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**CONFIRMATIONAL MONITORING AND
INSPECTION PLANS
FORMER PACCAR DEFENSE SYSTEMS SITE
RENTON, WASHINGTON**

**Prepared for:
PACCAR Inc.**

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

November 1997

EXECUTIVE SUMMARY **CONFIRMATION MONITORING PLAN** **PACCAR, RENTON SITE**

BACKGROUND AND PURPOSE

The Cleanup Action Plan (CAP) approved by the Washington State Department of Ecology (Ecology) in September 1991 requires that PACCAR develop Confirmation Monitoring Plans to assess the success of the remediation at the former PACCAR Defense Systems site located in Renton, Washington. The major goals of the remediation were to meet ground water and surface water *cleanup levels* at the site boundary (point of compliance) and to prevent contact with contaminants that remain on the site. The cleanup actions completed at the site include:

- Excavating and treating soils above *hot-spot action levels* using solidification (for metals) and bioremediation (for soils containing petroleum residues).
- Excavating and disposing off-site a small volume of soil and sediment containing PCBs and CPAHs above hot-spot action levels.
- Covering the remaining soils above cleanup levels with structural fill or pavement to prevent:
 - direct contact with contaminated soil;
 - erosion of contaminated soil; and
 - generation of contaminated dust.

The Confirmation Monitoring Plan, as required by the CAP, addresses the following elements:

- Ground-Water Quality Monitoring,
- Surface Water Quality Monitoring, and
- Monitoring the Integrity of the Structural Fill and Pavement Covers.

Collectively, these plan elements provide for monitoring conditions at the PACCAR site to assess that the completed remediation is sufficiently protective of human health and the environment.

GROUND-WATER QUALITY MONITORING PLAN

Ground-water quality monitoring at the site is required to meet two objectives:

- Assess the performance of the remedy at the point of compliance (site boundary); and
- Confirm that ground-water quality is not impacted from the leaching of metals from stabilized soils that contain metals above hot-spot action levels.

The ground-water monitoring program was developed using guidance provided by Ecology and the results of monitoring completed since 1984. Analysis of hydrologic data indicates

that the western and southern portions of the site are downgradient with respect to ground-water flow directions. Ground water beneath most of the site flows towards the Cedar River. A small amount of the site's flow beneath the south-southeastern portion of the site potentially flows towards the Renton well field.

The CAP identifies benzene, vinyl chloride, lead, and arsenic as the ground-water contaminants of concern. Analyses for carcinogenic polycyclic aromatic hydrocarbons (CAPHs), petroleum hydrocarbons (TPH) and chromium will also be made because these constituents remain in site soils above cleanup levels. Analyses for pentachlorophenol (PCP) will be made because PCP was detected in several recent ground-water samples.

- The confirmational monitoring program will begin in March 1998 and will continue to October 2012 (15 years). Monitoring beyond 2012 may be required if cleanup levels are not achieved.
- Ground-water monitoring will be completed in twenty-one (21) existing and nine (9) to be installed wells (see Figures E-1 and E-2 for well locations; Table E-1 summarizes the monitoring schedule).

SURFACE WATER QUALITY MONITORING PLAN

Surface water quality monitoring at the site is required to assess that surface water cleanup levels are met at the point of compliance that is defined as the site boundary where surface water leaves the site.

- Sampling will be completed twice per year (March and October) at five locations. Four of the locations are where surface water leaves the site. The fifth location is "upstream" of the site and will provide data on the quality of urban runoff in areas adjacent to the site.
- Analyses will be made for metals, CAPHs, PCBs, petroleum hydrocarbons and vinyl chloride.

STRUCTURAL FILL AND PAVEMENT COVERS MONITORING PLAN

- Inspection of the structural fill (and pavement) covers will be completed on an annual basis to ensure that the cover systems maintain their integrity.
- The inspection will consist of observing the condition of the cover to identify areas where the cover integrity may have been compromised by erosion, excavation, settlement, rutting, etc. Repairs will be recommended and completed as necessary.

TABLE E-1 - GROUND-WATER QUALITY MONITORING SCHEDULE

		Year		1		2		3		4		5		6		7		8		9		10	
Well Number	Screen Depth (feet)	Zone	March 1998	October 1998	March 1999	October 1999	March 2000	October 2000	March 2001	October 2001	March 2002	October 2002	March 2003	October 2003	March 2004	October 2004	March 2005	October 2005	March 2006	October 2006	March 2007	October 2007	
Confirmation Upper Sand/Aquitard Wells																							
OSP-7S(a)	12-17	upper sand	VTALC	VTALC	VTALC	(b)	VTALC	(b)	VTALC	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
LW-6S	4-9	fill/upper aquitard	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
LW-9S	9-14	fill/upper aquitard	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
MW-3I	16-21	upper sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
U1S	10-20	upper sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
A(S)*	target 15-20	upper sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
B(S)*	target 10-15	upper sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
C(S)*	target 15-20	upper sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
Confirmation Lower Sand/Delta Deposits																							
OSP-7D(a)	30-35	lower sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
LW-6D	27-37	lower sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
LW-9D	28-38	lower sand	VTAPe	VTAPe	VTA	(b)	VTA	(b)	VTA	(b)	VPTALCPe	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
OSP-2D	34-44	lower sand/delta	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
OSP-3D	37-47	lower sand/delta	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
OSP-4D	40-45	lower sand/delta	VTAPe	VTAPe	VTA	(b)	VTA	(b)	VTA	(b)	VPTALCPe	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALCPe	(c)	(c)	
OSP-5D	47-52	lower sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
OSP-6D	36-46	lower sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
MW-10	23-33	upper sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
A(D)*	target 35-45	lower sand	VTAPe	VTAPe	VTA	(b)	VTA	(b)	VTA	(b)	VPTALCPe	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
B(D)*	target 35-45	lower sand	VTAPe	VTAPe	VTA	(b)	VTA	(b)	VTA	(b)	VPTALCPe	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
C(D)*	target 35-45	lower sand	VTA	VTA	VTA	(b)	VTA	(b)	VTA	(b)	VPTALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
D(D)*	target 35-45	lower sand	VTAPe	VTAPe	VTA	(b)	VTA	(b)	VTA	(b)	VPTALCPe	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	(c)	
Stabilized Cell Wells																							
OW-4S	12-22	upper sand	TALC	TALC	TALC	(b)	TALC	(b)	TALC	(b)	TALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
OSP-7S	12-17	upper sand	see above	see above	see above	(b)	see above	(b)	see above	(b)	see above	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
LW-7S	5-10	fill/upper aquitard	ALC	ALC	ALC	(b)	ALC	(b)	ALC	(b)	ALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
SC-1(S)*	target 10-15	upper sand	ALC	ALC	ALC	(b)	ALC	(b)	ALC	(b)	ALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
SC-2(S)*	target 10-15	upper sand	ALC	ALC	ALC	(b)	ALC	(b)	ALC	(b)	ALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
Information Wells																							
OSP-1S	12-22	upper sand	ALC	ALC	ALC	(b)	ALC	(b)	ALC	(b)	ALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
OSP-1D	41-51	lower sand	ALC	ALC	ALC	(b)	ALC	(b)	ALC	(b)	ALC	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	
OW-4D	36-46	lower sand	TA	TA	TA	(b)	TA	(b)	TA	(b)	TA	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	TA	(c)	(c)	
R-10(S)	4-9	upper sand	VPe	VPe	V	(b)	V	(b)	V	(b)	VPe	(b)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	V	(c)	(c)	

Refine Monitoring Program Based on 1997-98 Data

Five Year Review

Five Year Review

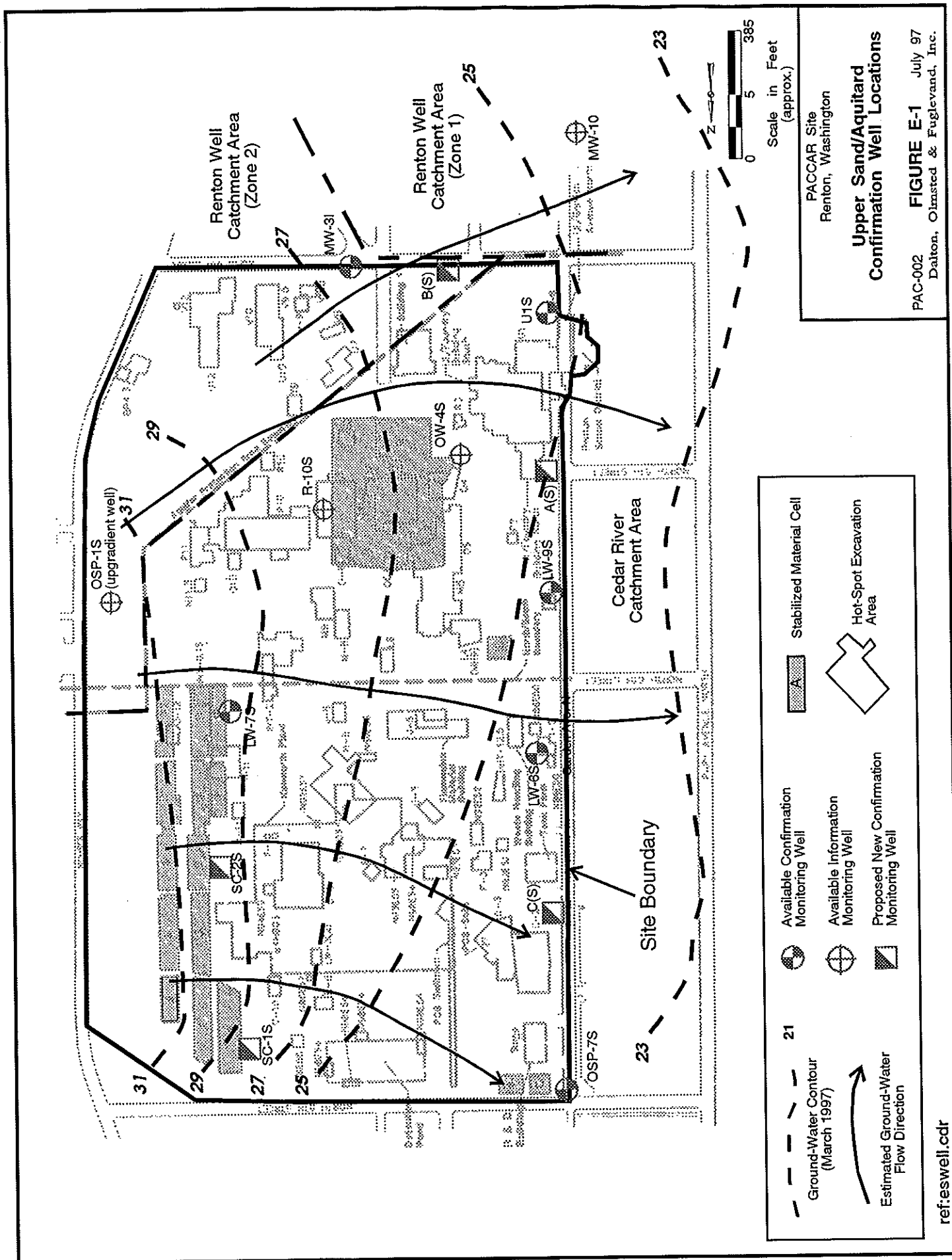
Notes: (a) - Sampling schedule based on results from wells LW-1S and LW-1D.
(b) - Sampling for indicated monitoring parameter will be based on results of sampling completed between March 1997 and October 1998 (see text).
(c) - Sampling for indicated monitoring parameter will be based on results of the 5-year review (see text).
V- Volatile Organic Compounds
T - Total Petroleum Hydrocarbons
A - Arsenic
L - Lead
C - Chromium
P - Carcinogenic Polycyclic Aromatic Hydrocarbons
Pe - Pentachlorophenol
---- - Sampling for indicated monitoring parameter will be based on results of sampling completed between March 1997 and October 1998.
* - Proposed new wells

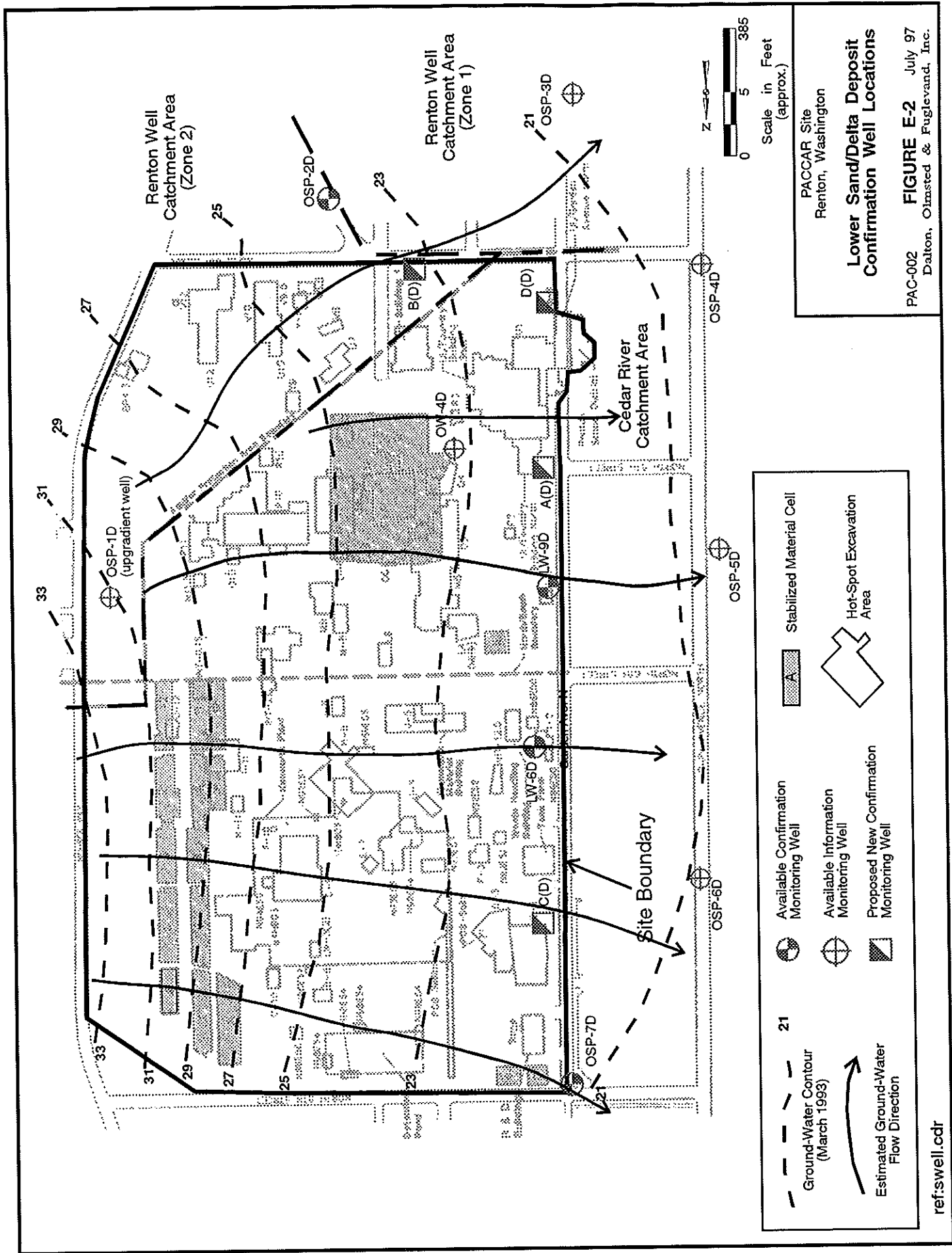
TABLE E-1 - GROUND-WATER QUALITY MONITORING SCHEDULE

Well Number	Screen Depth (feet)	Zone	Year		11		12		13		14		15	
			March 2008	October 2008	March 2009	October 2009	March 2010	October 2010	March 2011	October 2011	March 2012	October 2012		
Confirmation Upper Sand/Aquitard Wells														
OSP-7S(a)	12-17	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
LW-6S	4-9	fill/upper aquitard	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
LW-9S	9-14	fill/upper aquitard	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
MW-3I	16-21	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
U1S	10-20	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
A(S)*	target 15-20	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
B(S)*	target 10-15	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
C(S)*	target 15-20	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
Confirmation Lower Sand/Delta Deposits														
OSP-7D(a)	30-35	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
LW-6D	27-37	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
LW-9D	28-38	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)	
OSP-2D	34-44	lower sand/delta	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
OSP-3D	37-47	lower sand/delta	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
OSP-4D	40-45	lower sand/delta	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)	
OSP-5D	47-52	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
OSP-6D	36-46	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
MW-10	23-33	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
A(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)	
B(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)	
C(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)	
D(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)	
Stabilized Cell Wells														
OW-4S	12-22	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	TALC	(c)	
OSP-7S	12-17	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	see above	(c)	
LW-7S	5-10	fill/upper aquitard	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)	
SC-1(S)*	target 10-15	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)	
SC-2(S)*	target 10-15	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)	
Information Wells														
OSP-1S	12-22	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)	
OSP-1D	41-51	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)	
OW-4D	36-46	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	TA	(c)	
R-10(S)	4-9	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	V _{Pe}	(c)	

Five Year Review

Notes: (a) - Sampling schedule based on re:
(b) - Sampling for indicated monitorin
sampling completed between IV
(c) - Sampling for indicated monitorin
the 5-year review (see text).
V- Volatile Organic Compounds
T - Total Petroleum Hydrocarbons
A - Arsenic
L - Lead
C - Chromium
P - Carcinogenic Polycyclic Aromatic
Pe - Pentachlorophenol
---- - Sampling for indicated monitorir
sampling completed between IV
* - Proposed new wells





**CONFIRMATIONAL MONITORING AND INSPECTION PLANS
FORMER PACCAR DEFENSE SYSTEMS SITE
RENTON, WASHINGTON**

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Dalton, Olmsted & Fuglevand, Inc.

Confirmation Monitoring and Inspection Plans
Former PACCAR Defense Systems Site, Renton, Washington
November 1997

Appendix B - Ground Water and Surface Water Sampling Procedures
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Ref: MONPLNR_FD

**CONFIRMATIONAL MONITORING AND INSPECTION PLANS
FORMER PACCAR DEFENSE SYSTEMS SITE
RENTON, WASHINGTON**

INTRODUCTION

Scope and Organization

The following Confirmational Monitoring and Inspection Plans were prepared as required in Section 6. COMPLIANCE MONITORING of the Final Cleanup Action Plan (CAP) (Ecology 1991) for the former PACCAR Defense Systems site located in Renton, Washington (Figure 1). The CAP requires that PACCAR develop Confirmational Monitoring Plans for ground water and surface water. The CAP also requires that an "inspection plan" be developed to ensure that the structural fill and pavement cover maintains its integrity.

This document contains five major sections including this **INTRODUCTION** section. The other major sections are:

- **PROJECT BACKGROUND;**
- **GROUND-WATER MONITORING;**
- **SURFACE WATER MONITORING;** and
- **STRUCTURAL FILL INSPECTION.**

Tables and figures which support these sections follow at the end of the text.

The Cleanup Action Plan (CAP) (Ecology 1991) for the site outlines the general requirements for monitoring at the site. Monitoring is required based on WAC 173-340-360(8)(b) which states:

"Long-term monitoring (WAC 173-340-410) and institutional controls (WAC 173-340-440) shall be required if on-site disposal, isolation, or containment is the selected cleanup action for the site or a portion of the site. Such measures shall be required until residual hazardous substance concentrations no longer exceed site cleanup levels established under WAC 173-340-700 through WAC 173-340-760."

Monitoring at the PACCAR site, as required in the CAP and outlined in this plan, will continue as long as residual hazardous substance concentrations remain above cleanup levels. The distribution of monitoring between the three plan elements (ground water, surface water, structural fill), however, is anticipated to change with

time. If technical data demonstrate that cleanup levels are met in ground water, exposure risk at the site would be limited to direct soil contact and/or runoff in surface water. Ground-water monitoring may then be reduced or eliminated as discussed in the ground-water monitoring portion of this plan.

PROJECT BACKGROUND

Required Cleanup Actions and Status of Remediation

The Cleanup Action Plan (CAP) for the PACCAR site was approved by Ecology in September 1991 after completion of a Remedial Investigation (RI) and Feasibility Study (FS) and after public review. The cleanup actions contained in the CAP include:

- Excavating and treating soil which exceed Hot-Spot Action Levels (HSALs) using solidification (for metals) and bioremediation (for petroleum residues).
- Excavating and disposing off-site a small volume of soil and sediment containing polychlorinated biphenyls (PCBs) and carcinogenic polycyclic aromatic hydrocarbons (CPAHs) above HSALs.
- Covering the site with structural fill or pavement to prevent:
 - direct contact with contaminated soil;
 - erosion of contaminated soil; and
 - generation of contaminated dust.
- Implementing institutional controls. One of these controls consists of restricting on-site extraction of ground water.
- Developing and implementing a compliance monitoring plan. The required monitoring and inspection plans are to be based on "*data collected as part of the remedial investigation, interim water quality monitoring program, and other studies*" (Ecology 1991).

The PACCAR site is 80 acres in size. The north 40 acres were initially remediated to allow construction of the existing Kenworth Truck Plant (Figure 2). The truck plant began operation in May 1993. Remediation of the south 40-acres was substantially completed in October 1997.

Excavation of soils (Figure 2) required by the CAP was completed in December 1995. Soils which contained metals above action levels were stabilized and placed in cells at the locations shown on Figure 2. Stabilization activities were completed in 1994. Excavated soils which contained petroleum hydrocarbons above action levels

were bioremediated and placed back on the site. Bioremediation of soils containing petroleum hydrocarbons was completed in October 1997.

Site Hydrogeology

The PACCAR site is located in the Cedar River Valley north of downtown Renton and south of Lake Washington (Figure 3). The valley was created by glacial erosion and has since been partially filled with glacial and non-glacial sediments. Glacial drift uplands define the valley perimeter to the east and south, while bedrock defines the perimeter to the west.

The most recent deposits which fill the valley are delta fan and alluvial deposits of the Cedar River estimated to be roughly 100 feet thick in the Renton area (Figure 4). Several hundred feet of very dense glacial and interglacial materials underlie the valley deposits. The coarser portions of the delta fan deposits make up the Cedar River Aquifer which provides water to the Renton wells. These fan deposits consist of coarse gravel and cobbles near the former river mouth (in the vicinity of the Renton well field) and grade progressively finer-grained in a radial outward direction (toward the site and Lake Washington). The estimated extent of the very coarse deposits which comprise the Cedar River Aquifer is shown on Figure 3. Fan deposits that occur beneath the site are likely to be predominately sand and silty sand. Overlying the delta fan deposits are more alluvial deposits of the Cedar River consisting of sand, gravel, silt and peat. The deposits generally become finer grained and more interbedded beneath the PACCAR site

For discussion and analysis purposes, the geologic system beneath and in the vicinity of the site was divided into several ground-water units. To clarify the specific deposits screened by the proposed confirmation wells, the logs of existing wells and geotechnical subsurface profiles developed (by Hart Crowser) for the Kenworth truck plant were used to refine the geologic sections presented in the Hart Crowser (1989) Remedial Investigation (Figures 5.2 and 5.3 of the RI, Sections A-A', B-B' and C-C'). Geologic sections A-A', B-B' and C-C' were revised and two additional geologic sections (D-D' and E-E') were constructed to show the zones screened by the proposed confirmation wells. Trends of the geologic sections are shown on Figures 5 and 6. Geologic sections are shown on Figures 7 to 10. The geologic units that underlie the PACCAR site are described below:

Upper Fill/Aquitard: This unit is comprised of variable materials including fill, silt/clay, and peat layers that generally lie at an elevation higher than 15 feet. The fill materials are comprised of sand and gravel (including backfill placed as part of the remediation) with, in some places, fragments of scrap metal, brick, coal, slag, ash, and wood. The fill overlies a silty sand/sandy silt material about 5 to 10 feet thick, although this material may be absent beneath some parts of the site.

Upper Sand: The Upper Sand unit underlies the Upper Fill/Aquitard unit between an approximate elevation of 0 and 15 feet and generally consists of fine to medium sand with some gravelly and/or silty zones. Beneath portions of the site, the Upper Sand is interbedded with the overlying Upper Fill/Aquitard and underlying Middle Aquitard (discussed below). The Upper Sand appears to grade into the Lower Sand unit beneath the northeastern portion of the site (see Figure 8; C-C'), although the geologic data is not sufficient to assess specific relationships. The data suggest that the valley wall may have been encountered in well DM-5D. The Upper Sand grades into the delta-fan deposits south of the site (see Figures 7 and 8; A-A', C-C').

Middle Aquitard: This unit lies under or is interbedded with the Upper Sand beneath most of the site. It consists of interbedded peat, clay, silt and sand that lie between an approximate elevation of 0 to 15 feet. The Middle Aquitard disappears south of the site (see Figure 7; A-A') and beneath the northeastern portion of the site (see Figure 8; C-C').

Lower Sand: The Lower Sand unit underlies the Middle Aquitard beneath much of the site between an approximate elevation of 0 and -30 feet. Beneath the northwestern portion of the site the Lower Sand is interbedded with the Middle and Lower Aquitards. It is comprised mostly of fine to medium sand with occasional silty and gravelly zones. The Lower Sand lies immediately beneath the Upper Sand within the northeastern portion of the site, where geologic data indicates the Middle Aquitard disappears. The Lower Sand materials grade coarser into the Delta-Fan deposits to the south.

Delta-Fan Deposits: Coarse grained deposits of sand and gravel are present south of and beneath the southern portion of the PACCAR site. These materials were deposited as a delta-fan and comprise the Cedar River Aquifer tapped by the Renton well field (see Figures 3, 4 and 7, Section A-A').

Lower Aquitard and Dense Glacial Sands: These units underlie the Lower Sand and Delta-Fan deposits. The Lower Aquitard is composed of fine grained silt and clay deposits that formed the valley floor prior to deposition of the overlying Delta Fan and Lower Sand deposits. Underlying the Lower Aquitard are very Dense Glacial Sands.

The current evaluation (see Figures 8 to 10, C-C', D-D' and E-E' of this memorandum) revises the geologic interpretation presented in Figures 5.2 and 5.3, Sections A-A', B-B' and C-C' of the 1989 RI. On Figure 5.3, the "*Middle Aquitard*" designation is changed to "*Lower Aquitard*" and the "*Lower Sand*" is changed to "*Dense Glacial Sands*". The change is made based on geotechnical testing for construction of the truck plant. This testing indicates that very dense glacial deposits (Dense Glacial Sands) are present at a higher elevation as compared to the geology presented in the 1989 RI. The testing also indicates that fine grained silt/clay deposits separate the Lower Sand from the Dense Glacial Sands.

The elevation of the top of the fine grained Lower Aquitard deposits beneath the site ranges between approximately -19 and -66 feet (Figure 11). The elevation of this unit is highest beneath the northeastern portion of the site and is lowest beneath the southern portion of the site.

Ground-Water Flow Directions and Aquifer Protection Program

Ground-water Flow Directions: As part of the RI and later ground-water monitoring, regular water level measurements were made and ground-water flow maps were prepared. Ground-water flow maps are available for measurements made since mid-1986 (over ten years).

Figures 12 and 13 show the estimated flow directions in the Upper Aquitard/Upper Sand and Lower Sand/Delta Deposit ground-water zones based on data collected in March 1993 and March 1997. These periods are considered to be representative (accounting for water level elevation fluctuations) of the general flow directions beneath the site based on review of the available flow maps prepared through March 1997. As shown on the figures, ground water flows in a generally westerly and southwesterly direction beneath the site in both zones and indicate that the western and southern site boundaries are located on the downgradient sides of the PACCAR site. The ground-water flow maps also indicate that site remediation and construction of the truck plant have not discernibly altered the ground-water flow patterns presented in the RI.

Aquifer Protection Program: The City of Renton conducted a well field protection study to define the boundaries of an Aquifer Protection Area (APA) that was incorporated into a city ordinance. Ground-water flow directions indicate that a majority of the site is separated from the City of Renton well field by a ground-water divide. Ground-water on the north side of the divide flows towards the Cedar River downstream of the well field while ground water on the south side potentially flows towards the well field. These two areas are termed the Cedar River and Renton Well Catchment Areas, respectively.

The APA consists of two zones: Zone 1 and Zone 2 (Figure 2). Certain land use activities are restricted within each zone with the intent of minimizing the possibility of aquifer contamination within the "capture area" of the well field. None of the PACCAR site falls within Zone 1. However, a portion of the southeast corner of the site falls within Zone 2 (Figures 2, 12 and 13).

GROUND-WATER MONITORING PLAN

Ground-water Quality Background Information

An extensive ground-water quality database for the PACCAR site was developed during completion of several projects including a Remedial Investigation (RI) and Feasibility Study (FS) (Hart Crowser 1989, 1990a) and sampling conducted as part of the Ecology-approved Interim Water Quality Monitoring Program (Dalton, Olmsted & Fuglevand, Inc., 1990a and 1990b). Ground-water samples have been obtained from on-site and off-site wells since June of 1984. Through March of 1997 over 75 wells (well locations are shown on Figure 5) were sampled one or more times and over 200 samples were analyzed for a variety of constituents including priority pollutants:

- Volatile and Semivolatile (Extractable) Organic Compounds;
- Pesticides and PCBs; and
- Total and dissolved metals.

Based on the analyses of the ground-water samples as part of the remedial investigation for the constituents listed above, arsenic, lead, benzene and vinyl chloride were identified in the CAP as the ground-water contaminants of concern. Of these contaminants, only vinyl chloride exceeded drinking water standards in off-site wells (only within the Cedar River catchment area). Additional information regarding ground-water quality is contained in the RI/FS (Hart Crowser 1989, 1990a), CAP (Ecology 1991) and Interim Water Quality Monitoring Reports (Hart Crowser, 1997 and references contained therein).

Ground-Water Cleanup Levels

Ground-water quality monitoring at the site is required to meet two objectives:

- Assess the performance of the remedy at the point of compliance; and
- Confirm that ground-water quality is not impacted from leaching of metals from stabilized soil which contains metals above the hot-spot action levels.

Since containment was selected as part of the soil remediation program, a confirmational monitoring program which ensures the protection of ground water and surface water was required by the CAP. The CAP anticipated that the contaminants of concern which would remain in soil above cleanup levels would include arsenic, chromium, lead, CPAHs, PCBs and petroleum hydrocarbons (TPH).

The CAP identified arsenic, lead, vinyl chloride and benzene as the ground-water contaminants of concern (see Section 5.4). Both cleanup levels (CULs) and HSALs for ground-water contaminants of concern are presented in the CAP (see sections 3.6.2 and 5.4). These levels are:

	Cleanup Level (mg/l)	Hot-Spot Level (mg/l)
• Arsenic	0.005	0.05
• Vinyl Chloride	0.0004	0.002
• Benzene	0.005	0.005
• Lead	0.005	0.05

The CULs were set based on the procedures and requirements of the Model Toxics Control Act (MTCA) (Method B) and are the target goals for remediation of ground water at the PACCAR site. The HSALs are based on drinking water standards - maximum contaminant levels or MCLs - that, in some cases, are higher than the MTCA cleanup levels.

HSALs were developed to provide a standard to determine whether "active" remediation of ground water (such as pump and treat) should, in the future, be required at the site. If ground-water concentrations still exceed the HSALs beyond a reasonable period of time (at the point of compliance and well after soil remediation is complete) then active remediation may be required. Conversely, if the concentrations are below a HSAL but above the CUL, then active remediation will not be required and monitoring will continue. The CAP also allows the monitoring frequency, locations and parameters to be reduced with Ecology approval.

The CAP anticipated that excavation and treatment (stabilization) of soil containing the highest metals concentrations would bring the ground water metals concentrations below the Safe Drinking Water Act (SDWA) MCLs. Soil quality data collected during the Remedial Investigation (RI) (Hart Crowser 1989) indicated no current on-site source of either vinyl chloride or parent chemicals. Based on this data and on declining concentrations in ground water, it was anticipated that vinyl chloride concentrations would decline to below SDWA MCLs in three to five years after the remediation was completed. If such a decline were to occur, or occurred in a reasonable period of time after the initial five years of monitoring, active ground-water remediation would not be required.

In addition to the ground-water contaminants of concern, several other parameters will also be included in the monitoring because they are present in remaining site soils and stabilized materials or were detected above MTCA cleanup levels in ground-water samples (i.e. pentachlorophenol - PCP). These parameters and cleanup/hot-spot action levels are:

	Cleanup Level (mg/l)	Hot-Spot Level (mg/l)
• Chromium	0.08(a)	0.10(b)
• CPAHs(c)	0.0001	(e)
• TPH	1(d)	(e)
• PCP	0.00073(a)	0.001(b)

- (a) - Based on MTCA Method B for chromium (VI) and PCP.
- (b) - Based on drinking water MCLs for total chromium and PCP.
- (c) - CPAHs are benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd) pyrene (WAC 173-340-200)
- (d) - Non-health based standard set for prevention of adverse aesthetic water quality characteristics {WAC 173-340-720(2)}
- (e) - Maximum Contaminant Levels are not available for these contaminants. A HSAL will be developed based on the specific compounds which cause an exceedance of cleanup levels, as appropriate.

Point of Compliance

The ground water point of compliance is the site boundary (shown on Figure 2) consistent with WAC 173-340-720(6)(c) and Section 3.6.2 of the CAP. A conditional point of compliance is used because the site cleanup used all practicable methods of treatment and the on-site extraction of ground water for drinking water use is restricted as part of the institutional controls.

Comparison of Ground-Water Quality Data with Cleanup Levels

Ground-water quality sampling has been conducted on and in the vicinity of the PACCAR site since June of 1984 (over ten years). Since completion of the RI in 1989, ground-water monitoring has been completed on a regular basis according to the Ecology approved interim long-term monitoring plan (DOF 1990b). Sampling is conducted on a semiannual and annual basis. The last sampling event for which data is available occurred in March 1997. Analyses are made for volatile organic compounds (EPA Method 8240/8260), semivolatile organic compounds (EPA Method 8270), and dissolved arsenic and lead as part of the long-term monitoring program.

A summary of the ground-water quality data collected since July 1988 for site boundary wells is presented in the March 1997 Hart Crowser (1997) monitoring report. In June 1995 a comprehensive evaluation of the existing data was submitted to Ecology (DOF 1995). This analysis indicated that concentrations of several ground-water contaminants of concern had declined in concentration (e.g. vinyl chloride) and that several of the constituents likely meet cleanup standards (e.g. lead and benzene). The analysis also indicated that other constituents analyzed routinely

by the analytical methods used were below cleanup levels developed using the procedures specified in the Model Toxics Control Act.

Attainment Evaluation Procedures for Ground-Water Contaminants of Concern: Guidance published by Ecology (Ecology 1992;1995 - Section A6.0) provide statistical procedures to evaluate whether contaminants of concern in ground water have attained CULs. At the PACCAR site these contaminants include arsenic, vinyl chloride, benzene, and lead. In addition, the CAP identified chromium, CPAHs, PCBs and TPH to be of potential concern because of their presence in soil and stabilized materials. Pentachlorophenol is also of potential concern because it was detected in ground-water samples from several wells.

Comparison of sample data with CULs is to be done on a well by well basis. Because a large number of non-detects are anticipated once concentration stability is reached in various well samples, a nonparametric statistical procedure will be used to evaluate when attainment is achieved. The selected procedure is based on the 95% confidence limit for the median. This nonparametric procedure is outlined in Section 5.3.3 of the Ecology statistical guidance (Ecology 1992). In addition, no sample concentration can exceed twice the cleanup level, and less than 10% of the samples can exceed the cleanup level.

Aquifer Stability: Approximately ten years of water level data indicates that ground-water flows generally in a westerly direction beneath the site within both the Upper Aquitard/Sand and Lower Sand/Delta Deposit zones. Assessment of ground-water flow directions indicates that site remediation or construction of the truck plant have not impacted the hydrologic conditions beneath the site. This finding is supported by the vinyl chloride concentration data collected from locations LW-6 and LW-9. As shown on Figure 21, vinyl chloride concentrations have shown a consistent decline through the remedial period. Based on this data, it is not anticipated that contaminant concentrations will "increase" after completion of the remediation, as sometimes occurs when an active ground-water remedy, such as pump and treat, is employed. Therefore, site water quality data which has been collected as part of the Interim Water Quality Monitoring Program can be used to assess whether cleanup levels are currently being achieved at the site boundary.

The contaminants of concern detected in soil and/or ground water are discussed below. Appendix A provides a well by well summary (for point of compliance wells) for the CAP ground-water contaminants of concern. Tables 1 to 5 provide a summary of available data collected since 1988 for arsenic, vinyl chloride, lead, benzene, and CPAHs. Table 6 provides a summary of the ground-water quality attainment status based on the assessment summarized in Appendix A.

Arsenic - The CAP soil CUL of 20 mg/kg was based on the soil/dust ingestion exposure pathway. Total arsenic concentrations in soil ranged from 1 mg/kg to 180 mg/kg with the majority of sample concentrations falling within the 2 mg/kg and 10

mg/kg range. The Puget Sound background concentration for arsenic in soils is approximately 7 mg/kg (Ecology 1994). The CAP hot-spot action level for arsenic was 100 mg/kg. Materials containing arsenic concentrations above 100 mg/kg were excavated and stabilized on-site.

Arsenic was identified to be a contaminant of concern in ground water because arsenic was detected above the CAP cleanup level of 5 ug/l. The CAP identifies both a CUL (5 ug/l) and a HSAL (50 ug/l). In the past, the highest concentrations of dissolved arsenic were detected in wells OSP-4D (62 ug/l) and LW-12S (55 ug/l) (Table 1). Lower concentrations between 5 ug/l and 28 ug/l were detected in other site boundary wells (MW-10, MW-3I, LW-6D, LW-9D, OW-4D, LW-9S, OSP-6D and LW-5D). Arsenic concentrations above 5 ug/l have also been detected in upgradient well OSP-1S.

Wells along the portion of the site boundary which appear to exceed the arsenic ground-water cleanup level are shown on Figure 14 and Figure 15. One recent sample concentration from an off-site well (OSP-4D) exceeds the HSAL.

The trends of arsenic concentrations with time for selected wells are shown on Figures 16, 17, and 18. Through early 1996, the data indicated that arsenic concentrations declined in ground water beneath the site. The most consistent decline occurred in well MW-3I (Figure 18) where concentrations declined from 17 ug/l to less than 5 ug/l from November 1988 to March 1995. However, arsenic concentrations increased in many of the well samples collected in March 1997. Additional sampling is required to assess the cause of the March 97 increases.

The available data suggest that at least some of the arsenic detected in the wells may be the leaching of naturally occurring arsenic in soil beneath the water table. While this may not be relevant in assessing compliance with ground-water CUL, it is important to understand the nature and cause of an exceedance in assessing trends and possible corrective actions.

Arsenic is a naturally occurring element in soil. The solubility of arsenic is, in part, effected by pH and Eh (redox potential) of water (Welch et al, 1988). In water, arsenic is generally present as arsenate, arsenite, or both depending on the pH and Eh conditions. Under anaerobic conditions, arsenite would be the predominate species present. Arsenite compounds are reported to be four to ten times more soluble in water than arsenate compounds (Bodek et al, 1988). Anaerobic conditions in ground water beneath the site are indicated by the following:

- Data at the site indicate that vinyl chloride was produced by the degradation of other solvents. This degradation process generally occurs under anaerobic conditions.
- The highest arsenic concentrations have been detected downgradient of the LW-12 tank area where the release of diesel/fuel oil has occurred. The biodegradation of petroleum constituents in ground water uses oxygen and can locally create anaerobic conditions favorable for the leaching of naturally occurring arsenic.

Continued monitoring of arsenic concentrations in ground water is necessary to assess the concentration trends (i.e. concentration stability has not been achieved to date) in ground-water samples from several wells and to assess attainment of the CULs in accordance with Ecology guidance.

Vinyl Chloride - Vinyl chloride was identified as a contaminant of concern based on detections in ground water. A summary of vinyl chloride analyses in site boundary wells is presented in Table 2 and Appendix A. A maximum concentration of 120 ug/l was detected in ground water from well LW-9D in July 1988. Vinyl chloride concentrations have been consistently detected in perimeter and downgradient wells LW-6D, LW-9D, and OSP-5D. The vinyl chloride detections have occurred within the west-central and southern portions of the site (Figures 19 and 20).

Vinyl chloride concentrations have declined with time as anticipated by the CAP. Figure 21 shows concentrations of vinyl chloride with time in wells LW-6S, LW-6D, LW-9S and LW-9D while Figure 22 shows the concentrations with time in downgradient wells OSP-5S and OSP-5D. The latest sampling of wells at and near the site perimeter (point of compliance) indicates that vinyl chloride concentrations are at or below the HSAL (based on the drinking water standard of 2 ug/l) at the site boundary.

In March 1997, an improved analytical method (EPA Method 8260) was used to analyze ground-water samples for vinyl chloride. A detection limit of 0.2 ug/l was achieved that is below the CUL of 0.4 ug/l. Vinyl chloride was detected above the CUL but below the HSAL in site boundary wells LW-9S (0.42 ug/l), MW-3I (0.71 ug/l), LW-9D (1.2 ug/l) and MW-10 (0.44 ug/l).

While the emphasis of the interim monitoring program and this memorandum has been to evaluate ground-water quality conditions at the point of compliance (site boundary), monitoring has also been completed at "interior" location R-10S (Figure 19). R-10S is the replacement well for LW-10S and is being monitored because of the presence of vinyl chloride. Vinyl chloride concentration data for

these wells is summarized in Table A-1 of the Hart Crowser (1997) "Groundwater and Surface Water Quality Data Report". The vinyl chloride trends using data from wells LW-10 and R-10S are shown on Figure 22.

As shown on Figure 22, vinyl chloride concentrations at location LW-10S/R-10S have fluctuated over a wide range. In July 1988 and October 1990 concentrations were measured at 120 ug/l. By March 1994 concentrations had declined to below 35 ug/l. However, in October 1994, vinyl chloride concentrations increased to 120 ug/l and in March and October 1995 were again below the limits of detection (1 to 3 ug/l). However, in February 1996 to March 1997, vinyl chloride was measured to be over 100 ug/l in samples from well R-10S.

The cause of the fluctuation in vinyl chloride in R-10S is not evident. PACCAR is completing additional sampling of R-10S to provide data to assess the level of vinyl chloride concentrations at this well location.

Benzene - Benzene was identified as a contaminant of concern based on detections in ground-water samples. The source of the benzene were underground fuel tanks that were removed (see Section 6.1.2 of the RI). Soils from around the tanks was also removed and treated. A summary of benzene analyses in site boundary wells is presented in Table 3 and Appendix A. Benzene concentrations were measured in from three to seventeen samples in each of the site boundary wells. The lower number of analyses is from well U1W that was installed after LW-12S was abandoned in 1992 as part of the remedial activities at the site.

The CAP CUL for benzene is 5 ug/l. Benzene was only detected (since 1988) at concentrations above the CUL in two wells (LW-12S and LW-12D) in samples collected in July 1988. The maximum concentration detected in LW-12S was 10 ug/l. Since July 1988, and considering data from wells U1S and U1W, benzene has not been detected above the CUL in Upper Aquitard/Sand zone samples collected from sixteen sampling rounds in the LW-12 tank area.

The maximum concentration detected in LW-12D was 52 ug/l in July 1988. Between February 1989 and October 1992 benzene was not detected in well LW-12D in seven samples. In 1992, LW-12D was abandoned as part of the remedial activities at the site.

The available data indicate that benzene concentrations in ground water meet the CUL of 5 ug/l. This is based on the following:

- The source of benzene has been removed;
- Benzene has not been detected above CULs in any of the site boundary wells with the exception of LW12S and LW12D; and

- Benzene has not been detected above the reporting limit in the Upper Aquitard/Sand and Lower Sand zones at the LW-12S, U1W, U1S and LW-12 D locations in seven to thirteen samples collected between February 1989 and March 1997.

As summarized in Appendix A, most wells have been sampled for benzene 9 to 15 times since 1988. Based on this data, benzene should no longer be considered a contaminant of concern for the PACCAR site. Wells LW-6S, LW-6D, LW-9S, LW-9D, OSP-5D, MW-3I and OSP-2D meet the benzene CUL based on 8 or more samples.

While benzene should no longer be considered a contaminant of concern, benzene is included in the target analyte list for the EPA Method 8021 analyses and will be reported for wells where vinyl chloride is being analyzed.

Lead - The CAP soil CUL for lead of 250 mg/kg was based on the soil/dust ingestion exposure pathway. Total lead concentrations ranged from less than detected to 8,400 mg/kg with the majority of sample concentrations falling within the non-detectable range. The Puget Sound background concentration for lead in soil is approximately 24 mg/kg (Ecology 1994). The CAP HSAL for lead was 3,000 mg/kg. Materials above the HSAL were excavated and stabilized on-site.

Dissolved lead concentrations in ground water are being monitored because lead was present in soil at relatively high concentrations and because lead, in the past, has been detected above the CUL of 5 ug/l in ground water. A maximum lead concentration of 11 ug/l was detected in wells LW-6D (February 1989) and OSP-6S (November 1988).

The available data (see Table 4) indicate that lead concentrations in ground water meet the CUL of 5 ug/l and should no longer be considered a ground-water contaminant of concern for the site. This is based on the following:

- Lead has a low solubility and mobility in the natural environment; and
- Lead has not been detected above the CUL (5 ug/l), or for the most part, the reporting limit (1 ug/l), in the Upper Aquitard/Sand and Lower Sand zone wells since February 1989. Between March 1990 and March 1997 the site boundary wells have been sampled at least eight times (Table 4).

Chromium - The soil CUL of 100 mg/kg was based on the soil/dust ingestion exposure pathway. Total chromium concentrations ranged from less than detected to 1,600 mg/kg with the majority of the sample concentrations falling within the 10 mg/kg to 70 mg/kg range. The Puget Sound chromium background concentration is reported to be approximately 48 mg/kg (Ecology 1994). The

CAP HSAL was 600 mg/kg. Materials above the HSAL were excavated and stabilized on-site.

Chromium was not identified as a contaminant of concern in ground water in the CAP based on its low mobility in soil and ground-water quality data presented in the RI. As noted in Table 7.3 of the RI, chromium has a high soil/water partition coefficient and would not be expected to migrate readily through soil. The low mobility is confirmed based on ground-water sample analyses from wells located on and down gradient of the site. Dissolved chromium was generally not detected in ground water at detection limits of less than 5 ug/l (see Tables 6.6 and 6.7 of the RI). The reported detections were less than 10 ug/l. The CAP provides no ground-water CULs for chromium, however, the reported detections are well below the CULs of 80 ug/l (based on Method B of the MTCA) and the current MCL of 100 ug/l. Based on data collected as part of the RI chromium concentrations meet the MTCA Method B CULs.

Polycyclic Aromatic Hydrocarbons (PAHs) - PAHs detected on the site consist of two types; Low Molecular Weight PAHs (LPAHs) and High Molecular Weight PAHs (HPAHs). The HPAHs include those PAHs which have been classified as carcinogens (CPAHs) by the MTCA. CPAHs include: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd) pyrene (WAC 173-340-200).

CPAH concentrations ranged between not detected and 1,100 mg/kg with the majority of samples falling within the 1 mg/kg to 10 mg/kg range. The soil CULs for CPAHs was 1 mg/kg based on the soil/dust ingestion exposure pathway. The HSAL was 100 mg/kg. During remediation, materials containing CPAH concentrations above the HSAL were excavated and disposed of off-site. The CAP does not present soil CULs or HSALs for LPAHs.

A review of water quality data and CULs summarized in DOF (1995), indicate that none of the LPAHs detected in ground water (e.g. naphthalene, fluorene) exceed the ground water quality CULs. For example, fluorene was detected in well LW-12S at a concentration of 15 ug/l in October 1992. This compares with a cleanup level of 640 ug/l.

The CAP does not provide a ground-water CUL or HSAL for CPAHs because remediation of CPAHs was primarily based on the soil ingestion/inhalation exposure pathway. Excavation and off-site disposal of soil containing high concentrations of CPAHs also reduced the potential for leaching of CPAHs to adversely effect ground-water quality. No CPAHs were detected in ground water at the site boundary above a reported detection limit of 1 ug/l (see Table 5). As noted in Table 7.3 of the RI, CPAHs have a high soil/water partition coefficient

(similar to PCBs) and would not be expected to migrate readily through soil. The low mobility is confirmed based on ground water sample analyses from wells located on and downgradient of the site (Table 5 and Appendix A). However, the reported detection limit of 1 ug/l is above the current MTCA Method A CPAHs cleanup level of 0.1 ug/l. To achieve a detection limit of 0.1 ug/l, a different analytical method (i.e. EPA Method 8310 rather than EPA Method 8270) would have to be used. Analysis for CPAHs using Method 8310 will be conducted to confirm that CPAH concentrations are below the MTCA Method A cleanup level.

PCBs - PCB Aroclors 1254 and 1260 were detected in site soils at a maximum concentration of 24 mg/kg during the RI at a soil hot-spot within the northwest portion of the site. The CAP HSAL was 7 mg/kg based on the soil/dust ingestion exposure pathway. Confirmation sampling after soil excavation indicates that soils and sediments containing PCBs meet the CAP CUL of 1 mg/kg over the vast majority of the site. The excavated materials containing PCBs above the HSAL were disposed of off-site.

In addition, as part of the remediation of other soils, Hart Crowser collected 533 confirmation soil samples. PCBs were only detected in 40 of the samples and only three samples were above the 1 mg/kg CUL (1.4 to 2.1 mg/kg).

PCBs were not included in the interim monitoring program based on their low mobility in soil and ground-water quality data presented in the RI. As noted in Table 7.3 of the RI, PCB 1254 and 1260 have high soil/water partition coefficients and would not be expected to migrate readily through soil, especially at the low concentrations detected in site soil. The low mobility is confirmed based on ground-water sample analyses completed as part of the Remedial Investigation from wells located on and down gradient of the site, at detection limits generally ranging between 0.5 ug/l and 1 ug/l.

The CAP provides no ground-water CUL for PCBs. The available data indicate little need to conduct ground-water monitoring for PCBs. Relatively low concentrations of PCBs were detected in soil. No PCBs were detected in ground water samples during the RI and PCBs have extremely low mobility in the subsurface environment. No sampling for PCBs is proposed in this plan.

Total Petroleum Hydrocarbons (TPHs) - A major objective of the soil remediation was to cleanup soils which contain petroleum hydrocarbons to protect ground-water quality. Historical data and testing indicate the presence of gasoline, diesel, cutting oil, and lubricating oil range hydrocarbons. The RI indicates that concentrations of TPH ranged between not detected up to approximately 58,000 mg/kg (based on Method 418.1 analyses). The highest concentrations were detected within the south half of the site (see Section 6.2.3 of

the RI). Hot-spot soils with TPH concentrations above 2,500 mg/kg using the "GC/FID" method (similar to WTPH-D-extended) were excavated and treated. This analytical method was chosen to target the range of TPH compounds which have the greatest potential to impact ground-water quality.

Only limited TPH data are available for ground water. In February 1988, TPH measurements (Method 418.1) were made in ground water samples from OW-1, OW-2, and OW-3 (Figure 5). These wells are located downgradient of the portion of the site where the highest TPH concentrations were detected in soil. TPHs were not detected (detection limit of 0.05 mg/l).

Free product (diesel/fuel oil) was detected in the vicinity of the LW-12 tank area. Two wells located downgradient of this area U1N and U1S detected TPH in ground water between 0.5 mg/l and 2 mg/l prior to hot-spot excavation. Remediation of this soil was completed in October 1995. Because of the presence of petroleum hydrocarbons, sampling and analysis for TPH are part of this plan.

Pentachlorophenol (PCP) - PCP was not identified to be a soil or ground-water contaminant of concern in the CAP. However, PCP was detected in wells OSP-4S (1 ug/l) and OSP-4D (2 ug/l) in March 1995, and in R-10S (13 to 170 ug/l) in February 1996 and March 1997. Later sampling of OSP-4 wells did not detect PCP, however the detection level of 10 ug/l was higher than the reported detections. R-10S is located interior to the site while the OSP-4 wells are located downgradient of the southwest portion of the site. The MTCA Method B cleanup level for PCP is 0.73 ug/l and the drinking water maximum contaminant level (MCL) is 1 ug/l. The limited data indicate that the MCL was exceeded in wells OSP-4D and R-10S. Because of the reported detections, sampling and analysis for PCP are part of this plan.

Water Level Monitoring Locations

As part of the ground-water monitoring program, water level measurements will continue to be made in selected monitoring wells. The water levels will be used to estimate ground-water flow directions beneath the site. Water levels will be measured in the wells listed in Table 7. Well locations are shown on Figures 5 and 6.

Confirmation Monitoring Program Ground-Water Sampling Locations

Table 8 lists the wells to be sampled as part of the ground-water monitoring program. Figures 6, 12 and 13 show their locations. The locations of the well screens in relation to the site geology are shown on Figures 7 to 10. The wells are divided into three categories:

- Wells where the results of the sample analyses will be used to assess attainment of cleanup and hot-spot levels at the point of compliance and to insure that no migration to the City of Renton wells is occurring;
- Wells which will monitor ground-water quality downgradient of the stabilized material cells; and
- Wells where the results of the sample analyses will be used for informational purposes and will be monitored at PACCAR's discretion.

Figure 12 show the locations of the solidified soils and the associated monitoring wells.

Installation of New Wells

As part of the confirmation monitoring program, nine new wells will be installed as listed in Table 8. The wells will be installed in accordance with WAC 173-160.

- Wells SC-1 and SC-2 will be installed into the upper sand to monitor ground-water quality downgradient of the stabilized soil cells located within the northeastern portion of the site (Figure 12).
- Wells A(S), A(D), B(S), B(D), C(S), C(D) and D(D) will be installed to monitor ground-water quality at the point of compliance (Figures 12 and 13).

Ground-Water Monitoring Parameters

Field Parameters

During each sampling round, field measurements will be made for the following parameters:

- Well water levels;
- pH;
- Specific conductivity; and
- Temperature.

Laboratory Parameters

Volatile organic compounds, polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), dissolved arsenic, lead and chromium, and pentachlorophenol will be analyzed in selected well samples as listed in Table 9.

The specific parameters which will be analyzed in a particular well and the frequency of the analyses are based on several factors including:

- Results of previous analyses; and
- Primary use of the data derived from a well (i.e. - confirmation or information).

Sampling Procedures and Analytical Methods

The sampling procedures are outlined in Appendix B. The analytical methods to be used are:

- Volatiles - EPA Method 8021 (including vinyl chloride and benzene);
- Polycyclic Aromatic Hydrocarbons - EPA Method 8310 (for CPAHs);
- TPH - WTPH-D (extended) (petroleum hydrocarbons);
- Arsenic - SW 7061;
- Lead SW 7421;
- Chromium - SW 6010; and
- Pentachlorophenol - EPA Method 8270-SIM

Ground-Water Monitoring Schedule

Table 9 summarizes the ground-water monitoring schedule that begins in March 1998. Monitoring will be completed through at least October 2012 (15 years). Based on the results of ground-water sampling, the frequency of sampling may be increased and the monitoring period may be extended. Periodic reviews will be completed on at least 5-year intervals.

Data collected in 1997 and 1998 will be used to refine the monitoring program for 1999 to 2003 as discussed in the following section titled "*Ground-Water Quality Data Reporting and Evaluation*".

The sampling schedule beginning in March 2003 will be based on the results of the previous sampling using the following criteria.

- If CULs are achieved by the latest two rounds of sampling, at least one year apart, no additional sampling or analysis will be required, except as noted on the schedule (i.e. sampling of selected wells in March 2007 and March 2012).
- For those constituents where a HSAL was established in the CAP and the CUL is exceeded, sampling will be completed annually except if concentrations exceed one-half the HSAL. If one-half the HSAL is exceeded, sampling will be conducted semiannually.
- For those constituents where a HSAL was not established in the CAP, sampling will be completed on a semiannual basis if CULs are exceeded.

- For those constituents that are being monitored on a semiannual basis because of an exceedance of one-half the HSAL or the CUL, the frequency of sampling will be reduced to annually when the indicated levels (discussed above) are not exceeded for two years (four sampling rounds).

At any time during the monitoring program, the sampling frequency may be increased, or as appropriate, decreased using the criteria listed above.

City of Renton - Access to Wells

PACCAR will provide reasonable access to the monitoring wells by the City of Renton with the following conditions:

- Renton will provide PACCAR with 30-day notice and a written sampling and analysis plan that outlines sampling procedures, constituents to be analyzed, analytical protocols and the analytical laboratory Renton intends to use.
- Renton will allow PACCAR to collect split samples.
- Renton will provide PACCAR with copies of data and reports that document the Renton sampling and analysis work.

Inspection, Maintenance and Abandonment of Wells

PACCAR will inspect and maintain the monitoring wells in a serviceable condition for the duration of the monitoring program. After cleanup levels are achieved in a well and additional sampling or water level measurement is not scheduled, the City of Renton will be contacted to determine whether Renton is interested in maintaining the monitoring well for future sampling. Depending on their response, one of the following actions will be taken:

- If Renton is not interested in completing future sampling in the well, the well will be abandoned in accordance with Washington State regulations.
- If Renton is interested in completing future sampling in an off-site well, Renton will assume the responsibility for inspecting, maintaining and abandoning the well.
- If Renton is interested in completing future sampling in an on-site well, PACCAR will provide Renton with reasonable access as described in the section titled "*City of Renton - Access to Wells*". PACCAR will maintain the well (based on inspections made by Renton) and Renton will reimburse PACCAR for

reasonable maintenance costs. Should site activities (e.g. construction) require that the well be abandoned, PACCAR will assume the cost of abandoning the well, and Renton will be given the opportunity of reinstalling the well at a mutually agreed upon location, at Renton's cost.

- Prior to abandoning a well, PACCAR will obtain Ecology's approval.

Ground-Water Quality Data Reporting and Evaluation

Ground-water quality data will be compiled and submitted to Ecology on a routine basis as the monitoring program progresses. The level of discussion included in the submittals with respect to concentration trends and compliance with CULs will vary. Monitoring reports will be submitted as follows:

- **Monitoring Period Report.** Once per year following the March sampling round. The report will present a tabulation of the water level and water quality monitoring data. Ground-water flow maps will be presented in the report. The October data will be presented in the annual monitoring report.
- **Annual Monitoring Report.** Once per year following the October sampling round. The report will present a tabulation of the water level and water quality monitoring data, ground-water flow maps, and an assessment of the results relative to CULs. The annual review may be used by PACCAR or Ecology as a technical basis to propose modifications to the monitoring program. Changes to sampling location, testing frequency, and/or monitoring parameters may be proposed.
- **Evaluate 1997 and 1998 Data.** After the October 1998 data is received and evaluated, the need for more frequent sampling and analysis of selected constituents will be determined using the following criteria based on either the HSAL or CUL:

Arsenic	25 ug/l
Lead	25 ug/l
Chromium	25 ug/l
Vinyl chloride	1 ug/l
Any CPAH compound	0.1 ug/l(a) (based on PQL)
TPH	1 mg/l
Other reported compounds	exceed cleanup level
(a)- Based on MTCA Method A (WAC 173-340-720)	

If the criteria are exceeded in any of the 1997 and 1998 samples, semiannual sampling of the well and analysis of the constituent that exceeded the criteria will be conducted. The frequency of sampling will be reduced to annually where the indicated criteria (previously exceeded) are not exceeded for two years (four

sample rounds). The results of this evaluation will be part of the 1998 Annual Monitoring Report described above.

- **Five-Year Review.** Consistent with WAC 173-340-420, the cleanup action will be reviewed by Ecology and PACCAR no less frequently than every five years. In December 2002, after the initial five-year monitoring period starting with the March 1998 sampling event, and at least at five-year intervals thereafter, as appropriate, a comprehensive review of the monitoring data will be made. The five-year review will assess concentration trends and compliance with cleanup levels on a well by well basis. These assessments will be used by PACCAR and Ecology to determine the need for additional monitoring or active ground-water remediation.

The monitoring reports will be submitted to Ecology and the City of Renton within ninety days of receiving data from the analytical laboratory. Data quality will be evaluated using QA procedures outlined in the work plan that is attached as Appendix C. The chemical data will also be submitted in a mutually agreed upon electronic format.

Trend Analyses and Comparison to Cleanup (CUL) and Hot-Spot (HSAL) Levels

Assessment of concentration trends over time will be made using time series plots for individual wells. The plots will show the CUL and HSAL, as appropriate. The plots will be reviewed in qualitative terms to evaluate concentration trends and concentration stability. The rate of change at discrete well locations where CUL or HSAL appear to be exceeded will be assessed to determine an approximate time when CULs or HSALs will be attained.

Ground-water quality monitoring data will be compared to CULs on a well by well basis. At the end of a five-year monitoring period, the latest two rounds of sample results, at least one year apart, will be compared to the CULs. If the results are below the CUL, the CUL will have been attained. A similar comparison will be made to determine whether the HSALs have been attained.

Other Potential Program Adjustments

Analytical Methods

The analytical procedures for monitoring constituents may be revised. Changes may be warranted based on our increased knowledge of the chemicals that are in individual wells or development of improved analytical procedures. A proposal will be submitted to Ecology for approval prior to implementing any changes.

Ground-Water Sampling Technique

The initial sampling technique consists of purging and sampling wells using either a bailer or submersible pump. In the future, it may be decided to install dedicated pumps in wells based on technical and cost considerations. A proposal will be submitted to Ecology for approval prior to changing the sampling methods.

Criteria for Implementing Active Remedial Measures and Contingency Plan

Section 5.4 of the CAP addresses the condition where active ground-water remedial measures may be required by Ecology:

"Ground water will be monitored for five years following remediation. If, after that time, contaminant concentrations are not below MCL's, a pump and treat, or other positive treatment system may be required by Ecology for removal of ground-water contamination. The design will require Ecology approval."

"If data collected during the initial five year monitoring period warrant, Ecology may allow a further period of time to allow contamination levels to come below MCL's. The decision of whether to wait longer or install a treatment system, and the exact nature of any treatment system, will be based upon data collected during the initial five year monitoring period. The Engineering Design Report will include a detailed ground-water monitoring plan which specifically indicates conditions which will require installation of a pump and treat or other positive treatment system. Any change in the monitoring plan will require the approval of Ecology."

Consistent with the CAP, after the initial five-year monitoring period, PACCAR will compare the last two years of monitoring data to the HSALs to determine whether the HSALs are exceeded. If the HSALs are not exceeded in any of the samples, no active ground-water remediation will be considered.

However, if the HSALs are exceeded in one or more of the samples (last two years of initial five year period), Ecology and PACCAR will evaluate available data with regard to whether or not human health and the environment are adequately protected. If the evaluation indicates additional protection of human health and the environment may be warranted, the following actions will be taken:

- Additional testing to assess the cause of the exceedance will be completed if warranted. Whether such testing will be conducted will depend on the type and location of the exceedance and a judgment whether such testing would be successful in identifying the cause of the exceedance. A sampling and analysis

plan and schedule will be submitted to Ecology for review and approval if such testing is deemed necessary.

- Additional remedial actions, such as source control, pump and treat or other actions, will be evaluated. The need for and type of remedial actions will be discussed with Ecology. After a remedial approach is selected, a plan and schedule will be prepared to design and implement the selected remedial action which will likely require public comment. This plan may include collection of additional data necessary to complete the design.

SURFACE WATER MONITORING

Surface Water Quality Background Information

The quality of surface water migrating off the site via drainage ditches was evaluated in the past during the RI (Hart Crowser 1989, 1990a) and as part of the Interim Water Quality Monitoring Program (see references). Additional data was also collected as part of surface water sampling conducted during the site construction and remediation activities that started in August/September 1991. The results of the analyses indicate that the pre-remediation quality of runoff from the site is similar to or of better quality than that of runoff in urban residential and commercial neighborhoods. Low concentrations of several metals and vinyl chloride have been detected in runoff.

Surface Water Collection System

The surface water collection system has been substantially changed as part of site redevelopment activities. Locations SW-3 (former location) and SW-4 sampled as part of the remedial investigation no longer exist. The general outline of the storm water drainage system is shown on Figure 23.

Major changes to the surface water collection system include:

- Abandonment and replacement of the north-south storm sewer pipeline that was located in the center of the site. This pipeline previously carried flow from both on-site and off-site sources. It was replaced with a new pipeline located along Houser Way North and in the eastern portion of the site. The new pipeline now only carries flow from off-site sources.
- Remediating and filling a ditch system previously located in the northwest portion of the site. Former sampling station SW-3 was downstream of this ditch system. New station SW-3 is downstream of several surface water sources (Figure 23).

- Filling and paving the ditch system upstream of sampling station SW-4.
- Paving and installing a drainage system over much of the north half of the site. This system includes a concrete lined detention basin, oil water separator and biological filter to treat runoff from the north half of the site.
- Upgrading the drainage system within the south-half of the site.

Surface Water Cleanup Levels

Surface water CULs for chromium(VI), lead, copper, nickel and zinc are contained in Table 3.7 of the CAP. The CAP also requires that monitoring for arsenic, CPAHs, PCBs and TPH be conducted because these constituents remain in soil above soil cleanup levels. Ecology has also requested that vinyl chloride be monitored in surface water. CULs for these additional constituents are summarized below:

	Cleanup Level (mg/l)	
• Arsenic	0.048(a)	as 24-hour avg. conc.
• Chromium(VI)	0.011(a)	as 4-day avg. conc.
• Lead	0.001(a)	as 4-day avg. conc.
• Copper	0.007(a)	as 4-day avg. conc.
• Nickel	0.056(a)	as 24-hour avg. conc.
• Zinc	0.047(a)	as 24-hour avg. conc.
• CPAHs	(c)	---
• PCBs	0.0001(a)(b)	as 24-hour avg. conc.
• TPH	(d)	---
• Vinyl Chloride	(e)	---

- (a) Based on chronic aquatic life criteria (EPA 1986), assuming a local water hardness of 50 mg/l CaCO₃.
- (b) Modified based on analytical considerations.
- (c) No freshwater ambient criteria exist for CPAHs. CPAHs will be monitored for informational purposes. If significant detections occur, a cleanup level will be established based on the specific compound(s) which are detected.
- (d) No freshwater criteria exist for TPH.
- (e) No freshwater ambient criteria exist for vinyl chloride. Vinyl chloride will be monitored for informational purposes. If significant detections occur, a cleanup level will be established.

Point of Compliance

The surface water point of compliance will be the site boundary where surface water leaves the site.

Surface Water Sampling Locations

Surface water locations will be sampled as described below. The sampling locations are shown on Figure 23.

- **SW-MH** - Storm waters generated off site will be sampled at a man-hole located near the southeast corner of the site. Data from this location will be used for informational purposes on storm water quality for the general area.
- **SW-DP** - Storm waters generated on the paved north half of the site will be sampled at the outlet of the detention basin. Data from this location will be used for informational purposes because storm water being sampled is derived from paved surfaces associated with the truck manufacturing facility and discharge is regulated under a storm water discharge permit.
- **SW-3** - Surface water generated on site (erosion control ponds and ditches, east/west interceptor and off site (Houser Way Bypass).
- **SW-5** - Storm waters from the south half of the site (where the structural fill cover will be installed) will be sampled at this location.
- **SW-6** - Storm waters from the area where Building 17 was formerly located.

Sampling Procedures and Analytical Methods

The previously approved analytical methods will be used, with the addition of hexavalent chromium analyses. All analyses will be conducted on unfiltered samples. The sampling procedures are outlined in Appendix B. The analytical methods to be used are:

- Total nickel, chromium, copper and zinc by SW 6010, EPA method 200.7, ICAP;
- Total lead by EPA Method 7421;
- Hexavalent chromium by EPA method 7196, colormetric;
- Arsenic - SW 7061;
- PCBs - SW 8080;
- TPH - WTPH-D(extended);
- CPAHs - EPA method 8310; and
- Vinyl Chloride - EPA Method 8021.

Surface Water Monitoring Schedule

Surface water sampling will be conducted semi-annually during the initial on-set of a storm event in March and October, weather permitting. Samples during these general periods will be collected from a storm event that produces more than 0.1 inch of rainfall and occurs at least 72 hours after the last 0.1 inch rainfall event.

Duration of the Surface Water Monitoring Program

In accordance with the CAP, surface water monitoring will continue until residual hazardous substance concentrations in all on-site media no longer exceed site CULs established in Section 3.6 of the CAP or for a minimum of five years.

Five Year Review

Surface water data will be reviewed in 2003 after an initial five-year period starting in March 1998.

Data Evaluation and Reporting

Quality Assurance:

The quality of the data will be evaluated using the QA procedures outlined in Appendix C.

Reporting to Ecology After Each Sampling Event

Data will be submitted to Ecology in a report within ninety days of receiving the data from the analytical laboratory. This report will present the surface water quality data in tabular form and discuss the quality of the data with respect to QA considerations.

Comparison to Cleanup Levels (CULs)

Data from sampling location SW-5 will be compared to the cleanup levels in two steps. The first step will be a direct comparison to the CULs. If the sample concentrations are below the CULs, monitoring will continue as outlined in this plan.

However, if the concentration of one or more of the parameters with CULs based on 24-hour or 4-day averages is exceeded, then a plan to assess whether the concentrations exceed the applicable time-weighted averages will be prepared and submitted to Ecology for approval. After Ecology approval is received, the plan will be implemented according to an agreed upon schedule.

Adjustments to the Surface Water Monitoring Program

Major program reviews will be completed on at least a five-year basis. Guidelines for making other adjustments are summarized below.

During the First Five Years. No adjustments are anticipated. There is some possibility that the surface water monitoring plan will be modified to be consistent with permits for storm water discharge.

After the First Five Years. The surface water monitoring plan will be modified as appropriate, based on data collected during the initial five years.

Contingency Plan and Schedule

If surface water concentrations exceed the CULs, the following actions will be taken:

- Additional testing to assess the cause of the exceedance will be completed if warranted. Whether such testing will be conducted will depend on the type and location of the exceedance and a judgment whether such testing would be successful in identifying the cause of the exceedance. Prior to any testing, a sampling and analysis plan and schedule will be submitted to Ecology for review and approval.
- Additional remedial actions will be evaluated. The need and type of remedial actions will be discussed with Ecology. After a remedial approach is selected a plan and schedule will be prepared to design and implement the selected remedial action which will likely require public comment.
- To complete development of the south portion of the site storm water discharge permits (Storm Water Pollution Prevention Plan under NPDES) will likely be necessary. The monitoring program will be revised, as appropriate, to be consistent with these permits.

STRUCTURAL FILL COVER MONITORING

The structural fill and pavement cover will be monitored on an annual basis after the cover is completed. The cover over the north end of the site was completed in May 1993 and the cover over the south end will be substantially complete in November 1997. The annual monitoring will include the following:

- A site walk will be completed by an engineer or technician, who will observe the condition of the cover and note areas where the cover has been disturbed by erosion, excavation, vegetation, or other means. Paved

areas will also be observed for settlements, ruts or other features which may affect the effectiveness of the paving material to act as a cover;

- Any necessary repairs will be recommended based on the site observations. The engineer or technician will document that the repairs were made in accordance with their recommendations; and
- In areas where the cover has been disturbed during the past year, PACCAR will provide documentation of the repairs.

Reporting

An annual report will be submitted to Ecology during the first quarter after the reporting year which presents the results of the site observations, documents the cover repairs which occurred during the previous year, and presents recommendations for other actions, as appropriate.

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TABLE 1 - Summary of Dissolved Arsenic Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Jul-88	Feb-89	Mar-90	Oct-90	Mar-91	Oct-91	Mar-92	Oct-92	Mar-93	Oct-93	Mar-94	Oct-94
Upper Aquitard/Sand Wells (ug/l)												
LW-1S	9	*	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*
LW-6S	6	5 u	5 u	*	5 u	*	5 u	*	6	*	5 u	*
LW-9S	15	15	13	*	7	*	15	*	5 u	*	7	*
LW-12S	16	28	27	28	29	55	28	49	A	A	A	A
OSP-1S	5 u	*	6	*	5 u	*	6	*	*	*	11	*
OSP-4S	5 u(1)	*	5 u	*	5 u	*	5 u	*	5 u	*	7	*
OSP-5S	5 u(1)	*	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*
OSP-6S	7 (1)	*	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*
OW-4S	5 u(1)	*	5	*	5	*	5 u	*	*	*	*	*
U1S	*	*	*	*	*	*	*	*	*	5 u	5 u	5
U1W	*	*	*	*	*	*	*	*	8	*	5 u	A
MW-3I	17	17	12	*	16	*	13	*	10	*	6	*
MW-10	27 (1)	25	20	*	22	*	5 u	*	23	*	5	*
LW-10S/R10S	*	*	*	*	*	*	5 u	*	*	*	5 u	*
Lower Sand/Delta Deposit Wells (ug/l)												
LW-1D	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*
LW-6D	12	10	8	*	7	*	7	*	12	*	7	*
LW-9D	8	8	8	*	16	*	7	*	7	*	5 u	*
LW-12D	5 u	5 u	5 u	*	5 u	*	5 u	*	A	A	A	A
OSP-1D	5 u(1)	*	5 u	*	5 u	*	5 u	*	*	*	5	*
OSP-2D	5 u(1)	5 u	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*
OSP-3D	6 (1)	*	5 u	*	5 u	*	44	*	5 u	*	5 u	*
OSP-4D	42 (1)	42	32	*	42	*	45	*	45	*	26	*
OSP-5D	5 u(1)	*	5 u	*	5 u	*	5 u	*	5 u	*	5 u	*
OSP-6D	10 (1)	*	9	*	9	*	10	*	9	*	5 u	*
OW-4D	13 (1)	*	11	*	10	*	13	*	*	*	*	*

Notes: * - Not sampled

(1) - Sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

TABLE 1 - Summary of Dissolved Arsenic Concentrations in Ground Water

	Mar-95	Oct-95	Feb-96	Oct-96	Mar-97
Upper Aquitard/Sand Wells (ug/l)					
LW-1S	5 u	*	5 u	*	7
LW-6S	5 u	*	5 u	*	4
LW-9S	5 u	*	5 u	*	23
LW-12S	A	A	A	A	A
OSP-1S	*	*	5 u	*	1 u
OSP-4S	5 u	*	5 u	*	1 u
OSP-5S	5 u	*	5 u	*	2
OSP-6S	5 u	*	5 u	*	5
OW-4S	12	*	11	*	20
U1S	5 u	5 u	5 u	5 u	5
U1W	A	A	A	A	A
MW-3I	5 u	*	5 u	*	18
MW-10	5	*	5 u	*	28
LW-10S/R10S	*	5	5 u	*	2
Lower Sand/Delta Deposit Wells (ug/l)					
LW-1D	5 u	*	5 u	*	4
LW-6D	5 u	*	5 u	*	13
LW-9D	5 u	*	5 u	*	11
LW-12D	A	A	A	A	A
OSP-1D	*	*	5 u	*	2
OSP-2D	5 u	*	5 u	*	1
OSP-3D	5 u	*	5 u	*	6
OSP-4D	20	*	5 u	*	62
OSP-5D	5 u	*	5 u	*	5
OSP-6D	5 u	*	5 u	*	14
OW-4D	5 u	*	6	*	16

Notes: * - Not sampled

(1) - Sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

TABLE 2 - Summary of Vinyl Chloride Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Jul-88	Feb-89	Mar-90	Oct-90	Mar-91	Oct-91	Mar-92	Oct-92	Mar-93	Oct-93	Mar-94	Oct-94
Upper Aquitard/Sand Wells (ug/l)												
LW-1S	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-6S	1 u	1 u	1 u	*	1 u	*	1 u	*	1	*	1 u	*
LW-9S	1 u	1 u	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-12S	1 u	1 u	1 u	1 u	1 u	5 u	1 u	1 u	A	A	A	A
OSP-1S	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-4S	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5S	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-6S	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4S	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	*	*
U1S	*	*	*	*	*	*	*	*	1 u	1 u	1 u	1 u
U1W	*	*	*	*	*	*	*	*	1 u	1 u	1 u	A
MW-3I	1 u	1 u	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
MW-10	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW10S/R10S	120	*	*	120	14	*	15	9	27	18	32	120
Lower Sand/Delta Deposit Wells (ug/l)												
LW-1D	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-6D	41	38	28	31	24	9	3	1 u	1 u	1 u	1 u	1 u
LW-9D	120	62	32	31	13	30	8	32	13	7	2	2
LW-12D	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	A	A	A	A
OSP-1D	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-2D	1 u(1)	1 u	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-3D	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-4D	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5D	4	5	4	3	1 u	3	2	3	3	1 u	1	2
OSP-6D	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4D	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	*	*

Notes: * not sampled

(1) - Sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

J - estimated concentration

TABLE 2 - Summary of Vinyl Chloride Concentrations in Ground Water

	Mar-95	Oct-95	Feb-96	Oct-96	Mar-97
Upper Aquitard/Sand Wells (ug/l)					
LW-1S	1 u	*	3 u	*	0.2 u
LW-6S	1 u	*	3 u	*	0.2 u
LW-9S	1 u	*	3 u	*	0.42
LW-12S	A	A	A	A	A
OSP-1S	*	*	3 u	*	0.2 u
OSP-4S	1 u	*	3 u	*	0.2 u
OSP-5S	1 u	*	3 u	*	0.2 u
OSP-6S	1 u	*	3 u	*	0.2 u
OW-4S	1 u	*	3 u	*	1
U1S	1 u	3 u	3 u	3 u	0.2 u
U1W	A	A	A	A	A
MW-3I	1 u	*	3 u	*	0.71
MW-10	1 u	*	3 u	*	0.44
LW10S/R10S	1 u	3 u	125	120	110
Lower Sand/Delta Deposit Wells (ug/l)					
LW-1D	1 u	*	3 u	*	0.38
LW-6D	1 u	3 u	3 u	3 u	0.2 u
LW-9D	1 u	3 u	1 J	2 J	1.2
LW-12D	A	A	A	A	A
OSP-1D	*	*	3 u	*	0.2 u
OSP-2D	1 u	*	3 u	*	0.2 u
OSP-3D	1 u	*	3 u	*	0.2 u
OSP-4D	1 u	*	3 u	*	0.2 u
OSP-5D	1 u	3 u	2 J	1 J	1.8
OSP-6D	1 u	*	3 u	*	0.2 u
OW-4D	1 u	*	3 u	*	1

Notes: * not sampled

(1) - Sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

J - estimated concentration

TABLE 3 - Summary of Benzene Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Jul-88	Feb-89	Mar-90	Oct-90	Mar-91	Oct-91	Mar-92	Oct-92	Mar-93	Oct-93	Mar-94	Oct-94
Upper Aquitard/Sand Wells (ug/l)												
LW-1S	1 u	*	1 u	*	1 u	*	2	*	1 u	*	1 u	*
LW-6S	1 u	1 u	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-9S	1 u	1 u	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-12S	10	3	1 u	4	1 u	5 u	1	5	A	A	A	A
OSP-1S	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-4S	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5S	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-6S	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4S	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	*	*
U1S	*	*	*	*	*	*	*	*	1 u	1 u	1 u	1 u
U1W	*	*	*	*	*	*	*	*	1 u	1 u	1 u	A
MW-3I	1 u	1 u	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
MW-10	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW10S/R10-S	1 u	*	1	*	1 u	*	1 u	1 u	1 u	1 u	1 u	1 u
Lower Sand/Delta Deposit Wells (ug/l)												
LW-1D	1 u	*	1 u	*	1 u	*	1 u	*	2	*	2	*
LW-6D	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u
LW-9D	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u
LW-12D	52	1 u	1 u	1 u	1 u	1 u	1 u	1 u	A	A	A	A
OSP-1D	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-2D	1 u(1)	1 u	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-3D	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-4D	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5D	1 u(1)	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u	1 u
OSP-6D	1 u(1)	*	1 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4D	1 u(1)	*	1 u	*	1 u	*	1 u	*	*	*	*	*

Notes: * not sampled

(1) - Sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

J - estimated concentration

TABLE 3 - Summary of Benzene Concentrations in Ground Water

	Mar-95	Oct-95	Feb-96	Oct-96	Mar-97
Upper Aquitard/Sand Wells (ug/l)					
LW-1S	2	*	1 J	*	1.3
LW-6S	1 u	*	3 u	*	0.1 u
LW-9S	1 u	*	3 u	*	0.1 u
LW-12S	A	A	A	A	A
OSP-1S	*	*	3 u	*	0.1 u
OSP-4S	1 u	*	3 u	*	0.1 u
OSP-5S	1 u	*	3 u	*	0.1 u
OSP-6S	1 u	*	3 u	*	0.1 u
OW-4S	1 u	*	3 u	*	0.1 u
U1S	1 u	3 u	3 u	3 u	0.1 u
U1W	A	A	A	A	A
MW-3I	1 u	*	3 u	*	0.1 u
MW-10	1 u	*	3 u	*	0.1 u
LW10S/R10-S	1 u	3 u	3 u	3 u	0.23
Lower Sand/Delta Deposit Wells (ug/l)					
LW-1D	1 u	*	3 u	*	0.1 u
LW-6D	1	3 u	3 u	3 u	0.1 u
LW-9D	1 u	3 u	3 u	3 u	0.1 u
LW-12D	A	A	A	A	A
OSP-1D	*	*	3 u	*	0.1 u
OSP-2D	1 u	*	3 u	*	0.1 u
OSP-3D	1 u	*	3 u	*	0.1 u
OSP-4D	1 u	*	3 u	*	0.1 u
OSP-5D	1 u	3 u	3 u	3 u	0.1 u
OSP-6D	1 u	*	3 u	*	0.1 u
OW-4D	1 u	*	3 u	*	0.1 u

Notes: * not sampled

(1) - Sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

J - estimated concentration

TABLE 4 - Summary of Dissolved Lead Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Jul-88	Feb-89	Mar-90	Oct-90	Mar-91	Oct-91	Mar-92	Oct-92	Mar-93	Oct-93	Mar-94	Oct-94
Upper Aquitard/Sand Wells (ug/l)												
LW-1S	5 u	*	5 u	*	1.3	*	1 u	*	1 u	*	1 u	*
LW-6S	5 u	5 u	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-9S	9	7	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-12S	7	7	5 u	10 u	1.3	5 u	1 u	2	A	A	A	A
OSP-1S	5	*	5 u	*	1.2	*	1 u	*	*	*	1 u	*
OSP-4S	5 u(1)	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5S	5 u(1)	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-6S	11 (1)	*	5 u	*	1.4	*	1 u	*	1 u	*	1 u	*
OW-4S	5 u(1)	*	5 u	*	1 u	*	1 u	*	*	*	*	*
U1S	*	*	*	*	*	*	*	*	1 u	*	1 u	*
U1W	*	*	*	*	*	*	*	*	1 u	1 u	1 u	A
MW-3I	5 u	7	5 u	*	2.7	*	1 u	*	1 u	*	1 u	*
MW-10	6	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW10S/R10-S	*	*	*	*	*	*	1 u	*	*	*	1 u	*
Lower Sand/Delta Deposit Wells (ug/l)												
LW-1D	7	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-6D	8	11	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-9D	7	6	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-12D	5	5 u	5 u	*	1 u	*	1 u	*	A	A	A	A
OSP-1D	5 u(1)	*	5 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-2D	5 u(1)	5 u	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-3D	5 u(1)	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-4D	5 u(1)	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5D	5 u(1)	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-6D	5 u(1)	*	5 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4D	5 u(1)	*	5 u	*	1 u	*	1 u	*	*	*	*	*

Notes: * not sampled

(1) - sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

TABLE 4 - Summary of Dissolved Lead Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Mar-95	Oct-95	Feb-96	Oct-96	Mar-97
Upper Aquitard/Sand Wells (ug/l)					
LW-1S	1 u	*	1 u	*	1 u
LW-6S	1 u	*	1 u	*	1 u
LW-9S	1 u	*	1 u	*	1 u
LW-12S	A	A	A	A	A
OSP-1S	*	*	1	*	1 u
OSP-4S	1 u	*	1 u	*	1 u
OSP-5S	1 u	*	1 u	*	1 u
OSP-6S	1 u	*	1 u	*	1 u
OW-4S	1 u	*	1 u	*	1 u
U1S	*	1 u	1 u	1 u	1 u
U1W	A	A	A	A	A
MW-3I	1 u	*	1 u	*	1 u
MW-10	1 u	*	1 u	*	1 u
LW10S/R10-S	*	1 u	1 u	*	1 u
Lower Sand/Delta Deposit Wells (ug/l)					
LW-1D	1 u	*	1 u	*	1 u
LW-6D	1 u	*	1 u	*	1 u
LW-9D	1 u	*	1 u	*	1 u
LW-12D	A	A	A	A	A
OSP-1D	*	*	1 u	*	1 u
OSP-2D	1 u	*	1 u	*	1 u
OSP-3D	1 u	*	1 u	*	1 u
OSP-4D	1 u	*	1 u	*	1
OSP-5D	1 u	*	1 u	*	1 u
OSP-6D	1 u	*	1 u	*	1 u
OW-4D	1 u	*	1 u	*	1 u

Notes: * not sampled

(1) - sample obtained in November 1988

A - Well abandoned

u - not detected at indicated concentration

TABLE 5 - Summary of CPAH (2) Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Jul-88	Feb-89	Mar-90	Oct-90	Mar-91	Oct-91	Mar-92	Oct-92	Mar-93	Oct-93	Mar-94	Oct-94
Upper Aquifer/Sand Wells (ug/l)												
LW-1S	4 u	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-6S	4 u	4 u	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-9S	4 u	4 u	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-12S	4 u	4 u	4 u	2 u	5 u	10 u	1 u	5 u	A	A	A	A
OSP-1S	4 u(1)	*	4 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-4S	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5S	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-6S	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4S	4 u(1)	4 u	4 u	*	1 u	*	1 u	*	*	*	*	*
U1S	*	*	*	*	*	*	*	*	1 u	1 u	1 u	1 u
U1W	*	*	*	*	*	*	*	*	1 u	1 u	1 u	A
MW-3I	4 u	4 u	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
MW-10	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW10S/R10-S	4 u	*	*	*	*	*	*	*	*	*	1 u	1 u
Lower Sand/Delta Deposit Wells (ug/l)												
LW-1D	*	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-6D	6 u	4 u	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-9D	4 u	4 u	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
LW-12D	4 u	4 u	4 u	2 u	1 u	1 u	1 u	1 u	A	A	A	A
OSP-1D	4 u(1)	*	4 u	*	1 u	*	1 u	*	*	*	1 u	*
OSP-2D	4 u(1)	4 u	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-3D	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-4D	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-5D	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OSP-6D	4 u(1)	*	4 u	*	1 u	*	1 u	*	1 u	*	1 u	*
OW-4D	4 u(1)	4 u	4 u	*	1 u	*	1 u	*	*	*	*	*

Notes: * not sampled

(1) - Sample obtained in November 1988

(2) - Carcinogenic Polycyclic Aromatic Hydrocarbons - benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

A - Well abandoned

u - not detected at indicated concentration

J - estimated concentration

TABLE 5 - Summary of CPAH (2) Concentrations in Ground Water

PACCAR Site
Renton, Washington

	Mar-95	Oct-95	Feb-96	Oct-96	Mar-97
Upper Aquitard/Sand Wells (ug/l)					
LW-1S	1 u	*	1 u	*	1 u
LW-6S	1 u	*	1 u	*	1 uJ
LW-8S	1 u	*	1 u	*	1 uJ
LW-12S	A	A	A	A	A
OSP-1S	*	*	1 u	*	1 uJ
OSP-4S	1 u	*	1 u	*	10 u
OSP-5S	1 u	*	1 u	*	1 u
OSP-6S	1 u	*	1 u	*	1 u
OW-4S	1 u	*	1 u	*	1 u
U1S	1 u	1 u	1 u	1 u	1 u
U1W	A	A	A	A	A
MW-3I	1 u	*	1 u	*	1 uJ
MW-10	1 u	*	1 u	*	1 u
LW10S/R10-S	1 u	*	1 uJ	*	1 uJ
Lower Sand/Delta Deposit Wells (ug/l)					
LW-1D	1 u	*	1 u	*	1 u
LW-6D	1 u	*	1 u	*	1 uJ
LW-9D	1 u	*	1 u	*	1 uJ
LW-12D	A	A	A	A	A
OSP-1D	*	*	1 u	*	1 u
OSP-2D	1 u	*	1 u	*	1 uJ
OSP-3D	1 u	*	1 u	*	1 uJ
OSP-4D	1 u	*	1 u	*	1 u
OSP-5D	1 u	*	1 u	*	1 u
OSP-6D	1 u	*	1 u	*	1 u
OW-4D	1 u	*	1 u	*	1 uJ

Notes: * not sampled

(1) - Sample obtained in November 1988

(2) - Carcinogenic Polycyclic Aromatic Hydrocarbons - benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

A - Well abandoned

u - not detected at indicated concentration

J - estimated concentration

TABLE 6 - Summary of Ground-water Attainment Status (6)

Well No.	Arsenic		
	Attainment Status	95% median conc. (ug/l)	Cleanup Level > 2 Times >10% spls.
Upper Aquitard/Sand Wells			
OSP-1S	5	11	Yes
LW-1S	2	7	ok
LW-6S	1	<5	ok
LW-9S	2	23	Yes
LW-12S	---	---	---
OSP-4S	2	7	ok
OSP-5S	1	<5	ok
OSP-6S	1	5	ok
OW-4S	2	20	Yes
U1W	---	---	---
U1S	1	5	ok
MW-3I	2	18	Yes
MW-10	2	28	Yes
Lower Sand/Delta Deposit Wells			
OSP-1D	5	5	ok
LW-6D	2	13	Yes
LW-9D	2	11	Yes
LW-12D	---	---	---
OSP-2D	1	<5	ok
OSP-3D	2	6	ok
OSP-4D	4	62	Yes
OSP-5D	1	5	ok
OSP-6D	2	14	Yes
OW-4D	2	16	Yes

Attainment Status

- 1 - Cleanup level has been attained.
- 2 - Hot-spot level has been attained.
- 3 - Additional sampling is required to assess whether cleanup levels have been attained using an analytical method with a lower reporting limit.
- 4 - Hot-spot level not attained.
- 5 - Upgradient well.
- 6 - Based on latest four sampling round results.

Well No.	Vinyl Chloride		
	Attainment Status	95% median conc. (ug/l)	Cleanup Level > 2 Times >10% spls.
Upper Aquitard/Sand Wells			
OSP-1S	2,3	<1	---
LW-1S	2,3	<1	---
LW-6S	2,3	1	---
LW-9S	2	0.42	---
LW-12S	---	---	---
OSP-4S	2,3	<1	---
OSP-5S	2,3	<1	---
OSP-6S	2,3	<1	---
OW-4S	2,3	1	---
U1W	---	---	---
U1S	2,3	<1	---
MW-3I	2	0.71	---
MW-10	2	0.44	---
Lower Sand/Delta Deposit Wells			
OSP-1D	2,3	<1	---
LW-6D	2,3	<1	---
LW-9D	2	2	---
LW-12D	---	---	---
OSP-2D	2,3	<1	---
OSP-3D	2,3	<1	---
OSP-4D	2,3	<1	---
OSP-5D	2	2	---
OSP-6D	2,3	<1	---
OW-4D	2	1	---

2-times Level

- ok - No concentration exceeds two times the cleanup level

10% spls.

- ok - Less than 10% of samples exceed the cleanup level

---- Recent data not available to allow evaluation

TABLE 6 - Summary of Ground-water Attainment Status (6)

Well No.	Lead		
	Attainment Status	95% median conc. (ug/l)	Cleanup Level
Upper Aquitard/Sand Wells			
OSP-1S	5	<5	ok
LW-1S	1	<5	ok
LW-6S	1	<5	ok
LW-9S	1	<5	ok
LW-12S	---	---	---
OSP-4S	1	<5	ok
OSP-5S	1	<5	ok
OSP-6S	1	<5	ok
OW-4S	1	<5	ok
U1W	---	---	---
U1S	1	<5	ok
MW-3I	1	<5	ok
MW-10	1	<5	ok
Lower Sand/Delta Deposit Wells			
OSP-1D	5	<5	ok
LW-1D	1	<5	ok
LW-6D	1	<5	ok
LW-9D	1	<5	ok
LW-12D	---	---	---
OSP-2D	1	5	ok
OSP-3D	1	<5	ok
OSP-4D	1	<5	ok
OSP-5D	1	<5	ok
OSP-6D	1	<5	ok
OW-4D	1	<5	ok

Attainment Status

- 1 - Cleanup level has been attained.
- 2 - Hot-spot level has been attained.
- 3 - Additional sampling is required to assess whether cleanup levels have been attained using an analytical method with a lower reporting limit.
- 4 - Hot-spot level not attained.
- 5 - Upgradient well.
- 6 - Based on latest four sampling round results.

Well No.	Benzene		
	Attainment Status	95% median conc. (ug/l)	Cleanup Level
Upper Aquitard/Sand Wells			
OSP-1S	5	<5	ok
LW-1S	1	<5	ok
LW-6S	1	<5	ok
LW-9S	1	<5	ok
LW-12S	---	---	---
OSP-4S	1	<5	ok
OSP-5S	1	<5	ok
OSP-6S	1	<5	ok
OW-4S	1	<5	ok
U1W	---	---	---
U1S	1	<5	ok
MW-3I	1	<5	ok
MW-10	1	<5	ok
Lower Sand/Delta Deposit Wells			
OSP-1D	5	<5	ok
LW-1D	1	<5	ok
LW-6D	1	<5	ok
LW-9D	1	<5	ok
LW-12D	---	---	---
OSP-2D	1	<5	ok
OSP-3D	1	<5	ok
OSP-4D	1	<5	ok
OSP-5D	1	<5	ok
OSP-6D	1	<5	ok
OW-4D	1	<5	ok

2-times Level

- ok - No concentration exceeds two times the cleanup level

10% spls.

- ok - Less than 10% of samples exceed the cleanup level

----- Recent data not available to allow evaluation

TABLE 7 - Summary of Water Level Measurement Wells

PACCAR Site
Renton, Washington

Well Number	Screen Depth(ft)	Zone	Ground Elev. (feet MSL)	M.P. Elevation (feet MSL)	MP
Upgradient Wells					
OSP-13D	37-47	upper sand	36.6	36.22	TOC
B-15D	TBD	TBD	38.0	37.52	TOC
OSP-8D	40-50	lower sand	38.5	38.09	TOC
OSP-9D	40-50	lower sand	41.8	41.15	TOC
Site Wells					
OSP-1S	12-22	upper sand	37.9	41.44	TOC
OSP-1D	41-51	lower sand	38.0	41.51	TOC
LW-1S	3-6	upper sand	26.3	25.84	TOC
LW-1D	27-37	mid.aquitard/lower sand	26.3	25.98	TOC
LW-2S	maximum 14	upper sand	29.3	28.98	TOC
LW-2D	25-35	middle aquitard	29.4	28.78	TOC
LW-4S	maximum 14	upper aquitard	40.4	39.87	TOC
LW-6S	4-9	fill/upper aquitard	31.0	29.7	TOC
LW-6D	27-37	lower sand	31.0	30.58	TOC
LW-7S	maximum 10	fill/upper aquitard	33.8	33.74	TOC
LW-9S	9-14	fill/upper aquitard	30.1	32.12	TOC
LW-9D	28-38	lower sand	30.1	31.95	TOC
LW-13S	maximum 10	upper aquitard	35.0	37.32	TOC
LW-13D	33-38	lower sand	35.0	37.46	TOC
LW-14S	maximum 15	upper sand	31.9	31.5	TOC
MW-1S(N)	2-5	fill/upper aquitard	26.5	26.56	TOC
MW-2S(W)	2-5	fill/upper aquitard	28.7	28.85	TOC
MW-2D(R)	TBD	TBD	27.6	29.43	TOC
MW-3S(S)	3-6	upper aquitard	32.3	34.39	TOC
MW-3I(N)	16-21	upper sand	32.3	34.39	TOC
OSP-10D	37-47	lower sand	37.7	40.74	TOC
OW-4S	12-22	upper sand	29.9	34.83	TOC
OW-4D	36-46	lower sand	29.9	34.77	TOC
R-10S	4-9	upper sand	30.7	39.17	TOC
R-10D	22-32	mid.aquitard/lower sand	30.7	38.24	TOC
DM-2D	19-29	upper aquitard	28.8	28.4	TOC
DM-5D	60-70	lower sand	40.4	40.13	TOC
A(S)	target - 15-20	upper sand	TBD	TBD	TBD
B(S)	target - 10-15	upper sand	TBD	TBD	TBD
C(S)	target - 15-20	upper sand	TBD	TBD	TBD
A(D)	target - 35-45	lower sand	TBD	TBD	TBD
B(D)	target - 35-45	lower sand	TBD	TBD	TBD
C(D)	target - 35-45	lower sand	TBD	TBD	TBD
D(D)	target - 35-45	lower sand	TBD	TBD	TBD
SC-1(S)	target - 10-15	upper sand	TBD	TBD	TBD
SC-2(S)	target - 10-15	upper sand	TBD	TBD	TBD
LW-7S	5-10	fill/upper aquitard	33.8	33.74	TOC
Downgradient Wells					
U1S	10-20	upper sand	31.7	30.44	TOC
HC-2I	38-48	delta deposits	35.5	35.05	TOC
HC-4I	42-52	delta deposits	35.0	34.61	TOC
HC-5I	38-48	delta deposits	30.6	30.28	TOC
HC-6I	38-48	lower sand/delta	29.1	28.73	TOC
OSP-2S	12-22	upper sand	33.2	32.94	TOC
OSP-2D	34-44	lower sand/delta	33.2	32.74	TOC
OSP-3D	37-47	lower sand/delta	34.5	34.5	TOC
OSP-4S	13-23	upper sand	31.8	31.45	TOC
OSP-4D	40-45	lower sand/delta	31.8	31.45	TOC
OSP-5S	11-21	upper sand	29.6	29.57	TOC
OSP-5D	47-52	lower sand	29.6	29.59	TOC
OSP-6S	12-17	upper sand	26.7	26.31	TOC
OSP-6D	36-46	lower sand	26.7	26.31	TOC

TABLE 7 - Summary of Water Level Measurement WellsPACCAR Site
Renton, Washington

OSP-7S	12-17	upper sand	27.4	27.06	TOC
OSP-7D	30-35	lower sand	27.4	26.98	TOC
MW-5	34-44	lower sand	38.8	38.3	TOC
MW-10	23-33	upper sand	34.0	34.12	TOC
MW-11	25-35	delta deposits	32.0	32.24	TOC

Notes: TBD - To Be Determined

TOC - Top of Casing

MP- Measuring Point

TABLE 8 - Summary Data - Confirmation Wells

PACCAR Site
Renton, Washington

Well Number	Screen Depth (ft.)	Screen Elevation (ft.)	Zone	Geologic Reference Section
Site Boundary Upper Sand/Aquitard Confirmation Wells				
OSP-7S	12 - 17	15.4 to 10.4	upper sand**	E-E'
LW-6S	4 - 9	27.0 to 22.0	fill/upper aquitard	E-E'
LW-9S	9 - 14	21.1 to 16.1	fill/upper aquitard	D-D'; E-E'
MW-3I	16 - 21	16.3 to 11.3	upper sand	nearest section A-A'(2)
U1S	10 - 20	22 to 12	upper sand	B-B'; E-E'
A(S)*	target 15 - 20	16 to 11	upper sand	E-E'
B(S)*	target 10 - 15	16 to 11	upper sand	nearest section A-A'; B-B' (4)
C(S)*	target 15 - 20 (7)	16 to 11	upper sand	C-C'; E-E'
Site Boundary Lower Sand/Delta Deposit Confirmation Wells				
OSP-7D	30 - 35	-2.5 to -7.5	lower sand	E-E'
LW-6D	27 - 37	4 to -6	lower sand**	E-E'
LW-9D	28 - 38	2.1 to -7.9	lower sand**	D-D'; E-E'
OSP-2D	34 - 44	-1 to -11	lower sand/delta-fan	nearest section A-A'(3)
OSP-3D	37 - 47	-2.5 to -12.5	lower sand/delta-fan	E-E'
OSP-4D	40 - 45	-8.2 to -13.2	lower sand/delta-fan	B-B'
OSP-5D	47 - 52	-17.4 to -22.4	lower sand	D-D'
OSP-6D	36 - 46	-9.3 to -19.3	lower sand**	C-C'
MW-10	23 - 33	11.0 to 1.0	upper sand	E-E'
A(D)*	target 35 - 45	-3 to -13	lower sand	E-E'
B(D)*	target 35 - 45	-3 to -13	lower sand	nearest section A-A'; B-B' (5)
C(D)*	target 35 - 45(7)	10 to 20	lower sand	C-C'; E-E'
D(D)*	target 35 - 45	-3 to -13	lower sand	E-E'
Confirmation Stabilized Material Wells				
OW-4S	12 - 22	17.9 to 7.9	upper sand	B-B'
OSP-7S	12 - 17	15.4 to 10.4	upper sand	E-E'
LW-7S	5 - 10	28.8 to 23.8	fill/upper aquitard	D-D'
SC-1(S)*	target 10 - 15	18 to 13	upper sand	C-C'
SC-2(S)*	target 10 - 15	18 to 13	upper sand	C-C'
Information Wells (6)				
OSP-1S	12 - 22	25.9 to 15.9	upper sand	A-A'; B-B'; D-D'
OSP-1D	41 - 51	-3 to -13	lower sand	A-A'; B-B'; D-D'
OW-4D	36 - 46	-6.1 to -16.1	lower sand	B-B'
R-10(S)	4 - 9	26.7 to 21.7	upper sand	B-B'

(1) - Near LW-12

(2) - Near HC-1I

(3) - Near HC-2I

(4) - Between MW-3IN and U1S

(5) - Between OSP-2D and LW-12

(6) - These wells are not confirmation wells and are being monitored for information purposes only.

(7) - Relatively low permeability materials may be present within the target screening interval. The goal is to place the screens in relatively permeability materials (e.g. sand). Well screen placement may vary from that indicated and will be based on geologic observations made during drilling.

* - Proposed new wells

** - Revised screened zone designation

Notes: (a) - Sampling schedule based on results from wells LW-1S and LW-1D.
(b) - Sampling for indicated monitoring parameter will be based on results of sampling completed between March 1997 and October 1998 (see text).
(c) - Sampling for indicated monitoring parameter will be based on results of the 5-year review (see text).

V- Volatile Organic Compounds
T - Total Petroleum Hydrocarbons
A - Arsenic
L - Lead
C - Chromium
P - Carcinogenic Polycyclic Aromatic Hydrocarbons
Pe - Pentachlorophenol

---- - Sampling for indicated monitoring parameter will be based on results of sampling completed between March 1997 and October 1998.

* - Proposed new wells

TABLE 9 - GROUND-WATER QUALITY MONITORING SCHEDULE

		Year	11		12		13		14		15	
Well Number	Screen Depth (feet)	Zone	March 2008	October 2008	March 2009	October 2009	March 2010	October 2010	March 2011	October 2011	March 2012	October 2012
Confirmation Upper Sand/Aquitard Wells												
OSP-7S(a)	12-17	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
LW-6S	4-9	fill/upper aquitard	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
LW-9S	9-14	fill/upper aquitard	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
MW-3I	16-21	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
U1S	10-20	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
A(S)*	target 15-20	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
B(S)*	target 10-15	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
C(S)*	target 15-20	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
Confirmation Lower Sand/Delta Deposits												
OSP-7D(a)	30-35	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
LW-6D	27-37	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
LW-9D	28-38	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)
OSP-2D	34-44	lower sand/delta	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
OSP-3D	37-47	lower sand/delta	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
OSP-4D	40-45	lower sand/delta	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)
OSP-5D	47-52	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
OSP-6D	36-46	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
MW-10	23-33	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
A(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)
B(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)
C(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC	(c)
D(D)*	target 35-45	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	VPTALC _{Pe}	(c)
Stabilized Cell Wells												
OW-4S	12-22	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	TALC	(c)
OSP-7S	12-17	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	see above	(c)
LW-7S	5-10	fill/upper aquitard	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)
SC-1(S)*	target 10-15	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)
SC-2(S)*	target 10-15	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)
Information Wells												
OSP-1S	12-22	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)
OSP-1D	41-51	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	ALC	(c)
OW-4D	36-46	lower sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	TA	(c)
R-10(S)	4-9	upper sand	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	V _P e	(c)

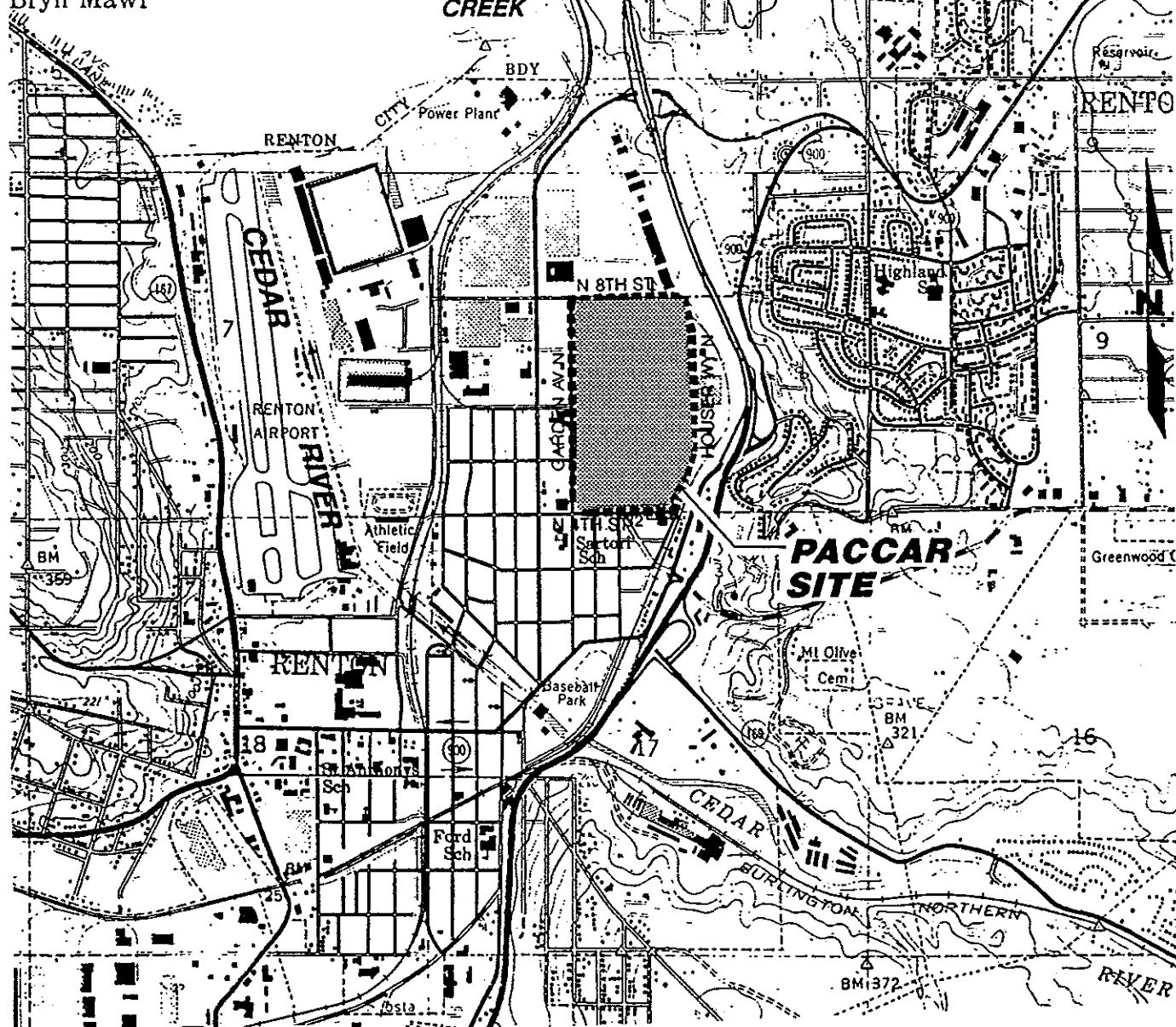
Five Year Review

Notes: (a) - Sampling schedule based on res
(b) - Sampling for indicated monitorin
sampling completed between M
(c) - Sampling for indicated monitoring
the 5-year review (see text).
V- Volatile Organic Compounds
T - Total Petroleum Hydrocarbons
A - Arsenic
L - Lead
C - Chromium
P - Carcinogenic Polycyclic Aromatic
Pe - Pentachlorophenol
---- - Sampling for indicated monitorin
sampling completed between M
* - Proposed new wells

LAKE WASHINGTON

Bryn Mawr

JOHNS
CREEK



PACCAR Site

0 2000 4000
Scale in Feet

Based on figure prepared by Hart-Crowser (1988)
Map was prepared using USGS 7.5-minute quadrangles
of Mercer Island and Renton, Washington

ref: fig1pf.cdr

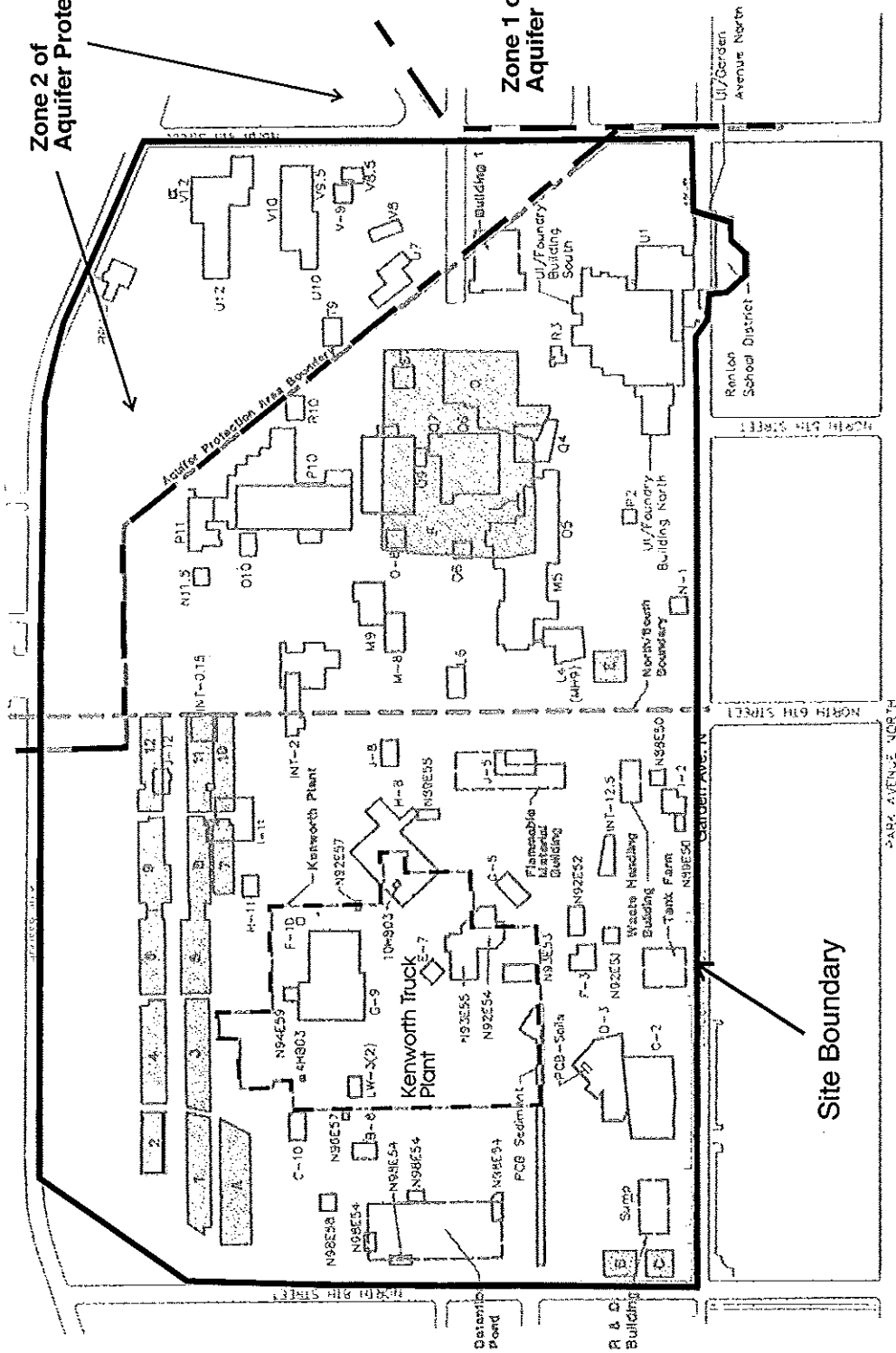
PACCAR Site
Renton, Washington

VICINITY MAP

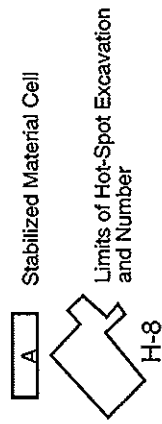
PAC-002 **FIGURE 1** March 1996
Dalton, Olmsted & Fuglevand, Inc.

Zone 2 of
Aquifer Protection area

Zone 1 of
Aquifer Protection area



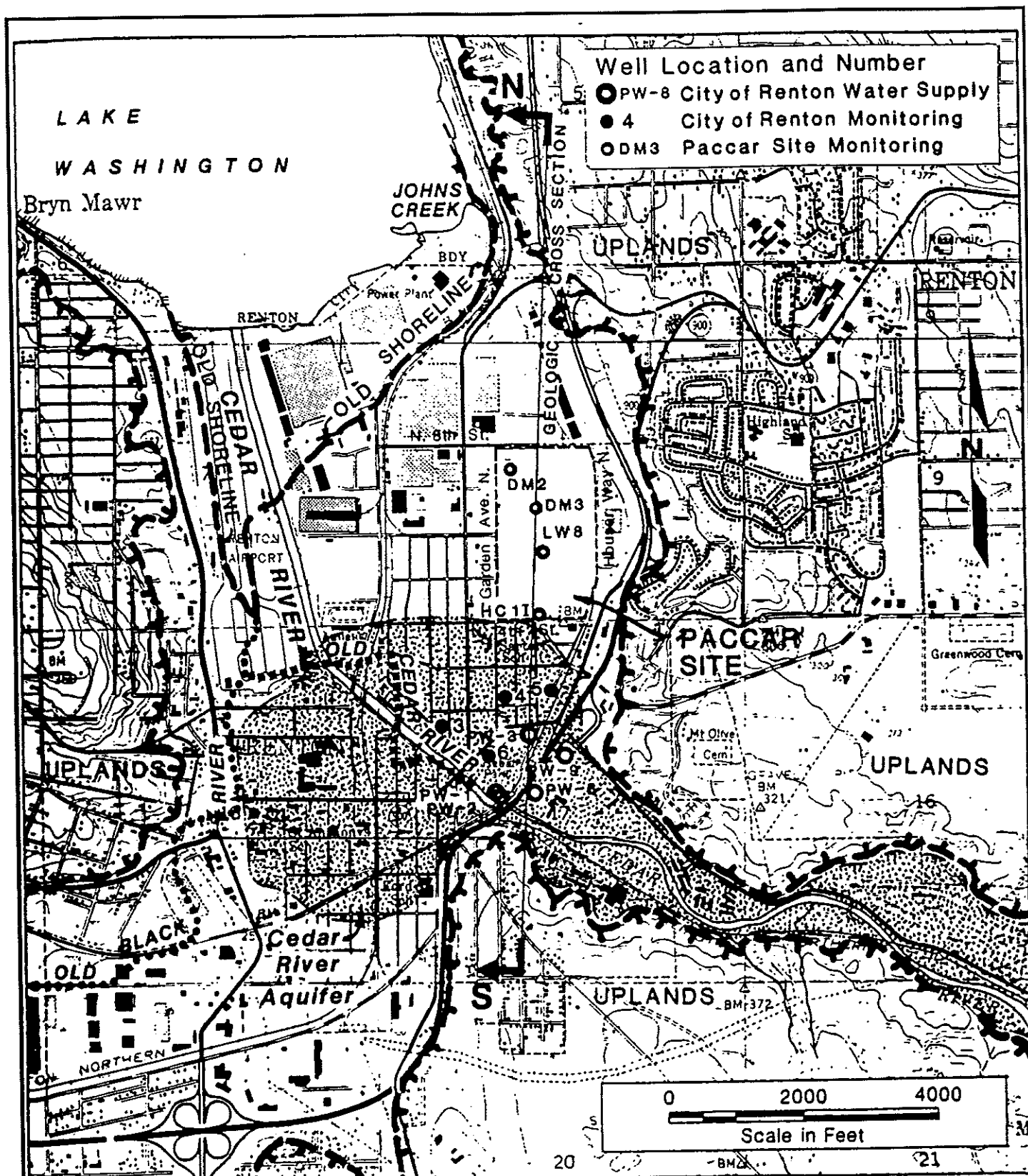
Site Boundary







PACAR Site
Renton, Washington

**Locations of Excavated Hot-Spots
and Solidified Soil Cells**

PAC-002 **FIGURE 2** March 96
Dalton, Olmsted & Fuglev...



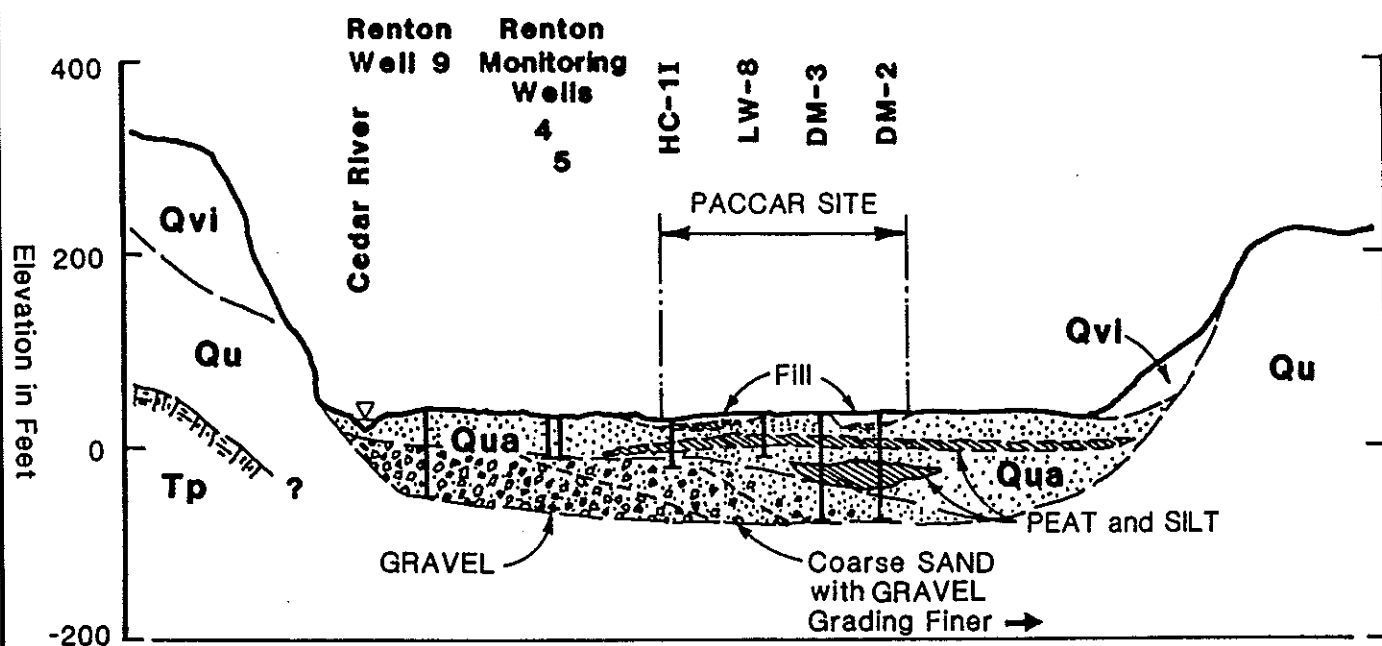
-  Valley Boundary
-  Old Shoreline Lake Washington
-  Old Cedar River Channel
-  Old Black River Channel

ref: fig3pl.cdr

PACCAR Site
Renton, Washington

**Regional Hydrogeologic Map
Showing Extent of Cedar River Aquifer**

PAC-002 **FIGURE 3** March 1996
Dalton, Olmsted & Fuglevand, Inc.



- Qua** Undifferentiated Cedar River Alluvium
- Qvi** Vashion Ice-contact Deposits
- Qu** Undifferentiated Glacial Drift
- Tp** Bedrock

See Figure 3 for Trend of Geologic Section

Horizontal Scale in Feet

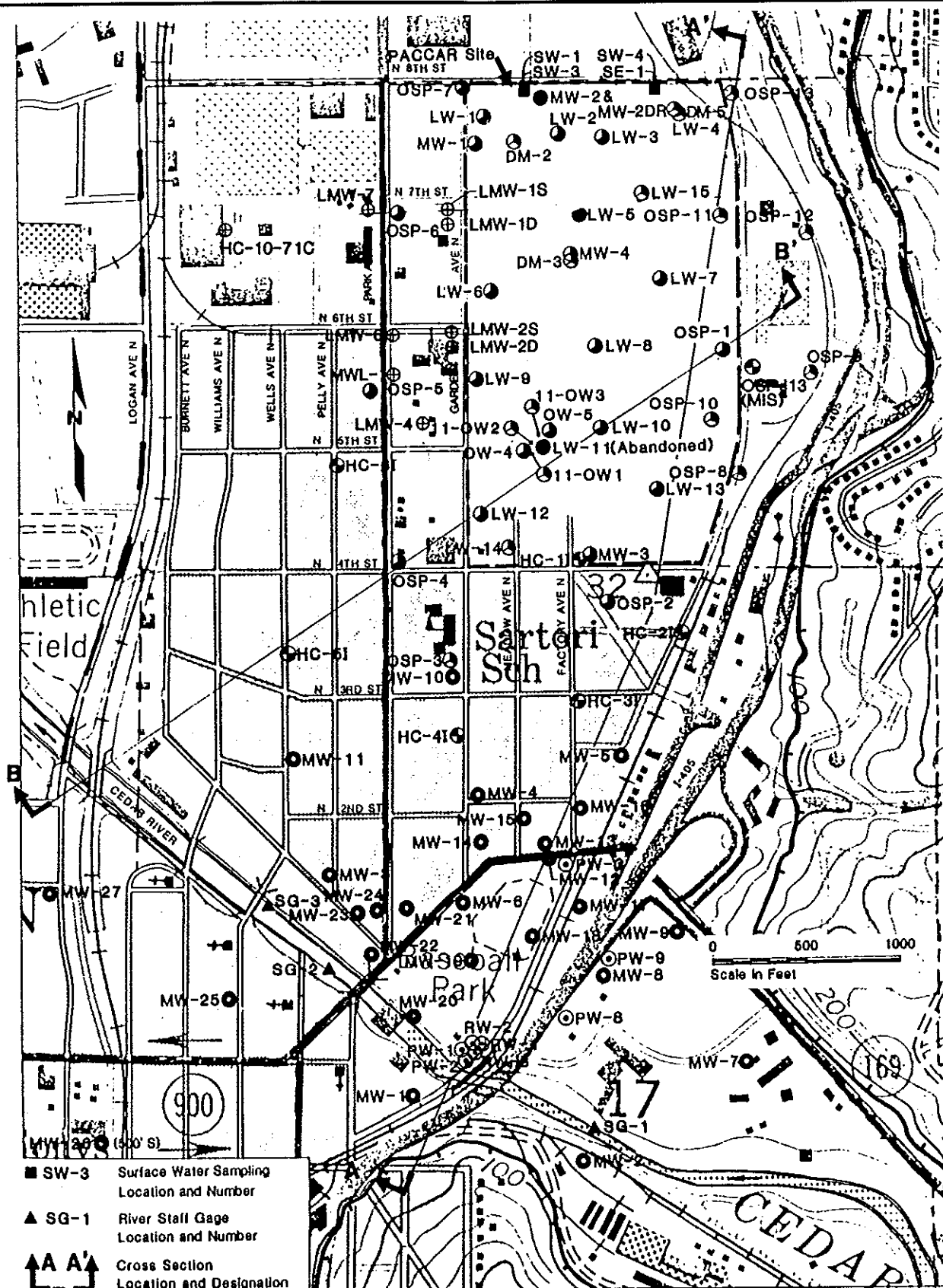


Vertical Scale in Feet

Vertical Exaggeration x 10

PACCAR Site
Renton, Washington

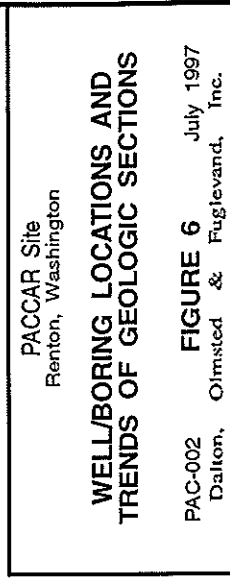
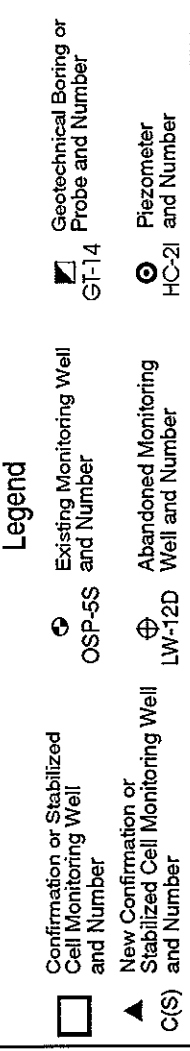
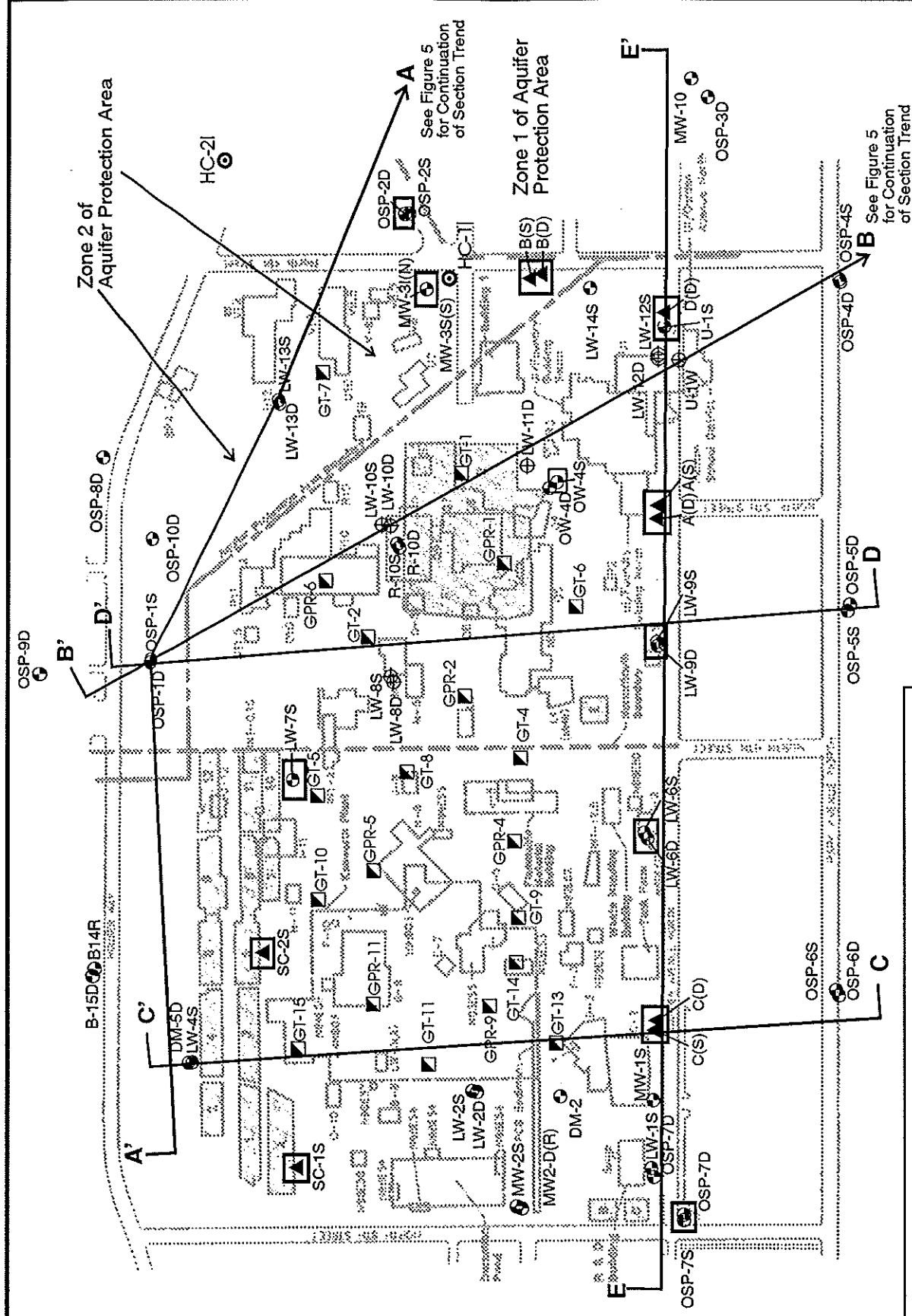
Vicinity
Geologic Cross Section

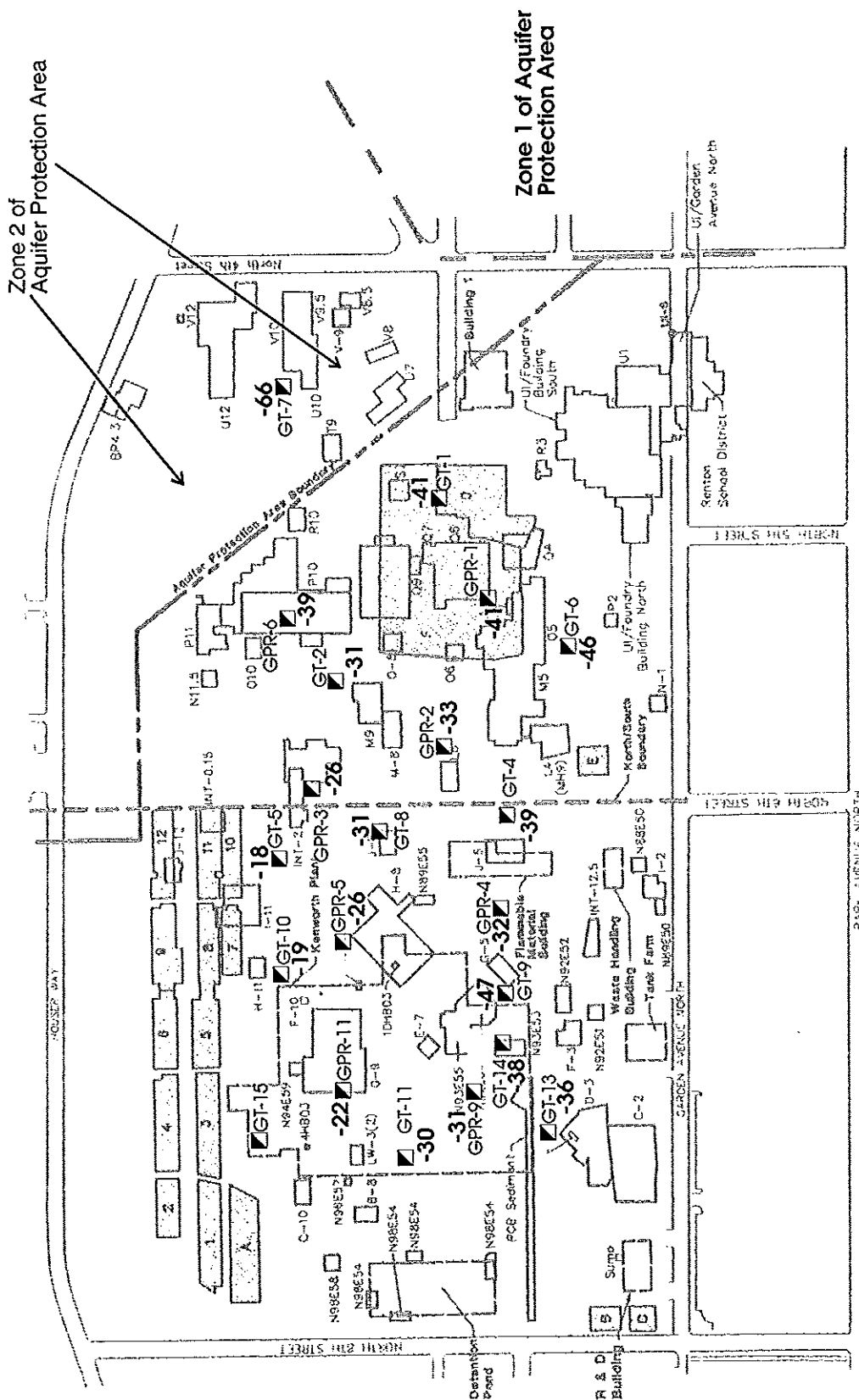


PACCAR Site
Renton, Washington

**Well Location Map
Showing Cross Section Trends**

PAC-002 **FIGURE 5** March 1995
Dalton, Olmsted & Fuglevand, Inc.

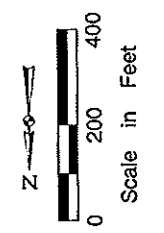




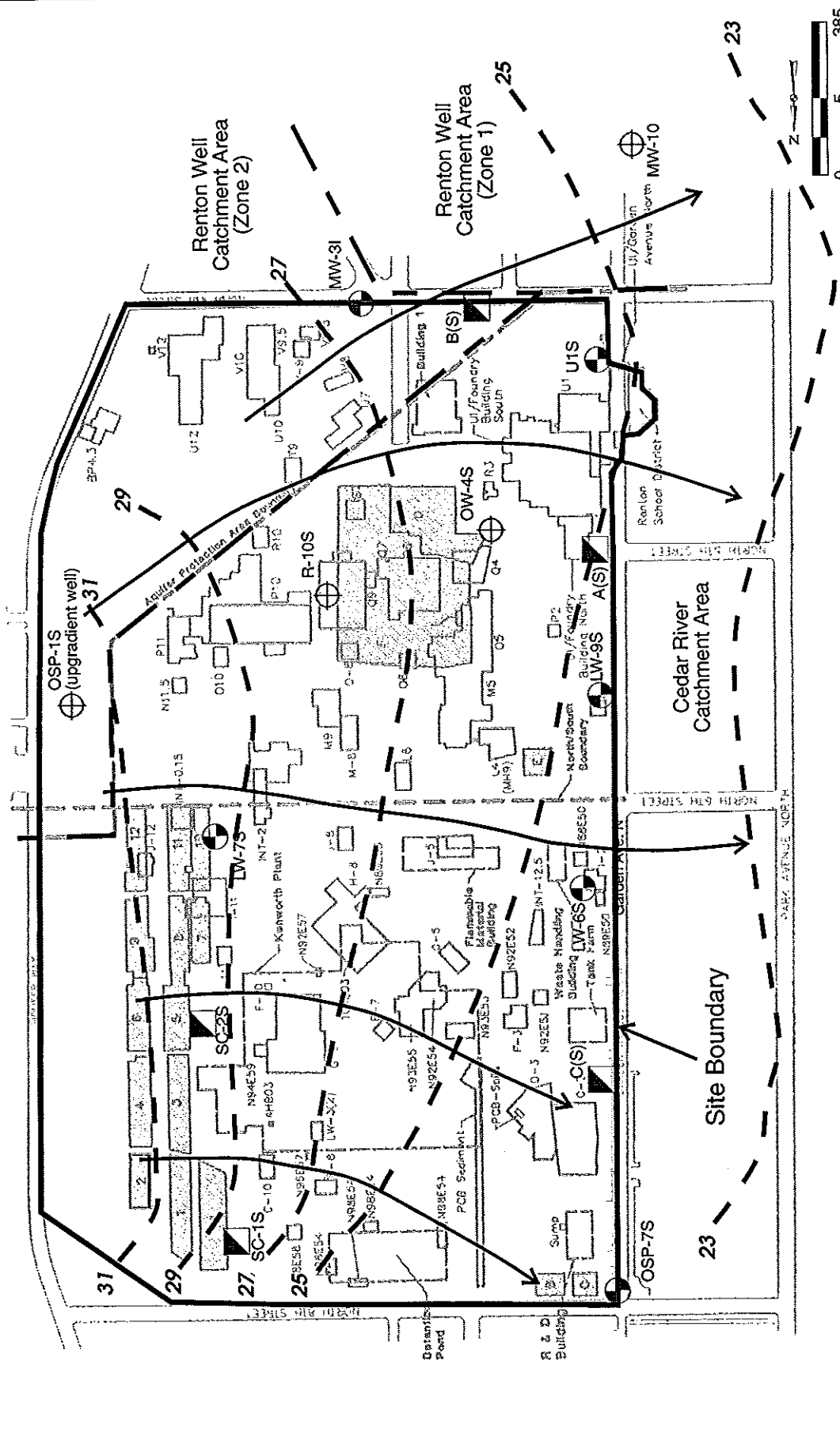
PACCAR Site
Renton, Washington

**Elevation of Top
of Lower Aquitard**

PAC-002 **FIGURE 11** July 1997
Dalton, Olmsted & Fuglevand, Inc.



- Legend**
- Geotechnical Boring or GT-14 Probe and Number
 - Elevation of Lower Aquitard (feet)
 - 46



Ground-Water Contour (March 1997)

Estimated Ground-Water Flow Direction

Available Confirmation Monitoring Well

Available Information Monitoring Well

Proposed New Confirmation Monitoring Well

Stabilized Material Cell

Hot-Spot Excavation Area

PACCAR Site
Renton, Washington

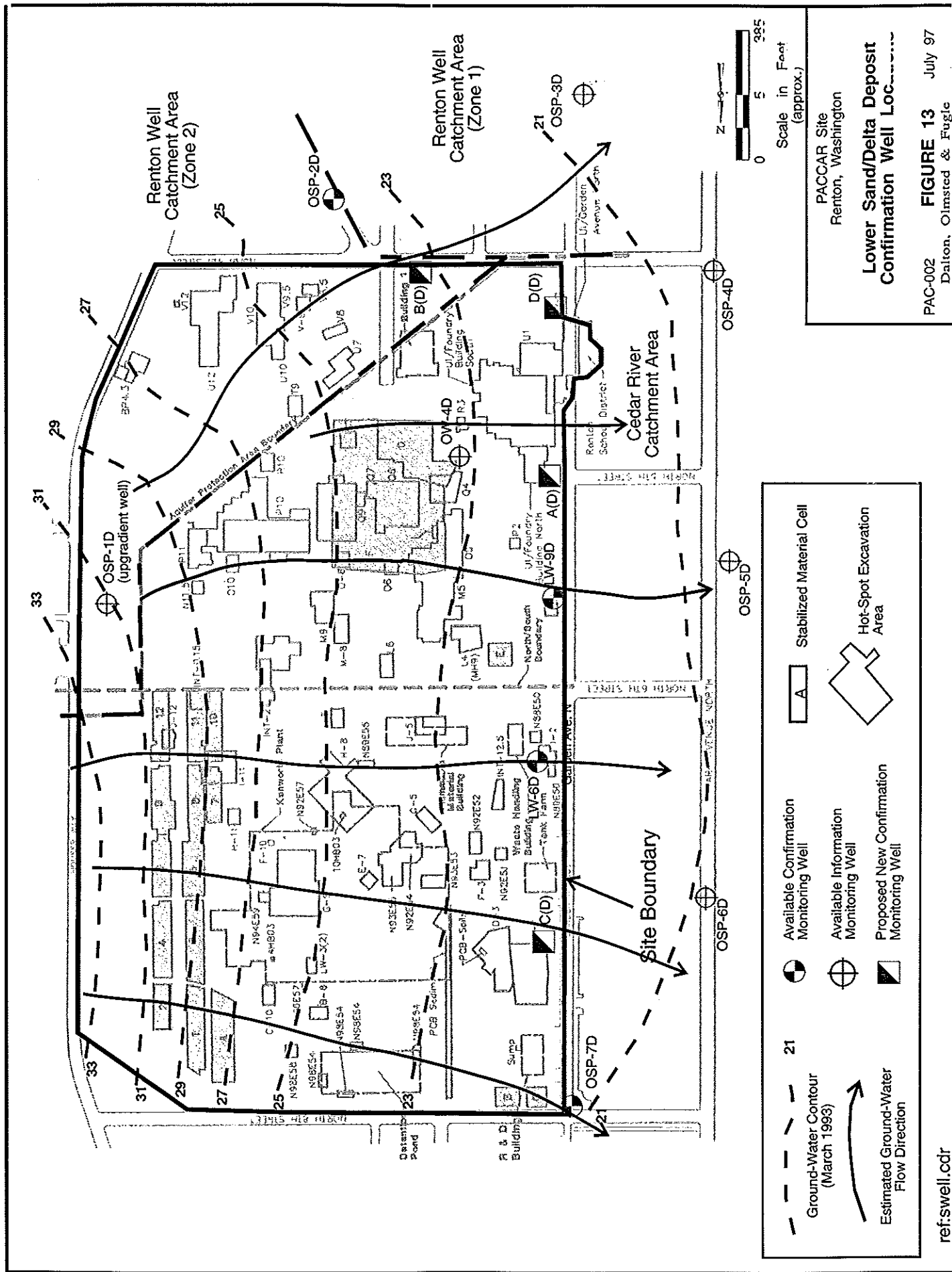
Upper Sand/Aquitard Confirmation Well Loc.....

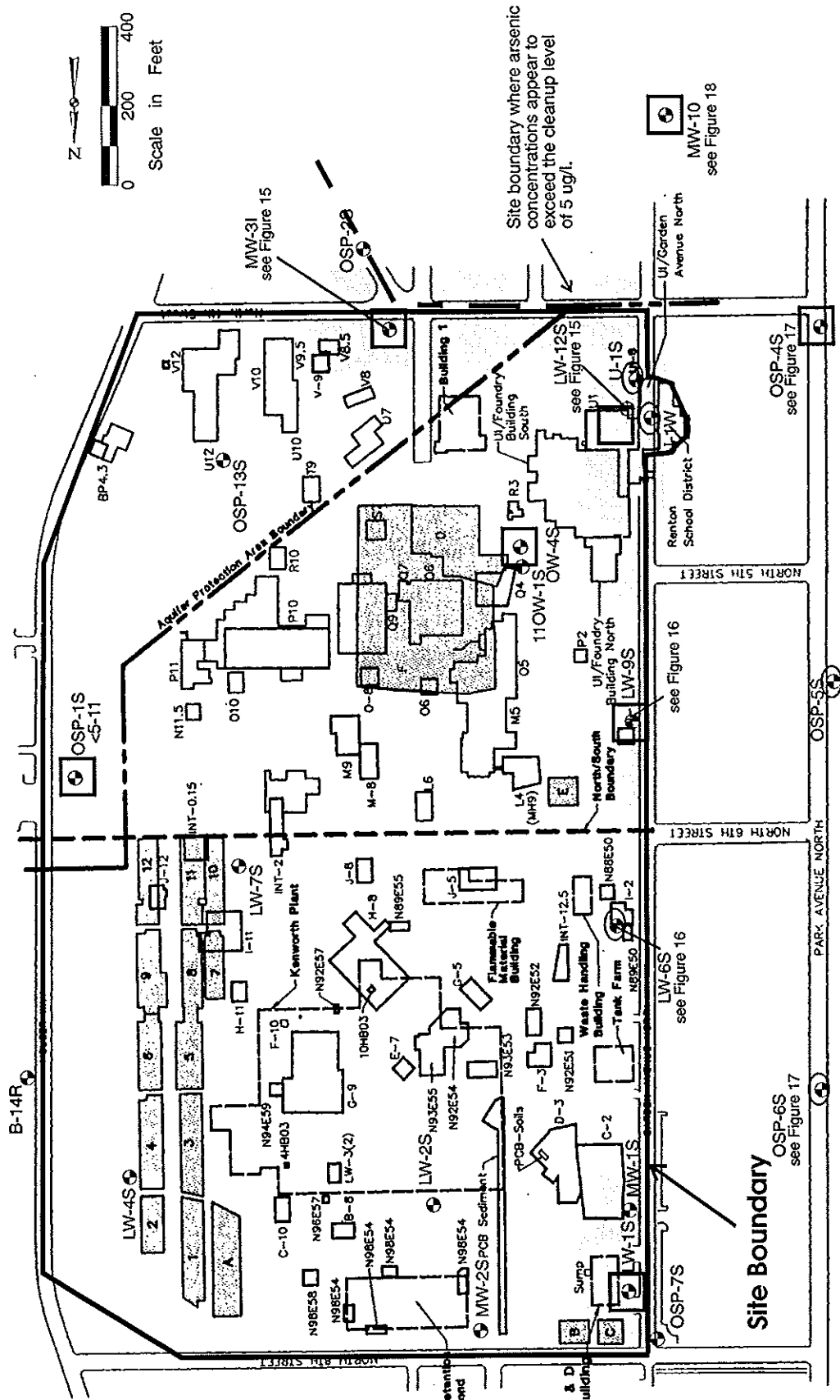
FIGURE 12 July 97

PAC-002 Dalton, Olmsted & Fugle

Scale in Feet (approx.)

0 5 385

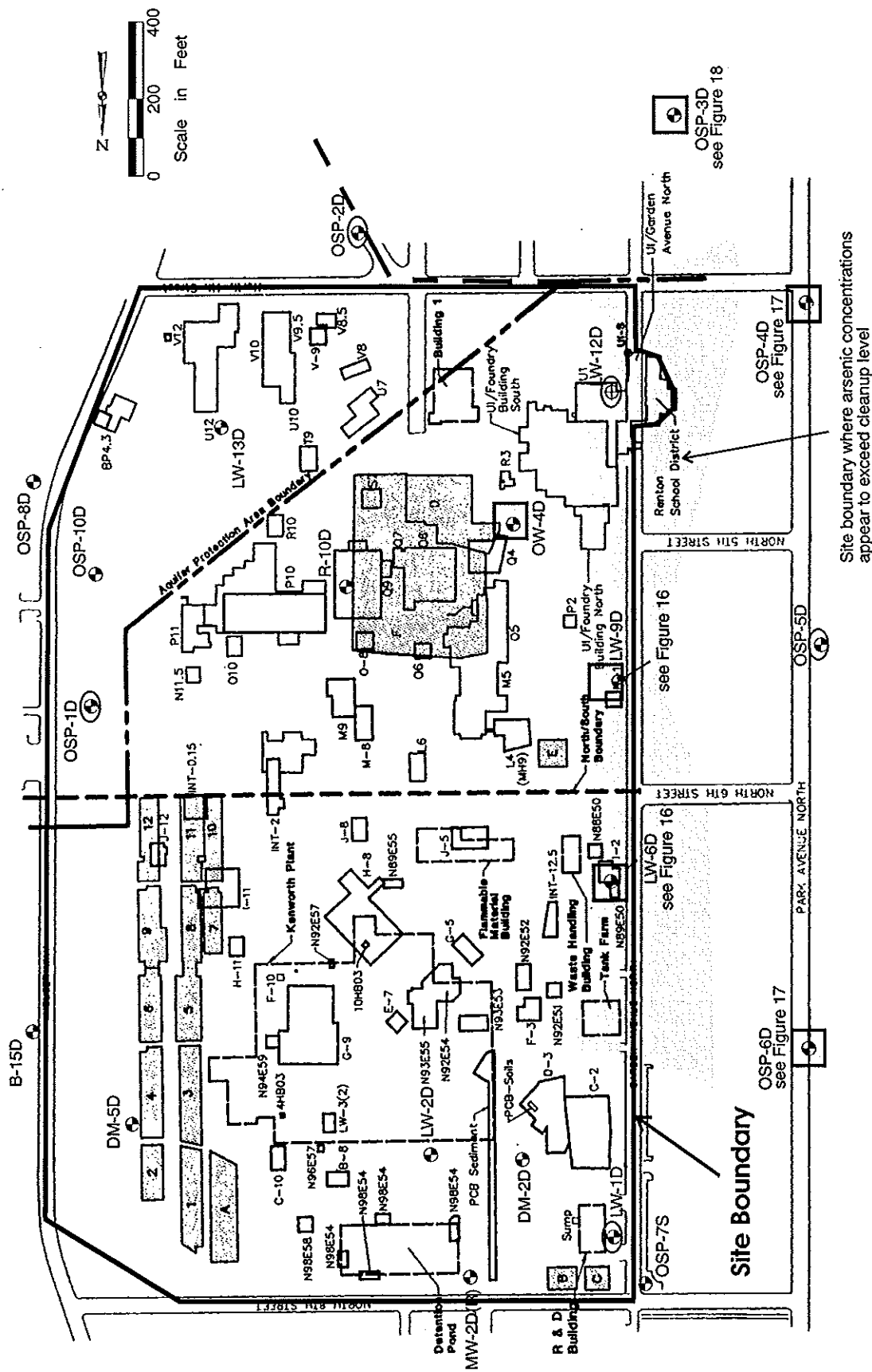




- Available Monitoring Well
OSP-5S and Number
- Abandoned Monitoring Well
LW-12S and Number
- Meets Cleanup Std.
- Potentially Exceeds Cleanup Std.
- <5-11 Range of Arsenic Conc. in ug/l-ppb

Note: Based on data collected since 1988. Selected Conc. trends are shown on Figures 16 to 18.

See Table 1 and Attachment A for Arsenic Concentration Summary



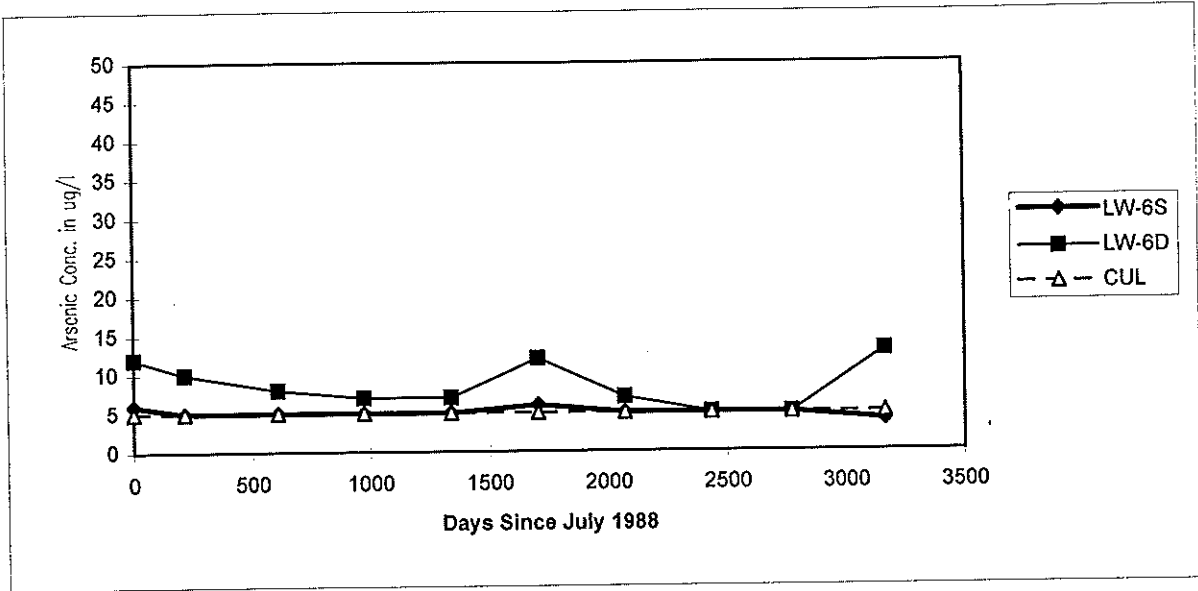
PAC-002 **FIGURE 15** **JULY 1997**
Dalton, Olmsted & Fuglievand, Inc.

Note: Based on data collected since 1988. Selected Conc. trends are shown on Figures 16 to 18.

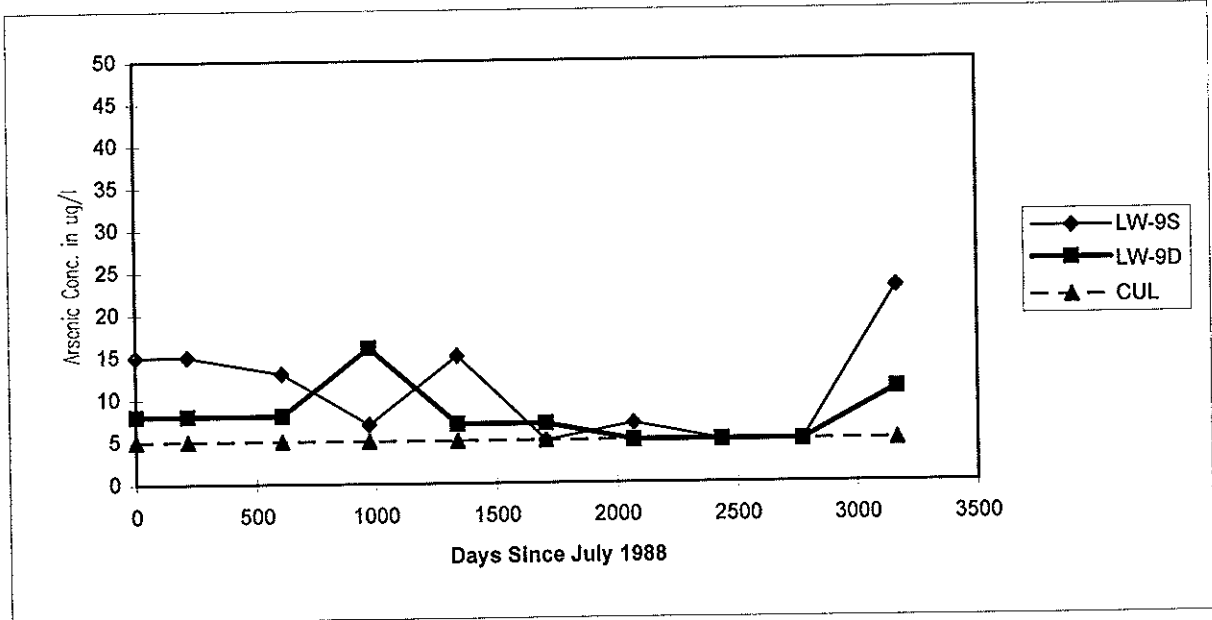
ref: ras2.cdr

FIGURE 16 - Arsenic Concentrations in Wells LW-6S, LW-6D, LW-9S and LW-9D

PACCAR Site
Renton, Washington



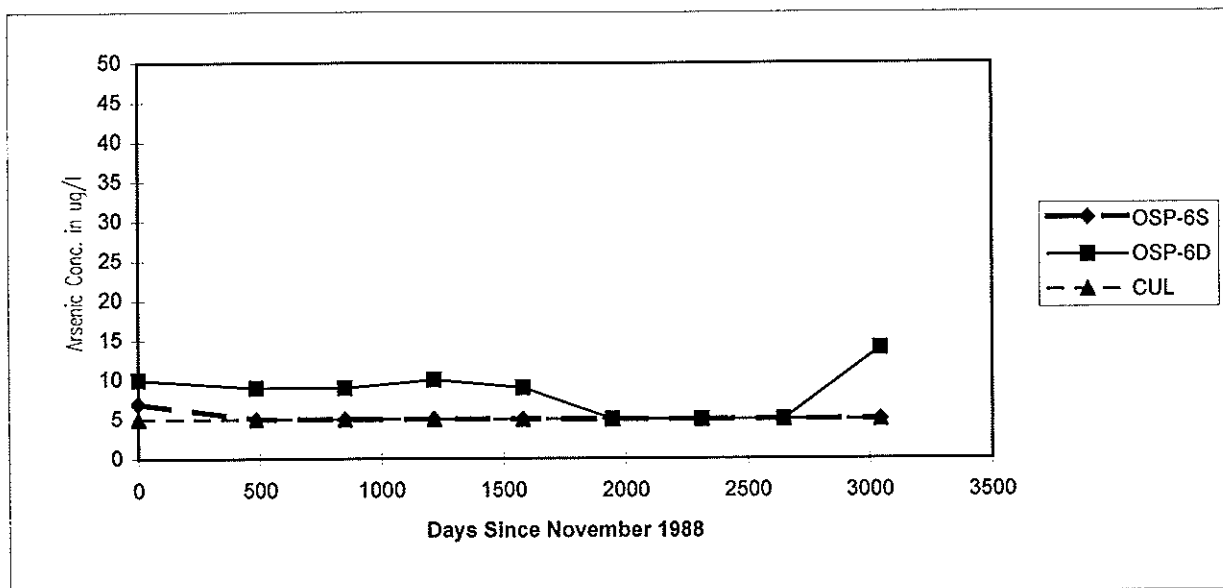
Arsenic in ug/l					Arsenic in ug/l				
Date	Days	LW-6S	LW-6D	CUL	Date	Days	LW-9S	LW-9D	CUL
Jul-88	0	6	12	5	Jul-88	0	15	8	5
Feb-89	215	<5	10	5	Feb-89	215	15	8	5
Mar-90	608	<5	8	5	Mar-90	608	13	8	5
Mar-91	973	<5	7	5	Mar-91	973	7	16	5
Mar-92	1339	<5	7	5	Mar-92	1339	15	7	5
Mar-93	1704	6	12	5	Mar-93	1704	<5	7	5
Mar-94	2069	<5	7	5	Mar-94	2069	7	<5	5
Mar-95	2434	<5	<5	5	Mar-95	2434	<5	<5	5
Feb-96	2771	<5	<5	5	Feb-96	2771	<5	<5	5
Mar-97	3165	4	13	5	Mar-97	3165	23	11	5



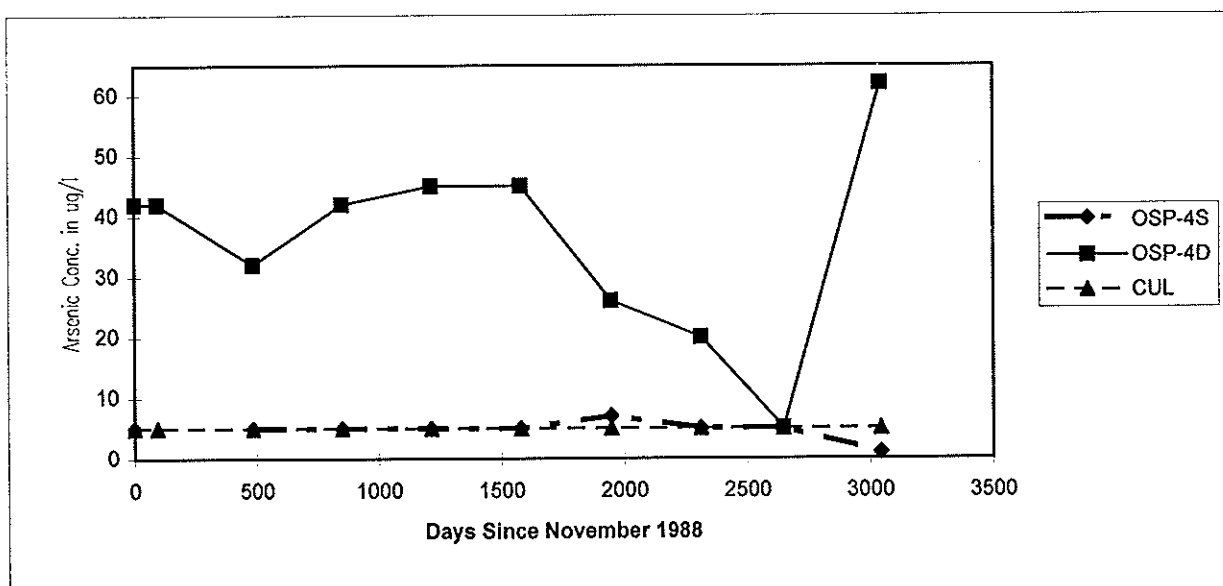
Note: CUL - Cleanup Level (arsenic - 5 ug/l)

FIGURE 17 - Arsenic Concentrations in Wells OSP-6S, OSP-6D, OSP-4S, and OSP-4D

PACCAR Site
Renton, Washington



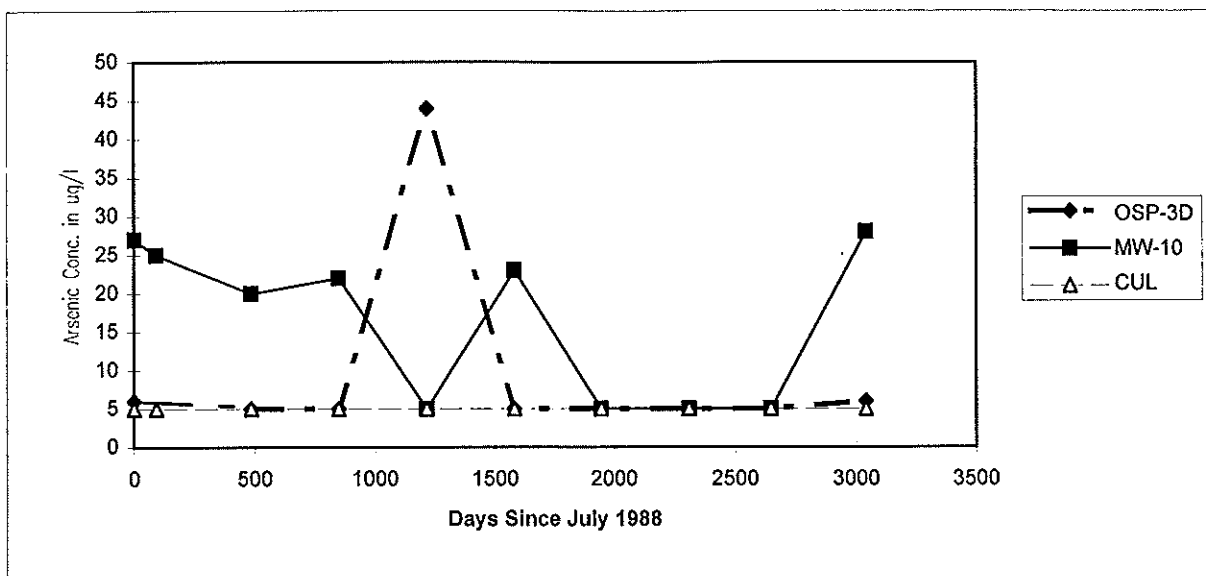
Arsenic in ug/l					Arsenic in ug/l				
Date	Days	OSP-6S	OSP-6D	CUL	Date	Days	OSP-4S	OSP-4D	CUL
Nov-88	0	7	10	5	Nov-88	0	5	42	5
Mar-90	485	<5	9	5	Feb-89	92		42	5
Mar-91	850	<5	9	5	Mar-90	485	<5	32	5
Mar-92	1216	<5	10	5	Mar-91	850	<5	42	5
Mar-93	1581	<5	9	5	Mar-92	1216	<5	45	5
Mar-94	1946	<5	<5	5	Mar-93	1581	<5	45	5
Mar-95	2311	<5	<5	5	Mar-94	1946	7	26	5
Feb-96	2648	<5	<5	5	Mar-95	2311	<5	20	5
Mar-97	3042	5	14	5	Feb-96	2648	<5	<5	5
					Mar-97	3042	<1	62	5



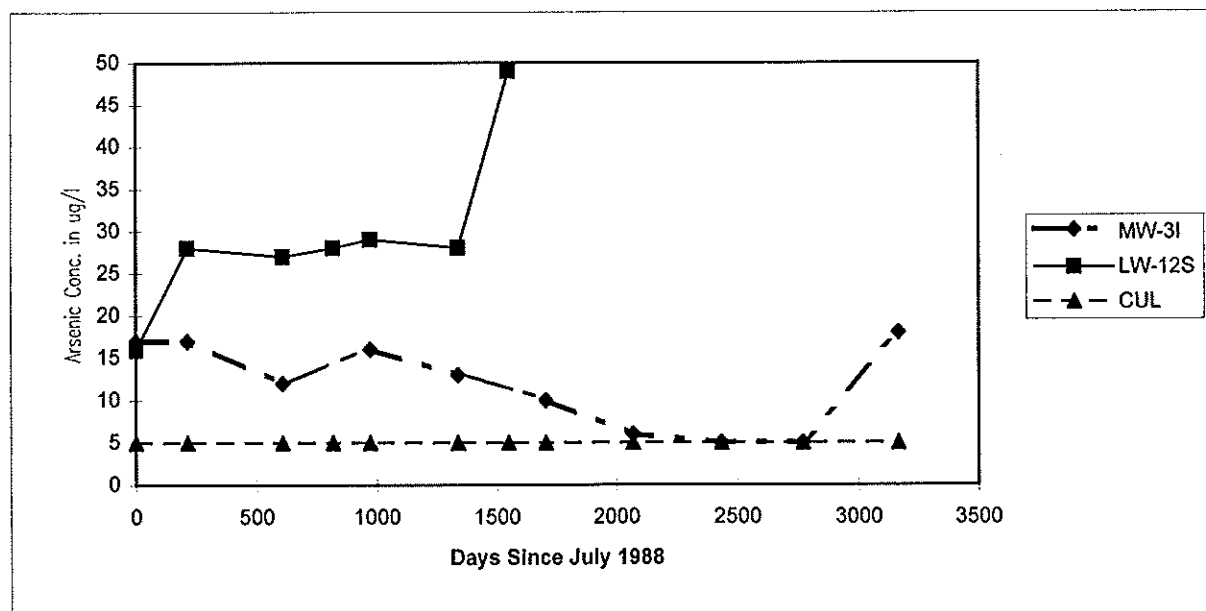
Note: CUL - Cleanup Level (arsenic 5 ug/l)

FIGURE 18 - Arsenic Concentrations in Wells MW-10, OSP-3D, MW-3I, and LW-12S

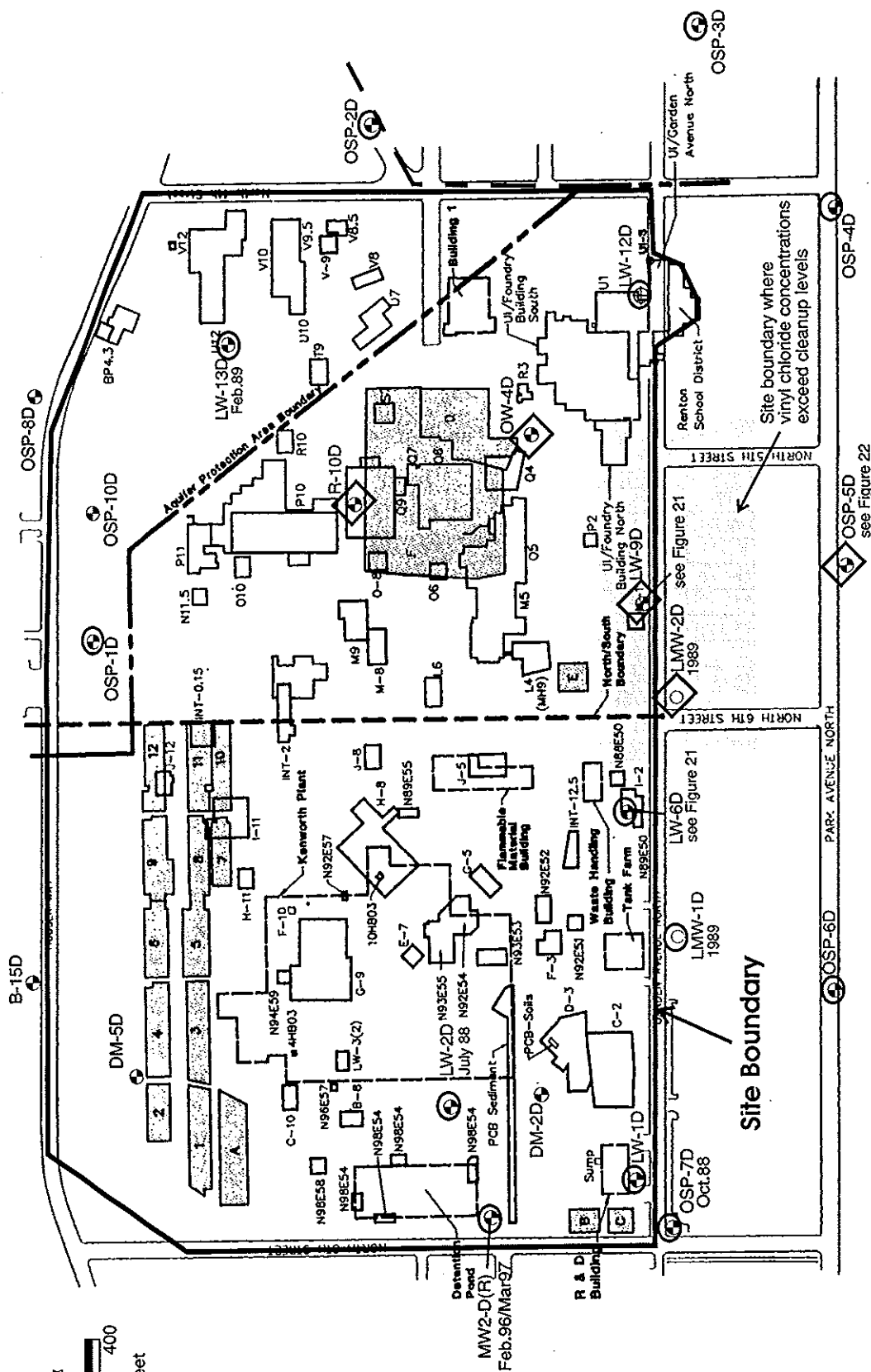
PACCAR Site
Renton, Washington



Arsenic in ug/l					Arsenic in ug/l				
Date	Days	OSP-3D	MW-10	CUL	Date	Days	MW-3I	LW-12S	CUL
Nov-88	0	6	27	5	Jul-88	0	17	16	5
Feb-89	92		25	5	Feb-89	215	17	28	5
Mar-90	485	<5	20	5	Mar-90	608	12	27	5
Mar-91	850	<5	22	5	Oct-90	818		28	5
Mar-92	1216	44	<5	5	Mar-91	973	16	29	5
Mar-93	1581	<5	23	5	Mar-92	1339	13	28	5
Mar-94	1946	<5	5	5	Oct-92	1549		49	5
Mar-95	2311	<5	5	5	Mar-93	1704	10		5
Feb-96	2648	<5	<5	5	Mar-94	2069	6		5
Mar-97	3042	6	28	5	Mar-95	2434	<5		5
					Feb-96	2771	<5		5
					Mar-97	3165	18		5



Note: CUL - Cleanup Level (arsenic 5 ug/l)



Legend

- OSP-6D Vinyl Chloride not detected
- OSP-9D Vinyl Chloride appears to exceed cleanup level
- Feb.89 Date of last analysis

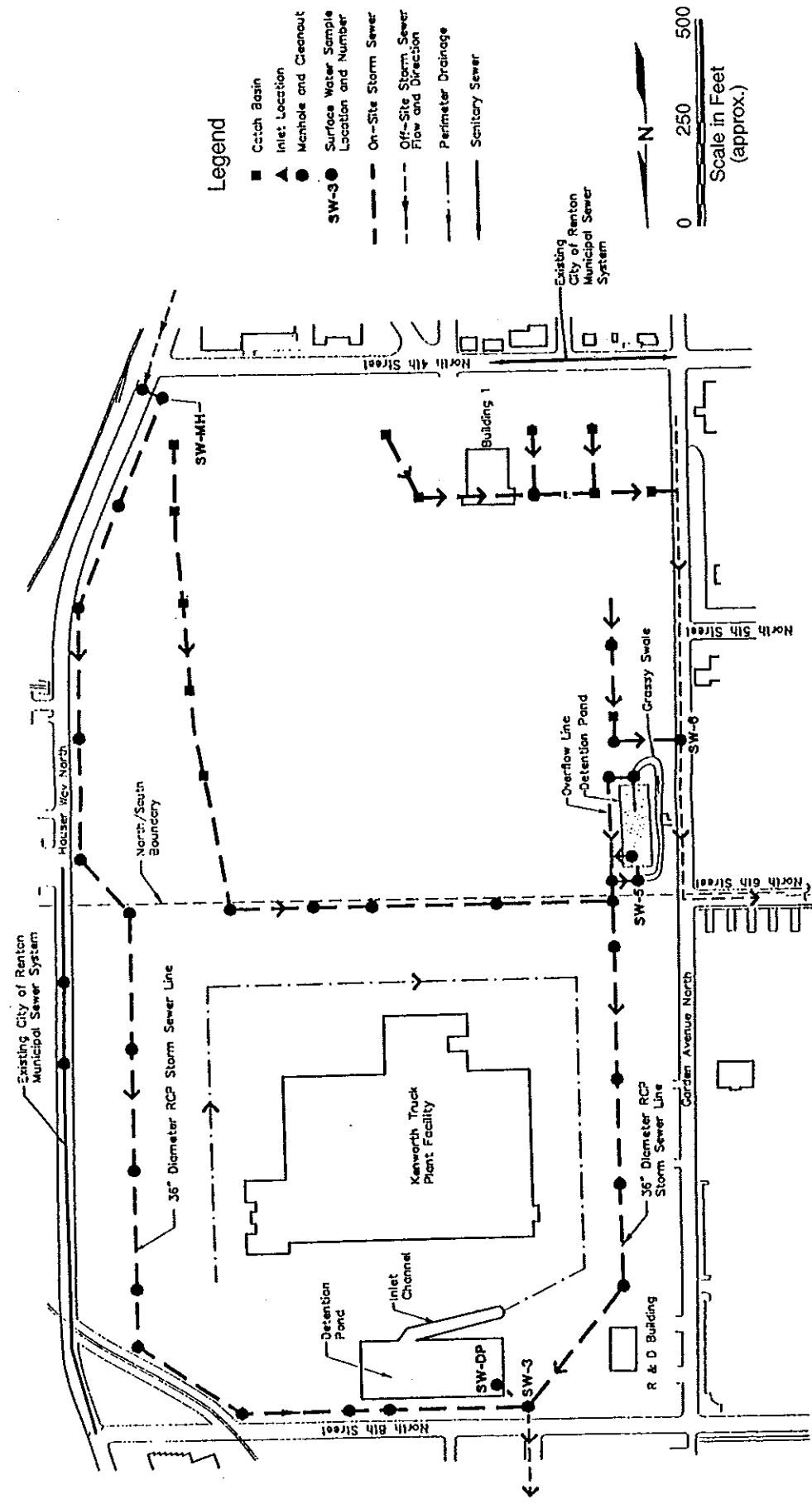
Based on data collected since 1988. See Table 2 and Attachment A for vinyl chloride conc. summaries.

- OSP-5S Available Monitoring Well and Number
- LW-12D Abandoned Monitoring Well and Number
- LMW-1D Well by Landau (status unknown)

PACCAR Site
Renton, Washington

VINYL CHLORIDE EXCEEDANCES IN SITE BOUNDARY LOWER SAND WELLS

PAC-002 FIGURE 20 July 1997
Dalton, Olmsted & Fuglevand, Inc.



PACCAR Site
Renton, Washington

**SURFACE WATER
SAMPLING LOCATIONS**

PAC-002 **FIGURE 23** March 1996
Dalton, Olmsted & Fuglevand, Inc.

Cleanup Level Comparisons - Wells LW-1S and LW-1D

PACCAR Site
Renton, Washington

Date	Days	LW-1S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	9	<5	<1	<1	<4
Mar-90	608	<5	<5	<1	<1	<4
Mar-91	973	<5	1.3	<1	<1	<1
Mar-92	1339	<5	<1	2	<1	<1
Mar-93	1704	<5	<1	<1	<1	<1
Mar-94	2069	<5	<1	<1	<1	<1
Mar-95	2434	<5	<1	2	<1	<1
Feb-96	2771	<5	<1	1	<3	<1
Mar-97	3165	7	<1	1.3	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-1S - Summary of Findings:

- (1) - Number of samples - 9
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP action level of 2 ug/l.
- (5) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (4) - The latest sample had an arsenic concentration of 7 ug/l that is above the cleanup level.
- (5) - The data indicate that concentrations of lead, benzene and vinyl chloride are below cleanup levels. Additional sampling for arsenic is indicated because of the March 97 sampling result. Note that OSP-7S is being substituted for LW-1S.

Date	Days	LW-1D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	<5	7	<1	<1	na
Mar-90	608	<5	<5	<1	<1	<4
Mar-91	973	<5	<1	<1	<1	<1
Mar-92	1339	<5	<1	<1	<1	<1
Mar-93	1704	<5	<1	2	<1	<1
Mar-94	2069	<5	<1	2	<1	<1
Mar-95	2434	<5	<1	<1	<1	<1
Feb-96	2771	<5	<1	<3	<3	<1
Mar-97	3165	4	<1	<0.1	0.38	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-1D - Summary of Findings:

- (1) - Number of samples - 9
- (2) - Concentrations of arsenic, and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP cleanup level of 0.4 ug/l.
- (5) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (4) - The last eight reported lead concentrations were below the cleanup level.
Application of the nonparametric method for the Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the latest eight lead results indicates a Upper Confidence Limit of <5 ug/l which meets the cleanup level of 5 ug/l.
- (5) - The data indicate that concentrations of CAP contaminants of concern are below cleanup levels. Note that OSP-7D is being substituted for LW-1D.

Cleanup Level Comparisons - OSP-6S and OSP-6D

PACCAR Site
Renton, Washington

Date	Days	OSP-6S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	7	11	<1	<1	<4
Mar-90	485	<5	<5	<1	<1	<4
Mar-91	850	<5	1.4	<1	<1	<1
Mar-92	1216	<5	<1	<1	<1	<1
Mar-93	1581	<5	<1	<1	<1	<1
Mar-94	1946	<5	<1	<1	<1	<1
Mar-95	2311	<5	<1	<1	<1	<1
Feb-96	2648	<5	<1	<3	<3	<1
Mar-97	3042	5	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OSP-6S - Summary of Findings:

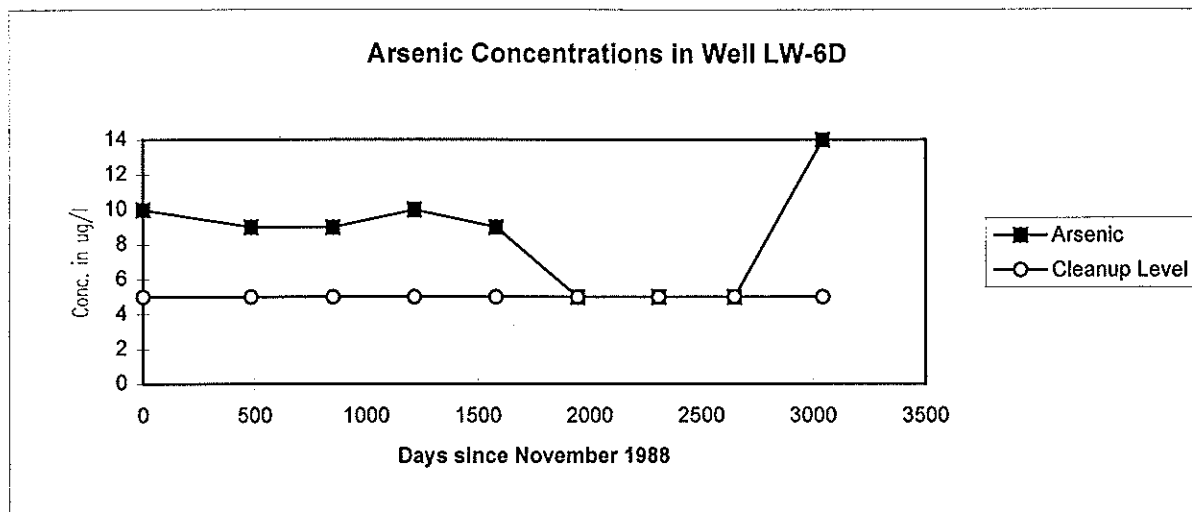
- (1) - Number of samples - 9
- (2) - Concentrations of benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP cleanup level of 0.4 ug/l.
- (5) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (4) - The last eight reported arsenic and lead concentrations were at or below the cleanup level.
Application of the nonparametric method for the Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the last eight lead and arsenic results indicates an Upper Confidence Limit concentrations of 5 or <5 ug/l for arsenic and lead which meet the cleanup level of 5 ug/l.
- (5) - The data indicate that concentrations of CAP contaminants of concern are below cleanup levels.

Date	Days	OSP-6D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	10	<5	<1	<1	<4
Mar-90	485	9	<5	<1	<1	<4
Mar-91	850	9	<1	<1	<1	<1
Mar-92	1216	10	<1	<1	<1	<1
Mar-93	1581	9	<1	<1	<1	<1
Mar-94	1946	<5	<1	<1	<1	<1
Mar-95	2311	<5	<1	<1	<1	<1
Feb-96	2648	<5	<1	<3	<3	<1
Mar-97	3042	14	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OSP-6D - Summary of Findings:

- (1) - Number of samples - 9
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP cleanup level of 0.4 ug/l.
- (5) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (4) - The last reported arsenic concentration is above the cleanup level but is below the the CAP action level. Additional monitoring is required to assess whether the arsenic cleanup level is currently being exceeded.



Date	Days	Arsenic	Cleanup Level
Nov-88	0	10	5
Mar-90	485	9	5
Mar-91	850	9	5
Mar-92	1216	10	5
Mar-93	1581	9	5
Mar-94	1946	<5	5
Mar-95	2311	<5	5
Feb-96	2648	<5	5
Mar-97	3042	14	5

Cleanup Levels Comparisons - Wells LW-6S and LW-6D

PACCAR Site
Renton, Washington

Date	Days	LW-6S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	6	<5	<1	<1	<4
Feb-89	215	<5	<5	<1	<1	<4
Mar-90	608	<5	<5	<1	<1	<4
Mar-91	973	<5	<1	<1	<1	<1
Mar-92	1339	<5	<1	<1	<1	<1
Mar-93	1704	6	<1	<1	1	<1
Mar-94	2069	<5	<1	<1	<1	<1
Mar-95	2434	<5	<1	<1	<1	<1
Feb-96	2771	<5	<1	<3	<3	<1
Mar-97	3165	4	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-6S - Summary of Findings

- (1) - Number of samples - 10
- (2) - Concentrations of benzene and lead are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 0.4 ug/l.
- (5) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (4) - Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) indicates a medium Upper Confidence Limit concentration of 6 ug/l for arsenic and 1 ug/l for vinyl chloride which are above the cleanup levels of 5 ug/l and 0.4 ug/l respectively.
- (5) - Additional sampling for arsenic and vinyl chloride are necessary to determine if cleanup levels are being exceeded.

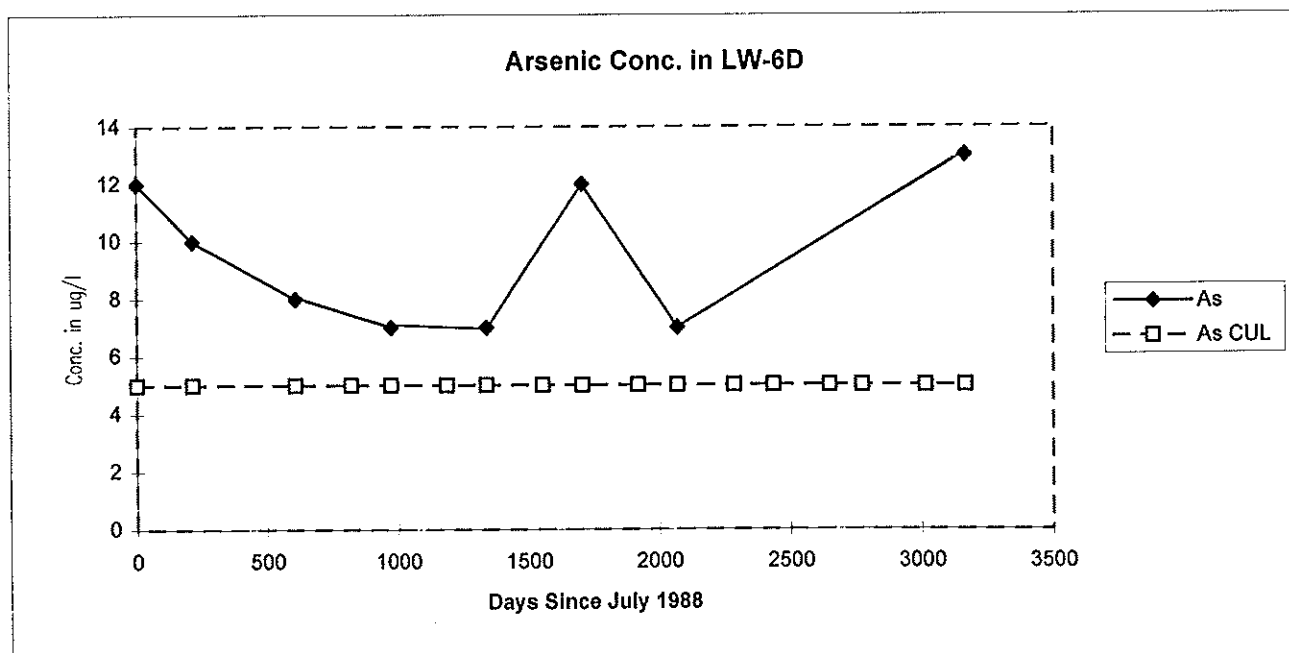
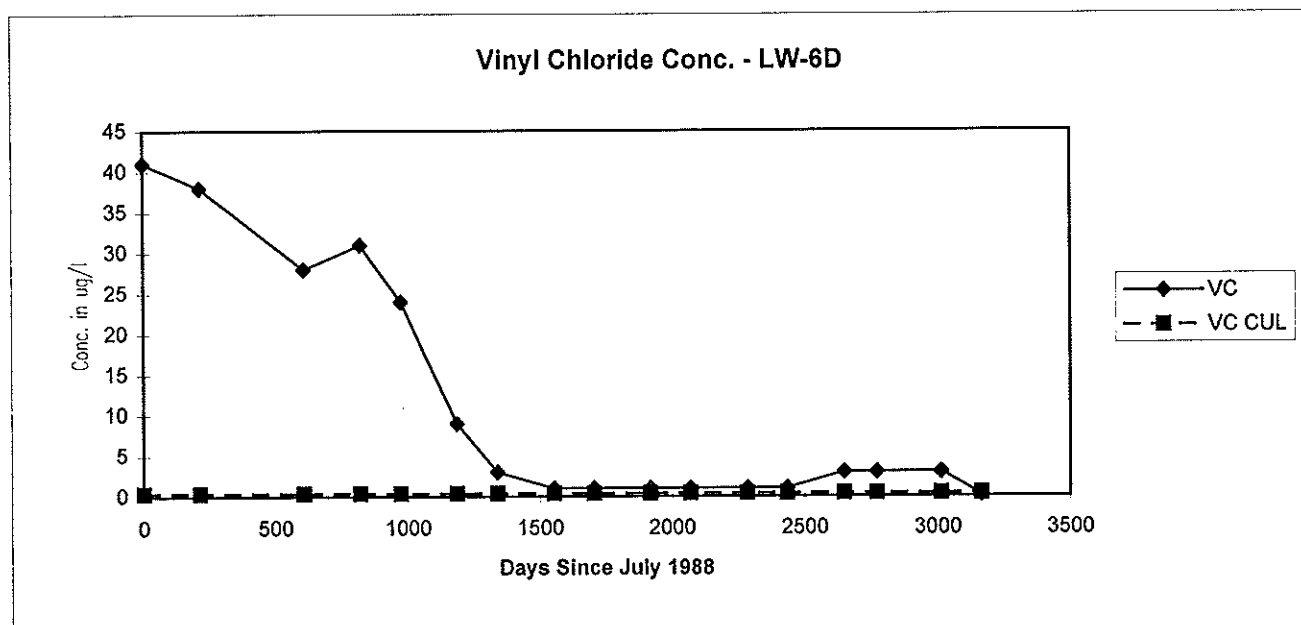
Date	Days	LW-6D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	12	8	<1	41	<6
Feb-89	215	10	11	<1	38	<4
Mar-90	608	8	<5	<1	28	<4
Oct-90	822	*	*	<1	31	*
Mar-91	973	7	<1	<1	24	<1
Oct-91	1187	*	*	<1	9	*
Mar-92	1339	7	<1	<1	3	<1
Oct-92	1553	*	*	<1	<1	*
Mar-93	1704	12	<1	<1	<1	<1
Oct-93	1918	*	*	<1	<1	*
Mar-94	2069	7	<1	<1	<1	<1
Oct-94	2283	*	*	<1	<1	*
Mar-95	2434	<5	<1	1	<1	<1
Oct-95	2648	*	*	<3	<3	*
Feb-96	2771	<5	<1	<3	<3	<1
Oct-96	3014	*	*	<3	<3	*
Mar-97	3165	13	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-6D - Summary of Findings

- (1) - Number of samples - 10 to 17
- (2) - Concentrations of benzene are below the CAP cleanup level.
- (3) - Concentrations of vinyl chloride appear to have declined to below the CAP cleanup level of 0.4 ug/l (see vinyl chloride concentration graph - below).
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.

- LW-6D (con't)**
- (5) - The last eight reported lead concentrations were below the cleanup level.
Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the last eight lead results indicates an Upper Confidence Limit of <5 ug/l for lead which meets the cleanup level of 5 ug/l.
 - (6) - The last arsenic concentration (March 1997) was above the cleanup level.
Additional sampling is required to further evaluate arsenic conc.



Cleanup Levels Comparisons - Wells LW-6S and LW-6D

PACCAR Site
Renton, Washington

LW-6D					
Days(1)	VC	VC CUL	Days(1)	As	As CUL
0	41	0.4	0	12	5
215	38	0.4	215	10	5
608	28	0.4	608	8	5
822	31	0.4	822		5
973	24	0.4	973	7	5
1187	9	0.4	1187		5
1339	3	0.4	1339	7	5
1553	<1	0.4	1553		5
1704	<1	0.4	1704	12	5
1918	<1	0.4	1918		5
2069	<1	0.4	2069	7	5
2283	<1	0.4	2283		5
2434	<1	0.4	2434	<5	5
2648	<3	0.4	2648		5
2771	<3	0.4	2771	<5	5
3014	<3	0.4	3014		5
3165	<0.2	0.4	3165	13	5

Notes: VC - Vinyl Chloride
As - Arsenic
CUL - Cleanup Up Level
Concentrations in ug/l
(1) - Days since July 1988

Cleanup Level Comparisons - Wells LW-9S and LW-9D

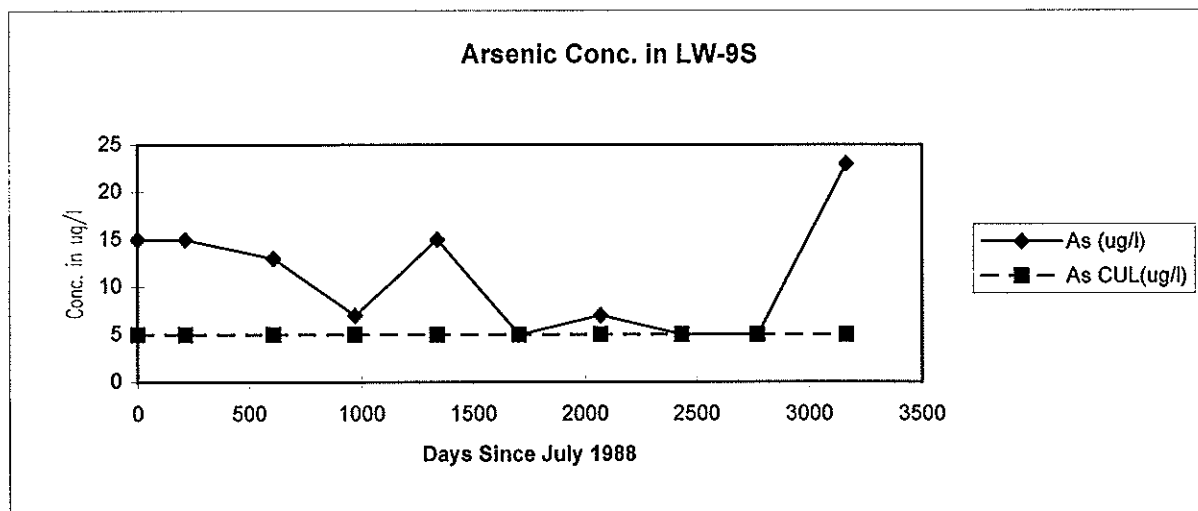
PACCAR Site
Renton, Washington

Date	Days	LW-9S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	15	9	<1	<1	<4
Feb-89	215	15	7	<1	<1	<4
Mar-90	608	13	<5	<1	<1	<5
Mar-91	973	7	<1	<1	<1	<1
Mar-92	1339	15	<1	<1	<1	<1
Mar-93	1704	<5	<1	<1	<1	<1
Mar-94	2069	7	<1	<1	<1	<1
Mar-95	2434	<5	<1	<1	<1	<1
Feb-96	2771	<5	<1	<3	<3	<1
Mar-97	3165	23	<1	<1	0.42	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-9S - Summary of Findings

- (1) - Number of samples - 10
- (2) - Concentrations of benzene are below CAP cleanup level.
- (3) - Concentrations of vinyl chloride are below the CAP action level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - The last eight reported lead concentrations were below the cleanup level.
Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the latest eight lead results indicates a median Upper Confidence Limit of <5 ug/l for lead which meets the cleanup level of 5 ug/l.
- (6) - Arsenic concentrations declined in Well LW-9S (see graph below) to below the cleanup level by March 1995. However the latest concentration is above the cleanup level.
Additional sampling is recommended.



Days	As (ug/l)	As CUL(ug/l)
0	15	5
215	15	5
608	13	5
973	7	5
1339	15	5
1704	<5	5
2069	7	5
2434	<5	5
2771	<5	5
3165	23	5

CUL - Cleanup Level

Revised: 7/29/97 (Compar-LW9)

Cleanup Level Comparisons - Wells LW-9S and LW-9D

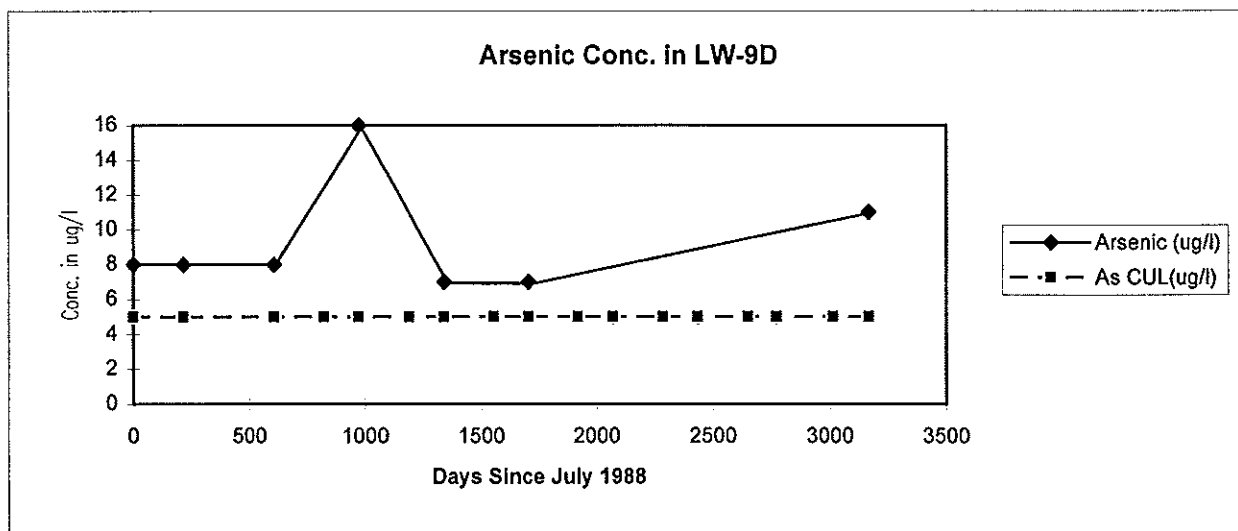
PACCAR Site
Renton, Washington

Date	Days	LW-9D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	8	7	<1	120	<4
Feb-89	215	8	6	<1	62	<4
Mar-90	608	8	<5	<1	32	<4
Oct-90	822	*	*	<1	31	*
Mar-91	973	16	<1	<1	13	<1
Oct-91	1187	*	*	<1	30	*
Mar-92	1339	7	<1	<1	8	<1
Oct-92	1553	*	*	<1	32	*
Mar-93	1704	7	<1	<1	13	<1
Oct-93	1918	*	*	<1	7	*
Mar-94	2069	<5	<1	<1	2	<1
Oct-94	2283	*	*	<1	2	*
Mar-95	2434	<5	<1	<1	<1	<1
Oct-95	2648	*	*	<3	<3	*
Feb-96	2771	<5	<1	<3	1.0	<1
Oct-96	3014	*	*	<3	2.0	*
Mar-97	3165	11	<1	<0.1	1.2	<1

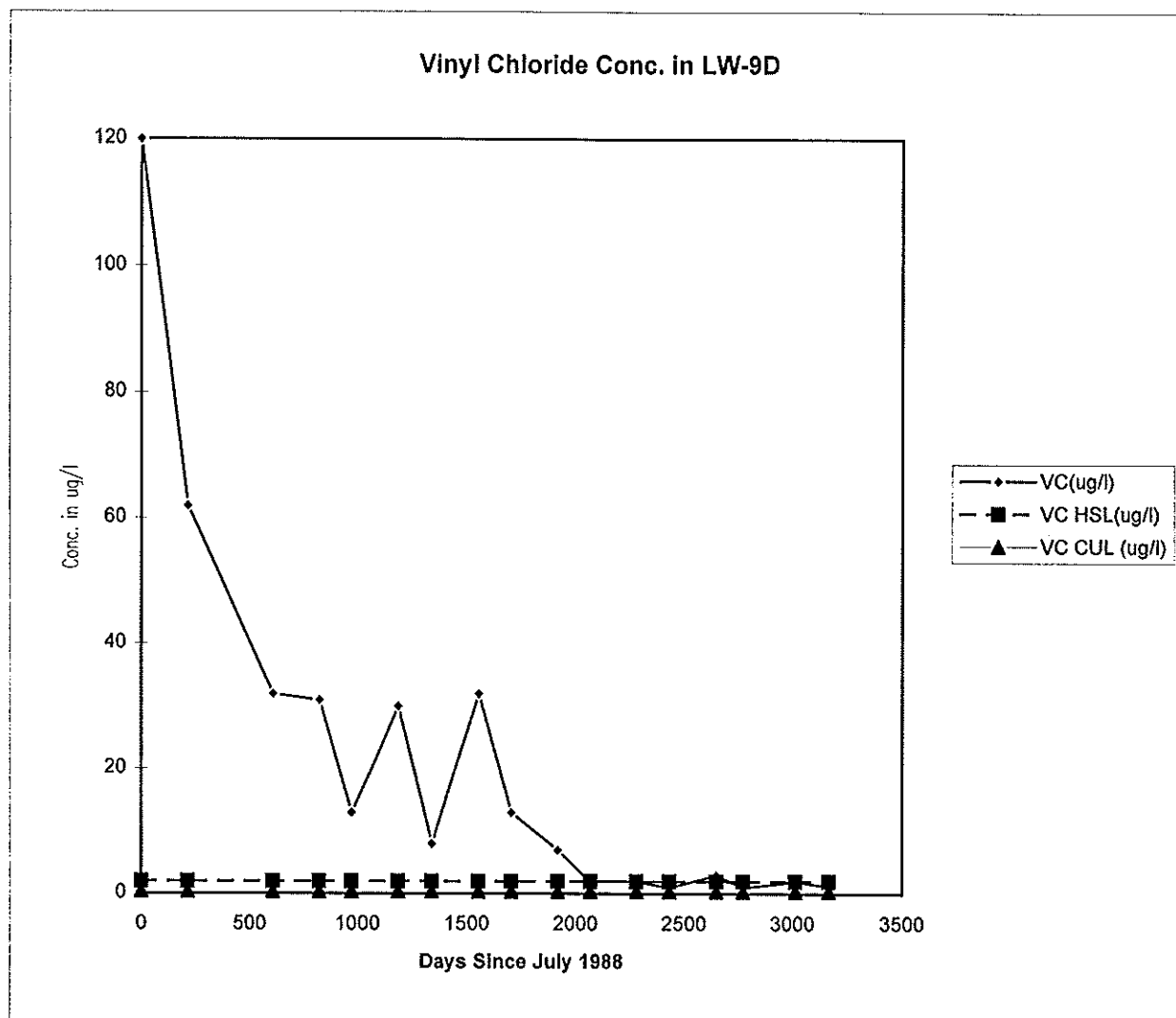
CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-9D - Summary of Findings

- (1) - Number of samples - 10 to 17
- (2) - Concentrations of benzene are below the CAP cleanup level.
- (3) - Concentrations of vinyl chloride appear to have declined to below the CAP hot-spot level of 2 ug/l (see vinyl chloride concentration graph - below).
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - The last eight reported lead concentrations were below the cleanup level.
Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the latest eight lead results indicates a median Upper Confidence Limit of <5 ug/l for lead which meets the cleanup level of 5 ug/l.
- (6) - The last arsenic concentration was above the cleanup level. Additional sampling is required.
A graph of arsenic concentrations with time is presented below.



Revised: 7/29/97 (Compar-LW9)



Days(1)	Arsenic (ug/l)	As CUL(ug/l)	Days(1)	VC(ug/l)	VC HSL(ug/l)	VC CUL (ug/l)
0	8	5	0	120	2	0.4
215	8	5	215	62	2	0.4
608	8	5	608	32	2	0.4
822		5	822	31	2	0.4
973	16	5	973	13	2	0.4
1187		5	1187	30	2	0.4
1339	7	5	1339	8	2	0.4
1553		5	1553	32	2	0.4
1704	7	5	1704	13	2	0.4
1918		5	1918	7	2	0.4
2069	<5	5	2069	2	2	0.4
2283		5	2283	2	2	0.4
2434	<5	5	2434	<1	2	0.4
2648		5	2648	<3	2	0.4
2771	<5	5	2771	1.0	2	0.4
3014		5	3014	2.0	2	0.4
3165	11	5	3165	1.2	2	0.4

Notes:

VC - Vinyl Chloride

As - Arsenic

CUL - Cleanup Level

(1) - Days Since July 1988

Revised: 7/29/97 (Compar-LW9)

Cleanup Level Comparisons - OSP-4S and OSP-4D

PACCAR Site
Renton, Washington

		OSP-4S				
Date	Days	Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	<5	<5	<1	<1	<4
Mar-90	485	<5	<5	<1	<1	<5
Mar-91	850	<5	<1	<1	<1	<1
Mar-92	1216	<5	<1	<1	<1	<1
Mar-93	1581	<5	<1	<1	<1	<1
Mar-94	1946	7	<1	<1	<1	<1
Mar-95	2311	<5	<1	<1	<1	<1
Feb-96	2648	<5	<1	<3	<3	<1
Mar-97	3042	<5	<1	<0.1	<0.2	<10
CAP Cleanup Level		5	5	5	0.4	na
CAP Hot-spot Action Level		50	50	5	2	na

OSP-4S - Summary of Findings

- (1) - Number of samples - 9
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 0.4 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Eight of the nine arsenic analyses meet cleanup levels.

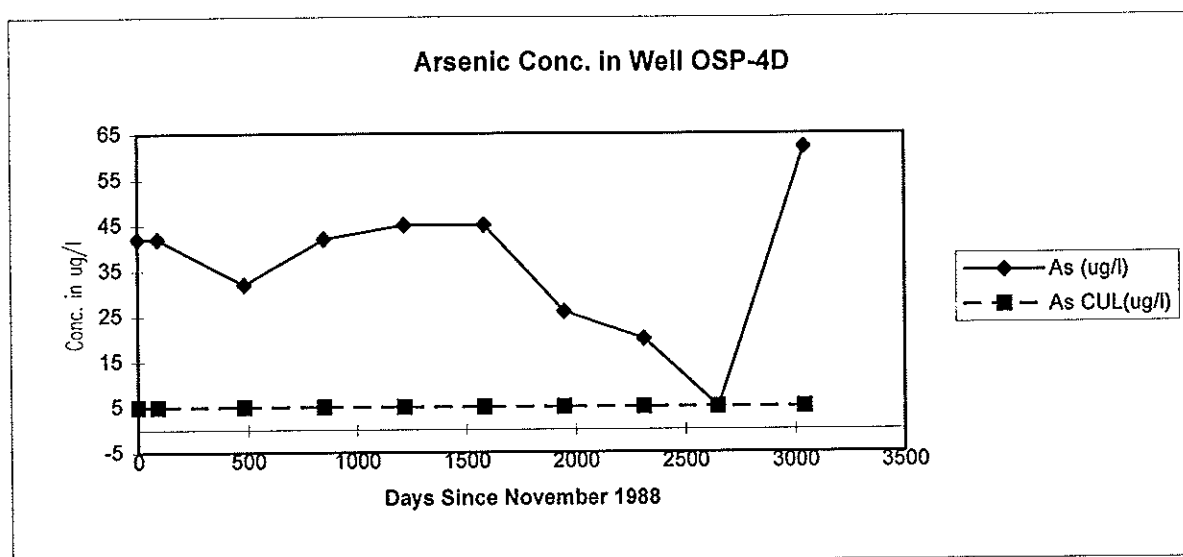
Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) indicates a median Upper Confidence Limit concentration of 7 ug/l for arsenic which is above the cleanup level of 5 ug/l. The exceedance is judged be the result of the small sample size rather than reflecting actual exceedance.

		OSP-4D				
Date	Days	Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	42	<5	<1	<1	<4
Feb-89	92	42	*	*	*	*
Mar-90	485	32	<5	<1	<1	<4
Mar-91	850	42	<1	<1	<1	<1
Mar-92	1216	45	<1	<1	<1	<1
Mar-93	1581	45	<1	<1	<1	<1
Mar-94	1946	26	<1	<1	<1	<1
Mar-95	2311	20	<1	<1	<1	<1
Feb-96	2648	<5	<1	<3	<3	<1
Mar-97	3042	62	1	<0.1	<0.2	<1
CAP Cleanup Level		5	5	5	0.4	na
CAP Hot-spot Action Level		50	50	5	2	na

OSP-4S - Summary of Findings

- (1) - Number of samples - 9 to 10
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 0.4 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Arsenic concentrations exceed the cleanup level.

Additional sampling is required.



Days	As (ug/l)	As CUL(ug/l)
0	42	5
92	42	5
485	32	5
850	42	5
1216	45	5
1581	45	5
1946	26	5
2311	20	5
2648	5	5
3042	62	5

CUL - Cleanup Level

Cleanup Levels Comparison - Wells MW-10 and OSP-3D

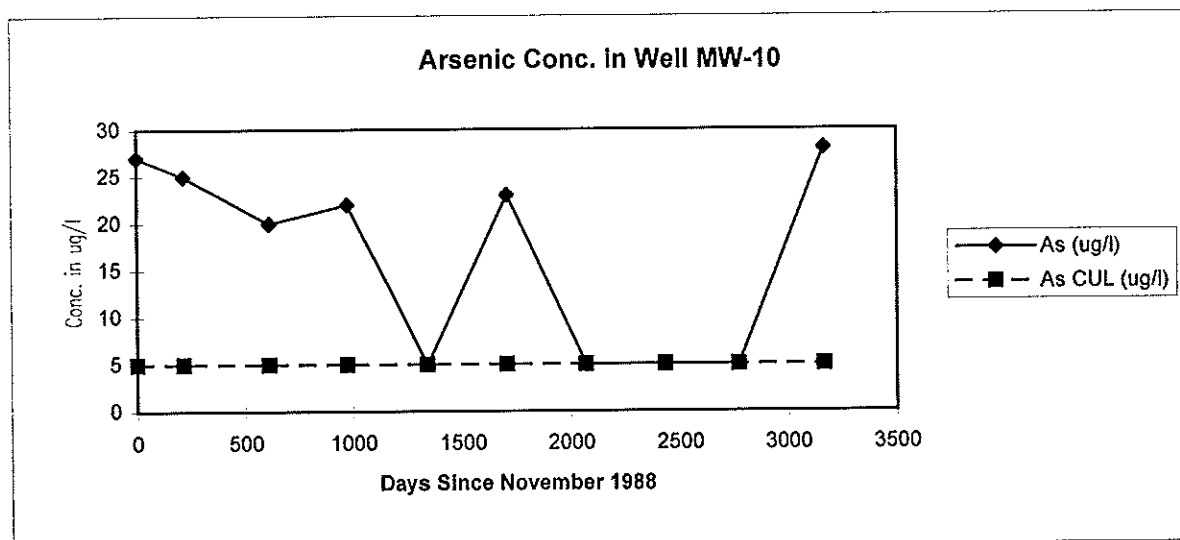
PACCAR Site
Renton, Washington

Date	Days	MW-10				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	27	6	<1	<1	<4
Feb-89	215	25				
Mar-90	608	20	<5	<1	<1	<4
Mar-91	973	22	<1	<1	<1	<1
Mar-92	1339	<5	<1	<1	<1	<1
Mar-93	1704	23	<1	<1	<1	<1
Mar-94	2069	5	<1	<1	<1	<1
Mar-95	2434	5	<1	<1	<1	<1
Feb-96	2771	<5	<1	<3	<3	<1
Mar-97	3165	28	<1	<0.1	0.44	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

MW-10 - Summary of Findings

- (1) - Number of samples - 9 to 10
- (2) - Concentrations of benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - The last eight lead analyses meet cleanup levels.
- (6) - Arsenic was exceeded in six of the ten available samples.



Days	As (ug/l)	As CUL (ug/l)
0	27	5
215	25	5
608	20	5
973	22	5
1339	<5	5
1704	23	5
2069	5	5
2434	5	5
2771	5	5
3165	28	5

CUL - Cleanup Level

Cleanup Levels Comparison - Wells MW-10 and OSP-3D

PACCAR Site
Renton, Washington

Date	Days	OSP-3D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	6	<5	<1	<1	<4
Feb-89	215					
Mar-90	608	<5	<5	<1	<1	<4
Mar-91	973	<5	<1	<1	<1	<1
Mar-92	1339	44	<1	<1	<1	<1
Mar-93	1704	<5	<1	<1	<1	<1
Mar-94	2069	<5	<1	<1	<1	<1
Mar-95	2434	<5	<1	<1	<1	<1
Feb-96	2771	<5	<1	<3	<3	<1
Mar-97	3165	6	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OSP-3D - Summary of Findings

- (1) - Number of samples - 9
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 0.4 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Seven of the nine arsenic analyses meet cleanup levels.

Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) indicates a median Upper Confidence Limit concentration of 44 ug/l for arsenic which is above the cleanup level of 5 ug/l. However, the 44 ug/l is substantially above the other six analyses. Additional sampling is necessary to provide sufficient data to assess attainment of the arsenic cleanup level at OSP-3D.

Cleanup Level Comparisons - Wells OSP-5S and OSP-5D

PACCAR Site
Renton, Washington

Date	Days	OSP-5S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	<5	<5	<1	<1	<4
Mar-90	485	<5	<5	<1	<1	<4
Mar-91	850	<5	<1	<1	<1	<1
Mar-92	1216	<5	<1	<1	<1	<1
Mar-93	1581	<5	<1	<1	<1	<1
Mar-94	1946	<5	<1	<1	<1	<1
Mar-95	2311	<5	<1	<1	<1	<1
Feb-96	2648	<5	<1	<3	<3	<1
Mar-97	3042	2	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OSP-5S - Summary of Findings

- (1) - Number of samples - 9
- (2) - Concentrations of arsenic, lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 0.4 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.

Date	Days	OSP-5D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	<5	<5	<1	4	<4
Feb-89	92	*	*	<1	5	*
Mar-90	485	<5	<5	<1	4	<4
Oct-90	699	*	*	<1	3	*
Mar-91	850	<5	<1	<1	<1	<1
Oct-91	1064	*	*	<1	3	*
Mar-92	1216	<5	<1	<1	2	<1
Oct-92	1430	*	*	<1	3	*
Mar-93	1581	<5	<1	<1	3	<1
Oct-93	1795	*	*	<1	<1	*
Mar-94	1946	<5	<1	<1	1	<1
Oct-94	2160	*	*	<1	2	*
Mar-95	2311	<5	<1	<1	<1	<1
Oct-95	2525	*	*	<3	<3	*
Feb-96	2648	<5	<1	<3	<2	<1
Oct-96	2891	*	*	<3	<1	*
Mar-97	3042	5	<1	<0.1	1.8	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

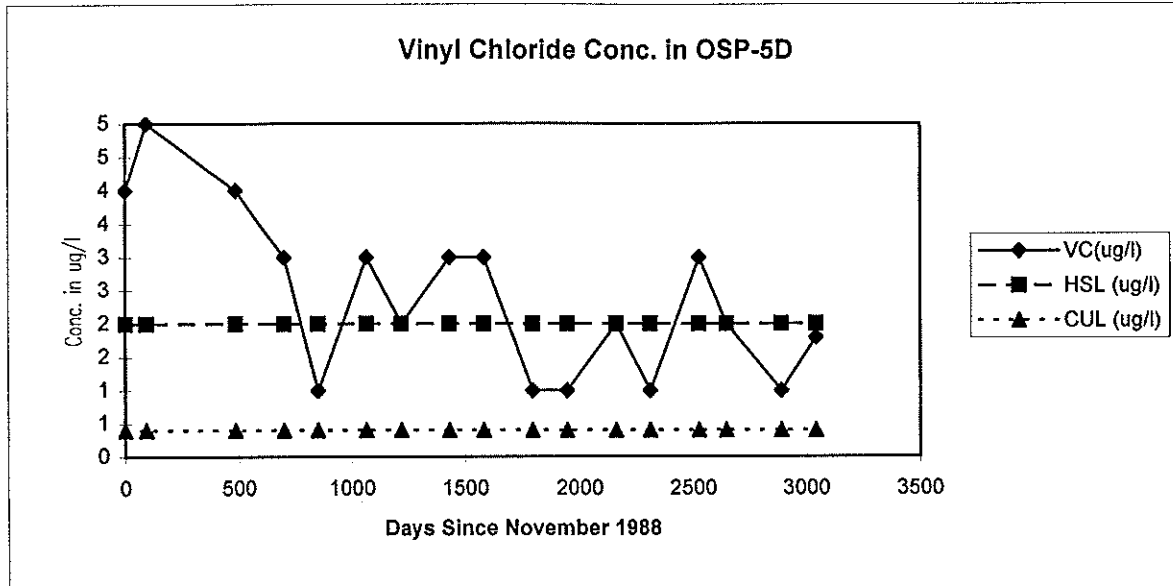
OSP-5D - Summary of Findings

- (1) - Number of samples - 9 to 17
- (2) - Concentrations of arsenic, lead and benzene are at or below CAP cleanup levels.
- (3) - Vinyl chloride concentrations have declined (see graph below). Seven of the last eight sample concentrations were at or below the hot-spot action level of 2 ug/l. Additional sampling is required to confirm the downward trend and assess when concentration stability is achieved.

Cleanup Level Comparisons - Wells OSP-5S and OSP-5D

PACCAR Site
Renton, Washington

(4) - CPAHs were not detected at a reporting limit of 1 ug/l.



Days	VC(ug/l)	HSL (ug/l)	CUL (ug/l)
0	4	2	0.4
92	5	2	0.4
485	4	2	0.4
699	3	2	0.4
850	<1	2	0.4
1064	3	2	0.4
1216	2	2	0.4
1430	3	2	0.4
1581	3	2	0.4
1795	<1	2	0.4
1946	1	2	0.4
2160	2	2	0.4
2311	<1	2	0.4
2525	<3	2	0.4
2648	<2	2	0.4
2891	<1	2	0.4
3042	1.8	2	0.4

HSL - Hot Spot Action Level

CUL - Cleanup Level

Cleanup Levels Comparisons - Wells MW-3I and OSP-2D

PACCAR Site
Renton, Washington

Date	Days	MW-3I				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	17	<5	<1	<1	<4
Feb-89	215	17	7	<1	<1	<4
Mar-90	608	12	<5	<5	<5	<4
Mar-91	973	16	2.7	<1	<1	<1
Mar-92	1339	13	<1	<1	<1	<1
Mar-93	1704	10	<1	<1	<1	<1
Mar-94	2069	6	<1	<1	<1	<1
Mar-95	2434	<5	<1	<1	<1	<1
Feb-96	2771	<5	<1	<3	<3	<1
Mar-97	3165	18	<1	<0.1	0.71	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

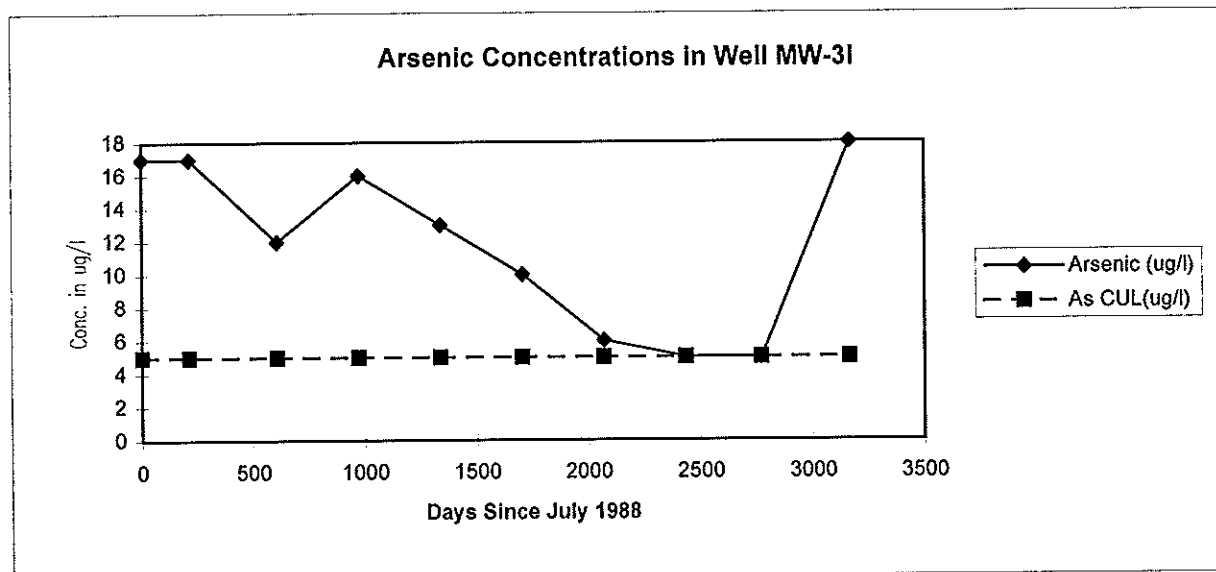
MW-3I - Summary of Findings

- (1) - Number of samples - 10
- (2) - Concentrations of benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Nine of the ten lead analyses meet cleanup levels.

The last eight sample analyses were below the cleanup level

- (6) - Arsenic concentrations are below the hot-spot action level of 50 ug/l.

Additional data is required to assess arsenic concentration trends



Days	Arsenic (ug/l)	As CUL(ug/l)
0	17	5
215	17	5
608	12	5
973	16	5
1339	13	5
1704	10	5
2069	6	5
2434	<5	5
2771	<5	5
3165	18	5

CUL - Cleanup Level

Revised: 7/29/97
(Compar-MW-3I-OSP-2D)

Cleanup Levels Comparisons - Wells MW-3I and OSP-2D

PACCAR Site
Renton, Washington

Date	Days	OSP-2D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	<5	<5	<1	<1	<4
Feb-89	92	<5	<5	<1	<1	<4
Mar-90	485	<5	<5	<1	<1	<4
Mar-91	850	<5	<1	<1	<1	<1
Mar-92	1216	<5	<1	<1	<1	<1
Mar-93	1581	<5	<1	<1	<1	<1
Mar-94	1946	<5	<1	<1	<1	<1
Mar-95	2311	<5	<1	<1	<1	<1
Feb-96	2648	<5	<1	<3	<3	<1
Mar-97	3042	1	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OSP-2D - Summary of Findings

- (1) - Number of samples - 10
- (2) - Concentrations of arsenic, lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.

Cleanup Levels Comparison - Wells U1S, U1W, LW-12S and LW-12D

PACCAR Site
Renton, Washington

Date	Days	U1S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	*	*	*	*	*
Feb-89	215	*	*	*	*	*
Mar-90	608	*	*	*	*	*
Mar-91	973	*	*	*	*	*
Mar-92	1339	*	*	*	*	*
Mar-93	1704	8	<1	<1	<1	<1
Oct-93	1918	<5	*	<1	<1	<1
Mar-94	2069	<5	<1	<1	<1	<1
Oct-94	2283	5	*	<1	<1	<1
Mar-95	2434	<5	*	<1	<1	<1
Oct-95	2648	<5	<1	<3	<3	<1
Feb-96	2771	<5	<1	<3	<3	<1
Oct-96	3014	<5	<1	<3	<3	<1
Mar-97	3165	5	<1	<0.1	<0.2	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

U1S - Summary of Findings

- (1) - Number of samples -6 to 9
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride appear to be below the CAP cleanup level of 0.4 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - The last eight arsenic analyses meet cleanup levels.

Date	Days	U1W				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	*	*	*	*	*
Feb-89	215	*	*	*	*	*
Mar-90	608	*	*	*	*	*
Mar-91	973	*	*	*	*	*
Mar-92	1339	*	*	*	*	*
Mar-93	1704	8	<1	<1	<1	<1
Oct-93	1918	*	<1	<1	<1	<1
Mar-94	2069	<5	<1	<1	<1	<1
Oct-94	2283	*	1	*	*	*
Mar-95	2434	*	<1	*	*	*

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

U1W - Summary of Findings

- (1) - Number of samples -2 to 5
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - One of two arsenic analyses meet cleanup levels.

Application of the nonparametric method for the median Upper Confidence Limit (Section

5.3.3 - Ecology Statistical Guidance) indicates a median Upper Confidence Limit concentration of 8 ug/l for arsenic which exceeds the cleanup level of 5 ug/l. Additional samples should be collected to confirm that cleanup levels have been achieved.

Date	Days	LW-12S				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	16	7	10	<1	<4
Feb-89	215	28	7	3	<1	<4
Mar-90	608	27	<5	<1	<1	<4
Oct-90	822	28	<10	<4	<1	<2
Mar-91	973	29	1.3	<1	<1	<5
Oct-91	1187	55	<5	<5	<5	<10
Mar-92	1339	28	<1	1	<1	<1
Oct-92	1553	49	2	5	<1	<5
Mar-93	1704	*	*	*	*	*
Oct-93	1918	*	*	*	*	*
Mar-94	2069	*	*	*	*	*
Oct-94	2283	*	*	*	*	*
Mar-95	2434	*	*	*	*	*

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

LW-12D - Summary of Findings

- (1) - Number of samples - 8
- (2) - Six of the eight analyses for lead are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Seven of the eight analyses meet the benzene cleanup level.
Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the latest seven results indicates a median Upper Confidence Limit of 5 ug/l for benzene which indicates the cleanup level of 5 ug/l is achieved.
- (6) - Concentration stability for arsenic was not achieved by October 1992.

Date	Days	LW-12D				
		Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Jul-88	0	<5	5	52	<1	<4
Feb-89	215	<5	<5	<1	<1	<4
Mar-90	608	<5	<5	<1	<1	<4
Oct-90	822	*	*	<1	<1	<2
Mar-91	973	<5	<1	<1	<1	<1
Oct-91	1187	*	*	<1	<1	<1
Mar-92	1339	<5	<1	<1	<1	<1
Oct-92	1553	*	*	<1	<1	<1
Mar-93	1704	*	*	*	*	*
Oct-93	1918	*	*	*	*	*
Mar-94	2069	*	*	*	*	*
Oct-94	2283	*	*	*	*	*
Mar-95	2434	*	*	*	*	*
CAP Cleanup Level		5	5	5	0.4	na
CAP Hot-spot Action Level		na	na	na	2	na

LW-12D - Summary of Findings

- (1) - Number of samples - 5 to 8
- (2) - Concentrations of arsenic and lead are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Seven of the eight analyses meet the benzene cleanup level.
Application of the nonparametric method for the median Upper Confidence Limit (Section 5.3.3 - Ecology Statistical Guidance) using the latest seven results indicates a median Upper Confidence Limit of less than 1ug/l for benzene which indicates the cleanup level of 5 ug/l is achieved.

Cleanup Level Comparisons - OW-4S and OW-4D

PACCAR Site
Renton, Washington

		OW-4S				
Date	Days	Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	<5	<5	<1	<1	<2
Feb-89	92					<2
Mar-90	485	5	<5	<1	<1	<2
Mar-91	850	5	<1	<1	<1	<1
Mar-92	1216	<5	<1	<1	<1	<1
Mar-93	1581					
Mar-94	1946					
Mar-95	2311	12	<1	<1	<1	<1
Feb-96	2648	11	<1	<3	<3	<1
Mar-97	3042	20	<1	<0.1	1	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OW-4S - Summary of Findings

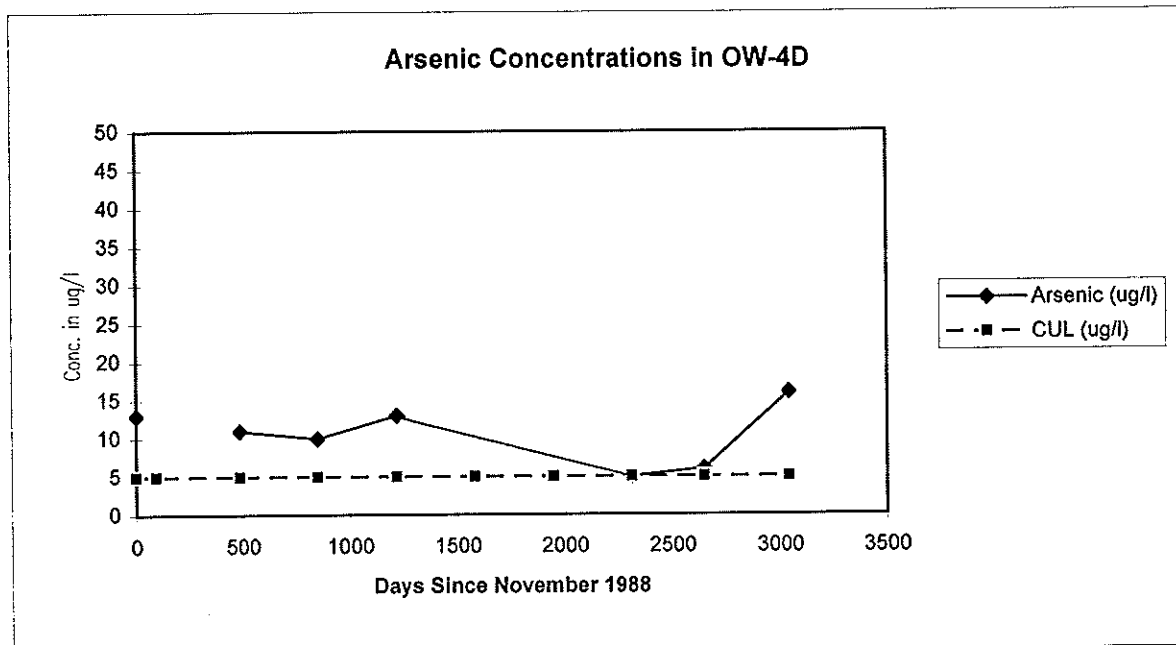
- (1) - Number of samples - 7
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Concentrations of arsenic are below the hot-spot action level.

		OW-4D				
Date	Days	Arsenic (ug/l)	Lead(ug/l)	Benzene(ug/l)	VC(ug/l)	CPAHs(ug/l)
Nov-88	0	13	<5	<1	<1	<2
Feb-89	92					<2
Mar-90	485	11	<5	<1	<1	<2
Mar-91	850	10	<1	<1	<1	<1
Mar-92	1216	13	<1	<1	<1	<1
Mar-93	1581					
Mar-94	1946					
Mar-95	2311	<5	<1	<1	<1	<1
Feb-96	2648	6	<1	<3	<3	<1
Mar-97	3042	16	<1	<0.1	1	<1

CAP Cleanup Level	5	5	5	0.4	na
CAP Hot-spot Action Level	50	50	5	2	na

OW-4D - Summary of Findings

- (1) - Number of samples - 7
- (2) - Concentrations of lead and benzene are below CAP cleanup levels.
- (3) - Concentrations of vinyl chloride are below the CAP hot-spot level of 2 ug/l.
- (4) - CPAHs were not detected at a reporting limit of 1 ug/l.
- (5) - Arsenic concentrations are below the hot-spot action level.



Days	Arsenic (ug/l)	CUL (ug/l)
0	13	5
92		5
485	11	5
850	10	5
1216	13	5
1581		5
1946		5
2311	<5	5
2648	6	5
3042	16	5

CUL - Cleanup Level

**APPENDIX B
GROUND WATER AND SURFACE WATER
SAMPLING PROCEDURES**

*Out of place -
See App. B following*

APPENDIX C
QUALITY ASSURANCE PROCEDURES

*Out of Place
See App. C Following*

APPENDIX B
FIELD SAMPLING PROCEDURES
GROUNDWATER AND SURFACE WATER SAMPLING

CONTENTS

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APPENDIX B FIELD SAMPLING PROCEDURES GROUNDWATER AND SURFACE WATER SAMPLING

Groundwater Sampling

B-1

Surface Water Sampling

B-2

FIGURE

B-1 Groundwater Sampling Data Form

APPENDIX B

FIELD SAMPLING PROCEDURES

GROUNDWATER AND SURFACE WATER SAMPLING

The following procedures will be used in collecting groundwater and surface water samples. Use of standardized methods is necessary in maintaining consistency between monitoring events which will occur over an extended period of time. Additionally, many of the planned chemical analyses are directly influenced by turbidity of the water samples. For this reason, it is stressed that sampling methods minimize turbidity and that field measurements document the amount of suspended material present.

Groundwater Sampling

A combination of purging pumps and stainless steel bailers will be used in sampling groundwater monitoring wells. The purging and sampling sequence will involve the following steps:

- ▶ Measure water from the top of PVC casing in feet;
- ▶ Calculate volume of standing water in the well;
- ▶ Remove three to five casing volumes of water using a submersible purge pump;
- ▶ Monitor pH, temperature, specific conductivity and turbidity as purging progresses;
- ▶ Collect purge water in containers provided by PACCAR and eventually dispose of the purge water off site;
- ▶ Collect groundwater quality samples using the pump or a stainless steel bailer lowered gently into the well to minimize disturbance and turbidity (see additional instructions below); and
- ▶ Record pertinent data on a copy of the field form presented on Figure B-1.

Prior to purging, the bailer or sampling pump will be cleaned with a dilute solution of a laboratory grade detergent (such as Alconox) and will be triple rinsed with deionized water. Prior to collecting a sample after purging, the

bailer or sampling pump will be cleaned again using the same procedure and then will be rinsed in the water to be sampled.

Groundwater samples will be placed in containers provided by the receiving laboratory with the appropriate preservatives. When a bailer is used for sampling it will be lowered carefully into the well using a clean polypropylene rope. The initial bails will be discarded to the appropriate containers to rinse the bailer. When a pump is used for sampling, the initial water pumped from the well also be discarded to rinse the tubing.

Samples of volatile organics, PAH, TPH, and pentachlorophenol chemical analyses will be placed in containers provided by the receiving laboratory. Samples for volatile analysis will be filled first to a meniscus, capped, inverted, and tapped to ensure no air bubbles remain. If samples contain bubbles, the procedure will be repeated. Sample collection will minimize turbulence. The capped container will be placed in chilled coolers for transport to the laboratory using chain of custody procedures.

Samples for dissolved metals analysis (As, Cr, Pb) will be filtered in the field using an in-line 0.45 micron FF-8000 filter (or equivalent) prior to being placed in containers provided by the receiving laboratory and preserved with nitric acid to pH 2 or less. These sample containers will be placed in chilled coolers and be transported to the laboratory using chain of custody procedures.

Surface Water Sampling

Surface (storm) water samples will be obtained from man-holes connected to the storm drainage system. Samples will be obtained during the on-set of storm events in accordance with the schedule outlined in the Confirmational Monitoring and Inspection Plans, weather permitting. Samples during these general periods will be collected from events that produce more than 0.1 inch of rainfall which occur at least 72 hours after the last 0.1 inch rainfall.

Surface water samples will be obtained using either a peristaltic pump or Kemmerer type sampler (or equivalent). Prior to sampling, the sampling equipment will be cleaned with a dilute solution of a laboratory grade detergent (such as Alconox) and will be triple rinsed with deionized water. In addition, the equipment will be rinsed in the water to be sampled prior to collecting the samples for analysis.

Water samples will be placed in containers provided by the laboratory containing the appropriate preservatives. Samples for metals analysis will not be filtered and will be preserved with nitric acid to pH 2 or less. The samples will

be placed in chilled coolers and transported to the laboratory using standard chain of custody procedures.

Surface water will be visually described and documented for turbidity, flow speed and quantity, surface sheen, odors, and any other pertinent information.

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Groundwater Sampling Data

Job No. _____ Date _____

[illegible]

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APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

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- C-1 Quality Assurance Project Roles and Assignments
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⁽¹⁾ Note: Laboratory-specific information. Completed tables to be provided prior to plan implementation.

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APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

Introduction

The purpose of this Quality Assurance Project Plan (QAPP) is to give, in specific terms, the quality assurance (QA) and quality control (QC) objectives, organization, and functional activities associated with the sampling and analysis of groundwater and surface water samples obtained for the Confirmational Monitoring Plans for the former PACCAR Defense Systems site.

The Washington State Department of Ecology (Ecology) provides specific guidelines for preparation of a QAPP (Ecology, 1991). Several other EPA documents were also used in preparing this document (EPA, 1980, 1994a, and 1994b). This QAPP is consistent with and meets the intent of these guidelines.

Groundwater and surface water samples will be collected and analyzed during the confirmation monitoring program. The program is intended to produce data of sufficient technical quality to determine that the site meets the conditions imposed by the Final Cleanup Action Plan (Ecology, 1991) and Confirmational Monitoring and Inspection Plan (Dalton, Olmstead & Fuglevand, 1997).

Organization and Responsibility

The project roles with primary QA responsibility include the Project Manager, the Project QA Manager, the Laboratory/Field Coordinators, and the Analytical Laboratory Manager. The individuals fulfilling these project roles, phone numbers, and a brief description of responsibilities are shown in Table C-1.

Data Quality Objectives

Data quality objectives, including precision, accuracy (bias), representativeness, completeness, comparability, and data reporting limits are dictated by the project requirements and intended uses of the data. The data must be of sufficient quality to identify the chemicals of concern. Ecology (1991) and EPA (1994b) were used to select the appropriate analytical levels, analytical methods, and quality assurance/quality control (QA/QC) procedures for characterizing soil and water quality to meet the intended data uses.

An assessment of data quality is based upon quantitative (precision, accuracy, and completeness) and qualitative (representativeness and comparability) quality assurance objectives. Definitions of these parameters and the applicable quality control procedures are given below.

Sensitivity (Reporting Limits). Reporting limits will be adequate to identify target analytes to compare results to applicable regulatory standards which negotiated cleanup levels, hot spot action levels, or MTCA Method B cleanup levels. These standards are listed with the planned analyte list in Table C-2.

Precision. Precision measures the scatter in the data resulting from random error. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the MS/MSD or duplicates.

Analytical precision measurements will be carried on project-specific samples at a minimum frequency of one per laboratory analysis group or one in 20 samples, whichever is more frequent, per matrix analyzed. Laboratory precision will be evaluated against quantitative RPD performance criteria presented in Table C-3 (pending final laboratory selection).

Blind field duplicates will be carried out at a minimum frequency of one per indicator chemical analysis group or one in 20 samples, whichever is more frequent. Currently, no performance criteria have been established for field duplicates. Field duplicate precision will therefore be screened against a RPD of 50 percent for water samples. However, no data will be qualified based solely on field duplicate precision.

Accuracy (Bias). Accuracy measures the closeness of the measured value to the true value. Analytical accuracy is assessed by "spiking" samples with known standards (surrogates or matrix spikes) and establishing the percent recovery. Accuracy measurements on matrix spike samples will be carried out at a minimum frequency of one in 20 samples per matrix analyzed. Because MS/MSDs measure the effects of potential matrix interferences of a specific matrix, the laboratory will perform MS/MSDs only on samples from this investigation and not from other projects. Surrogate recoveries will be determined for every sample analyzed for organics. Laboratory accuracy will be evaluated against quantitative matrix spike and surrogate spike recovery performance criteria as presented in Table C-4 (pending final laboratory selection).

Representativeness. Representativeness measures how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the matrix sampled. The sampling plan design, sampling

techniques, and sample handling protocols (e.g., storage, preservation, and transportation) have been developed to assure representative samples; these procedures are discussed in Appendix A.

Completeness. Completeness is defined as the ratio of acceptable (non-rejected) measurements obtained to the total number of measurements for an activity. The target completeness goal for this project is 90 percent.

Comparability. Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The use of standard techniques for both sample collection and laboratory analysis should make data collected comparable to both internal and other data generated. Sample collection methods and other field methods are described in Appendix A.

Laboratory internal quality control checks, performance evaluation standards, preventative maintenance, and corrective action, as described in other sections of this document, will be implemented to help meet the quality assurance objectives established for these analyses.

Sampling Procedures

The site-specific SAPs outline the data needs identified for this work. Appendix A presents the specific procedures—including field equipment decontamination procedures, sample labeling, sample custody procedures, and quality control samples—to be used for obtaining representative samples to fulfill these data needs. The information provided within this QAPP outlines the data documentation procedures that will be followed to meet data quality objectives.

To control the quality of samples submitted for laboratory analysis, established preservation and storage measures will be followed. Table C-5 provides information on holding times, sample containers, and sample preservation requirements.

All sampling activities will be documented in a field logbook. Field observations including field monitoring and visual and olfactory observation will be noted. The original field notes will be kept in Hart Crowser's project files and will be available for review upon written request.

Sample labels will clearly indicate the sample number, sampler's initials, date, and any pertinent comments. A typical sample label is shown on Figure C-1. Labels will be filled out at the time of sampling. Sample and blind duplicate

identification numbers will be identified clearly in our field logbooks during sample collection.

Samples will be transported to the laboratory in a cooler cooled to 4° C using "blue ice". A completed custody form will be sealed in a ziplock bag and taped to the underside of the cooler's lid. The completed custody seals will be attached. A typical custody seal is shown on Figure C-2. Custody records will be maintained for all samples recovered. This record will be signed by the sampler and others who subsequently hold custody of the sample. Specifications for analyses may also be made on the custody record. A typical Custody Record Form is presented on Figure C-3.

Laboratory Custody Procedures. The samples will be delivered to the laboratory the day of sampling, or as soon as possible thereafter to ensure that holding times are not exceeded. A designated sample custodian will accept custody of the shipped samples and verifies that the chain of custody form matches the samples received. The sample delivery group (SDG) of samples will be given a laboratory number and each sample will be assigned a unique sequential identification number that includes the laboratory case identification number.

The laboratory sample custodian is responsible for seeing that all samples are transferred to the proper analyst or stored in the appropriate secure area. The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted, disposed of, or returned to Hart Crowser. The laboratory will maintain an internal tracking system for samples that includes identification of sample custodians within the laboratory.

Analytical Procedures

The analytical methods used for this project are summarized below. The method detection limits or reporting limit goals for analyses of groundwater and surface water samples are provided in Table C-2.

Chemical analyses of groundwater and surface water samples will be performed by a laboratory participating in Ecology's Laboratory Accreditation Program. The specific laboratory has not yet been selected, but will be identified in February 1998 and confirmed with submission of an addendum to this plan. This addendum will include the quality assurance criteria in Tables C-3 and C-4.

Testing and analysis methods for this project (listed below) were selected on the basis of quantitation limits and the level of analytical quality control necessary to meet data quality objectives and intended data uses. The reporting limits are

Initial data reduction, evaluation, and reporting at the laboratory will be carried out as described in the appropriate analytical protocols and the laboratory's QA Manual. Quality control data resulting from methods and procedures described in this document will also be reported.

Minimum Data Reporting Requirements

The following describes the minimum data reporting requirements necessary to ensure sufficient reporting of analytical data to allow proper QA/QC reporting.

Sample IDs. Records will be produced that clearly match all blind duplicate QA samples with laboratory sample IDs.

Sample Receipt. Custody forms will be filled out for all sample shipments to document problems in sample packaging, custody, and sample preservation.

Reporting. For each analytical method run, all analytes for each sample will be reported as a detected concentration or as less than the specific reporting limit. The laboratories will also report dilution factors for each sample as well as date of extraction (if applicable) and date of analysis. Standard data packages will consist of a case narrative, sample results, QA sample results, and custody forms. Soil results (including non-detects) will be reported on a dry weight basis. All sample results will be reported in hard copy and in electronic files in Excel.

Internal Quality Control Reporting

Internal quality control samples will be analyzed at the rates specified in the applicable analytical method.

- ▶ **Laboratory Blanks.** All analytes will be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.
- ▶ **Surrogate Spike Samples.** Surrogate spike recoveries will be reported with all organic reports where appropriate. The report shall also specify the control limits for surrogate spike results. Any out of control recoveries (as defined in the specified method) will result in the sample being rerun or the data will be qualified.
- ▶ **Matrix Spike Samples.** Matrix spike recoveries will be reported for all organic and inorganic analyses. All general sample results will be designated as corresponding to a particular matrix spike sample. The report will indicate

what sample was spiked. The report will also specify the control limits for matrix spike results for each method and matrix.

- ▶ **Laboratory Duplicates and/or Matrix Spike Duplicate Pairs.** Relative percent differences will be reported for all duplicate pairs as well as analyte/matrix specific control limits.
- ▶ **Laboratory Control Samples (LCS).** When run for internal quality control, LCS results will be reported with the corresponding sample data. Control limits for LCS will be reported as specified.

Quality Control Procedures

Quality control procedures provide the means of controlling the precision and bias of the results. Adherence to established procedures for sample collection, preservation, and storage will minimize errors resulting from sampling and sample instability. Analytical and measurement systems must be in statistical control, which means that errors have been reduced to acceptable levels and then documented.

Field Quality Control Procedures

Field quality control procedures used for this project will consist of the collection of field duplicate samples at a minimum of 5 percent per each work plan group, matrix, and chemistry analytical method performed.

- ▶ **Trip Blanks.** Trip blank samples will be collected once per sampling event per matrix sampled and analyzed for volatile organics or volatile aromatics.
- ▶ **Blind Duplicates.** Blind duplicate samples will be reported as any other sample. Relative percent differences will be calculated for duplicate samples and evaluated as part of the data quality review.

Laboratory Quality Control Procedures

The laboratories' quality control officer is responsible for assuring that all routine internal quality assurance and quality control procedures are implemented by the laboratory. The laboratory quality control procedures used for this project will consist of the following, at a minimum:

- ▶ Instrument calibration and standards as defined in EPA SW-846 Methods (EPA, 1994b);

- ▶ Laboratory blank measurements at a minimum frequency of 5 percent or 1-per-20 samples; and
- ▶ Accuracy and precision measurements as defined above, at a minimum frequency of 5 percent or 1-per-20 samples.

Performance and System Audits

Hart Crowser's Project QA Officer will monitor the performance of the field and laboratory QA program. This will be achieved through regular contact with the field and analytical QA staff.

Laboratory Performance

To ensure comparable data, all samples of a given matrix to be analyzed by each specified analytical method will be processed consistently by the analytical laboratory.

Preventative Maintenance Procedures

Field Preventative Maintenance

Preventative maintenance on field instruments and equipment will follow the operations manuals. Field meters, including pH, conductivity, and temperature probes, will be calibrated and maintained by Hart Crowser's equipment manager, as well as by appropriate field staff when in use. All routine maintenance will be recorded in instrument log books or directly on the instrument as appropriate.

Laboratory Preventative Maintenance

Preventative maintenance in the laboratory will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments, and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. Details of the maintenance procedures are addressed in the respective laboratory's Standard Operating Procedures and Methods manuals.

Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to change as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet one or another of the method-specific quality control criteria.

Table C-2 – Water Analyte Detection Limit Goals with Comparable Cleanup Le

CAS Number	Compound	Lab PQL (1)	Groundwater Cleanup Levels with Source (2)	Surface Water Cleanup Levels	Detection Limit Goal (3)
Metals in ug/L					
7440-38-2	Arsenic	4	5 CAP	48	4
7440-47-3	Chromium	10	80 B	—	10
18540-29-9	Hexavalent Chromium	10	—	11	10
7440-50-8	Copper	1	—	7	1
7439-92-1	Lead	2	5 CAP	1	2
7440-02-0	Nickel	30	—	56	30
7440-66-6	Zinc	20	—	47	20
Volatile Organics in ug/L					
71-55-6	1,1,1-Trichloroethane	1	200 A	—	1
79-34-5	1,1,2,2-Tetrachloroethane	1	1 PQL	—	1
79-00-5	1,1,2-Trichloroethane	1	1 PQL	—	1
95-50-1	1,2-Dichlorobenzene	1	720 B	—	1
75-34-3	1,1-Dichloroethane	1	800 B	—	1
75-35-4	1,1-Dichloroethene	1	1 PQL	—	1
107-06-2	1,2-Dichloroethane	0.5	5 A	—	1
78-87-5	1,2-Dichloropropane	1	1 PQL	—	1
71-43-2	Benzene	1	5 CAP	NA	1
75-27-4	Bromodichloromethane	1	1 PQL	—	1
75-25-2	Bromoform	1	5.54 B	—	1
74-83-9	Bromomethane	1	11.2 B	—	1
56-23-5	Carbon Tetrachloride	1	1 PQL	—	1
108-90-7	Chlorobenzene	1	160 B	—	1
67-66-3	Chloroform	1	7.17 B	—	1
74-87-3	Chloromethane	1	3.37 B	—	1
156-59-2	cis-1,2-Dichloroethene	1	80 B	—	1
542-75-6	cis-1,3-Dichloropropene	1	1 PQL	—	1
124-48-1	Dibromochloromethane	1	1 PQL	—	1
100-41-4	Ethylbenzene	1	800 B	—	1
75-09-2	Methylene Chloride	5	5.83 B	—	5
127-18-4	Tetrachloroethene	1	1 PQL	—	1
108-88-3	Toluene	1	1,600 B	—	1
156-60-5	Trans-1,2-Dichloroethene	1	160 B	—	1
10061-02-6	Trans-1,3-Dichloropropene	1	1 PQL	—	1
79-01-6	Trichloroethene	1	5 A	—	1
75-01-4	Vinyl Chloride	0.4	0.4 CAP	0.4	0.4
1330-20-7	Xylene (Total)	2	16,000 B	—	2
Carcinogenic PAHs in ug/L					
56-55-3	Benzo(a)Anthracene	0.1	0.1 PQL	NA	0.1
50-32-8	Benzo(a)Pyrene	0.1	0.1 PQL	NA	0.1
205-99-2	Benzo(b)Fluoranthene	0.1	0.1 PQL	NA	0.1
207-08-9	Benzo(k)Fluoranthene	0.1	0.1 PQL	NA	0.1
218-01-9	Chrysene	0.1	0.1 PQL	NA	0.1
53-70-3	Dibenzo(a,h)Anthracene	0.1	0.1 PQL	NA	0.1
193-39-5	Indeno(1,2,3-c,d)Pyrene	0.1	0.1 PQL	NA	0.1
Pentachlorophenol in ug/L					
87-86-5	Pentachlorophenol	1	1 PQL	—	1
Total Petroleum Hydrocarbons in mg/L					
NA	Diesel-Range	0.25	1 A	100 (4)	0.5
NA	Oil-Range	0.75	1 A	100 (4)	0.75
Polychlorinated Biphenyls in ug/L					
12674-11-2	PCB 1016	0.5	—	0.1	0.5
11104-28-2	PCB 1221	0.5	—	0.1	0.5
11141-16-5	PCB 1232	0.5	—	0.1	0.5
53469-21-9	PCB 1242	0.5	—	0.1	0.5
12672-29-6	PCB 1248	0.5	—	0.1	0.5
11097-69-1	PCB 1254	0.5	—	0.1	0.5
11096-82-5	PCB 1260	0.5	—	0.1	0.5

Notes:

(1) Practical quantification limit

(2) CAP=Cleanup Action Plan; A=MTCA Method A; B=MTCA Method B; PQL=Practical Quantification Limit

(1) & (3) Goal which will be negotiated during final laboratory selection

(4) City of Renton threshold level

NA = Not Available

— Media not tested for indicated analyte

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Table C-3 - Quality Assurance Objectives and Precision of Matrix Spike/Matrix Spike Duplicates

(Table to be provided with laboratory-specific data prior to plan implementation)

Sample Identification

Job Number: _____

Sample ID: _____ Lab ID: _____

Matrix: _____

Sampled by: _____

Date: _____ Time: _____

Preservative: _____ Analysis: _____



Sample Custody Seal

Custody Seal

CUSTODY SEAL CUSTODY SEAL CUSTODY SEAL CUSTODY SEAL

Date _____

Initials _____



**Laboratory
Submitted to:**

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-342-9530 FAX: 206-328-5587



HARTCROWSER

Sample Custody Record

[illegible]

White and Yellow Copies to Lab	Pink to Project Manager	Lab to Return White Copy to Hart Crowder
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CoreJobs\424911\cust fig



HARTCROWSER

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Figure C-3

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