget Sound on the northeast and commercial property on the rest of the sides (Figure 1).

Three underground storage tanks (USTs) – two 3,000-gallon gasoline and one 3,000-gallon diesel – were removed in June 1989 (Figure 2). Soil samples collected from the excavation were analyzed for Total Petroleum Hydrocarbons (TPH), benzene, toluene, ethylbenzene, and total xylenes (BTEX). TPH, benzene, and xylenes were found above the cleanup levels used at that time.

Over excavation of contaminated soil was done until clean limits were found on the north, east, and west walls. Contamination remained in the south wall and was left in place due to stability concerns of above ground storage tanks located there (Table 1).

The total depth reached during excavation was 14 feet below ground surface (bgs). The text does not indicate groundwater was found.

Approximately 450 cubic yards of contaminated soil removed during excavation was placed on plastic sheeting and spread out in a thin layer. It was tilled several times to enhance bioremediation. After 2 weeks, four composite samples were collected, analyzed for TPH and two for BTEX, and found to be compliant with cleanup levels. The soil was then used for backfill in the excavation.

Based on the review of the above listed reports, Ecology has the following comments:

1. No figure showing locations of samples collected was available for review.
2. Compliance of remaining soil contaminant levels have been compared to current Method A cleanup levels, which will be used at this Site shown in MTCA Table 740-1 (attached). Groundwater results will need to be compared to the cleanup levels listed in MTCA Table 720-1.
3. The Site needs additional work to fully characterize the soil contamination in both the horizontal and vertical directions. Groundwater will need to be sampled to determine if any impacts from the soil contamination are present.
4. Most of the confirmation samples collected from the excavation are above the current Method A cleanup levels. The exceptions are the samples labeled North Wall, West Wall, and South Wall, West End. Soil samples from these areas are needed to determine the current impacts.
5. Shallow soil samples (>1 foot below bgs) will need to be collected and analyzed for arsenic since the Site is within the Tacoma Smelter Plume area.
6. Soil samples will need to be analyzed for parameters listed in MTCA Table 830-1 (attached). These include, but are not limited to, metals and fuel additives.
7. The available laboratory data indicates that TPH-Diesel was not found above current Method A cleanup levels in soil in the UST area. Soil samples for this constituent will thus not be needed. Analyses of groundwater for TPH-Diesel will still be needed, along with the other appropriate analyses listed on Table 830-1.
8. Some information exists that appears to indicate that soil contamination around the above ground waste oil tanks was found. These tanks are shown on Figure 2 located south of the UST excavation. No documentation was found related to this. If this information is correct, sampling for waste oil constituents as listed in MTCA Table 830-1 is needed.
9. In accordance with WAC 173-340-7490, a Terrestrial Ecological Evaluation (TEE) needs to be completed for the Site. Please fill out the TEE form and any supporting information (as appropriate) and submit it to Ecology. The form can be found on our website at <http://www.ecy.wa.gov/biblio/ecy090300.html>.
10. Please note that any document submitted containing geologic, hydrologic, or engineering work must be under the seal of an appropriately licensed professional, as required by Chapters 18.43 and 18.220 RCW.
11. In accordance with WAC 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), data generated for Independent Remedial Actions shall be submitted simultaneously in both a written and electronic format. For additional information regarding electronic format requirements, see the website

<http://www.ecy.wa.gov/eim>. Be advised that according to the policy, any reports containing sampling data that are submitted for Ecology review are considered incomplete until the electronic data has been entered. Please ensure that data generated during on-site activities is submitted pursuant to this policy. **Data must be submitted to Ecology in this format for Ecology to issue a No Further Action determination.** Please be sure to submit the previous data not submitted yet, as well as any future data, in this format. Be advised that Ecology requires up to two weeks to process the data once it is received.

2. Establishment of cleanup standards.

Standard points of compliance are being used for the Site. The point of compliance for protection of groundwater shall be established in the soils throughout the Site. For soil cleanup levels based on human exposure via direct contact or other exposure pathways where contact with the soil is required to complete the pathway, the point of compliance shall be established in the soils throughout the Site from the ground surface to 15 feet bgs. In addition, the point of compliance for groundwater shall be established throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the Site.

Additional investigation is required to define the extent of impacts on the Site prior to establishing points of compliance.

3. Selection of cleanup action.

Ecology has determined the cleanup action you selected for the Site does not meet the substantive requirements of MTCA.

Cleanup actions have consisted of excavation and aeration of contaminated soil.

4. Cleanup.

Cleanup actions taken to date have consisted of excavation of approximately 450 cubic yards of contaminated soil. The excavated soil was then aerated and composite samples collected to verify soil cleanliness. The excavated soil was then returned to the excavation as backfill.

Ecology has determined the cleanup you performed does not meet any cleanup standards at the Site.

Limitations of the Opinion

1. Opinion does not settle liability with the state.

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70.105D.040(4).

2. Opinion does not constitute a determination of substantial equivalence.

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you performed is substantially equivalent. Courts make that determination. *See* RCW 70.105D.080 and WAC 173-340-545.

3. State is immune from liability.

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70.105D.030(1)(i).

Contact Information

Thank you for choosing to clean up the Site under the Voluntary Cleanup Program (VCP). After you have addressed our concerns, you may request another review of your cleanup. Please do not hesitate to request additional services as your cleanup progresses. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our web site: www.ecy.wa.gov/programs/tcp/vcp/vcpmain.htm. If you have any questions about this opinion, please contact me by phone at (360) 407-6263 or e-mail at cjoh461@ecy.wa.gov.

Sincerely,



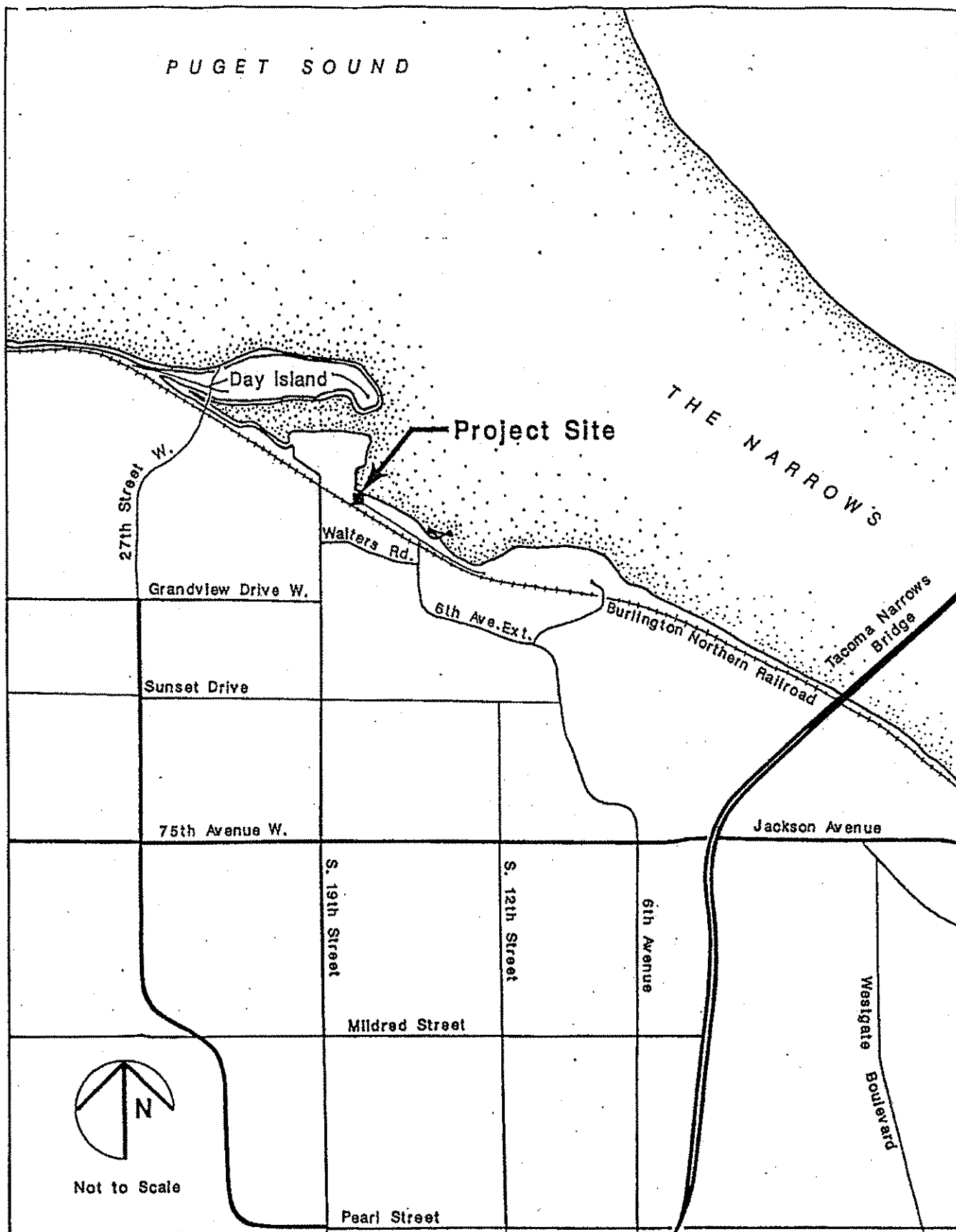
Carol A. Johnston
SWRO Toxics Cleanup Program

CAJ/ksc:Narrows Marina FA SW1416

Enclosures (2 figures, 4 tables)

cc: Bill Kane, ECO Compliance Corp.
Rob Olsen, TPCHD
Scott Rose, Ecology
Dolores Mitchell, Ecology (w/o enclosures)

91 7199 9991 7031 7908 4795



Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Vicinity Map

Narrows Marina
Tacoma, Washington

FIGURE

1

JOB NUMBER
15,398.001

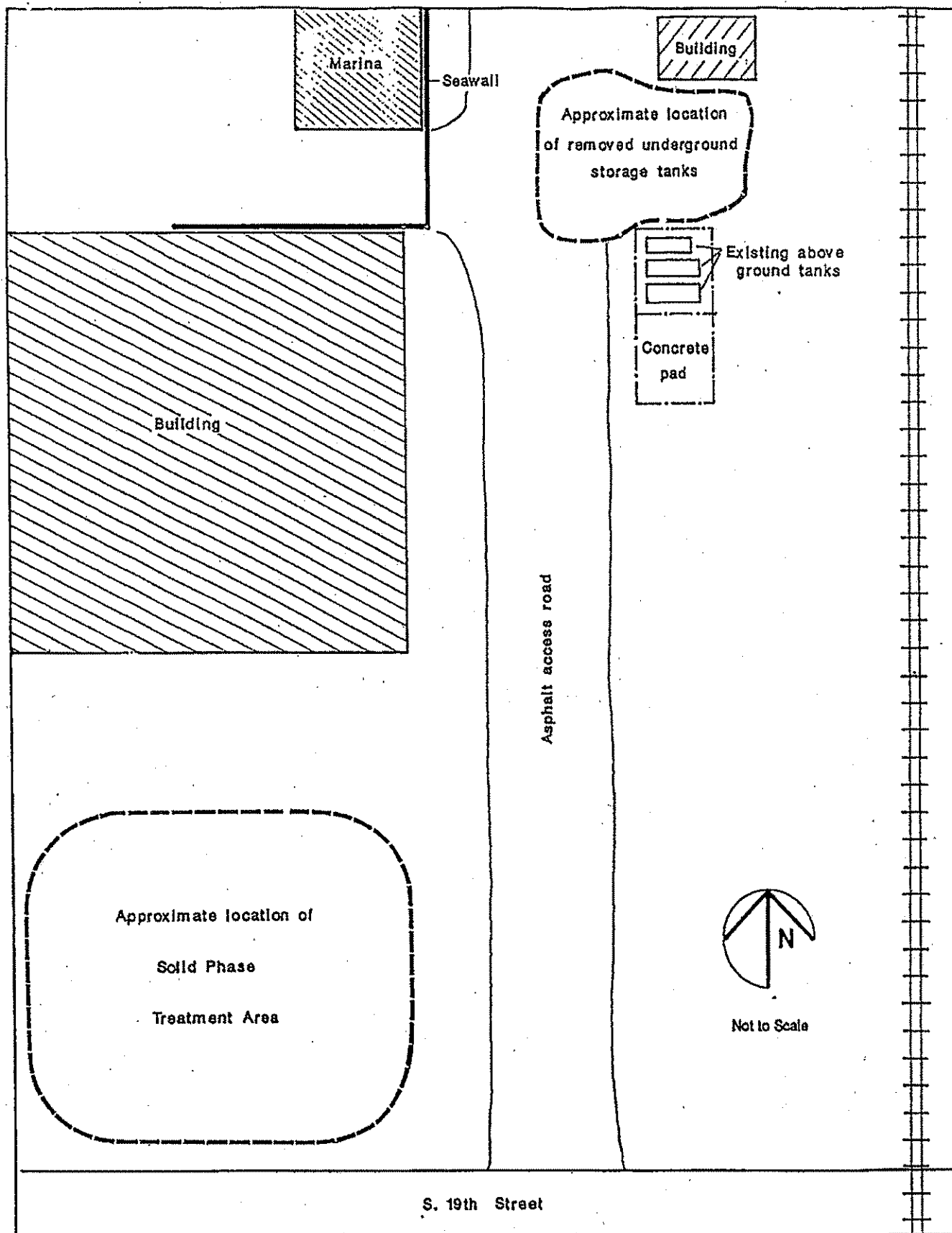
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APPROVED
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DATE
7 August 89

REVISED

DATE



Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Site Sketch
Narrows Marina
Tacoma, Washington

PLATE

2

Job Number
15,398.001

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DATE
8 August 89

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DATE

TABLE 1
SOIL SAMPLE ANALYTICAL RESULTS
NARROWS MARINA

SAMPLE SOURCE	DEPTH (FEET)	DATE	T P H 8015	BENZENE	ETHYL- BENZENE	TOLUENE	META & PARA XYLENES	ORTHO XYLENE
<u>TANK CAVITY</u>								
EAST WALL	8	6/7/89	37	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
NORTH WALL, FLOOR	11.5	6/7/89	< 5	0.04	< 0.025	< 0.025	< 0.025	< 0.025
SOUTH- SOUTHWEST WALL, FLOOR	11	6/7/89	208	1.04	5.7	3.9	28	6.4
WEST WALL, FLOOR	14	6/7/89	< 5	0.047	< 0.025	< 0.025	0.11	< 0.025
NORTH WALL	8.5	6/8/89	< 5	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
NORTH SIDE, FLOOR	13.5	6/8/89	< 5	0.038	0.095	0.034	0.21	0.043
WEST WALL	9	6/9/89	< 5	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
WEST SIDE FLOOR	12	6/9/89	7	0.16	0.073	0.033	0.19	< 0.025
SOUTH WALL, WEST END	9	6/9/89	21	< 0.025	< 0.025	< 0.025	0.11	< 0.025
MID SOUTH WALL	9	6/9/89	1,400	0.36	2.4	0.41	7.4	0.49
<u>TREATMENT AREA</u>								
QUAD 1	0.0-0.8	6/23/89	95	NA	NA	NA	NA	NA
QUAD 2	0.0-0.8	6/23/89	180	NA	NA	NA	NA	NA
QUAD 3	0.0-0.8	6/23/89	60	NA	NA	NA	NA	NA
QUAD 4	0.0-0.8	6/23/89	88	NA	NA	NA	NA	NA
EAST	0.0-0.8	7/5/89	NA	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
WEST	0.0-0.8	7/5/89	NA	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
ECOLOGY CLEAN-UP GUIDELINES			200	0.65	N/E	N/E	N/E	N/E

NOTES:

1. Units are mg/kg [parts per million (ppm)]
2. < Indicates below detection limit.
3. N/E indicates not established.
4. N/A indicates not analyzed.

Table 740-1
Method A Soil Cleanup Levels
for Unrestricted Land Uses.^a

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	20 mg/kg ^b
Benzene	71-43-2	0.03 mg/kg ^c
Benzo(a)pyrene	50-32-8	0.1 mg/kg ^d
Cadmium	7440-43-9	2 mg/kg ^e
Chromium		
Chromium VI	18540-29-9	19 mg/kg ^{f1}
Chromium III	16065-83-1	2,000 mg/kg ^{f2}
DDT	50-29-3	3 mg/kg ^g
Ethylbenzene	100-41-4	6 mg/kg ^h
Ethylene dibromide (EDB)	106-93-4	0.005 mg/kg ⁱ
Lead	7439-92-1	250 mg/kg ^j
Lindane	58-89-9	0.01 mg/kg ^k
Methylene chloride	75-09-2	0.02 mg/kg ^l
Mercury (inorganic)	7439-97-6	2 mg/kg ^m
MTBE	1634-04-4	0.1 mg/kg ⁿ
Naphthalenes	91-20-3	5 mg/kg ^o
PAHs (carcinogenic)		See benzo(a)pyrene ^d
PCB Mixtures		1 mg/kg ^p
Tetrachloroethylene	127-18-4	0.05 mg/kg ^q
Toluene	108-88-3	7 mg/kg ^r
Total Petroleum Hydrocarbons ^s		
Gasoline Range Organics		
Gasoline mixtures without benzene and the total of ethyl benzene, toluene and xylene are less than 1% of the gasoline mixture		100 mg/kg
All other gasoline mixtures		30 mg/kg
Diesel Range Organics		2,000 mg/kg
Heavy Oils		2,000 mg/kg
Mineral Oil		4,000 mg/kg
1,1,1 Trichloroethane	71-55-6	2 mg/kg ^t
Trichloroethylene	79-01-6	0.03 mg/kg ^u
Xylenes	1330-20-7	9 mg/kg ^v

[Note: Must also test for and meet cleanup levels for other petroleum components--see footnotes.]

Footnotes:

- a Caution on misusing this table. This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or for sites with relatively few hazardous substances, and the site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or it can be demonstrated using a terrestrial ecological evaluation under WAC 173-340-7492 or 173-340-7493 that the values in this table are ecologically protective for the site. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in this table should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the soil must be restored to these levels at a site. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.
- b Arsenic. Cleanup level based on direct contact using Equation 740-2 and protection of ground water for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.
- c Benzene. Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4) and (6).
- d Benzo(a)pyrene. Cleanup level based on direct contact using Equation 740-2. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).
- e Cadmium. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.
- f1 Chromium VI. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- f2 Chromium III. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.
- g DDT (dichlorodiphenyltrichloroethane). Cleanup level based on direct contact using Equation 740-2.
- h Ethylbenzene. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- i Ethylene dibromide (1,2 dibromoethane or EDB). Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4) and adjusted for the practical quantitation limit for soil.
- j Lead. Cleanup level based on preventing unacceptable blood lead levels.
- k Lindane. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit.
- l Methylene chloride (dichloromethane). Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- m Mercury. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- n Methyl tertiary-butyl ether (MTBE). Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- o Naphthalenes. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.
- p PCB Mixtures. Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs.

Table 720-1
Method A Cleanup Levels for Ground Water.^a

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	5 ug/liter ^b
Benzene	71-43-2	5 ug/liter ^c
Benzo(a)pyrene	50-32-8	0.1 ug/liter ^d
Cadmium	7440-43-9	5 ug/liter ^e
Chromium (Total)	7440-47-3	50 ug/liter ^f
DDT	50-29-3	0.3 ug/liter ^g
1,2 Dichloroethane (EDC)	107-06-2	5 ug/liter ^h
Ethylbenzene	100-41-4	700 ug/liter ⁱ
Ethylene dibromide (EDB)	106-93-4	0.01 ug/liter ^j
Gross Alpha Particle Activity		15 pCi/liter ^k
Gross Beta Particle Activity		4 mrem/yr ^l
Lead	7439-92-1	15 ug/liter ^m
Lindane	58-89-9	0.2 ug/liter ⁿ
Methylene chloride	75-09-2	5 ug/liter ^o
Mercury	7439-97-6	2 ug/liter ^p
MTBE	1634-04-4	20 ug/liter ^q
Naphthalenes	91-20-3	160 ug/liter ^r
PAHs (carcinogenic)		See benzo(a)pyrene ^d
PCB mixtures		0.1 ug/liter ^s
Radium 226 and 228		5 pCi/liter ^t
Radium 226		3 pCi/liter ^u
Tetrachloroethylene	127-18-4	5 ug/liter ^v
Toluene	108-88-3	1,000 ug/liter ^w
Total Petroleum Hydrocarbons ^x		
[Note: Must also test for and meet cleanup levels for other petroleum components—see footnotes!]		
Gasoline Range Organics		
Benzene present in ground water		800 ug/liter
No detectable benzene in ground water		1,000 ug/liter
Diesel Range Organics		500 ug/liter
Heavy Oils		500 ug/liter
Mineral Oil		500 ug/liter
1,1,1 Trichloroethane	71-55-6	200 ug/liter ^y
Trichloroethylene	79-01-6	5 ug/liter ^z
Vinyl chloride	75-01-4	0.2 ug/liter ^{aa}
Xylenes	1330-20-7	1,000 ug/liter ^{bb}

Footnotes:

- a Caution on misusing this table. This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for drinking water beneficial uses at sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, values in this table should not automatically be used to determine cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the ground water must be restored to those levels at all sites. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.
- b Arsenic. Cleanup level based on background concentrations for state of Washington.
- c Benzene. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- d Benzo(a)pyrene. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61), adjusted to a 1×10^{-5} risk. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(3).
- e Cadmium. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).
- f Chromium (Total). Cleanup level based on concentration derived using Equation 720-1 for hexavalent chromium. This is a total value for chromium III and chromium VI. If just chromium III is present at the site, a cleanup level of 100 ug/l may be used (based on WAC 246-290-310 and 40 C.F.R. 141.62).
- g DDT (dichlorodiphenyltrichloroethane). Cleanup levels based on concentration derived using Equation 720-2.
- h 1,2 Dichloroethane (ethylene dichloride or EDC). Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- i Ethylbenzene. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- j Ethylene dibromide (1,2 dibromoethane or EDB). Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantification limit.
- k Gross Alpha Particle Activity, excluding uranium. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).
- l Gross Beta Particle Activity, including gamma activity. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).
- m Lead. Cleanup level based on applicable state and federal law (40 C.F.R. 141.80).
- n Lindane. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- o Methylene chloride (dichloromethane). Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- p Mercury. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).
- q Methyl tertiary-butyl ether (MTBE). Cleanup level based on federal drinking water advisory level (EPA-822-F-97-009, December 1997).
- r Naphthalenes. Cleanup level based on concentration derived using Equation 720-1. This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.
- s PCB mixtures. Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantification limit. This cleanup level is a total value for all PCBs.
- t Radium 226 and 228. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).
- u Radium 226. Cleanup level based on applicable state law (WAC 246-290-310).

Table 830-1
Required Testing for Petroleum Releases.

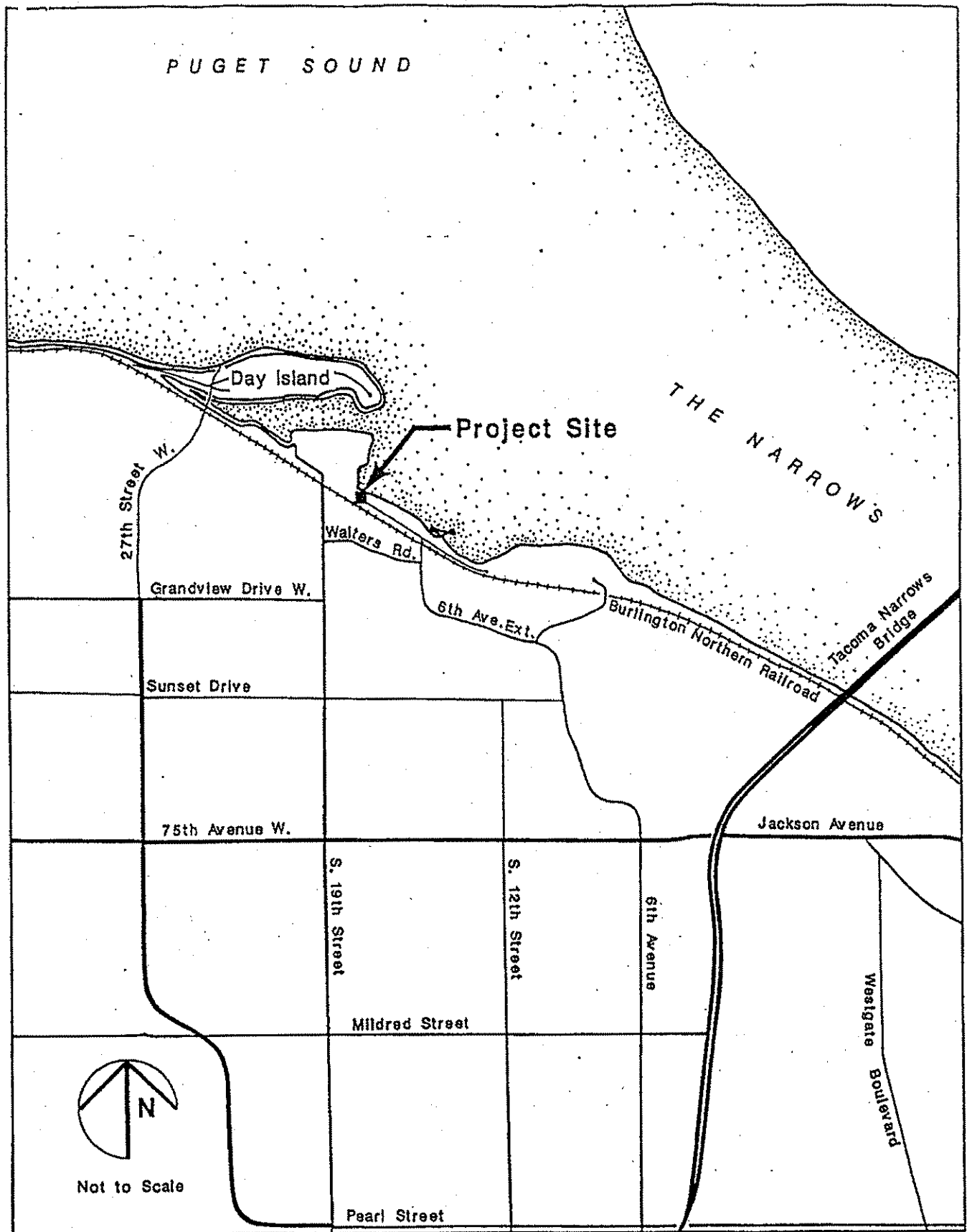
	Gasoline Range Organics (GRO) (1)	Diesel Range Organics (DRO) (2)	Heavy Oils (DRO) (3)	Mineral Oils (4)	Waste Oils and Unknown Oil (5)
Volatile Petroleum Compounds					
Benzene	X (6)	X (7)			X (8)
Toluene	X (6)	X (7)			X (8)
Ethyl benzene	X (6)	X (7)			X (8)
Xylenes	X (6)	X (7)			X (8)
n-Hexane	X (9)				
Fuel Additives and Blending Compounds					
Dibromoethane, 1-2 (EDB); and Dichloroethane, 1-2 (EDC)	X (10)				X (8)
Methyl tertiary-butyl ether (MTBE)	X (11)				X (8)
Total Lead and Other Additives	X (12)				X (8)
Other Petroleum Components					
Carcinogenic PAHs		X (13)	X (13)		X (8)
Naphthalenes	X (14)	X (14)	X (14)		X (14)
Other Compounds					
Polychlorinated Biphenyls (PCBs)			X (15)	X (15)	X (8)
Halogenated Volatile Organic Compounds (VOCs)					X (8)
Other	X (16)	X (16)	X (16)	X (16)	X (16)
Total Petroleum Hydrocarbons Methods					
TPH Analytical Method for Total TPH (Method A Cleanup Levels) (17)	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx	NWTPH-Dx	NWTPH-Gx & NWTPH-Dx
TPH Analytical Methods for TPH fractions (Methods B or C) (17)	VPH	EPH	EPH	EPH	VPH and EPH

[Editor's Note: See next page for the footnotes associated with Table 830-1.]

Use of Table 830-1: An "X" in the box means that the testing requirement applies to ground water and soil if a release is known or suspected to have occurred to that medium, unless otherwise specified in the footnotes. A box with no "X" indicates (except in the last two rows) that, for the type of petroleum product release indicated in the top row, analyses for the hazardous substance(s) named in the far-left column corresponding to the empty box are not typically required as part of the testing for petroleum releases. However, such analyses may be required based on other site-specific information. Note that testing for Total Petroleum Hydrocarbons (TPH) is required for every type of petroleum release, as indicated in the bottom two rows of the table. The testing method for TPH depends on the type of petroleum product released and whether Method A or Method B or C is being used to determine TPH cleanup levels. See WAC 173-340-830 for analytical procedures. The footnotes to this table are important for understanding the specific analytical requirements for petroleum releases.

Footnotes:

- (1) The following petroleum products are common examples of GRO: automotive and aviation gasolines, mineral spirits, stoddard solvents, and naphtha. To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Gx; if NWTPH-HCID results are used for this determination, then 90 percent of the "area under the TPH curve" must be quantifiable using NWTPH-Gx. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present (range can be measured by NWTPH-HCID). (See footnote 17 on analytical methods.)
- (2) The following petroleum products are common examples of DRO: Diesel No. 2, fuel oil No. 2, light oil (including some bunker oils). To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Dx quantified against a diesel standard. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present as measured in NWTPH-HCID.
- (3) The following petroleum products are common examples of the heavy oil group: Motor oils, lube oils, hydraulic fluids, etc. Heavier oils may require the addition of an appropriate oil range standard for quantification.
- (4) Mineral oil means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors.
- (5) The waste oil category applies to waste oil, oily wastes, and unknown petroleum products and mixtures of petroleum and nonpetroleum substances. Analysis of other chemical components (such as solvents) than those listed may be required based on site-specific information. Mixtures of identifiable petroleum products (such as gasoline and diesel, or diesel and motor oil) may be analyzed based on the presence of the individual products, and need not be treated as waste and unknown oils.
- (6) When using Method A, testing soil for benzene is required. Furthermore, testing ground water for BTEX is necessary when a petroleum release to ground water is known or suspected. If the ground water is tested and toluene, ethyl benzene or xylene is in the ground water above its respective Method A cleanup level, the soil must also be tested for that chemical. When using Method B or C, testing the soil for BTEX is required and testing for BTEX in ground water is required when a release to ground water is known or suspected.
- (7)(a) For DRO releases from other than home heating oil systems, follow the instructions for GRO releases in Footnote (6).
- (b) For DRO releases from typical home heating oil systems (systems of 1,100 gallons or less storing heating oil for residential consumptive use on the premises where stored), testing for BTEX is not usually required for either ground water or soil. Testing of the ground water is also not usually required for these systems; however, if the ground water is tested and benzene is found in the ground water, the soil must be tested for benzene.
- (8) Testing is required in a sufficient number of samples to determine whether this chemical is present at concentrations of concern. If the chemical is found to be at levels below the applicable cleanup level, then no further analysis is required.
- (9) Testing for n-hexane is required when VPH analysis is performed for Method B or C. In this case, the concentration of n-hexane should be deleted from its respective fraction to avoid double-counting its concentration. n-Hexane's contribution to overall toxicity is then evaluated using its own reference dose.
- (10) Volatile fuel additives (such as dibromoethane, 1-2 (EDB) (CAS# 106-93-4) and dichloroethane, 1-2 (EDC) (CAS# 107-06-2)) must be part of a volatile organics analysis (VOA) of GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for these chemicals.
- (11) Methyl tertiary-butyl ether (MTBE) (CAS# 1634-04-4) must be analyzed in GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for MTBE.
- (12)(a) For automotive gasoline where the release occurred prior to 1996 (when "leaded gasoline" was used), testing for lead is required unless it can be demonstrated that lead was not part of the release. If this demonstration cannot be made, testing is required in a sufficient number of samples to determine whether lead is present at concentrations of concern. Other additives and blending compounds of potential environmental significance may need to be considered for testing, including: tertiary-butyl alcohol (TBA); tertiary-amyl methyl ether (TAME); ethyl tertiary-butyl ether (ETBE); ethanol; and methanol. Contact the department for additional testing recommendations regarding these and other additives and blending compounds.
- (b) For aviation gasoline, racing fuels and similar products, testing is required for likely fuel additives (especially lead) and likely blending compounds, no matter when the release occurred.
- (13) Testing for carcinogenic PAHs is required for DRO and heavy oils, except for the following products for which adequate information exists to indicate their absence: Diesel No. 1 and 2, home heating oil, kerosene, jet fuels, and electrical insulating mineral oils. The carcinogenic PAHs include benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene, benzo(a)anthracene, and benzo(b)fluoranthene.
- (14)(a) Except as noted in (b) and (c), testing for the non-carcinogenic PAHs, including the "naphthalenes" (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene) is not required when using Method A cleanup levels, because they are included in the TPH cleanup level.
- (b) Testing of soil for naphthalenes is required under Methods B and C when the inhalation exposure pathway is evaluated.
- (c) If naphthalenes are found in ground water, then the soil must also be tested for naphthalenes.
- (15) Testing for PCBs is required unless it can be demonstrated that: (1) the release originated from an electrical device manufactured for use in the United States after July 1, 1979; (2) oil containing PCBs was never used in the equipment suspected as the source of the release (examples of equipment where PCBs are likely to be found include transformers, electric motors, hydraulic systems, heat transfer systems, electromagnets, compressors, capacitors, switches and miscellaneous other electrical devices); or, (3) the oil released was recently tested and did not contain PCBs.
- (16) Testing for other possible chemical contaminants may be required based on site-specific information.
- (17) The analytical methods NWTPH-Gx, NWTPH-Dx, NWTPH-HCID, VPH, and EPH are methods published by the Department of Ecology and available on the department's Internet web site: <http://www.ecy.wa.gov/programs/tcp/cleanup.html>.



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Vicinity Map

Narrows Marina
Tacoma, Washington

FIGURE

1

JOB NUMBER
15,398.001

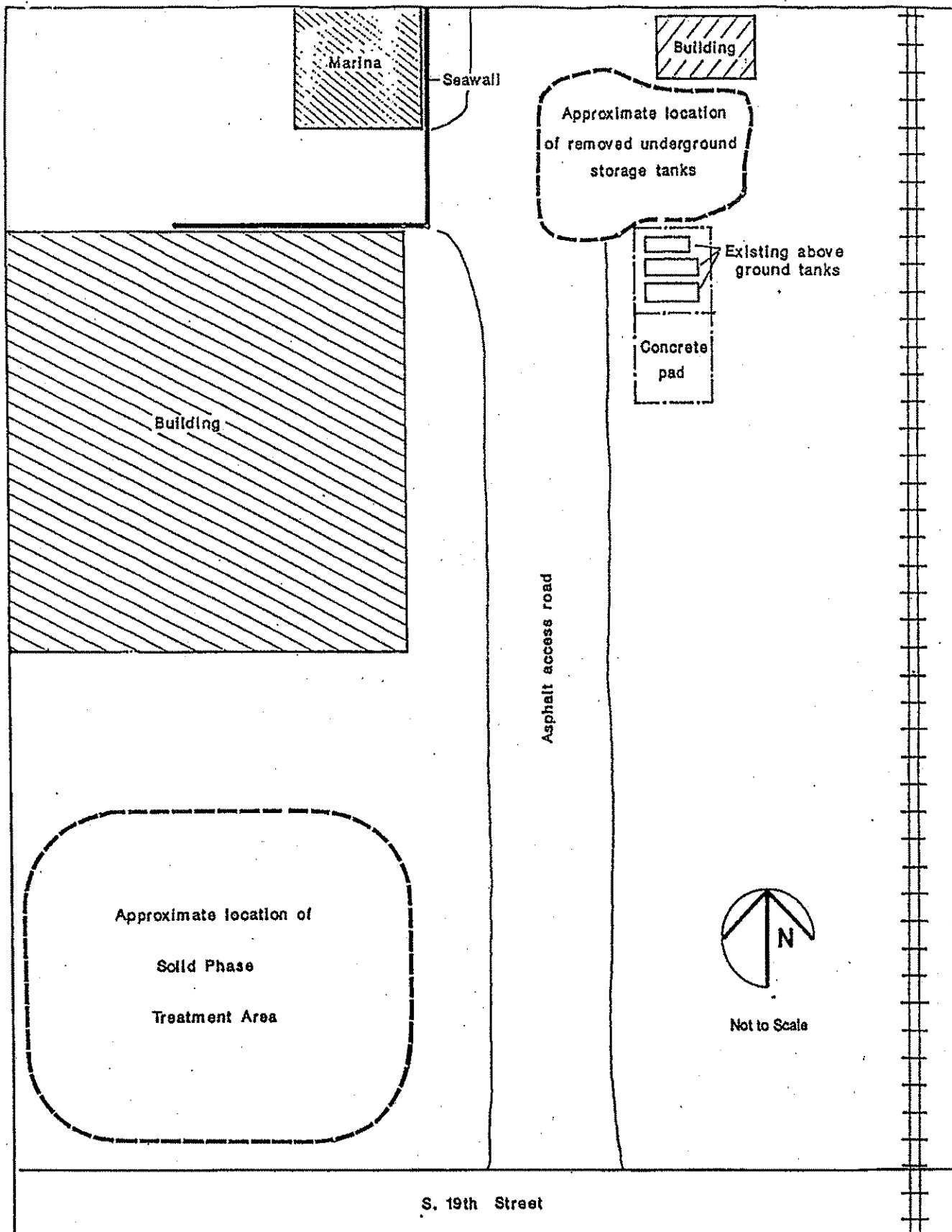
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7 August 89

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Site Sketch
Narrows Marina
Tacoma, Washington

PLATE

2

JOB NUMBER
15,398.001

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TABLE 1
SOIL SAMPLE ANALYTICAL RESULTS
NARROWS MARINA

SAMPLE SOURCE	DEPTH (FEET)	DATE	T P H 8015	BENZENE	ETHYL- BENZENE	TOLUENE	META & PARA XYLENES	ORTHO XYLENE
<u>TANK CAVITY</u>								
EAST WALL	8	6/7/89	37	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
NORTH WALL, FLOOR	11.5	6/7/89	< 5	0.04	< 0.025	< 0.025	< 0.025	< 0.025
SOUTH- SOUTHWEST WALL, FLOOR	11	6/7/89	208	1.04	5.7	3.9	28	6.4
WEST WALL, FLOOR	14	6/7/89	< 5	0.047	< 0.025	< 0.025	0.11	< 0.025
NORTH WALL	8.5	6/8/89	< 5	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
NORTH SIDE, FLOOR	13.5	6/8/89	< 5	0.038	0.095	0.034	0.21	0.043
WEST WALL	9	6/9/89	< 5	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
WEST SIDE FLOOR	12	6/9/89	7	0.16	0.073	0.033	0.19	< 0.025
SOUTH WALL, WEST END	9	6/9/89	21	< 0.025	< 0.025	< 0.025	0.11	< 0.025
MID SOUTH WALL	9	6/9/89	1,400	0.36	2.4	0.41	7.4	0.49
<u>TREATMENT AREA</u>								
QUAD 1	0.0-0.8	6/23/89	95	NA	NA	NA	NA	NA
QUAD 2	0.0-0.8	6/23/89	180	NA	NA	NA	NA	NA
QUAD 3	0.0-0.8	6/23/89	60	NA	NA	NA	NA	NA
QUAD 4	0.0-0.8	6/23/89	88	NA	NA	NA	NA	NA
EAST	0.0-0.8	7/5/89	NA	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
WEST	0.0-0.8	7/5/89	NA	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
ECOLOGY CLEAN-UP GUIDELINES			200	0.56	N/E	N/E	N/E	N/E

NOTES:

1. Units are mg/kg [parts per million (ppm)]
2. < Indicates below detection limit.
3. N/E Indicates not established.
4. N/A Indicates not analyzed.

Table 740-1
Method A Soil Cleanup Levels
for Unrestricted Land Uses.^a

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	20 mg/kg ^b
Benzene	71-43-2	0.03 mg/kg ^c
Benzo(a)pyrene	50-32-8	0.1 mg/kg ^d
Cadmium	7440-43-9	2 mg/kg ^e
Chromium		
Chromium VI	18540-29-9	19 mg/kg ^{f1}
Chromium III	16065-83-1	2,000 mg/kg ^{f2}
DDT	50-29-3	3 mg/kg ^g
Ethylbenzene	100-41-4	6 mg/kg ^h
Ethylene dibromide (EDB)	106-93-4	0.005 mg/kg ⁱ
Lead	7439-92-1	250 mg/kg ^j
Lindane	58-89-9	0.01 mg/kg ^k
Methylene chloride	75-09-2	0.02 mg/kg ^l
Mercury (inorganic)	7439-97-6	2 mg/kg ^m
MTBE	1634-04-4	0.1 mg/kg ⁿ
Naphthalenes	91-20-3	5 mg/kg ^o
PAHs (carcinogenic)		See benzo(a)pyrene ^d
PCB Mixtures		1 mg/kg ^p
Tetrachloroethylene	127-18-4	0.05 mg/kg ^q
Toluene	108-88-3	7 mg/kg ^r
Total Petroleum Hydrocarbons ^s		
[Note: Must also test for and meet cleanup levels for other petroleum components--see footnotes!]		
Gasoline Range Organics		
Gasoline mixtures without benzene and the total of ethyl benzene, toluene and xylene are less than 1% of the gasoline mixture		100 mg/kg
All other gasoline mixtures		30 mg/kg
Diesel Range Organics		2,000 mg/kg
Heavy Oils		2,000 mg/kg
Mineral Oil		4,000 mg/kg
1,1,1 Trichloroethane	71-55-6	2 mg/kg ^t
Trichloroethylene	79-01-6	0.03 mg/kg ^u
Xylenes	1330-20-7	9 mg/kg ^v

Footnotes:

- ^a Caution on misusing this table. This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or for sites with relatively few hazardous substances, and the site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or it can be demonstrated using a terrestrial ecological evaluation under WAC 173-340-7492 or 173-340-7493 that the values in this table are ecologically protective for the site. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in this table should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the soil must be restored to these levels at a site. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.
- ^b Arsenic. Cleanup level based on direct contact using Equation 740-2 and protection of ground water for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.
- ^c Benzene. Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747(4) and (6).
- ^d Benzo(a)pyrene. Cleanup level based on direct contact using Equation 740-2. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).
- ^e Cadmium. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.
- ^{f1} Chromium VI. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- ^{f2} Chromium III. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.
- ^g DDT (dichlorodiphenyltrichloroethane). Cleanup level based on direct contact using Equation 740-2.
- ^h Ethylbenzene. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- ⁱ Ethylene dibromide (1,2 dibromethane or EDB). Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4) and adjusted for the practical quantitation limit for soil.
- ^j Lead. Cleanup level based on preventing unacceptable blood lead levels.
- ^k Lindane. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit.
- ^l Methylene chloride (dichloromethane). Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- ^m Mercury. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- ⁿ Methyl tertiary-butyl ether (MTBE). Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).
- ^o Naphthalenes. Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.
- ^p PCB Mixtures. Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs.

Table 720-1
Method A Cleanup Levels for Ground Water.^a

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	5 ug/liter ^b
Benzene	71-43-2	5 ug/liter ^c
Benzo(a)pyrene	50-32-8	0.1 ug/liter ^d
Cadmium	7440-43-9	5 ug/liter ^e
Chromium (Total)	7440-47-3	50 ug/liter ^f
DDT	50-29-3	0.3 ug/liter ^g
1,2 Dichloroethane (EDC)	107-06-2	5 ug/liter ^h
Ethylbenzene	100-41-4	700 ug/liter ⁱ
Ethylene dibromide (EDB)	106-93-4	0.01 ug/liter ^j
Gross Alpha Particle Activity		15 pCi/liter ^k
Gross Beta Particle Activity		4 mrem/yr ^l
Lead	7439-92-1	15 ug/liter ^m
Lindane	58-89-9	0.2 ug/liter ⁿ
Methylene chloride	75-09-2	5 ug/liter ^o
Mercury	7439-97-6	2 ug/liter ^p
MTBE	1634-04-4	20 ug/liter ^q
Naphthalenes	91-20-3	160 ug/liter ^r
PAHs (carcinogenic)		See benzo(a)pyrene ^d
PCB mixtures		0.1 ug/liter ^s
Radium 226 and 228		5 pCi/liter ^t
Radium 226		3 pCi/liter ^u
Tetrachloroethylene	127-18-4	5 ug/liter ^v
Toluene	108-88-3	1,000 ug/liter ^w
Total Petroleum Hydrocarbons ^x		
[Note: Must also test for and meet cleanup levels for other petroleum components—see footnotes!]		
Gasoline Range Organics		
Benzene present in ground water		800 ug/liter
No detectable benzene in ground water		1,000 ug/liter
Diesel Range Organics		500 ug/liter
Heavy Oils		500 ug/liter
Mineral Oil		500 ug/liter
1,1,1 Trichloroethane	71-55-6	200 ug/liter ^y
Trichloroethylene	79-01-6	5 ug/liter ^z
Vinyl chloride	75-01-4	0.2 ug/liter ^{aa}
Xylenes	1330-20-7	1,000 ug/liter ^{bb}

Footnotes:

- a Caution on misusing this table. This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for drinking water beneficial uses at sites undergoing routine cleanup actions or those sites with relatively few hazardous substances. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, values in this table should not automatically be used to establish cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the ground water must be restored to those levels at all sites. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.
- b Arsenic. Cleanup level based on background concentrations for state of Washington.
- c Benzene. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- d Benzo(a)pyrene. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61), adjusted to a 1×10^{-5} risk. If other carcinogenic PAHs are suspected of being present at the site, test for them and use this value as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).
- e Cadmium. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).
- f Chromium (Total). Cleanup level based on concentration derived using Equation 720-1 for hexavalent chromium. This is a total value for chromium III and chromium VI. If just chromium III is present at the site, a cleanup level of 100 ug/l may be used (based on WAC 246-290-310 and 40 C.F.R. 141.62).
- g DDT (dichlorodiphenyltrichloroethane). Cleanup levels based on concentration derived using Equation 720-2.
- h 1,2 Dichloroethane (ethylene dichloride or EDC). Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- i Ethylbenzene. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- j Ethylene dibromide (1,2 dibromomethane or EDB). Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantitation limit.
- k Gross Alpha Particle Activity, excluding uranium. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).
- l Gross Beta Particle Activity, including gamma activity. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).
- m Lead. Cleanup level based on applicable state and federal law (40 C.F.R. 141.80).
- n Lindane. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- o Methylene chloride (dichloromethane). Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.61).
- p Mercury. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.62).
- q Methyl tertiary-butyl ether (MTBE). Cleanup level based on federal drinking water advisory level (EPA-822-P-97-009, December 1997).
- r Naphthalenes. Cleanup level based on concentration derived using Equation 720-1. This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.
- s PCB mixtures. Cleanup level based on concentration derived using Equation 720-2, adjusted for the practical quantitation limit. This cleanup level is a total value for all PCBs.
- t Radium 226 and 228. Cleanup level based on applicable state and federal law (WAC 246-290-310 and 40 C.F.R. 141.15).
- u Radium 226. Cleanup level based on applicable state law (WAC 246-290-310).

Table 830-1
Required Testing for Petroleum Releases.

	Gasoline Range Organics (GRO) (1)	Diesel Range Organics (DRO) (2)	Heavy Oils (DRO) (3)	Mineral Oils (4)	Waste Oils and Unknown Oil (5)
Volatile Petroleum Compounds					
Benzene	X (6)	X (7)			X (8)
Toluene	X (6)	X (7)			X (8)
Ethyl benzene	X (6)	X (7)			X (8)
Xylenes	X (6)	X (7)			X (8)
n-Hexane	X (9)				
Fuel Additives and Blending Compounds					
Dibromoethane, 1-2 (EDB); and Dichloroethane, 1-2 (EDC)	X (10)				X (8)
Methyl tertiary-butyl ether (MTBE)	X (11)				X (8)
Total Lead and Other Additives	X (12)				X (8)
Other Petroleum Components					
Carcinogenic PAHs		X (13)	X (13)		X (8)
Naphthalenes	X (14)	X (14)	X (14)		X (14)
Other Compounds					
Polychlorinated Biphenyls (PCBs)			X (15)	X (15)	X (8)
Halogenated Volatile Organic Compounds (VOCs)					X (8)
Other	X (16)	X (16)	X (16)	X (16)	X (16)
Total Petroleum Hydrocarbons Methods					
TPH Analytical Method for Total TPH (Method A Cleanup Levels) (17)	NWTPH-Gx	NWTPH-Dx	NWTPH-Dx	NWTPH-Dx	NWTPH-Gx & NWTPH-Dx
TPH Analytical Methods for TPH fractions (Methods B or C) (17)	VPH	EPH	EPH	EPH	VPH and EPH

[Editor's Note: See next page for the footnotes associated with Table 830-1.]

Use of Table 830-1: An "X" in the box means that the testing requirement applies to ground water and soil if a release is known or suspected to have occurred to that medium, unless otherwise specified in the footnotes. A box with no "X" indicates (except in the last two rows) that, for the type of petroleum product release indicated in the top row, analyses for the hazardous substance(s) named in the far-left column corresponding to the empty box are not typically required as part of the testing for petroleum releases. However, such analyses may be required based on other site-specific information. Note that testing for Total Petroleum Hydrocarbons (TPH) is required for every type of petroleum release, as indicated in the bottom two rows of the table. The testing method for TPH depends on the type of petroleum product released and whether Method A or Method B or C is being used to determine TPH cleanup levels. See WAC 173-340-830 for analytical procedures. The footnotes to this table are important for understanding the specific analytical requirements for petroleum releases.

Footnotes:

- (1) The following petroleum products are common examples of GRO: automotive and aviation gasoline, mineral spirits, standard solvents, and naphtha. To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Gx; if NWTPH-HCID results are used for this determination, then 90 percent of the "area under the TPH curve" must be quantifiable using NWTPH-Gx. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present (range can be measured by NWTPH-HCID). (See footnote 17 on analytical methods.)
- (2) The following petroleum products are common examples of DRO: Diesel No. 2, fuel oil No. 2, light oil (including some bunker oils). To be in this range, 90 percent of the petroleum components need to be quantifiable using the NWTPH-Dx quantified against a diesel standard. Products such as jet fuel, diesel No. 1, kerosene, and heating oil may require analysis as both GRO and DRO depending on the range of petroleum components present as measured in NWTPH-HCID.
- (3) The following petroleum products are common examples of the heavy oil group: Motor oils, lube oils, hydraulic fluids, etc. Heavier oils may require the addition of an appropriate oil range standard for quantification.
- (4) Mineral oil means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers and capacitors.
- (5) The waste oil category applies to waste oil, oily wastes, and unknown petroleum products and mixtures of petroleum and nonpetroleum substances. Analysis of other chemical components (such as solvents) than those listed may be required based on site-specific information. Mixtures of identifiable petroleum products (such as gasoline and diesel, or diesel and motor oil) may be analyzed based on the presence of the individual products, and need not be treated as waste and unknown oils.
- (6) When using Method A, testing soil for benzene is required. Furthermore, testing ground water for BTEX is necessary when a petroleum release to ground water is known or suspected. If the ground water is tested and toluene, ethyl benzene or xylene is in the ground water above its respective Method A cleanup level, the soil must also be tested for that chemical. When using Method B or C, testing the soil for BTEX is required and testing for BTEX in ground water is required when a release to ground water is known or suspected.
- (7)(a) For DRO releases from other than home heating oil systems, follow the instructions for GRO releases in Footnote (6).
- (b) For DRO releases from typical home heating oil systems (systems of 1,100 gallons or less storing heating oil for residential consumptive use on the premises where stored), testing for BTEX is not usually required for either ground water or soil. Testing of the ground water is also not usually required for these systems; however, if the ground water is tested and benzene is found in the ground water, the soil must be tested for benzene.
- (8) Testing is required in a sufficient number of samples to determine whether this chemical is present at concentrations of concern. If the chemical is found to be at levels below the applicable cleanup level, then no further analysis is required.
- (9) Testing for n-hexane is required when VPH analysis is performed for Method B or C. In this case, the concentration of n-hexane should be deleted from its respective fraction to avoid double-counting its concentration. n-Hexane's contribution to overall toxicity is then evaluated using its own reference dose.
- (10) Volatile fuel additives (such as dibromoethane, 1-2 (EDB) (CAS# 106-93-4) and dichloroethane, 1-2 (EDC) (CAS# 107-06-2)) must be part of a volatile organics analysis (VOA) of GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for these chemicals.
- (11) Methyl tertiary-butyl ether (MTBE) (CAS# 1634-04-4) must be analyzed in GRO contaminated ground water. If any is found in ground water, then the contaminated soil must also be tested for MTBE.
- (12)(a) For automotive gasoline where the release occurred prior to 1996 (when "leaded gasoline" was used), testing for lead is required unless it can be demonstrated that lead was not part of the release. If this demonstration cannot be made, testing is required in a sufficient number of samples to determine whether lead is present at concentrations of concern. Other additives and blending compounds of potential environmental significance may need to be considered for testing, including: tertiary-butyl alcohol (TBA); tertiary-amyl methyl ether (TAME); ethyl tertiary-butyl ether (ETBE); ethanol; and methanol. Contact the department for additional testing recommendations regarding these and other additives and blending compounds.
- (b) For aviation gasoline, racing fuels and similar products, testing is required for likely fuel additives (especially lead) and likely blending compounds, no matter when the release occurred.
- (13) Testing for carcinogenic PAHs is required for DRO and heavy oils, except for the following products for which adequate information exists to indicate their absence: Diesel No. 1 and 2, home heating oil, kerosene, jet fuels, and electrical insulating mineral oils. The carcinogenic PAHs include benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene, benzo(a)anthracene, and benzo(b)fluoranthene.
- (14)(a) Except as noted in (b) and (c), testing for the non-carcinogenic PAHs, including the "naphthalenes" (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene) is not required when using Method A cleanup levels, because they are included in the TPH cleanup level.
- (b) Testing of soil for naphthalenes is required under Methods B and C when the inhalation exposure pathway is evaluated.
- (c) If naphthalenes are found in ground water, then the soil must also be tested for naphthalenes.
- (15) Testing for PCBs is required unless it can be demonstrated that: (1) the release originated from an electrical device manufactured for use in the United States after July 1, 1979; (2) oil containing PCBs was never used in the equipment suspected as the source of the release (examples of equipment where PCBs are likely to be found include transformers, electric motors, hydraulic systems, heat transfer systems, electromagnets, compressors, capacitors, switches and miscellaneous other electrical devices); or, (3) the oil released was recently tested and did not contain PCBs.
- (16) Testing for other possible chemical contaminants may be required based on site-specific information.
- (17) The analytical methods NWTPH-Gx, NWTPH-Dx, NWTPH-HCID, VPH, and EPH are methods published by the Department of Ecology and available on the department's Internet web site: <http://www.ecy.wa.gov/programs/tcp/cleanup.html>.

