

ADDITIONAL
SUBSURFACE PETROLEUM HYDROCARBON
CONTAMINATION EVALUATION

CHEVRON BULK PLANT
Camas, Washington

Prepared For
Chevron U.S.A. Inc.

W-5770-3
January, 1991

RITTENHOUSE-ZEMAN & ASSOCIATES

Geotechnical & Environmental Consultants





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7 January 1991

W-5770-3

Chevron U.S.A., Inc.
P.O. Box 220
Seattle, Washington 98111

Attention: Mr. Hal Groves

Subject: Additional Subsurface Petroleum Hydrocarbon Evaluation
Former Chevron Bulk Fuel Terminal
Camas, Washington

Gentlemen:

Presented herein is a copy of the above referenced report. This report presents the results of additional site study, including soil sampling, monitoring well installation and laboratory analyses. Our work has been performed in general accordance with our proposal letter P-3360, dated 21 December 1989. Authorization to proceed with this study was provided in release number 116, dated 15 January, 1990.

We appreciate this opportunity to be of continued service to you, and would be pleased to discuss the contents of this report or other aspects of the project with you at your convenience.

Respectfully submitted,

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.

Stanley S. Thompson
Project Environmental Geologist

Additional Subsurface Petroleum Hydrocarbon Evaluation

Former Chevron Bulk Fuel Terminal

Camas, Washington

Prepared for

Chevron U.S.A., Inc.

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Seattle, Washington 98111

Prepared by

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W-5770-3

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**ADDITIONAL SUBSURFACE PETROLEUM
HYDROCARBON EVALUATION
FORMER CHEVRON BULK FUEL TERMINAL
CAMAS, WASHINGTON**

W-5770-3

1.0 SUMMARY

A brief summary of the results of our supplemental site evaluation and chemical analyses of the site soils and groundwater is presented below. The main body of the report should be consulted for detailed discussions of the report findings.

- o Previous work was performed at the site in two separate phases. The first phase included completing two borings to approximately 20 feet below ground surface, and collecting grab samples of cuttings. The second phase of work included drilling four soil borings and installing vapor monitoring wells to depths of approximately 22 to 23 feet. Results of these investigations indicated varying degrees of contamination by total petroleum hydrocarbons (TPH) from near surface extending down to the silty, less permeable zone beginning at approximately 18 to 20 feet below ground surface. No groundwater was encountered during either of these phases of study.

- o Three additional exploratory borings were accomplished at this site for the study using air-rotary with Odex eccentric bit drilling techniques and split-spoon sampling for retrieval of discrete soil samples. All three borings were completed as 2-inch groundwater monitoring wells. Wells MW-5 and MW-7 are located near areas of previously existing loading racks and above ground storage tanks, and monitoring well MW-6 was installed in an area inferred to be downgradient of former potential hydrocarbon source areas. Drilling conditions were extremely difficult due to the presence of large cobbles and boulders.

- o Subsurface conditions were generally consistent across the site. In general, approximately 2 to 6 feet of sandy silt overlies gravel, cobbles, and boulders to a depth of approximately 18 to 20 feet. At a depth of 18 to 20 feet, a 4 to 6-foot thick gravelly silt/silty gravel stratum was present. Beneath this siltier stratum, the gravels gradually become less silty, with fewer cobbles.
- o Groundwater was encountered in the boring approximately 34 feet below the ground surface. The local groundwater gradient appeared to be flowing in a west-southwesterly direction. Summer operation of Camas Municipal Well No. 6 may influence the local ground water regime and gradients.
- o Split-spoon soil samples were screened in the field for the presence of volatile organic compounds, using visual and olfactory perceptions. None of the samples appeared visually to have been impacted severely by petroleum hydrocarbons, and the analytical results indicated that highest concentrations of total petroleum hydrocarbons (TPH) were less than 13 parts per million (ppm). In each of the borings, we collected discrete soil samples from immediately above and below the silty gravel stratum, and near the saturated/unsaturated zone interface. The samples from above the silty layer contained TPH concentrations of between 7.1 and 12.9 ppm; the samples collected below the silty layer contained no detectable TPH concentrations. The samples collected near the saturated zone contained concentrations of TPH ranging from 5.4 to 10.2 ppm.
- o Groundwater samples were collected from the monitoring wells and were analyzed for benzene, toluene, ethyl benzene and xylenes (BTEX) by EPA Method 8020 and TPH by EPA Method 8015 modified. The analyses of these samples indicated non-detectable concentrations of BTEX and TPH (i.e. below method detection limits).
- o Based upon our explorations and analytical testing accomplished for this study phase, as well as the results of our previous site studies, dated 8

December 1987 and 14 November 1988, it appears that a relatively impermeable stratum consisting of silty gravel or gravelly silt exists at a depth of 18 to 20 feet below ground surface acting as an aquitard to the downward migration of groundwater or contaminants. Petroleum hydrocarbon impacts appear to be limited to the near surface zone.

2.0 PROJECT DESCRIPTION

The purpose of this study was to evaluate the site's subsurface soil quality with regard to petroleum hydrocarbon and volatile aromatic hydrocarbon concentrations, and to evaluate the groundwater beneath the site, both with regard to quality and migration direction.

The scope of work included: 1) subsurface exploration, monitoring well installation, soil and water sample collection and laboratory analyses, to further define subsurface conditions at the site; 2) literature search to identify regional geologic and hydrogeologic trends; 3) data evaluation report and preparation. This report has been prepared for the exclusive use of Chevron U.S.A., Inc. and their agents for specific application to this project in accordance with generally accepted environmental assessment practices.

3.0 SITE HISTORY

3.1 Site Vicinity

The site is bounded to the east by a parcel of land used by Washington Natural Gas. Immediately adjacent to the Washington Natural Gas building are concrete racks which once held above-ground storage tanks. Approximately 300 feet south of the site, the Tidland Corporation occupies several large buildings. According to city of Camas personnel, Tidland Corporation manufactures metal parts, primarily for the pulp & paper industry which typically involves the use of solvents. A raised railroad embankment lies immediately north of the site.

Across the railroad embankment, approximately 250 feet to the north of the site, is municipal well No. 6. According to a City of Camas official, their municipal wells are used primarily during the summer months, at which time, well No. 6 pumps in excess of 1400

gallons per minute. Municipal well No. 5, located approximately 1000 feet southeast of the site, pumps approximately 450 gallons per minute.

3.2 Potential Off-Site Impacts

A review of WDOE records for Leaking Underground Storage Tank (LUST) and EPA records of confirmed and suspected hazardous waste sites in the area does not indicate the presence of any reported releases in the vicinity of the project site.

The EPA CERCLIS List indicated no hazardous waste sites within a 1/2-mile radius of the site. WDOE LUST records indicated 5 sites within a 1/2-mile radius with underground storage tanks presently in place. A list of these sites and a map showing their locations in relation to the subject site are included in Appendix D.

3.3 Regional Geology & Hydrology

Geology of the area consists of stratified alluvial deposits of clay, silt, sand and gravel. The origins of these materials is mostly volcanic, which has been weathered and eroded by river transport. These sediments are loose or only slightly cemented. The gravel deposits in this area generally yield large volumes of water where the strata are saturated, as evidenced by the preponderance of water wells in the Camas-Washougal area. The water well report for City of Camas well number 6 indicates a "Medium hard gray rock" encountered in their boring of a depth of 83 feet 9 inches. This rock may be part of the upper member of the Troutdale formation, which also outcrops in the general area.

4.0 SITE CONDITIONS

The site is located at the southeast corner of S.E. 6th Avenue and S.E. Union Avenue in Camas, Washington (Figure 1). Previous to this phase of work, RZA completed two earlier phases of investigation for this site.

A preliminary petroleum hydrocarbon evaluation (RZA report W-5388, dated 8 December 1987) was conducted at the request of Chevron. This evaluation consisted of advancing two air-rotary exploratory soil borings to depths of approximately 20 feet (borings B-1 and B-2) and collecting grab samples of drill cuttings for laboratory analysis. Significant TPH levels were exhibited by the samples, particularly in the vicinity of the former TTLR,

and BTEX levels were generally detectable. This initial phase of investigation did not encompass all the potentially hydrocarbon impacted areas, so a second phase of work was authorized by Chevron.

The next phase of study was conducted by RZA at the site in September, 1988. This study consisted of advancing four air-rotary borings, collecting split-spoon soil samples at 5-foot intervals, and installing two-inch monitoring wells in each of the borings to depths ranging from 20 to 22 feet below ground surface (monitoring wells MW-1 through MW-4). The intent of this phase of study was to determine if the aquitard was continuous across the site. Wells were installed for use as monitoring points for seasonal perched groundwater or vapor extraction. The samples in this phase of work exhibiting the highest concentrations of TPH were from MW-1, in the northeast portion of the site, near former locations of above ground storage tanks. BTEX concentrations were less than those found in the 1987 study even when comparing cuttings grab samples with discreet samples. Hot weather during drilling and sampling (100°F) may have impacted results along with natural variation in lateral extent. The TPH detected in the site soils were identified as diesel based on interpretation of gas chromatography.

Subsurface explorations and monitoring well installations for the present study were conducted in January and February 1990. Also at the time of study, the underground heating fuel oil tank adjacent to the office was removed. No indications of petroleum hydrocarbon impact were observed and analytical results were below detection limits. The surface and subsurface conditions are described below. Exploration procedures and as-built logs are presented in Appendix A. Site conditions and approximate locations of the explorations for this and previous studies are indicated on the Site and Exploration Plan, Figure 2.

4.1 Surface Conditions

The subject site is roughly triangular in shape, extending approximately 160 feet in a north-south direction and approximately 300 feet in the east-west direction. Site topography is relatively flat with an estimate maximum relief of approximately 2 feet. An existing terminal warehouse building and office are located in the southeast quarter of the site. An existing vehicle maintenance garage is located in the northwest portion of the site. Fuel pumps were formerly located immediately northeast of the warehouse

building and storage tanks were formerly located immediately north of the pumps in the northeast portion of the site. In accordance with the site's previous use as a bulk fuels facility, we understand it was used primarily to store gasoline, heating oil and diesel. It is our understanding that all above-ground bulk storage tanks, the truck and trailer loading rack and pumps, were removed in 1984 following the closing of the facility in 1983. The underground fuel oil tank near the office building was removed in January 1990.

With the exception of the building areas, the site subgrade consists of crushed rock surfacing. No surface staining or evidence of spillage was observed. Portions of the ground surface are covered with a thick accumulation of weeds. Surface water drainage appears to be directed to the southwest, towards S.E. Union Avenue. The predominant direction of surface run-off in the general vicinity of the site appears to be to the south-southwest. A raised railroad embankment directly north of the site precludes run-off flow in a northerly direction.

4.2 Subsurface Conditions

The subsurface exploration program accomplished for this study consisted of 2 air-rotary borings using a downhole hammer with an eccentric over-reaming bit, drilled to a maximum depth of 47 feet below the ground surface. Due to the presence of gravels, cobbles and boulders, drilling conditions were extremely difficult. Split-spoon samples were taken immediately above and below the silty gravel/gravelly silt stratum, and near the saturated zone interface. The borings were continuously logged by observing drill cuttings discharged by the air compressor, and by noted changes in drilling action. All three of the borings were completed as 2-inch inside diameter (I.D.) Schedule 40 PVC monitoring wells with a screened interval of 15 feet.

4.2.1 Soil

Subsurface soil conditions as disclosed by our borings appear to be generally consistent across the site. Explorations encountered a 3 to 5-foot thick zone of silty sand with some gravel at the surface. Underlying this surficial silty sand was a very dense, sandy gravel with cobbles and boulders. The larger boulders generally extended from 6 feet in depth to approximately 16 feet. The sandy gravel extended to the full depth of our explorations. A very silty zone within this gravel was encountered at depths ranging from 18 to 22 feet across the site. This silty gravel was wet and apparently acts as a barrier of

relatively lower permeability or an aquitard to downward migration of surface waters. This silty gravel ranged in thickness from 3 to 5 feet. Underlying this silty gravel were interbeds of clean, sandy gravel, again with silty gravel zones at depth. Beginning approximately 30 feet below ground surface, clean pea size gravel was found to extend across the site, and in MW-6, this gravel was interbedded with clean, medium to coarse sand layers beginning at approximately 38 feet below ground surface. This stratigraphy is typical of Columbia River flood deposits, or may be due to outwash from ancient glacial lake Missoula, which once covered a large portion of Northwest Montana.

The explorations were completed to depths ranging from 45 to 47 feet below ground surface, and monitoring wells were installed in these borings to depths of 43¹/₂ to 45 feet. As-built diagrams illustrations details of the monitoring well installations are included on the boring logs attached with this report.

4.2.2 Groundwater

Groundwater was encountered in the borings at approximately 34 feet below ground surface. Relative soil moisture content was difficult to determine during drilling due to the driller's addition of water to the boring to facilitate removal of cuttings, and to cool the drill tools. Samples collected within the upper portion of the silty gravel stratum (at approximately 20 feet below surface) were generally moist to wet. Based on the geologic conditions observed, we would expect a seasonally perched groundwater table above the silty gravel zone.

Inquiries to the WDOE, City of Camas, City of Washougal, Clark County, and the USGS indicate no substantial shallow aquifers at the depth of the silty aquitard, or any wells utilizing groundwater within this zone for beneficial use. Available records do indicate presence of a regional groundwater aquifer, approximately 45 feet below the ground surface. Water is withdrawn from this aquifer to supply the City of Camas and the City of Washougal. Well no. 6, maintained by the City of Camas, is located approximately 250 feet to the north-northeast of the site with a 1,450 gallon per minute rating.

After the monitoring wells were installed, they were developed to remove any influence of the addition of water during drilling. Groundwater levels were allowed to equilibrate for 24 hours following development and groundwater depth measurements were collected.

From this data, we calculated a local groundwater gradient of 0.05 feet vertical to 100 horizontal, and generally the groundwater appears to be flowing in a west-southwesterly direction, toward the Columbia River. The implied groundwater contours presented with this report are based on a single measuring event and interpolation between three discrete measuring points. Groundwater gradient and flow directions are likely influenced by several factors, including the flow directions of the Washougal and Columbia rivers and the presence of a seasonally pumping municipal well, located approximately 250 feet north-northeast of the site. Appendix C contains the locations and logs of local municipal water wells maintained by the City of Camas.

5.0 PETROLEUM HYDROCARBON OCCURRENCE

The concentrations of petroleum hydrocarbons existing in the subsurface materials were determined by testing for:

1. Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1;
2. Volatile Aromatic Hydrocarbons (i.e., benzene, toluene, ethyl benzene, xylenes, or BTEX) by EPA Method 8020 and;
3. Volatile Aromatic Hydrocarbons (BTEX) in groundwater by EPA Method 8015, Modified.

5.1 Petroleum Hydrocarbon Occurrence - Soil

Discrete soil samples were collected during boring operations, and submitted for analysis to Sound Analytical Services, of Fife, Washington. These samples were collected near the top and bottom of the silty gravel/gravelly silt layer, and near the groundwater interface in each boring. Analyses for all soil samples indicate concentrations of BTEX below the method detection limit. The samples collected near the top of the silty layer in each of the borings contained detectable but relatively low concentrations of TPH (7.1 to 12.9 ppm TPH). TPH concentrations in samples collected near the lower extremity of the silty gravel stratum in each boring were below the laboratory's detection limit of 5.0 ppm. Soil samples collected near the groundwater interface contained TPH concentrations comparable to those in the samples collected near the top of the silty gravel stratum (5.4 to 10.2 ppm TPH). A summary of these analytical results is presented in Table 1 and the laboratory reports are included in Appendix B of this report.

5.2 Petroleum Hydrocarbon Occurrence - Groundwater

After installation of the monitoring wells, the wells were developed by bailing 4 to 5 well volumes, then were allowed to equilibrate for a minimum of 24 hours. Following this equilibration period, groundwater level measurements were made with an electronic depth probe. Prior to sampling, the wells were purged of a minimum of 4 well volumes, and representative groundwater samples were collected. The laboratory analyses for water samples from the three wells indicated concentrations of TPH below the method detection limit of 10 ppm, and volatile aromatic hydrocarbons (BTEX) concentrations below the detection limit of 0.001 ppm. These results are summarized in Table 1. Analytical laboratory certificates are attached.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this phase of our investigation, groundwater at depth below the silty aquitard layer does not appear to be impacted by fugitive petroleum hydrocarbon contamination. We noted apparent contamination in boring B-7, in the form of petroleum hydrocarbon sheen on drilling fluids circulated to the surface, from approximately 5 to 8 feet below ground surface, but because this phase of the investigation centered on ascertaining possible soil contamination at depth and groundwater quality, we did not collect shallow soil samples during this phase. Our earlier site studies, which characterized shallow subsurface conditions, showed elevated levels of petroleum hydrocarbons directly beneath the former TTLR and to a lesser extent in the vicinity of former bulk storage tanks.

Concentrations of petroleum hydrocarbon contamination in soil samples collected during boring operations were low to non-detectable, and analyses performed on groundwater samples collected from the monitoring wells indicated non-detectable concentrations of TPH and BTEX. Based on the this phase of investigation and previous results, it appears that petroleum hydrocarbon impacted zones area limited to the zone above the aquitard or within approximately 20 feet of the ground surface.

7.0 CLOSURE

The conclusions presented in this report are professional opinions, and are based on the explorations and testing accomplished for this study along with interpretation of data from the previous studies. The number, location, and depth of the monitoring well

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7 January 1991

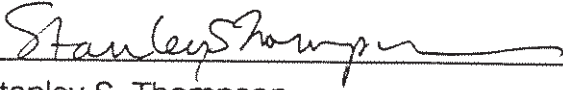
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installations, including analytical testing scope, were completed within the site and proposal constraints to yield the information required.


We appreciate the opportunity to be of service to you on this project. If you have any questions regarding this report, please do not hesitate to call.

Respectfully submitted,

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.



Stanley S. Thompson
Project Environmental Geologist

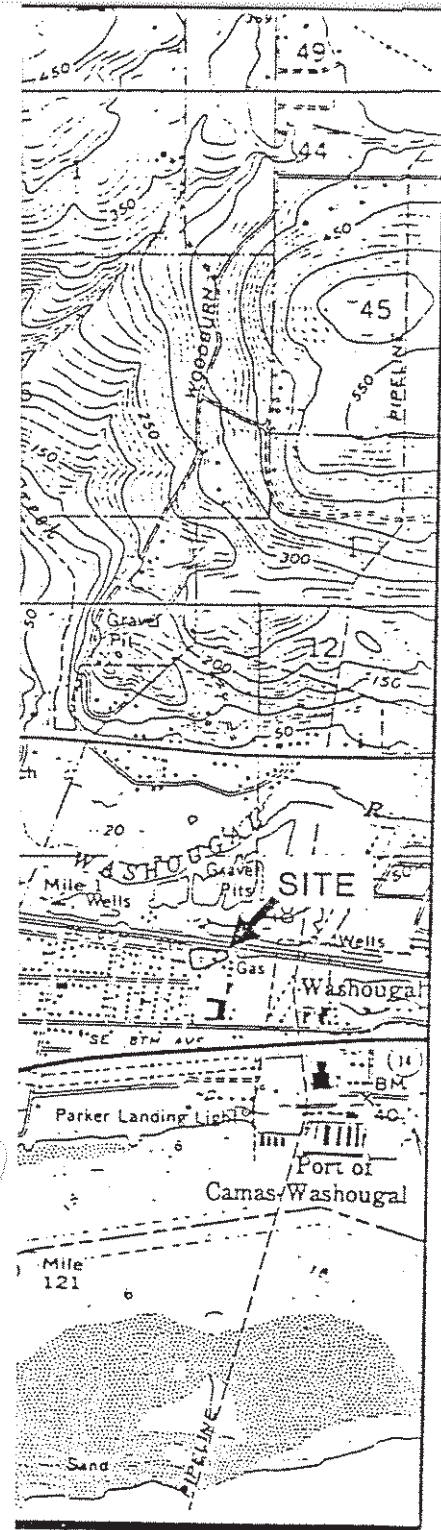


David G. Cooper, P.G.
Senior Environmental Geologist

Table 1

Laboratory Analytical Results (Soil and Groundwater)

Sample Number	Depth (feet)		TPH	Benzene	Toluene	Ethyl benzene	Xylenes
S-1	0-5	*	7,870	0.007	3.045	NT	21.365
S-2	5-10	*	6,870	0.010	0.743	NT	12.995
S-3	10-15	*	2,240	ND	0.009	NT	0.133
S-4	15-20	*	429	ND	0.005	NT	0.164
S-1	0-5	*	549	ND	ND	NT	ND
S-2	5-10	*	1,420	ND	0.007	NT	3.92
S-3	10-15	*	881	ND	0.080	NT	7.135
S-4	15-20	*	1,200	0.151	4.960	NT	21.945
S-2	8.5-9.5		552.0	ND	ND	ND	ND
S-5	22-23	*	552.0	ND	ND	ND	ND
S-1	3.5-4.0		<5.0	ND	ND	ND	ND
S-5	22.5-23.5		<5.0	ND	ND	ND	ND
S-2	8.5-9.5		111.0	ND	ND	ND	ND
S-5	22.5-24.0		<5.0	ND	ND	ND	ND
S-1	3.5-4.0		24.2	ND	ND	ND	ND
S-4	16-17	*	8.6	ND	ND	ND	ND
S-4A	16-17		11.0	ND	ND	ND	ND
S-1	20		7.1	<0.05	<0.05	<0.05	<0.05
S-2	25.5		<5.0	<0.05	<0.05	<0.05	<0.05
S-3	39.5		9.8	<0.05	<0.05	<0.05	<0.05
S-1	21		12.9	<0.05	<0.05	<0.05	<0.05
S-2	25.5		<5.0	<0.05	<0.05	<0.05	<0.05
S-3	35		10.2	<0.05	<0.05	<0.05	<0.05
S-1	20.5		10.8	<0.05	<0.05	<0.05	<0.05
S-2	25		<5.0	<0.05	<0.05	<0.05	<0.05
S-3	34.5		5.4	<0.05	<0.05	<0.05	<0.05
MW-5			<10.0	<0.001	<0.001	<0.001	<0.001
MW-6			<10.0	<0.001	<0.001	<0.001	<0.001
MW-7			<10.0	<0.001	<0.001	<0.001	<0.001



LK FUELS TERMINAL
CAMAS, WASHINGTON

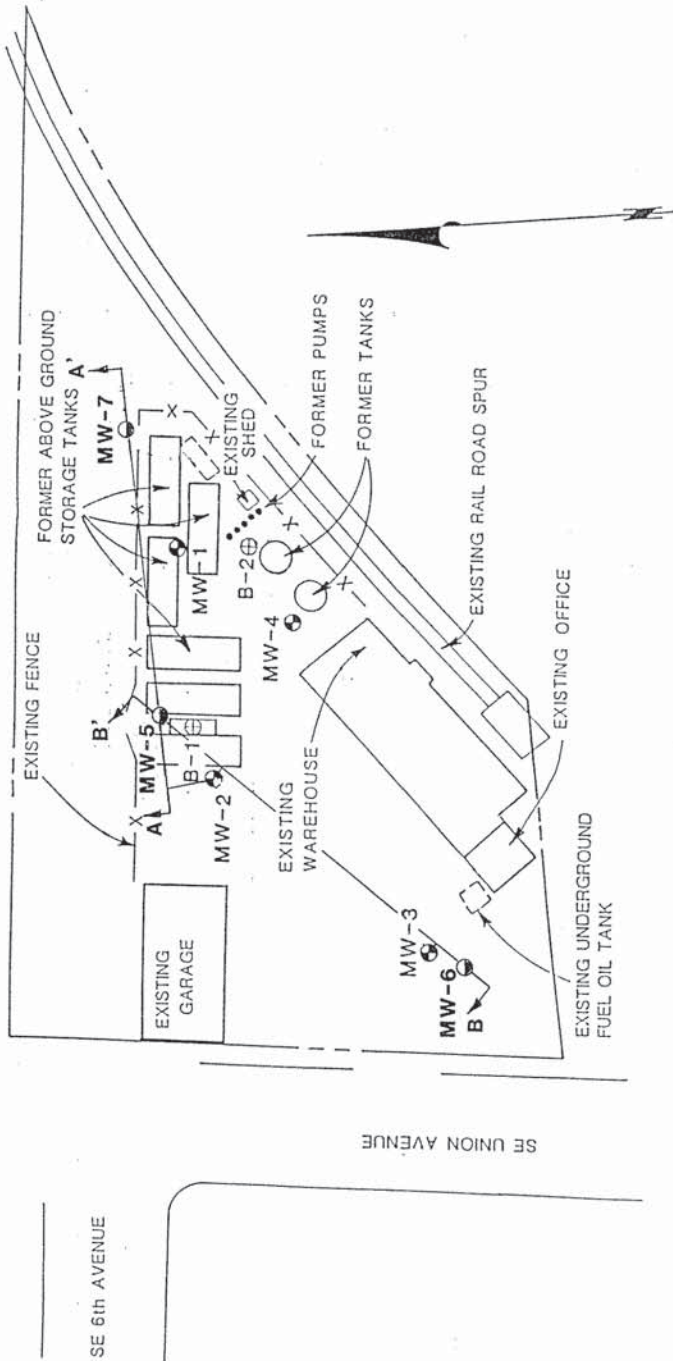
SITE VICINITY MAP
FIGURE 1

USE-ZEMAN &
OCIATES, INC.
Hydrogeological
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10th Avenue N.E.
Bellevue, WA 98005



.1
Method 8015, modified
Method 503E
by EPA method 8020
in milligrams per kilogram (mg/kg); in water, milligrams per liter (mg/l),
(ppm)
limits

sample from indicated depth interval



EXPLANATION

- ⊕ B-2 INDICATES BORING NUMBER & APPROXIMATE LOCATION FOR PREVIOUS STUDY, W-5388, OCT, 1987
- ⊙ MW-4 MONITORING WELL LOCATION DECEMBER 1989 STUDY
- ⊙ MW-7 MONITORING WELL LOCATION CURRENT STUDY

CHEVRON BULK FUELS TERMINAL
CAMAS, WASHINGTON

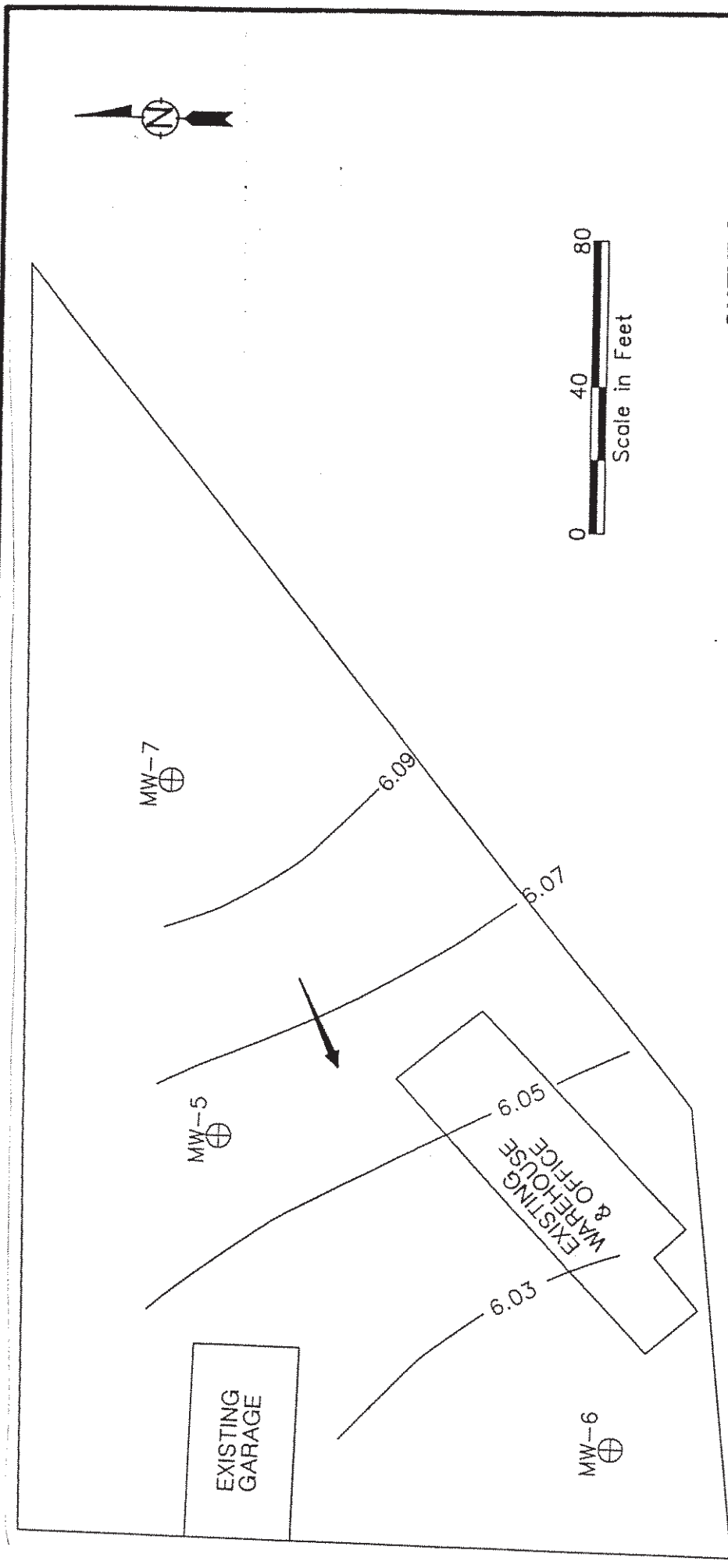
**SITE & EXPLORATION PLAN
FIGURE 2**



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Bellevue, Washington 98005

W.C. W-5770-3
BY SSI
DATE MAR 1990
SCALE NOTED

Base map from 12-70 revised Ground Plan by Standard Oil Company of California Western Operations, Inc.



CHEVRON U.S.A. INC.
 BULK FUEL TERMINAL
 CAMAS, WASHINGTON

**GROUNDWATER SURFACE ELEVATION CONTOUR
 MAP FOR 22 FEBRUARY 1990**

EXPLANATION

- MW-7 ⊕ INDICATES MONITORING WELL NUMBER AND APPROXIMATE LOCATION
- 6.09 — INFERRED GROUNDWATER SURFACE CONTOUR
- INFERRED DIRECTION OF GROUNDWATER MIGRATION

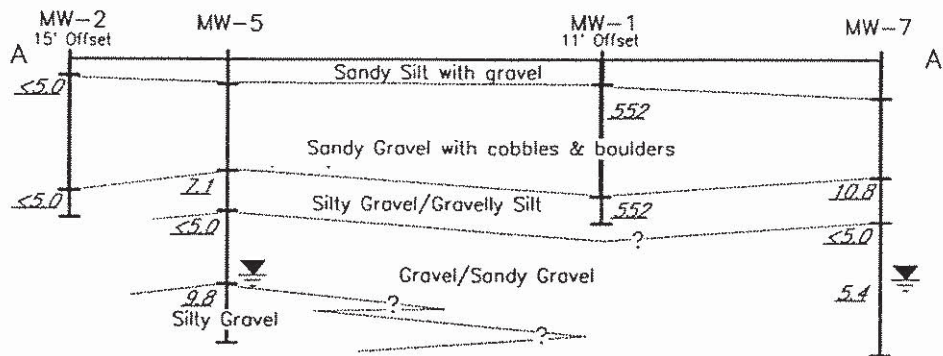
FIGURE 3



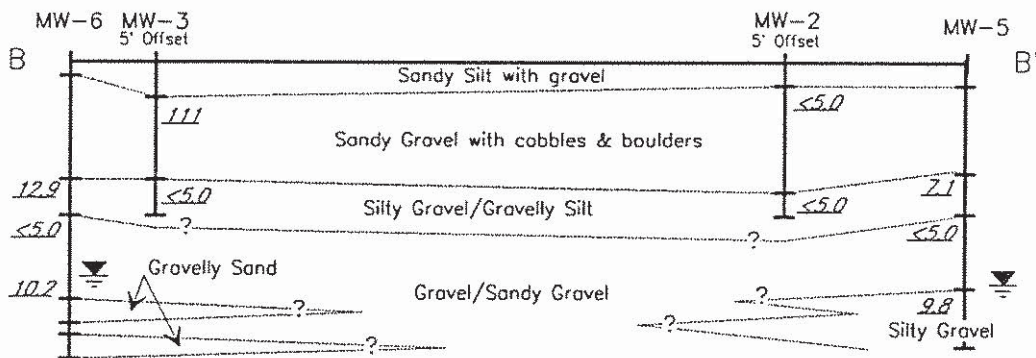
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 BY SST
 DATE DEC 1990
 SCALE NOTED

Generalized Cross Section A-A'



Generalized Cross Section B-B'



No Vertical Exaggeration
Scale: 1 inch = 30 feet

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Observed groundwater level
at time of drilling

Generalized Cross Sections
Figure 4

5.52 Concentration of total petroleum hydrocarbons (TPH) in soil sample collected at the indicated depth



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APPENDIX A
SUBSURFACE EXPLORATION PROCEDURES

APPENDIX A
W-5770-3

Subsurface Exploration

Three soil borings were advanced on the site to 1) to obtain soil samples; 2) determine the presence or absence of petroleum hydrocarbons in soils at depth; 3) allow installation of monitoring wells to groundwater; 4) to collect and analyze representative groundwater samples. The approximate exploration locations are shown on the Site and Exploration Plan, Figure 2. The borings were drilled by an exploration drilling company under subcontract to our firm. The borings consisted of advancing 8-inch steel casing into the silty gravel stratum, and cementing a 6-inch steel casing to that depth, thus creating a seal to prevent any potential shallow contamination from being drawn downward during drilling. Once the cement had hardened, the boring was continued by advancing a 5-inch diameter steel casing to depths ranging from 45 to 47 feet below ground surface. The borings were completed using an air-rotary drilling rig equipped with downhole hammer and Odex eccentric bit. The 8-inch and 5-inch steel casing were removed from the boring following the boring operation, but the 6-inch surface casing was left in-place. Split-spoon samples were obtained near the upper and lower extremes of the gravelly silt/silty gravel stratum, and near the saturated zone interface. The explorations were logged under the full-time supervision of an environmental geologist. The geologist classified the subsurface materials, kept a detailed log, and maintained custody of the recovered samples. The drill rig and all rods and tools were steam-cleaned prior to drilling at each monitoring well location. The sampler was decontaminated between each sampling interval by scrubbing with an Alconox solution, rinsed with tap water, and rinsed again with liberal quantities of distilled water.

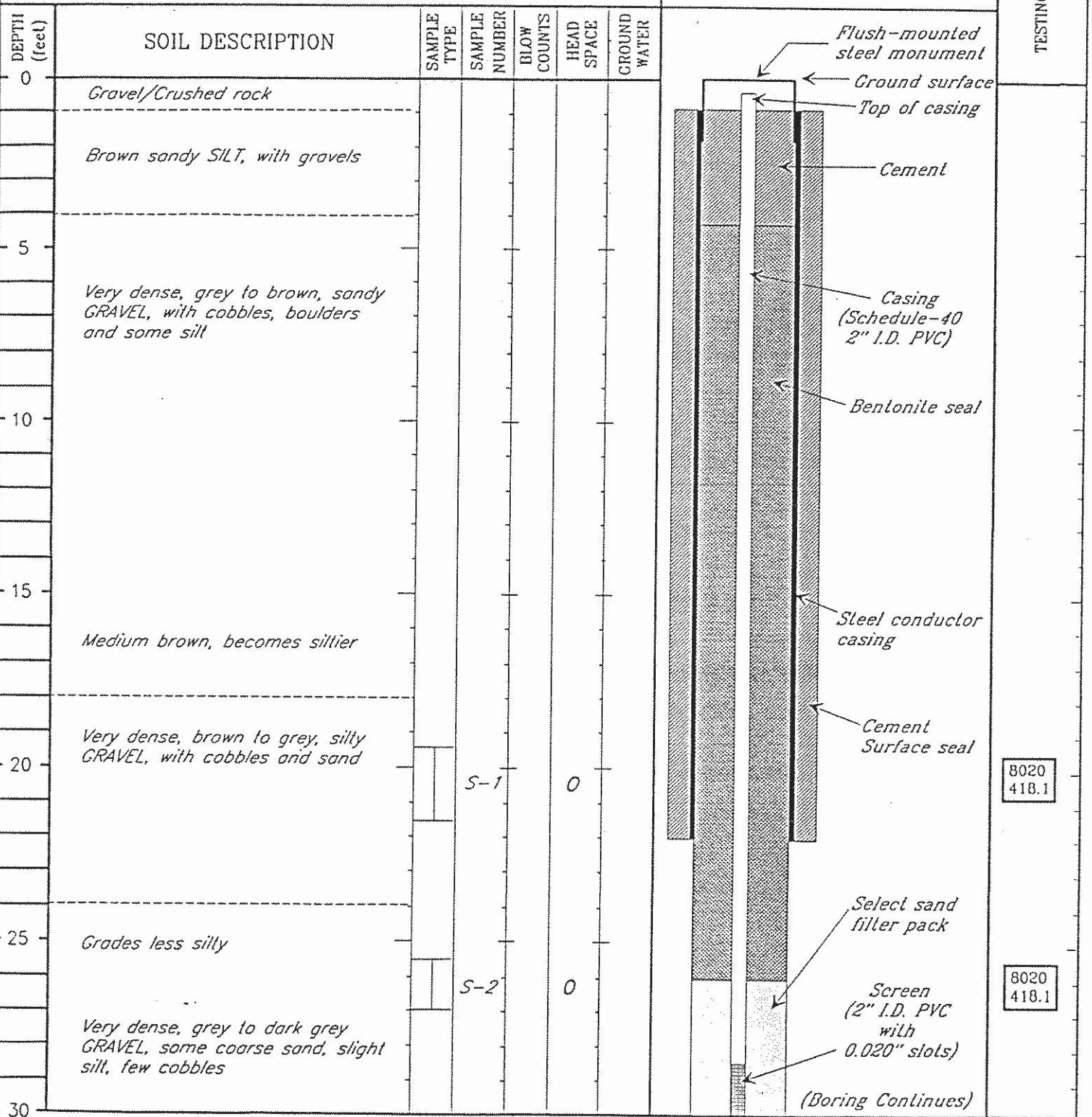
All three explorations were completed as monitoring wells. Each monitoring well consisted of 2-inch inside diameter (I.D.) Schedule 40 flush-threaded PVC casing coupled to a 15-foot length of 0.02-inch slotted well screen. The screened portion of the well was backfilled using 8-12 graded Monterey sand to approximately 2 feet above the screen. Above the sand packed portion of the well the annulus of the boring was

backfilled with bentonite to within 4 feet of the surface, and the remainder of the annulus was filled with cement. Flush monuments mounted in concrete completed the monitoring wells at the surface. Each well was equipped with a water-tight locking cap. All monitoring wells were constructed in accordance with State of Washington minimum standards for construction of wells, Chapter 173-160 WAC.

Monitoring well locations are shown on the Site and Exploration Plan, Figure 2. Monitoring well as-built information is included in this appendix.

Following installation of monitoring wells, the wells were developed by building. Following equilibration, groundwater samples were collected. Prior to sampling the groundwater, the monitoring wells were purged of water to insure samples representative of the formation water. Purging of the wells was accomplished by hand-bailing at least four well volumes. Groundwater samples were collected by carefully lowering a laboratory cleaned disposable bailer through the air/water interface and retrieving a sample from near the surface of the water in the well. The sample was carefully decanted into laboratory prepared glass vials with Teflon seals, excluding any air from the vials. The samples were immediately preserved by cooling, and transported to an analytical laboratory.

Elevation reference: *Ground surface* Well completed: *6 February 1990*
Ground surface elevation: *40.21 feet* Casing elevation: *39.96 feet*



LEGEND

I 2-inch O.D. split-spoon sample

8020 418.1 Chemical analysis (analyses performed)



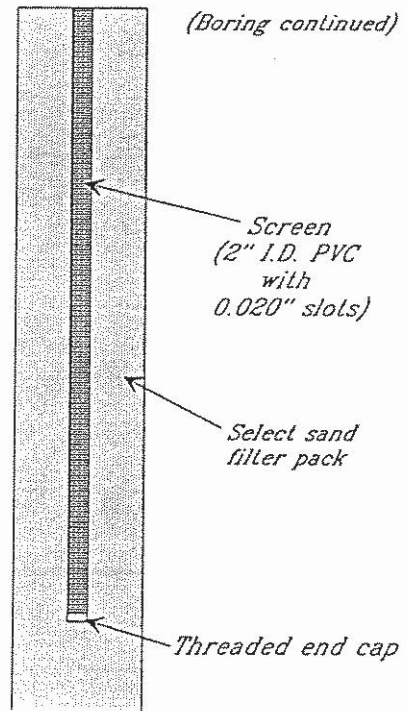
RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Elevation reference: *Ground surface* Well completed: *6 February 1990*
Ground surface elevation: *40.21 feet* Casing elevation: *39.96 feet*

AS-BUILT DESIGN

TESTING

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	HEAD SPACE	GROUND WATER
30	<i>Very dense, grey to dark grey GRAVEL, some coarse sand, slight silt, few cobbles</i>					
35	<i>Grades sillier</i>					
40	<i>Very dense, wet, grey to brown silty GRAVEL, with some coarse sand</i>		<i>S-3</i>		<i>0</i>	
45	<i>Boring terminated at approximately 45 feet below ground surface</i>					
50						
55						
60						



8020
418.1

LEGEND

I 2-inch O.D. split-spoon sample

8020 418.1 Chemical analysis (analyses performed)

▽ ATD Observed groundwater level (ATD = at time of drilling)



RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Elevation reference: *Ground surface* Well completed: *9 February 1990*
Ground surface elevation: *39.98 feet* Casing elevation: *39.71 feet*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	HEAD SPACE	GROUND WATER	AS-BUILT DESIGN		TESTING
0	<i>Crushed rock</i>						Flush-mounted steel monument		
	<i>Brown sandy SILT, with gravels</i>						Ground surface		
	<i>Very dense, grey to brown, sandy GRAVEL, with cobbles, boulders and some silt</i>						Top of casing		
5	<i>Becomes less silty</i>						Cement		
							Casing (Schedule-40 2" I.D. PVC)		
10							Bentonite seal		
15	<i>Becomes sillier</i>						Steel conductor casing		
	<i>Very dense, grey to brown, silty GRAVEL, with sand and cobbles</i>						Cement Surface seal		
20			S-1		0				8020 418.1
25	<i>Very dense, grey to brown sandy coarse GRAVEL, with some silt, sand and cobbles</i>								
	<i>Increasing cobbles</i>		S-2		0				8020 418.1
30	<i>Dense, grey to brown, sandy GRAVEL, some silt (few to no cobbles)</i>						Select sand filler pack		
							(Boring Continues)		

LEGEND

I 2-inch O.D. split-spoon sample

8020 418.1 Chemical analysis (analyses performed)



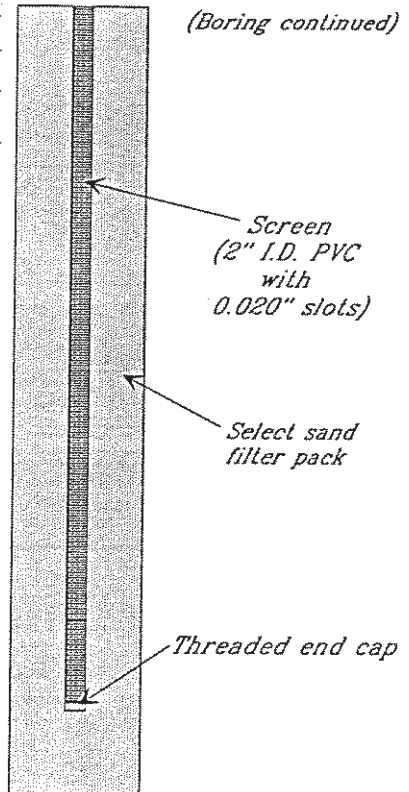
RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Elevation reference: *Ground surface* Well completed: *9 February 1990*
Ground surface elevation: *39.98 feet* Casing elevation: *39.71 feet*

AS-BUILT DESIGN

TESTING

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	HEAD SPACE	GROUND WATER
30	<i>Dense, grey to brown, sandy GRAVEL, some silt (few to no cobbles)</i>					
	<i>Becomes very dense</i>					
35	<i>Grades sandier</i>		<i>S-3</i>		<i>0</i>	
40	<i>Medium dense, grey to brown, gravelly SAND, some silt</i>					
	<i>Very dense, grey to brown, sandy GRAVEL, some silt</i>					
45	<i>Medium dense, grey to brown, gravelly SAND, some silt</i>					
	<i>Very dense, grey to brown, sandy GRAVEL, some silt</i>					
	<i>Boring terminated at approximately 47 feet below ground surface</i>					
50						
55						
60						



LEGEND

I 2-inch O.D. split-spoon sample

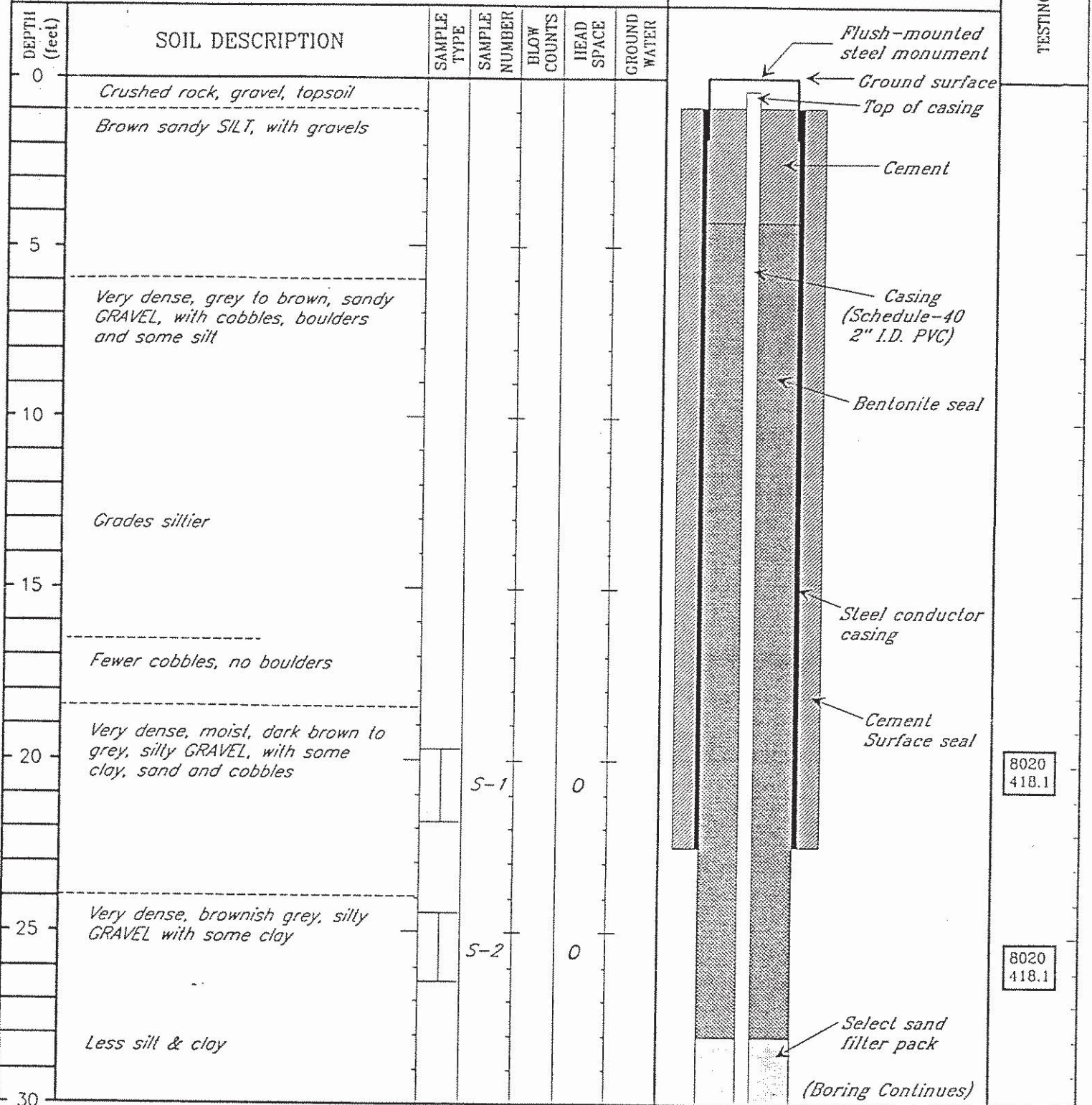
8020 418.1 Chemical analysis (analyses performed)

▽ (ATD = at time of drilling) Observed groundwater level



RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Elevation reference: *Arbitrary Datum* Well completed: *21 February 1990*
Ground surface elevation: *40.99 feet* Casing elevation: *40.73 feet*



LEGEND

I 2-inch O.D. split-spoon sample

8020 418.1 Chemical analysis (analyses performed)



RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
1400 140th Ave NE
Bellevue, Washington 98005

Elevation reference: <i>Ground surface</i> Well completed: <i>21 February 1990</i> Ground surface elevation: <i>40.99 feet</i> Casing elevation: <i>40.73 feet</i>							AS-BUILT DESIGN		TESTING
DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	HEAD SPACE	GROUND WATER			
30	<i>Very dense, brownish grey, slightly silty GRAVEL, with some coarse sand and cobbles</i>								
35			<i>S-3</i>		<i>0</i>				
40	<i>Few to no cobbles. "pea gravel"</i>								<div style="border: 1px solid black; padding: 2px; display: inline-block;">8020 418.1</div>
45									
50	<i>Boring terminated at approximately 47 feet below ground surface</i>								<div style="border: 1px solid black; padding: 2px; display: inline-block;">8020 418.1</div>
55									
60									<div style="border: 1px solid black; padding: 2px; display: inline-block;">8020 418.1</div>

LEGEND

2-inch O.D. split-spoon sample

8020
418.1

 Chemical analysis (analyses performed)

Observed groundwater level (ATD = at time of drilling)

RZA

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Environmental Consultants
 1400 140th Ave NE
 Bellevue, Washington 98005

APPENDIX B
ANALYTICAL LABORATORY RESULTS

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 · TELEPHONE (206)922-2310 · FAX (206)922-5047

Report To: Rittenhouse - Zeman

Date: January 31, 1990

Report On: Analysis of Soil

Lab No.: 9592

IDENTIFICATION:

Samples Received on 1-26-90

Project: W5770-3 Chevron Camas

ANALYSIS:

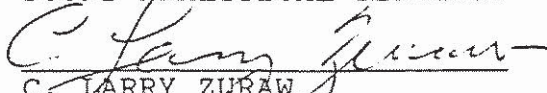
<u>Lab Sample No.</u>	<u>Client ID</u>	<u>Total Petroleum Hydrocarbons, mg/kg by EPA Method 418.1</u>
1	S-1 N	5.6
2	S-2 S	23.4
3	S-3 E	< 5.0
4	S-4 W	77.0
5	S-5 BOT	31.9
6	B-7 S-1	7.1

Lab Sample No. 6

Client ID: B-7 S-1

Benzene, mg/kg < 0.05
Toluene, mg/kg < 0.05
Ethyl Benzene, mg/kg < 0.05
Xylenes, mg/kg < 0.05
BTEX by EPA SW-846 Method 8020

SOUND ANALYTICAL SERVICES


C. LARRY ZURAW

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

DUPLICATES

Lab No:	9592	Client ID:	S-3 E
Date:	January 31, 1990	Matrix:	Soil
Client:	Rittenhouse-Zeman	Units:	mg/kg

Compound	Sample(S)	Duplicate(D)	RPD*	
Total Petroleum Hydrocarbons	< 5.0	< 5.0	----	

*RPD = relative percent difference
= $[(S - D) / ((S + D) / 2)] \times 100$

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Rittenhouse - Zeman

Date: February 8, 1990

Report On: Analysis of Soil

Lab No.: 9773

IDENTIFICATION:

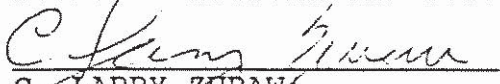
Samples Received on 2-7-90

Project: W-5770-3 Camas Chevron

ANALYSIS:

Lab Sample No.	1	2
Client Identification	B7 S2	B7 S3
Matrix/Units	Soil mg/kg	Soil mg/kg
Total Petroleum Hydrocarbons by EPA Method 418.1	< 5.0	9.8
Benzene	< 0.05	< 0.05
Toluene	< 0.05	< 0.05
Ethyl Benzene	< 0.05	< 0.05
Xylenes	< 0.05	< 0.05
BTEX by EPA SW-846 Method 8020		

SOUND ANALYTICAL SERVICES


C. LARRY ZURAW

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

DUPLICATES

Lab No: 9773 Client ID: B7 S3
Date: February 8, 1990 Matrix: Soil
Client: Rittenhouse-Zeman Units: mg/kg

Compound	Sample(S)	Duplicate(D)	RPD*	
Total Petroleum Hydrocarbons	9.8	9.6	2.1	
Benzene	< 0.05	< 0.05	---	
Toluene	< 0.05	< 0.05	---	
Ethyl Benzene	< 0.05	< 0.05	---	
Xylenes	< 0.05	< 0.05	---	

*RPD = relative percent difference
= $[(S - D) / ((S + D) / 2)] \times 100$

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS
 4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Rittenhouse-Zeman
 Report On: Analysis of Soil

Date: February 13, 1990

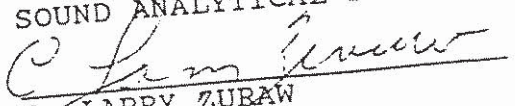
Lab No.: 9815

IDENTIFICATION:

Samples Received on 2-9-90
 Project: W-5770-3 Camas Chevron

ANALYSIS:

	1	2	3
Lab Sample No.			
Client ID:	B8-S1	B8-S2	B8-S3
Total Petroleum Hydrocarbons, mg/kg by EPA Method 418.1	12.9	< 5.0	10.2
Benzene	< 0.05	< 0.05	< 0.05
Toluene	< 0.05	< 0.05	< 0.05
Ethyl Benzene	< 0.05	< 0.05	< 0.05
Xylenes	< 0.05	< 0.05	< 0.05
BTEX by EPA SW-846 Method 8020			

SOUND ANALYTICAL SERVICES

 C. LARRY ZURAW

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Rittenhouse-Zeman

Date: February 27, 1990

Report On: Analysis of Water & Soil

Lab No.: 10016

Page 1 of 2

IDENTIFICATION:

Samples Received on 2-23-90

Project: W-5770-3 Camas Chevron

ANALYSIS:

Lab Sample No.	1	2	3
Client Identification	B9 - S1	B9 - S2	B9 - S3
Matrix/Units	Soil mg/kg	Soil mg/kg	Soil mg/kg
Total Petroleum Hydrocarbons by EPA Method 418.1	10.8	< 5.0	5.4
Benzene	< 0.05	< 0.05	< 0.05
Toluene	< 0.05	< 0.05	< 0.05
Ethyl Benzene	< 0.05	< 0.05	< 0.05
Xylenes	< 0.05	< 0.05	< 0.05
BTEX by EPA SW-846 Method 8020			


Continued

SOUND ANALYTICAL SERVICES, INC.

Rittenhouse-Zeman
 Page 2 of 2
 Lab No. 10016
 February 27, 1990

Lab Sample No.	4	5	6
Client Identification	MW-5	MW-6	MW-7
Matrix/Units	Water mg/l	Water mg/l	Water mg/l
Total Petroleum Fuel Hydrocarbons by EPA SW-846 Modified Method 8015	< 10	< 10	< 10
TPH as			
Benzene	< 0.001	< 0.001	< 0.001
Toluene	< 0.001	< 0.001	< 0.001
Ethyl Benzene	< 0.001	< 0.001	< 0.001
Xylenes	< 0.001	< 0.001	< 0.001
BTEX by EPA SW-846 Method 8020			

SOUND ANALYTICAL SERVICES


 C. LARRY ZEMAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

DUPLICATES

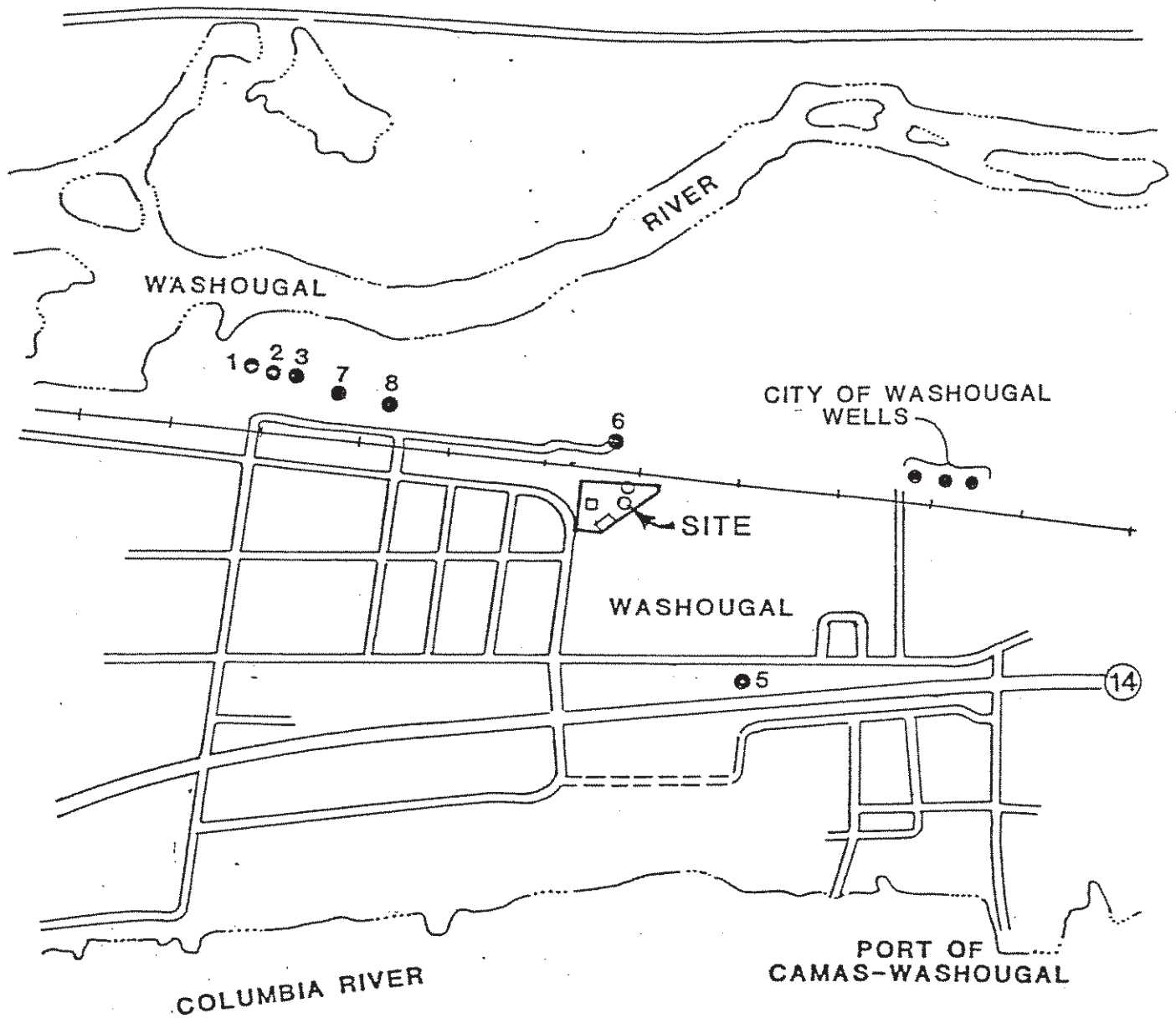
Lab No: 9815
Date: February 13, 1990
Client: Rittenhouse-Zeman

Client ID: B8-S3
Matrix: Soil
Units: mg/kg

Compound	Sample(S)	Duplicate(D)	RPD*	
Total Petroleum Hydrocarbons	10.2	8.5	18.2	

*RPD = relative percent difference
= $[(S - D) / ((S + D) / 2)] \cdot 100$

APPENDIX C
MUNICIPAL WATER WELL LOCATIONS/LOGS/LABORATORY ANALYSES



8 - MUNICIPAL WATER WELL NUMBER
 ● AND APPROXIMATE LOCATION

NOTE:

WELL LOGS REGISTERED WITH WDOE
 FOR WELL No.'s 5, 6, & 8 ARE ATTACHED.

**CHEVRON
 BULK FUELS TERMINAL
 CAMAS, WASHINGTON**

MUNICIPAL WATER WELL LOCATION PLAN

APPENDIX C

W.O. W-5770-3
 BY SST
 DATE MAR 1990
 SCALE N.T.S.

**RITTENHOUSE-ZEMAN &
 ASSOCIATES, INC.**
*Geotechnical & Hydrogeological
 Consultants*
 1400 140th Avenue N.E.
 Bellevue, WA 98005



FS

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 9326

Permit No. 8627

(1) OWNER: Name City of Camas Address 616 N.E. 4th Avenue
(2) LOCATION OF WELL: County Clark - Lot 9, Plat of Orchard 1/4 1/4 Sec T N, R W.M.
bearing and distance from section or subdivision corner Home within City of Camas & road right of way abutting theret

(3) PROPOSED USE: Domestic Industrial Municipal
Irrigation Test Well Other

(4) TYPE OF WORK: Owner's number of well (if more than one).....
New well Method: Dug Bored
Deepened Cable Driven
Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 71 ft. Depth of completed well 71 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8" Diam. from ft. to ft.
Threaded " Diam. from ft. to ft.
Welded " Diam. from ft. to ft.

Perforations: Yes No
Type of perforator used.....
SIZE of perforations 3/8" in. by 1-1/4" in.
408 perforations from 44' 6" ft. to 65 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes No
Manufacturer's Name.....
Type..... Model No.....
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes No Size of gravel:.....
Gravel placed from ft. to ft.

Surface seal: Yes No To what depth? 22 ft.
Material used in seal Concrete grout
Did any strata contain unusable water? Yes No
Type of water?..... Depth of strata.....
Method of sealing strata off gravity

(7) PUMP: Manufacturer's Name Johnson
Type V.H.S. Turbine H.P. 75

(8) WATER LEVELS: Land-surface elevation above mean sea level 38 ft.
Static level 36 ft. below top of well Date 7-25-68
Artesian pressure lbs. per square inch Date.....
Artesian water is controlled by (Cap. valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
as a pump test made? Yes No If yes, by whom? O.J. Norris
Yield: 450 gal./min. with 1 ft. drawdown after 8 hrs.
" " " " " "
" " " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level
Date of test 3-16-68
Flow test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 53° Was a chemical analysis made? Yes No

(10) WELL LOG: The East of Sec. 12 T1N R3 East of WM

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Surface dirt with small boulder	0	3
Gravel & Boulders, very little binder	3	7
Gravel & boulders w/ clay binder	7	21
Large gravel & small boulders, loose	21	24
Med. size gravel, fairly loose	24	33
Med. size gravel	33	35
Large to fine gravel, some red gravel	35	45
Started making water at 35 feet		
Med. to fine gravel, clean some red - very little sand	45	48
Some larger gravel	48	56
Med. to fine gravel, clean & loose	56	60
Med to fine gravel clean, loose	60	65
Med to fine gravel, clean, loose	65	67'6"
Loose gravel formation	67'6"	68'6"
Loose gravel formation	68'6"	69'6"
Fine yellow sand	69'6"	71
Sealed bottom with concrete	71	

Work started Feb. 14 1968 Completed Mar. 19 1968

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME O.J. NORRIS - WATER WELL DRILLING
(Person, firm, or corporation) (Type or print)
4411 N.E. 59th Avenue
Address Vancouver, Washington
[Signed] O.J. Norris (Well Driller)
License No. 223 02 4069 Date Sept. 9 1968

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 9325
 Permit No. 8544-1

(1) OWNER: Name City of Camas Address 616 N.E. 4th Avenue
 (2) LOCATION OF WELL: County Clark David C. Parker D.L.C. #48 Sec. 12 T. 1 N. R. 3E W.M.
 Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic Industrial Municipal
 Irrigation Test Well Other

(4) TYPE OF WORK: Owner's number of well #6
 (if more than one) ...
 New well Method: Dug Bored
 Deepened Cable Driven
 Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 16 inches.
 Drilled 85 ft. Depth of completed well 85 ft.

(6) CONSTRUCTION DETAILS:
 Casing installed: 16" OD Diam. from 0 ft. to 85 ft.
 Threaded Diam. from _____ ft. to _____ ft.
 Welded Diam. from _____ ft. to _____ ft.
 Perforations: Yes No
 Type of perforator used Mill knife
 SIZE of perforations 5/16 in. by 3-1/2 in.
552 perforations from 56 ft. to 80 ft.
 _____ perforations from _____ ft. to _____ ft.

Screens: Yes No
 Manufacturer's Name _____
 Type _____ Model No. _____
 Diam. _____ Slot size _____ from _____ ft. to _____ ft.
 Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel: _____
 Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? 22 ft.
 Material used in seal Concrete crout
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata 27
 Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
 Type: _____ H.P.

(8) WATER LEVELS: Land-surface elevation 48 ft.
 above mean sea level...
 Static level 45 ft. below top of well Date 6-29-68
 Artesian pressure _____ lbs. per square inch Date _____
 Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
 Was a pump test made? Yes No If yes, by whom? City
 Yield: 1600 gal./min. with 5 ft. drawdown after 12 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test June 29, 1968
 Bailor test _____ gal./min. with _____ ft. drawdown after _____ hrs.
 Artesian flow _____ g.p.m. Date _____
 Temperature of water 53° Was a chemical analysis made? Yes No

See Enclosed

(10) WELL LOG:
 Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Surface Soil	0	2
Gravel & Small Boulders	2	6
Gravel & Boulders	6	10
Gravel & Small Boulders	10	14
Boulders	14	15
Pea Gravel	15	17
Boulders	17	19
Boulders	19	21
Large to Medium gravel	21	26
Medium to fine gravel, some sand	26	30
Medium to fine gravel with a few boulders	30	40
Med. to fine gravel with fine sand	40	48'6"
Med to fine gravel with some sand	48'6"	53
Water bearing gravel and sand	53	55
Med to fine gravel, water bearing	55	59
Med to fine gravel, water bearing	59	69
Med to fine gravel, some black sand water bearing	69	76
Med to large gravel	76	80
Gravel & small boulders, very tight formation	80	83'9"
Med hard gray rock	83'9"	85

Work started June 5 1968 Completed 6-27-68 1968

WELL DRILLER'S STATEMENT:
 This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

O.J. NORRIS-WATER WELL DRILLING
 NAME _____ (Person, firm, or corporation) (Type or print)
4411 N.E. 59th Avenue
 Address Vancouver, Washington

[Signed] O. J. Norris
 (Well Driller)

License No. 223 02 4069 Date Sept. 9 1968

State of Washington
 Department of Health
 Division of Laboratories
 1610 N.E. 150th St., Seattle, WA 98155
 (206)361-2898

Lab Number : 5401787 Customer : CITY OF CAMAS/JIM ANDERSON
 Date collected : 1-16-90 Address : P.O. BOX 1055
 Date Received : 1-17-90 City : CAMAS
 Date Tested : 1/25/90 19:25 State, Zip : WA, 98607
 Data File : >1A25I::D4 County : CLARK

Miscellaneous Sample Information : 5401787 DUP CAMS S06

System ID Number : 108002 System Name : CITY OF CAMAS

Non-Composited Samples

DSHS Source Number : S06
 Source Name : WELL #5

Composited Samples

Number of Sources Used in Composite : N/A
 DSHS Source #'s Composited : N/A

Analysis of Individual Sources Necessary: N/A

Analyst : PAMELA MS Date of Report : 2-2-70
 Instrument : 1 Analyst's Initials : *PA*
 Supervisor's Initials : *P*

*Charge \$250⁰⁰
for confirmation*

Results of Analysis by EPA Method 524.2

REGULATED COMPOUNDS

EPA Code #	Compound Name	MCL(ug/l)	* Amount (ug/l)	Compliance
2976	VINYL CHLORIDE	2	0.0	YES
2977	1,1-DICHLOROETHYLENE	7	0.0	YES
2981	1,1,1-TRICHLOROETHANE	200	0.0	YES
2982	CARBON TETRACHLORIDE	5	0.0	YES
2990	BENZENE	5	0.0	YES
2980	1,2-DICHLOROETHANE	5	0.0	YES
2984	TRICHLOROETHYLENE	5	0.0	YES
2969	P-DICHLOROBENZENE	75	0.0	YES

*Note: An Amount of 0.0 ug/l indicates that the true concentration is less than the detection limit of the method (0.5 ug/l for all compounds).

Lab Number : 5401787
Data File : >1A251::04

Results of Analysis by EPA Method 524.2
(continued)

Unregulated Compounds

Monitoring Required

EPA Code ‡	Compound Name	*Amount (ug/l)
2210	CHLOROMETHANE	0.0
2214	BROMOMETHANE	0.0
2216	CHLOROETHANE	0.0
2964	METHYLENE CHLORIDE	0.0
2979	T-1,2,-DICHLOROETHYLENE	0.0
2978	1,1-DICHLOROETHANE	0.0
2416	2,2-DICHLOROPROPANE	0.0
2380	CIS-1,2-DICHLOROETHYLENE	0.0
2941	CHLOROFORM (THM)	0.0
2410	1,1-DICHLOROPROPENE	0.0
2983	1,2-DICHLOROPROPANE	0.0
2408	DIBROMOMETHANE	0.0
2943	BROMODICHLOROMETHANE (THM)	0.0
2413	CIS-1,3-DICHLOROPROPENE	0.0
2991	TOLUENE	0.0
2985	1,1,2-TRICHLOROETHANE	0.0
2987	TETRACHLOROETHYLENE	.8
2413	TRANS-1,3-DICHLOROPROPENE	0.0
2412	1,3-DICHLOROPROPANE	0.0
2944	CHLORODIBROMOMETHANE (THM)	0.0
2989	CHLOROBENZENE	0.0
2986	1,1,1,2-TETRACHLOROETHANE	0.0
2992	ETHYL BENZENE	0.0
2995	M/P-XYLENE	0.0
2997	O-XYLENE	0.0
2996	STYRENE	0.0
2942	BROMOFORM (THM)	0.0
2993	BROMOBENZENE	0.0
2414	1,2,3-TRICHLOROPROPANE	0.0
2988	1,1,2,2-TETRACHLOROETHANE	0.0
2965	O-CHLOROTOLUENE	0.0
2966	P-CHLOROTOLUENE	0.0
2967	M-DICHLOROBENZENE	0.0
2968	O-DICHLOROBENZENE	0.0

*Note: An Amount of 0.0 ug/l indicates that the true concentration is less than the detection limit of the method (0.5 ug/l for all compounds).

Lab Number : 5401787
Data File : >1A251::D4

Results of Analysis by EPA Method 524.2
(continued)

Unregulated Compounds

Discretionary

EPA Code ‡	Compound Name	*Amount (ug/l)
2218	TRICHLOROFLUOROMETHANE	0.0
2430	BROMOCHLOROMETHANE	0.0
2994	ISOPROPYLBENZENE	0.0
2998	N-PROPYLBENZENE	0.0
2424	1,3,5-TRIMETHYLBENZENE	0.0
2426	TERT-BUTYLBENZENE	0.0
2418	1,2,4-TRIMETHYLBENZENE	0.0
2428	SEC-BUTYLBENZENE	0.0
2030	P-ISOPROPYLTOLUENE	0.0
2422	N-BUTYLBENZENE	0.0
2378	1,2,4-TRICHLOROBENZENE	0.0
2248	NAPHTHALENE	0.0
2246	HEXACHLOROBTADIENE	0.0
2420	1,2,3-TRICHLOROBENZENE	0.0

*Note: An Amount of 0.0 ug/l indicates that the true concentration is less than the detection limit of the method (0.5 ug/l for all compounds).

State of Washington
 Department of Social and Health Services
 Division of Health
 Public Health Laboratories
 1610 N.E. 150th St., Seattle, WA 98155
 (206)361-2898

Lah Number	: 5400533	Customer	: JIM ANDERSON
Date collected	: 8/01/88	Address	: P.O. BOX 1055
Date Received	: 8/03/88	City	: CAMAS
Date Tested	: 8/10/88 19:05	State, Zip	: WASHINGTON, 98607
Data File	: >1H10M:QT	County	: CLARK

Miscellaneous Sample Information : 5400533

System ID Number : 108002 System Name : CITY OF CAMAS

Non-Composited Samples

DSHS Source Number : S07
 Source Name : DEEP WELL # 6

Composited Samples

Number of Sources Used in Composite : NA
 DSHS Source #'s Composited : NA

Analysis of Individual Sources Necessary: NA

Analyst	: PAMELA MS	Date of Report	: 1/19/89
Instrument	: 1	Analyst's Initials	: PAN
		Supervisor's Initials	: JD

Charge \$200.00

Results of Analysis by EPA Method 524

REGULATED COMPOUNDS				
EPA Code #	Compound Name	MCL(ug/l)	* Amount (ug/l)	Compliance
2976	VINYL CHLORIDE	2	0.0	YES
2977	1,1-DICHLOROETHYLENE	7	0.0	YES
2981	1,1,1-TRICHLOROETHANE	200	0.0	YES
2982	CARBON TETRACHLORIDE	5	0.0	YES
2990	BENZENE	5	0.0	YES
2980	1,2-DICHLOROETHANE	5	0.0	YES
2984	TRICHLOROETHYLENE	5	0.0	YES
2969	P-DICHLOROBENZENE	75	0.0	YES

*Note: An Amount of 0.0 ug/l indicates that the true concentration is less than the detection limit of the method (0.5 ug/l for all compounds).

Lab Number : 5400533
Data File : 1410M:QT

Results of Analysis by EPA Method 524
(continued)

Unregulated Compounds

Monitoring Required

EPA Code ‡	Compound Name	*Amount (ug/l)
2210	CHLOROMETHANE	0.0
2214	BROMOMETHANE	0.0
2216	CHLOROETHANE	0.0
2979	T-1,2,-DICHLOROETHYLENE	0.0
2978	1,1-DICHLOROETHANE	0.0
2416	2,2-DICHLOROPROPANE	0.0
2380	CIS-1,2-DICHLOROETHYLENE	0.0
2941	CHLOROFORM (THM)	1.9
2410	1,1-DICHLOROPROPENE	0.0
2983	1,2-DICHLOROPROPANE	0.0
2408	DIBROMOMETHANE	0.0
2943	BROMODICHLOROMETHANE (THM)	0.0
2991	TOLUENE	0.0
2985	1,1,2-TRICHLOROETHANE	0.0
2987	TETRACHLOROETHYLENE	0.0
2412	1,3-DICHLOROPROPANE	0.0
2944	CHLORODIBROMOMETHANE (THM)	0.0
2989	CHLOROBENZENE	0.0
2986	1,1,1,2-TETRACHLOROETHANE	0.0
2992	ETHYL BENZENE	0.0
2995	M/P-XYLENE	0.0
2997	O-XYLENE	0.0
2996	STYRENE	0.0
2947	BROMOFORM (THM)	0.0
2993	BROMOBENZENE	0.0
2414	1,2,3-TRICHLOROPROPANE	0.0
2988	1,1,2,2-TETRACHLOROETHANE	0.0
2965	O-CHLOROTOLUENE	0.0
2966	P-CHLOROTOLUENE	0.0
2967	M-DICHLOROBENZENE	0.0
2968	O-DICHLOROBENZENE	0.0

*Note: An Amount of 0.0 ug/l indicates that the true concentration is less than the detection limit of the method (0.5 ug/l for all compounds).

Lab Number : 5400533
Data File : >1H10M::QT

Results of Analysis by EPA Method 524
(continued)

Unregulated Compounds

Discretionary

EPA Code ‡	Compound Name	*Amount (ug/l)
221A	TRICHLOROFLUOROMETHANE	0.0
243B	BROMOCHLOROMETHANE	0.0
2994	ISOPROPYL BENZENE	0.0
2998	N-PROPYL BENZENE	0.0
2424	1,3,5-TRIMETHYLBENZENE	0.0
2426	TERT-BUTYL BENZENE	0.0
2418	1,2,4-TRIMETHYLBENZENE	0.0
2428	SFC-BUTYL BENZENE	0.0
2030	P-ISOPROPYLTOLUENE	0.0
2422	N-BUTYL BENZENE	0.0
2378	1,2,4-TRICHLOROBENZENE	0.0
2248	NAPHTHALENE	0.0
2246	HEXACHLOROBUTADIENE	0.0
2420	1,2,3-TRICHLOROBENZENE	0.0

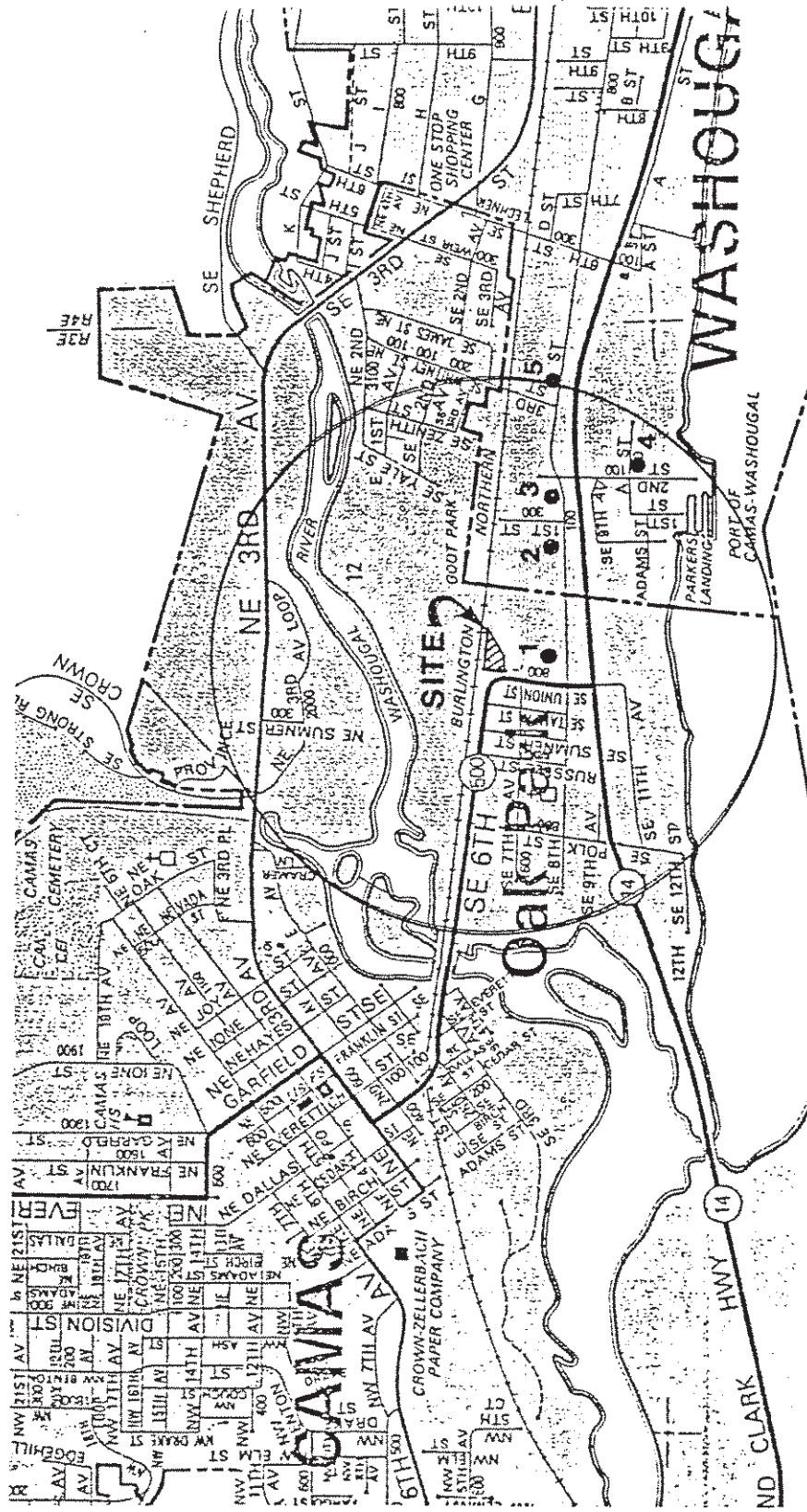
*Note: An Amount of 0.0 ug/l indicates that the true concentration is less than the detection limit of the method (0.5 ug/l for all compounds).

APPENDIX D
Potential Off-site Impacts
W-5770-3

APPENDIX D
POTENTIAL OFF-SITE IMPACTS

The following is a list of sites within a 1/2-mile radius of the subject site which have existing underground storage tanks

1. Tidland Corporation, 2363 SE 8th Avenue, Camas
2. Clark Co. PUD, 89 C Street, Washougal
3. Rapéd Robgrt's Food Store, 165 C Street, Washougal
4. Port Marina, 24 A Street, Washougal
5. Columbia Warehouse, 361 C Street, Washougal



**CHEVRON
BULK FUELS TERMINAL
CAMAS, WASHINGTON**

UNDERGROUND STORAGE TANK SITES

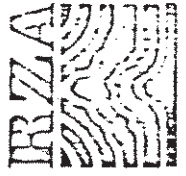
LEGEND

- 5. REFERENCE NUMBER AND APPROXIMATE LOCATION OF SITES WITH EXISTING UNDERGROUND STORAGE TANKS

APPENDIX D



APPROXIMATE SCALE IN FEET



**RITZENHOUSE-ZEMAN &
ASSOCIATES, INC.**
*Geotechnical & Hydrogeological
Consultants*
1-400 140th Avenue N.E.
Bellevue, WA 98005

W.O. W-5770-3
BY SSJ
DATE MAR 1990
SCALE NOTED

APPENDIX E
INQUIRIES & GOVERNMENTAL AGENCIES & PUBLICATIONS

APPENDIX E

Agency Documents Reviewed

Washington State Department of Ecology (WDOE) - Confirmed and Suspected Hazardous Waste Sites Report

Washington State Department of Ecology (WDOE), Southwestern Region, Site/Tank Report and Notifiers List

Washington State Department of Ecology (WDOE) - Underground Storage Tank List

U.S. Environmental Protection Agency (EPA), Region 10 - Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) List

Publications Reviewed

USGS Water Supply Paper 1600
Geology and Ground-Water Conditions of Clark County by M.J. Mundorff, 1964.

USGS Bulletin 1119
Geology of Portland, Or. and Adjacent Areas by Donald E. Trimble, 1963.