



RZA, INC.  
Geotechnical & Hydrogeological Consultants  
711 'H' Street, Suite 450  
Anchorage, Alaska 99501-3442  
(907) 276-6480 / FAX (907) 258-4128

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0009

12 December 1988

A-1204-4

UNOCAL  
3131 Elliott Avenue  
Seattle, Washington 98121

**RECEIVED**

JAN 04 1989

ANCHORAGE/WESTERN  
DISTRICT OFFICE

Attention: Mr. Leigh Carlson

Subject: Demolition and Excavation  
Observations and Testing At Station No. 5057  
International Airport Road  
Anchorage, Alaska

Gentlemen:

In accordance with your authorization, RZA, Inc. observed the removal of the underground storage tanks, above ground vertical tanks and fuel handling facilities at the above referenced site. Petroleum contaminated soils were also excavated and stockpiled, and five exploratory soil borings were drilled for monitoring well installations. This letter summarizes RZA's observations and testing during the demolition and subsequent site exploration.

### **SERVICE STATION DEMOLITION**

The demolition of the site was carried out by BC Contracting, under the direction of Northern Lights Petroleum Equipment, Inc. On 10 October 1988, the contractor began removal of the facilities on site. General site debris were taken to the Anchorage Municipal Landfill, and vehicles were towed to the ABC Towing Impound Lot awaiting pickup by the former station operator. By 18 October 1988 most of the building and other above ground structures were removed and excavation for tank removal began.

The tank areas excavated include: the 5,000 gallon diesel fuel tank and pump island in the southeast corner of the site; 10,000 and 5,000 gallon gasoline tanks north of the former building location; the waste oil tank area; the pump island area south of the

building location; and the area of a previous tank excavation in the northwest corner of the property. These excavations required the removal of additional soils surrounding the tanks or piping in an attempt to eliminate petroleum staining or odors which had resulted from the prior site operations. Other areas were dug and replaced with field screened on site soils during an effort to locate an existing water well which was reported to be within the building footprint. Water lines were traced, until the well was located and abandoned. The excavated areas are indicated on Figure 1, The Site Excavation Plan. On this Figure the average excavation depth in feet is indicated for each excavation area.

With the exception of the pump island excavation, an attempt was made to remove from the excavations all soil which showed visual evidence of petroleum staining, noticeable hydrocarbon odor or was found to cause a positive reading on an HNu photoionization meter calibrated to benzene. At the pump island, the excavation was terminated after about 1,000 cubic yards had been removed. All excavated material with the above characteristics was stockpiled in the northeast corner of the site in an area underlain by reinforced plastic sheeting, and the resulting excavations were backfilled with clean, imported fill. Samples of waste soils from each excavation were taken in order to characterize the material for future treatment or handling, if required.

Samples of the final excavation sidewalls and bases were taken and analyzed for total petroleum hydrocarbon and volatile aromatic hydrocarbons. The samples were obtained from below the surface of the remaining soil, and were sealed in glass bottles for delivery to the analytical laboratory. All soil analyses were subcontracted to Sound Analytical Services of Tacoma, Washington. Samples were sealed in coolers and delivered by overnight courier, under chain-of-custody procedures, to the laboratory. The analytical laboratory reports are summarized in Table 1 and included in Appendix A.

### **EXCAVATION PROCEDURES**

The excavation was completed between 18 October and 7 November 1988 by BC Contracting, using a trackhoe and dozer. The excavation and sampling results for the individual excavations are summarized below.

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### **Diesel Tank and Pump Island**

Approximately 150 cubic yards of impacted soil was excavated until no indication of petroleum was observed by field screening. Sample E1-1 was obtained from the excavation bottom, E1-2 from the sidewalls, and samples 1-1 and 1-2 from waste soils stockpiled in the northeast corner of the site.

Samples obtained from the excavation indicated TPH concentrations of 36.3 and 79 ppm, with some remaining volatile components, particularly sample E1-1 which indicated 26.7 ppm xylenes, 8.33 ppm ethylbenzene 8.12 ppm toluene and 0.32 ppm benzene. The TPH concentrations indicate that the impacted soils have largely been removed. Samples of waste soil indicated 2,972 and 3,123 parts per million (ppm) of total petroleum hydrocarbon, and some concentrations of volatile aromatic hydrocarbons.

### **Gasoline Tanks**

After excavating and removing the tanks, additional soils were removed in several stages. The final excavation included approximately 425 cubic yards of soil, with the deepest portion of the impacted soils below the west end of the tanks. No indications of petroleum impacts were noted during the final field screening. Samples E2-1 and E2-2 were collected from the final excavation north sidewall and base, respectively. Total petroleum hydrocarbons were reported as 25.6 ppm in sample E2-1 and below the detection limit of 5ppm in sample E2-2. Sample E2-2 indicated concentrations of toluene (1.44ppm) ethylbenzene (1.86 ppm) and xylenes (8.66 ppm).

Waste soil samples 2-1, 2-3, and 2-5 were taken at several stages during the excavation and are representative of typical waste soils added to the stockpile. Benzene was encountered only in sample 2-5 (0.11 ppm), while xylene concentrations were characteristically the highest of the volatile parameters analyzed. Total petroleum hydrocarbon concentrations are highest from shallow soils, while sample 2-5 from near the bottom of the excavation indicated a TPH concentration of 8.5 ppm.

### **Abandoned Tank Area**

In the northwest corner of the lot an excavation was found which had been the location of an underground tank. The hole had been filled with miscellaneous debris which was removed to the Municipal Landfill. While clearing out the debris an adjacent tank was

encountered which was partially on the UNOCAL lot and extended beyond the property line to the west, beneath a small radio repeater building owned by Reeves Aleutian Airways, the adjacent lessee of airport property.

The airport leasing office records indicate that two tanks were originally installed in this area in about 1969. During Reeves construction of their radio building in 1977 an airport surveying error was discovered which had resulted in overlapping lease boundaries between the UNOCAL lot and the adjacent Reeves lot, resulting in the building straddling the actively used UNOCAL tank. To correct this situation, the State of Alaska assumed ownership and control of the tank, reimbursed UNOCAL for a new tank and paid to have the tank filled with "inert material consistent with industry standards for the sealing of abandoned underground fuel storage tanks."

In December 1977 UNOCAL bought the replacement tank and apparently installed it in the location north of the service station building, where it remained in use until this demolition. At about the same time the disputed tank was filled with sand, and the second tank in the northwest property corner was removed.

The excavation for the removed tank was found to have some obvious petroleum impacts, and the area was excavated further until no petroleum stains, odor or HNu detections were encountered. The excavation reached a final dimension of approximately 65 feet x 50 feet, approximately 12 feet deep, and extended approximately 15 feet north of the lot line in the northwest corner. The former septic system for the station was encountered and was pumped, dismantled and removed. Approximately 1,200 cubic yards of soil was removed and stockpiled from this excavation.

Samples E3-1, E3-2, E3-3, and E3-4 were obtained from the west sidewall, base, northwest corner and north sidewall of the excavation, respectively, after completion. Of the samples, only E3-4 indicated detectable concentrations of total petroleum hydrocarbons (7.7 ppm). All the samples indicated some volatile aromatic hydrocarbon concentrations, primarily xylenes, ethylbenzene and toluene. Samples E3-2 from the excavation base indicated the highest concentrations, up to 2.26 ppm xylenes, and was the only sample recovered from the excavation to detect benzene (0.13 ppm).

The excavation was backfilled with clean imported fill and was compacted in lifts to the ground surface.

### **Gasoline Pump Island**

Some pipe leakage had occurred in the area of the pump islands, south of the former building location. The excavation of soils from this area was based on periodic field screening of the remaining material along the sides and base of the pit. Samples 4-1, 4-2 and 4-3 were obtained from the waste soils during excavation. Waste soil samples contained high total petroleum hydrocarbon concentrations, and volatile aromatics, particularly xylenes. The high xylene concentrations possibly indicate that the petroleum has aged and the more volatile compounds such as benzene have partitioned from the mixture, or degraded. Total lead concentrations were analyzed in samples 4-1 and 4-2, and were found to be 62.9 and 66.9 ppm respectively, indicating concentrations are not in excess of levels normally associated with natural soil conditions in the Anchorage area.

The pump island excavation removed approximately 1,000 cubic yards of material. The excavation was extended to a depth of approximately 18 to 20 feet below ground surface, in an area approximately 60 feet long and up to 35 feet across. At that point, some petroleum vapors were still present in the soils, particularly the south half of the excavation bottom and south sidewall. Field screening of the north, east and west excavation walls did not indicate any volatile organic vapors. Since further excavation appeared impractical, the excavation was stopped and samples were obtained. Samples E4-1, E4-2 and E4-3 were taken from the sidewalls and bottom of the excavation after digging was stopped. Sample E4-3, a composite of material from low on the south, east and northeast side walls of the pit indicated that not all impacted soil has been removed.

Perforated ABS drain pipe was laid in the excavation bottom for potential use in a vapor extraction system. The pipes were overlain with clean gravelly fill to a height of about 3 feet above the pipe, then the entire excavation was lined with visquene to act as a vapor barrier between the remaining, on site soils and the imported fill. The excavation was then filled and compacted in lifts to the ground surface.

### **Waste Oil Tank**

The 300 gallon waste oil tank was pumped by Alaska Pollution Control, Inc. (APC). The oil was tested by APC for total organic halogens and accepted for recycling. The tank was removed, and surrounding soil screened for obvious impacts. No visible staining, odors or vapor indications were found. Approximately 6 yards of the soil removed from the excavation to expose the tank was stockpiled near the west site boundary, until tested. Samples E5-2 and E5-2 were taken from the excavation sidewall and base respectively, and sample 5-1 was taken from the waste soils. All were analyzed for parameters which could be present from waste oils; i.e. heavy metals: arsenic, lead, and chromium; PCB's and total halogens. No evidence of waste oil impacts by these parameters was indicated.

Based on these results the stockpiled soils were added to the general waste soil pile, and the excavation was backfilled with clean imported fill.

### **Vertical Tank Area**

Test pits were dug in the area of the vertical tanks on the north boundary of the site. Shallow conditions immediately below each of the tanks and the distribution piping did not indicate petroleum impacts, based on observations, odors and HNu screening. Below a depth of approximately 8 feet the excavated soils began to smell of organic material due to the adjacent septic system which had been encountered in the abandoned tank excavation. Due to the organic material and odors, no impacts from petroleum could be detected by field screening methods at the time of excavation. The test pit was backfilled with clean imported fill and compacted. Sample E6-1 was obtained from a depth of approximately 11 feet below ground surface. Analyses indicate total petroleum hydrocarbon concentration of 2,516 ppm, and some volatile aromatic hydrocarbons, particularly xylenes (57.4 ppm). Since the septic system crib and affected soil to the west was removed by excavation, it is likely the source and most heavily impacted soils have been removed.

### **Site Clean-Up**

After excavations were completed, all remaining site debris were removed to the Municipal Landfill, and the site was leveled. The soil stockpile was reshaped and perforated pipes were installed for future soil treatment.

During the demolition phase of activities the primary sources of petroleum impacts were removed, and approximately 2,800 cubic yards of impacted soil was stockpiled on site for future treatment. A plan for the soil treatment is being prepared as of the date of this report. No further excavation of site soils is recommended.

### **SOIL BORINGS AND MONITORING WELL INSTALLATIONS**

Based on the observations, field screening and quantitative chemical analysis of soils from the excavations performed during demolition, four drilling locations were selected on and off-site to assess the extent of subsurface site contamination. Borings were drilled by Ambler Exploration, under subcontract to RZA, extending into the first encountered water table, to depths ranging from 41 to 65 feet below ground surface. The drilling, sampling and field screening procedures used during this assessment are summarized in Appendix B. Boring logs, including monitoring well as-built construction diagrams, are also included.

Split spoon soil samples were taken at 5 foot depth intervals in order to classify soils and for field screening using an HNu meter. Samples at 10 foot depth intervals were bottled for laboratory analyses.

Figure 2 indicates the approximate boring and monitoring well locations on the site and the adjacent properties. Wells MW-5 and MW-5A, installed during this assessment, are clustered wells to monitor conditions in two separate water bearing zones; the regional water table, and an apparent shallower, discontinuous perched water zone. Wells MW-6, 7 and 9 are intended to monitor conditions in groundwater surrounding the pump islands, a known source of shallower soil impacts.

During drilling, field headspace screening of soil samples with the HNu meter noted vapor concentrations up to 240 ppm in boring MW-5 in soil samples obtained from the ground surface to a depth of 45 feet, where a dense clayey silt layer approximately 7 feet thick was encountered. This clayey silt layer is apparently responsible for a perched groundwater condition in the overlying soils. Below this silt, HNu screening indicated less than 2 ppm of organic vapors in the headspace of soil samples. MW-5 was installed in the water table beneath the silt using a bentonite-cement grout to seal through the silt

strata. MW-5A was installed in an adjacent bore hole terminated in the top portion of the silt horizon to monitor conditions in the apparent perched water zone.

MW-6 was drilled on the adjacent Reeves property to the west of the pump island. No organic vapors were detected by the field headspace screening, and no visual stains or odors of petroleum were encountered. The boring was extended to a depth of 60 feet and encountered groundwater at a depth of approximately 51 feet, without indication of the shallower silt layer found in MW-5 and 5A.

MW-7, located south of the pump island encountered strong fuel odors and elevated HNu organic vapor headspace measurements from depths of 15 feet to the termination of the boring at 60 feet below ground surface. Groundwater was encountered at a depth of approximately 52 feet, and bailing indicated the presence of free-phase liquid petroleum on the groundwater surface. A monitoring well was installed and subsequent measurements have indicated an apparent free-phase petroleum thickness in excess of two feet floating on the groundwater surface.

Based on the findings of MW-7, another well is planned for the immediate area of the pump island. A larger diameter well will be installed at this location, designated MW-8, when materials for the well construction are available.

MW-9 was drilled north of the gasoline tank excavation and extended to a depth of 41 feet, where a dense grey-brown silt was encountered. Perched water conditions were found overlying the silt, and a monitoring well was installed. HNu headspace screening and odors indicated some organic vapor concentrations, (up to 200 ppm at the 35 foot depth), in soil overlying the perched water conditions.

#### **WELL DEVELOPMENT AND MONITORING**

The monitoring wells were developed by surging and bailing in order to produce good hydrologic communication with the surrounding formation. Water level and petroleum thickness measurements have been taken periodically. Well MW-7 has been bailed regularly and continues to contain an apparent free-phase petroleum thickness in excess of 2 feet. Samples of the product have been obtained and submitted to Northern Testing Laboratories and UNOCAL Research and Development Division for fingerprinting and



identification. Northern Testing Laboratories fingerprint identified the petroleum as gasoline, with no indications of other petroleum products such as diesel fuel or aviation gas. UNOCAL has not completed their identification as of the date of this letter.

#### ADDITIONAL ASSESSMENT

A plan for additional monitoring of recovery wells has been prepared, and is currently being undertaken. Six 4 inch diameter wells are planned in the area surrounding MW-7, where free-phase petroleum was found. The field procedures and well construction methods will be the same as the current assessment program. A remediation response will be formulated to recover free-phase petroleum while the assessment continues. A complete assessment report incorporating the current information will be presented once the anticipated scope of work is completed.

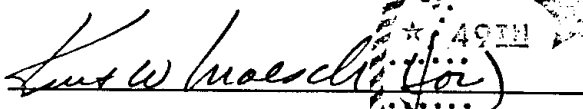
RZA, Inc. has been pleased to be of service to you in this matter. If you have any questions or if we may be of further assistance please feel free to contact us.

Respectfully submitted,

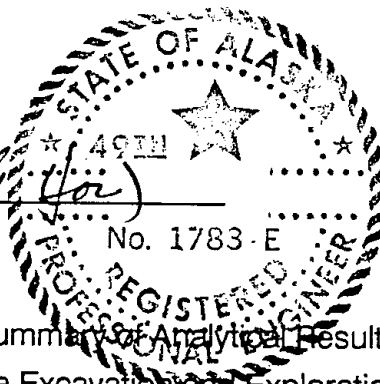
RZA, INC.



Daniel S. Whitman  
Senior Hydrogeologist



Alvin R. Zeman, P.E.



- Enclosure: Table 1 - Summary of Analytical Results  
Figure - Site Excavation and Exploration Plan  
Appendix A - Quantitative Analyses - Soils  
Appendix B - Subsurface Exploration and Sampling Procedures  
Soil Boring Logs (MW-5, 5A, 7 and 9)

TABLE 1

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EXCAVATION BASE AND SIDEWALLS  
SOIL SAMPLE ANALYSESJob Name: UNOCAL #5057  
Address: INTERNATIONAL AIRPORT  
ANCHORAGE, ALASKA

Job Number: A-1204-4

PARAMETER :	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL- BENZENE (mg/kg)	XYLENES, TOTAL (mg/kg)	TOTAL PETROLEUM HYDROCARBONS (mg/kg)	LEAD, TOTAL (mg/kg)
DIESEL FUEL TANK AREA						
SAMPLE NUMBER :						
E1-1 BASE	0.32	8.23	8.33	26.70	36.30	--
E1-2 WALLS	<0.05	0.27	<0.05	0.25	79.00	--
GASOLINE TANK AREA						
SAMPLE NUMBER :						
E2-1 W. WALL	<0.05	0.49	<0.05	0.14	25.60	--
E2-2 BASE	<0.05	1.44	1.86	8.66	<5	--
ABANDONED TANK AREA						
SAMPLE NUMBER :						
E3-1 W. WALL	<0.05	0.48	0.12	0.55	<5	--
E3-2 BASE	0.13	1.50	0.43	2.26	<5	--
E3-3 NW. CORNER	<0.05	0.46	0.07	0.42	<5	--
E3-4 N. WALL	<0.05	0.30	<0.05	0.22	7.70	--
GASOLINE PUMP ISLAND						
SAMPLE NUMBER :						
E4-1 N. WALL	<0.05	1.30	<0.05	0.07	11.00	--
E4-2 BASE	<0.05	1.38	0.08	0.58	12.00	18.30
E4-3 S,E,NE WALLS	0.80	152.00	57.30	171.00	726.00	--
VERTICAL TANK AREA						
SAMPLE NUMBER :						
E6-1 11 FT BELOW SURFACE	0.56	10.40	1.18	57.40	2,516.00	

TABLE 1

STOCKPILED WASTE SOIL  
SAMPLE ANALYSES

Job Name: UNOCAL #5057  
Address: INTERNATIONAL AIRPORT  
ANCHORAGE, ALASKA

Job Number: A-1204-4

PARAMETER :	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL- BENZENE (mg/kg)	XYLENES, TOTAL (mg/kg)	TOTAL PETROLEUM HYDROCARBONS (mg/kg)	LEAD, TOTAL (mg/kg)
DIESEL FUEL TANK AREA						
SAMPLE NUMBER :						
-----						
1-1 N. SIDE OF TANK	<0.05	0.67	0.81	5.46	2,972.00	--
1-2 BELOW TANK	0.09	1.60	2.06	20.30	3,123.00	--
-----						
GASOLINE TANK AREA						
SAMPLE NUMBER :						
-----						
2-1 S. OF TANKS, SHALLOW	<0.05	0.27	0.37	4.67	45.90	53.60
2-3 BETWEEN TANKS, 10 FT BELOW SURFACE	<0.05	0.21	0.10	2.65	91.70	43.40
2-5 DEEPEST PART OF EXCAVATION	0.11	0.28	<0.05	0.77	8.5	--
-----						
ABANDONED TANK AREA						
SAMPLE NUMBER :						
-----						
3-1 E. END, 8 FT BELOW SURFACE	<0.05	0.37	0.19	16.00	1,324.00	0.00
-----						
GASOLINE PUMP ISLAND						
SAMPLE NUMBER :						
-----						
4-1 UNDER PUMPS, 4 FT BELOW SURFACE	0.06	5.36	11.10	222.00	712.00	62.90
4-2 S.SIDE, 17 FT BELOW SURFACE	0.05	4.21	7.94	103.00	3,231.00	66.90
4-3 BASE, NE. CORNER	<0.05	0.83	0.10	1.53	49.00	--

TABLE 1

WASTE OIL TANK AREA  
SOIL SAMPLE ANALYSES

Job Name: UNOCAL #5057 Job Number: A-1204-4  
Address: INTERNATIONAL AIRPORT  
ANCHORAGE, ALASKA

PARAMETER :	ARSENIC (mg/kg)	CHROMIUM (mg/kg)	LEAD (mg/kg)	PCB'S (mg/kg)	TOTAL HALOGENS (mg/kg)
WASTE OIL TANK AREA SAMPLE NUMBER :					
E5-1 WALLS	<0.5	22.10	28.60	<0.1	1.10
E5-2 BASE	<0.5	25.40	22.80	<0.1	1.60
5-1 WASTE SOILS	<0.5	24.20	27.00	<0.1	1.20

Appendix A  
Quantitative Analyses Procedures - Soils  
A-1204-4

All laboratory analyses were subcontracted to Sound Analytical Services of Tacoma, Washington. Soil samples were identified by excavation number and sample number.

**Volatile Aromatic Hydrocarbon Analyses**

Selected soil samples were analyzed for volatile aromatic hydrocarbon concentrations. The analytical laboratory used EPA Method 8020 (soils) to determine concentrations of the most common volatile aromatic hydrocarbons associated with petroleum products, i.e., benzene, ethyl benzene, toluene, and xylenes (BTEX). The laboratory also performed duplicate samples for quality control. Results were reported in mg/kg units which are equivalent to parts per million (ppm) concentrations.

**Total Petroleum Hydrocarbon Analyses**

Selected soil samples were analyzed for total petroleum hydrocarbon concentrations using EPA Method 418.1. Results are reported in mg/kg units, equivalent to parts per million (ppm).

**Total Lead Analyses**

Several samples were selected for total lead analyses. The samples were chosen from areas where leaded gasoline impacts were suspected. The analytical laboratory used EPA Method 7420, a flame atomic absorption technique. Results are reported in mg/kg.

**Waste Oil Tank Area Analyses**

Several samples from the area of the waste oil tank were analyzed for parameters which could be indicative of waste oil contamination, including arsenic, chromium, lead, PCB's and total halogens by EPA Methods. Results are reported in ppm.

**Fuel Fingerprint**

A samples of the free phase petroleum taken form monitoring well MW-7 was analyzed using a gas chromatograph equipped with a flame ionization detector. The scan

provided an indication of the various hydrocarbons included in the petroleum mixture. The chromatogram was compared to analyses of typical petroleum products such as gasoline, diesel fuel and aviation fuel. No compounds other than gasoline were detected.

# SOUND ANALYTICAL SERVICES, INC.

0023

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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

Report To: Rittenhouse-Zeman & Assoc.      Date: November 7, 1988

Report On: Analysis of Soil                      Lab No: A 4394

IDENTIFICATION:

Samples received on 10-28-88  
Project No. A-1204-04

ANALYSIS:

Lab No.	1	2	3	4	5
Client ID	E1-2	E4-1	E4-2	E4-3	4-3
Benzene, mg/kg	< 0.05	< 0.05	< 0.05	0.80	< 0.05
Toluene, mg/kg	0.27	1.30	1.38	152	0.83
Ethyl benzene, mg/kg	< 0.05	< 0.05	0.08	57.3	0.10
Xylene, mg/kg	0.25	0.07	0.58	171	1.53
Total Petroleum Hydrocarbons, mg/kg	79	11	12	726	49
Total lead, mg/kg	----	----	18.3	----	----

Note: Detection limit is 0.05 mg/kg for BTX and 10.0 mg/kg for TPH.

Continued . . . . .

## SOUND ANALYTICAL SERVICES, INC.

Rittenhouse-Zeman Assoc.  
Page 2  
Lab No: A 4394  
November 7, 1988

ANALYSIS:

Lab No.	6	7	8
Client ID	E5-1	E5-2	5-1
Arsenic, ppm	< 0.5	< 0.5	< 0.5
Chromium, ppm	22.1	25.4	24.2
Lead, ppm	28.6	22.8	27.0
PCB, ppm	< 0.1	< 0.1	< 0.1
Total Halogens, ppm	1.1	1.6	1.2

SOUND ANALYTICAL SERVICES

  
STAN P. PALMQUIST



## SOUND ANALYTICAL SERVICES, INC.

Rittenhouse-Zeman & Assoc.  
 Page 3  
 Lab No: A 4395  
 November 7, 1988

ANALYSIS:

Lab No.	9	10	11
Client ID	E1-1	E2-1	E2-2
Benzene, mg/kg	0.32	< 0.05	< 0.05
Toluene, mg/kg	8.23	0.49	1.44
Ethyl benzene, mg/kg	8.33	< 0.05	1.86
Xylene, mg/kg	26.7	0.14	8.66
Total Petroleum Hydrocarbons, mg/kg	36.3	25.6	< 5

Note: Detection limit is 0.05 mg/kg for BTX and 10.0 mg/kg for TPH.

SOUND ANALYTICAL SERVICES



STAN P. PALMQUIST

# SOUND ANALYTICAL SERVICES, INC.

0026

SPECIALIZING IN INDUSTRIAL &amp; TOXIC WASTE ANALYSIS

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

Report To: Rittenhouse-Zeman &amp; Assoc.

Date: November 21, 1988

Report On: Analysis of Soil

Lab No: A 4514

IDENTIFICATION:

Samples received 11-16-88  
Project # A-1204-4  
Unocal International Airport

Purgeable Aromatics, per SW 846-Method 8020.

<u>Contaminant</u>	<u>Concentration, mg/kg (ppm)</u>	
Sample No.	E3-1	E3-2
Client ID.	833936	822937
Benzene	< 0.05	0.13
Toluene	0.48	1.50
Chlorobenzene	< 0.05	< 0.05
Ethyl benzene	0.12	0.43
meta & para xylene	0.40	1.65
ortho xylene	0.15	0.61
1,3 dichlorobenzene	< 0.05	< 0.05
1,4 dichlorobenzene	< 0.05	< 0.05
1,2 dichlorobenzene	< 0.05	< 0.05
Total Petroleum Hydrocarbons, Method 418.1	< 5	< 5

Continued . . . . .

# SOUND ANALYTICAL SERVICES, INC.

Rittenhouse-Zeman & Assoc.

Lab No. A 4514  
November 12, 1988

Purgeable Aromatics, per SW 846-Method 8020.

<u>Contaminant</u>	<u>Concentration, mg/kg (ppm)</u>			
	<u>Sample No.</u>	<u>E3-3</u>	<u>E3-4</u>	<u>E6-1</u>
Client ID.	822938	822939	822940	
Benzene	< 0.05	< 0.05	0.56	
Toluene	0.46	0.30	10.4	
Chlorobenzene	< 0.05	< 0.05	< 0.05	
Ethyl benzene	0.07	< 0.05	1.18	
meta & para xylene	0.31	0.17	28.8	
ortho xylene	0.11	0.05	28.6	
1,3 dichlorobenzene	< 0.05	< 0.05	< 0.05	
1,4 dichlorobenzene	< 0.05	< 0.05	< 0.05	
1,2 dichlorobenzene	< 0.05	< 0.05	< 0.05	
Total Petroleum Hydrocarbons, Method 418.1	< 5	7.7	2,516	

SOUND ANALYTICAL SERVICES

  
 STAN P. PALMQUIST

# SOUND ANALYTICAL SERVICES, INC.

0028

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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

Report To: Rittenhouse-Zeman & Assoc.      Date: November 7, 1988

Report On: Analysis of Soil                      Lab No: A 4395

## IDENTIFICATION:

Samples received on 10-27-88  
Project No. RZA 1204-4

## ANALYSIS:

Lab No.	1	2	3	4
Client ID	1-1	1-2	2-1	2-3
Benzene, mg/kg	< 0.05	0.09	< 0.05	< 0.05
Toluene, mg/kg	0.67	1.60	0.27	0.21
Ethyl benzene, mg/kg	0.81	2.06	0.37	0.10
Xylene, mg/kg	5.46	20.3	4.67	2.65
Total Petroleum Hydrocarbons, mg/kg	2,972	3,123	45.9	91.7
Total lead, mg/kg	----	----	53.6	43.4

Note: Detection limit is 0.05 mg/kg for BTX and 10.0 mg/kg for TPH.

Continued . . . . .

## SOUND ANALYTICAL SERVICES, INC.

Rittenhouse-Zeman &amp; Assoc.

Page 2

Lab No: A 4395

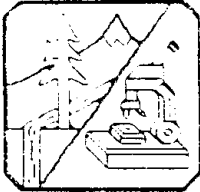
November 7, 1988

ANALYSIS:

Lab No.	5	6	7	8
Client ID	2-5	3-1	4-1	4-2
Benzene, mg/kg	0.11	< 0.05	0.06	0.05
Toluene, mg/kg	0.28	0.37	5.36	4.21
Ethyl benzene, mg/kg	< 0.05	0.19	11.1	7.94
Xylene, mg/kg	0.77	16.0	222	103
Total Petroleum Hydrocarbons, mg/kg	8.5	1,324	712	3,231
Total lead, mg/kg	----	----	62.9	66.9

Note: Detection limit is 0.05 mg/kg for BTX and 10.0 mg/kg for TPH.

Continued . . . . .



# NORTHERN TESTING LABORATORIES, INC.

800 UNIVERSITY PLAZA WEST SUITE A  
2505 FAIRBANKS STREET

FAIRBANKS, ALASKA 99709  
ANCHORAGE, ALASKA 99502

907-479-3116  
907-277-8878

Rittenhouse-Zeman & Associates  
1400-140th Avenue N.E.  
Bellevue, Washington 98005

Attn: Dan Whitman

Date Arrived: 11/16/88  
Time Arrived: 1640  
Date Sampled: 11/16/88  
Time Sampled: 1530  
Date Completed: 11/21/88

Source: MW-7

Sample ID#: A111688-7

Parameter	Unit	Result
-----------	------	--------

FID/GC FUEL SCAN:

Gasoline	ppm	152.000
----------	-----	---------

Please note that the sample was analyzed to determine the chemical make-up of the fuel in the water (i.e. gasoline, diesel, or jet fuel). The analyst did not attempt to quantify the gasoline present in the sample. This could easily have been done by further diluting the sample. No compounds other than gasoline were detected.

This analysis was performed by a subcontract laboratory.

Reported By:

Date: 11/28/88

Francois Rodigari, Anchorage Operations Manager

Appendix B  
Subsurface Exploration and Sampling Procedures  
A-1204-4

**Boring and Soil Sampling Procedures**

Four soils boring locations were drilled at the site between 7 and 19 November 1988. The purpose of the borings was to: 1) obtain soil samples; 2) determine the extent of petroleum hydrocarbons in the subsurface; and 3) install groundwater monitoring wells. The approximate boring locations are shown on the Site and Exploration Plan, Figure 1. Groundwater was encountered at each of the four boring locations, including a perched groundwater condition in boring MW-5, overlying the regional groundwater table. A fifth boring (MW-5) was drilled adjacent to MW-5 for the installation of a monitoring well in the perched water. All drilling rods, augers and samplers were used steam-cleaned or otherwise decontaminated prior to each use.

A Mobile B-61 drill rig equipped with 3-3/8 inch I.D. hollow-stem auger was used to advance the borings. Soil samples were obtained at 5.0-foot depth intervals during the drilling process. The borings were continuously logged by a hydrogeologist from our firm. The disturbed, but representative samples were obtained in general accordance with the Standard Penetration Test Procedures described in ASTM:D1586. This testing and sampling method consists of driving a standard 2-inch O.D. split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows required to drive the sampler the final 12 inches provided a measure of the relative density of granular soils or the relative consistency of cohesive soils. The sampler was then retrieved and the soil sample obtained from the sampler was classified and field screened using the headspace measurement procedures explained in this Appendix. Selected samples were then placed in laboratory prepared vials, sealed and held in an ice chest for transportation to the analytical laboratory. RZA's chain-of-custody procedures were used during shipping to maintain sample integrity.

**Monitoring Well Installation Procedures**

Monitoring wells were installed in five separate borings at the time of drilling. Monitoring well as-built diagrams are shown on the enclosed soil boring logs in this Appendix. The

monitoring wells were constructed of 2-inch I.D. Schedule 40 flush-threaded PVC casing coupled to a length of 0.020-inch slotted Schedule 40 PVC well screen. The well screens were placed a depth which intersects the static groundwater level. Monitoring well depths range from 41 to 64.5 feet.

The annular space between the auger and the well casing was filled with a select sand filter pack to a level above the top of the screen. Bentonite-cement seals were placed above the sand pack and a flush-mounted steel monument was cemented into place at the ground surface. The monitoring wells were developed by surging and bailing at least 3 to 5 casing volumes of water following installation.

### **Headspace Measurement Procedures**

Headspace measurements with an HNu field photoionization meter, calibrated to benzene, yields a semi-quantitative measurement of the volatile gas concentrations in the atmosphere in a closed container about half full of the soil sample. The measured concentrations are generally used only as a screening measurement because the detector responds to families of compounds with an ionization potential less than or equal to 10.2 electron volts (eV). Furthermore, the air quality in the headspace of the container can vary due to factors such as volatility, temperature, humidity and soil particle size.


The headspace measurements obtained for this project were collected by the following procedure to provide as much consistency as possible. A representative soil sample sufficient to fill a clean one pint glass jar approximately half full was collected from the sampling tools. An aluminum foil liner was then immediately placed over the mouth of the jar and the threaded lid was secured on top of the jar. The jars were then allowed to equilibrate to room temperature for about 24 hours. To obtain each measurement the foil seal was punctured with the HNu field photoionization meter probe. The internal air sampling pump and the HNu field photoionization meter continuously sampled the air in the jar's headspace. The greatest concentrations shown on the HNu field photoionization meter indicator were recorded since the sampled air is usually not homogeneous with respect to chemical concentrations.

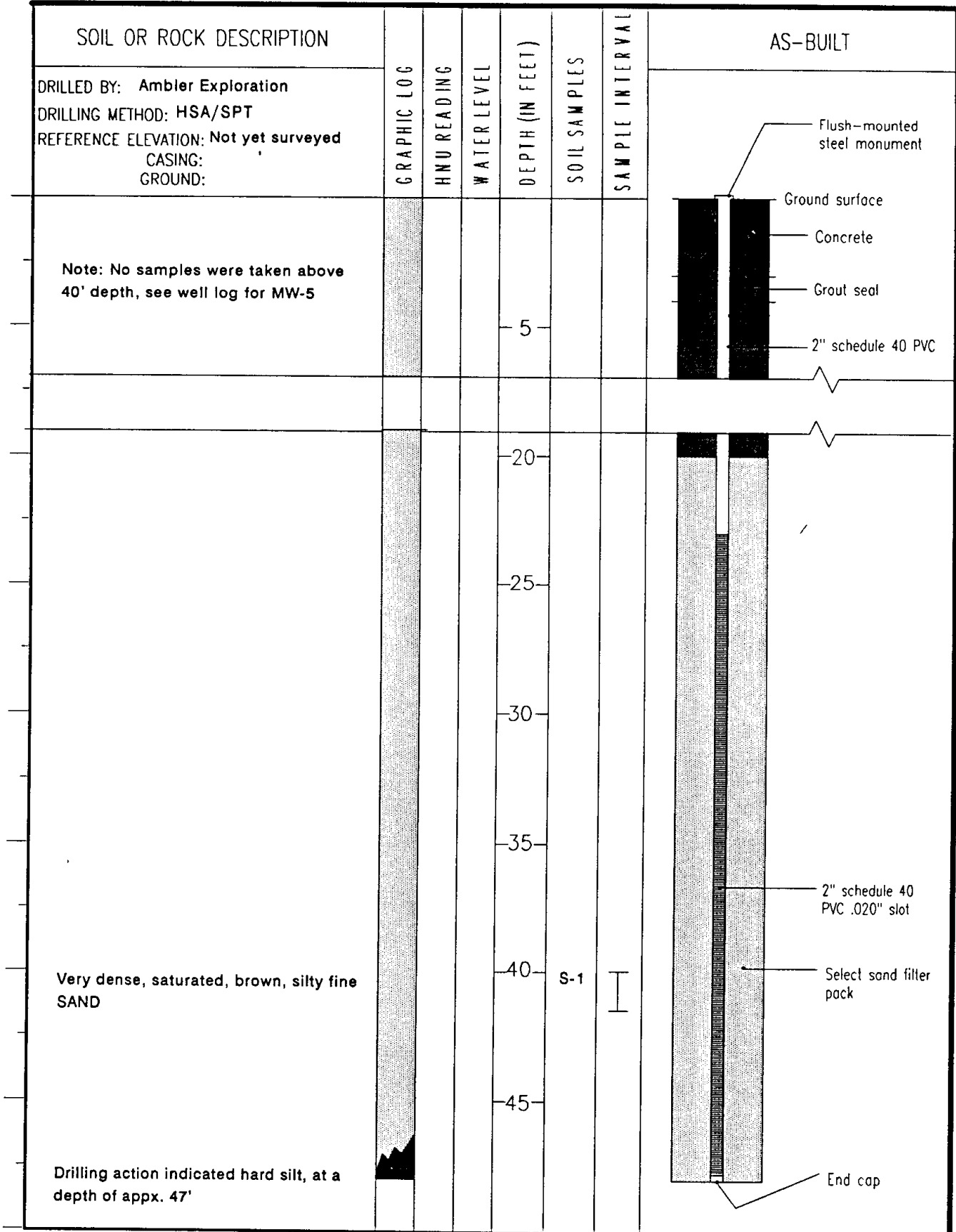






Drilled 11-7 and 11-8-88

SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: Ambler Exploration DRILLING METHOD: HSA/SPT REFERENCE ELEVATION: Assigned CASING: 93.81' GROUND: appx 94'							
							(continued)
Very dense, moist, brownish gray, fine to medium SAND; strong fuel odor		150		40	S-4	I	
Very dense, wet, grayish brown SILT; with some fine sand; moderate fuel odor		100		45	S-5	I	Grout seal
Dense, wet, brown-gray SILT; trace of fine sand; moderate fuel odor		110		50	S-6	I	
Very dense, wet to saturated, gray, medium SAND; grading downward to gray fine sand; no odor detected		1		55	S-7	I	
Very dense, moist to saturated, gray, fine to medium SAND; with 8" lense of gray silt		2		60	S-8	I	
Bottom of borehole at 65'				65			End cap
NOTE: Water level shown was observed in well on 11-12-88				70			
				75			2" schedule 40 PVC .020" slot





SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: Ambler Exploration DRILLING METHOD: HSA/SPT REFERENCE ELEVATION: Assigned CASING: 93.25' GROUND: appx 93.5'							
Surface: asphalt		0					
Loose, moist, brown, fine to medium SAND; trace silt		0		5	S-1	I	
Dense, moist, brown, fine SAND, trace silt		0		10	S-2	I	
Very dense, moist, brown, fine SAND; with 6" layer of fine sand		0		15	S-3	I	
Medium dense, moist, brown with rust spots, fine to medium SAND		0		20	S-4	I	
Dense, moist, brown with rust spots, fine to medium SAND		0		25	S-5	I	
Dense, moist, brown with rust spots and black organic masses (1 to 2 inches in size), medium SAND		1		30	S-6	I	
Very dense, moist, rusty brown, fine to medium SAND		1		35	S-7	I	
							continued



SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: Ambler Exploration DRILLING METHOD: HSA/SPT REFERENCE ELEVATION: Assigned CASING: 93.25' GROUND: appx 93.5'							
							(continued)
Dense, moist, rusty brown, medium SAND		1		40	S-8	I	<p>Select sand filter pack</p> <p>2" schedule 40 PVC .020" slot</p> <p>End cap</p>
Very dense, moist, brown, sandy SILT; overlying moist, brown, fine to medium SAND		1		45	S-9	I	
Very dense, moist, brown medium SAND; with masses of brown and black organic matter		0		50	S-10	I	
Very dense, wet, brown and gray speckled medium SAND		0		55	S-11	I	
Bottom of borehole at 60'				60			
				65			
Notes: 1. Water level shown was observed in well on 11-12-88 2. Drilling action indicated no extensive silt layer				70			
				75			



RITTENHOUSE-ZEMAN & ASSOCIATES, INC.  
Geotechnical & Hydrogeological Consultants

WELL NUMBER MW-7 PAGE 1 OF 2  
PROJECT NAME Unocal No.5057 W.O. A-1204-4  
Drilled 11-10-88

SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: Ambler Exploration DRILLING METHOD: HSA/SPT REFERENCE ELEVATION: Assigned CASING: 95.33' GROUND: appx 95.5'							
Surface: grass and sandy soil							Flush-mounted steel monument Ground surface Concrete Bentonite seal
Medium dense, moist, brown, silty, very fine SAND		0		5	S-1	I	2" schedule 40 PVC Native sand backfill
Medium dense, moist, gray and brown, mottled fine SAND; with rusty spots		0		10	S-2	I	Joint in casing
Very dense, moist, brown, medium SAND; with one 2" brown silt layer; musty odor		7		15	S-3	I	
Dense, moist, brown and rusty (layered), medium SAND; moderate fuel odor		100		20	S-4	I	
Very dense, moist, brown fine SAND; grading down to brown medium sand; moderate fuel odor		150		25	S-5	I	
Very dense, moist, gray and brown medium SAND; trace fine sand; rusty bands, black organic matter; moderate fuel odor		120		30	S-6	I	
Very dense, moist, grayish brown medium SAND; with grayish brown silt, lower several inches; moderate fuel odor		200		35	S-7	I	
							continued



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Geotechnical & Hydrogeological Consultants

WELL NUMBER MW-7  
PROJECT NAME Unocal No. 5057

PAGE 2 OF 2  
W.O. A-1204-4

Drilled 11-10-88



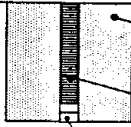
SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: <b>Ambler Exploration</b> DRILLING METHOD: <b>HSA/SPT</b> REFERENCE ELEVATION: <b>Assigned</b> CASING: 95.33' GROUND: appx 95.5'							
Very dense, moist, brown with rusty streaks, medium SAND; strong fuel odor		250		40	S-8	I	(continued) 
Very dense, moist, rusty brown and gray mottled, medium SAND; strong fuel odor		220		45	S-9	I	
Very dense, moist, rusty brown and gray mottled, medium SAND; strong fuel odor		200		50	S-10	I	
Very dense, wet, brownish gray, silty, medium SAND; strong fuel odor		220		55	S-11	I	
Bottom of borehole at 60 '				60			
Notes: 1. Water level shown was observed in well on 11-12-88 2. Drilling action indicated no extensive silt layer							
				65			
				70			
				75			



SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: <b>Ambler Exploration</b> DRILLING METHOD: <b>HSA/SPT</b> REFERENCE ELEVATION: <b>Not yet surveyed</b> CASING: GROUND:							
Medium dense, moist, brown-gray medium SAND; trace silt, occasional cobbles			0	5	S-1	I	
Dense, moist, brown-gray, gravelly SAND; trace silt, occasional cobbles LAB SAMPLE #1			0	10	S-2	I	
Medium dense, moist, brown-gray, gravelly SAND; trace silt, occasional cobbles			0	15	S-3	I	
Dense, moist, gray, silty, fine SAND; slight fuel odor LAB SAMPLE #2			3	20	S-4	I	
Very dense, moist, gray, silty, fine SAND; slight fuel odor			0	25	S-5	I	
Very dense, moist, gray, silty, fine SAND; slight fuel odor LAB SAMPLE #3			6	30	S-6	I	
Very dense, moist to wet, gray, silty fine SAND			200	35	S-7	I	
							continued



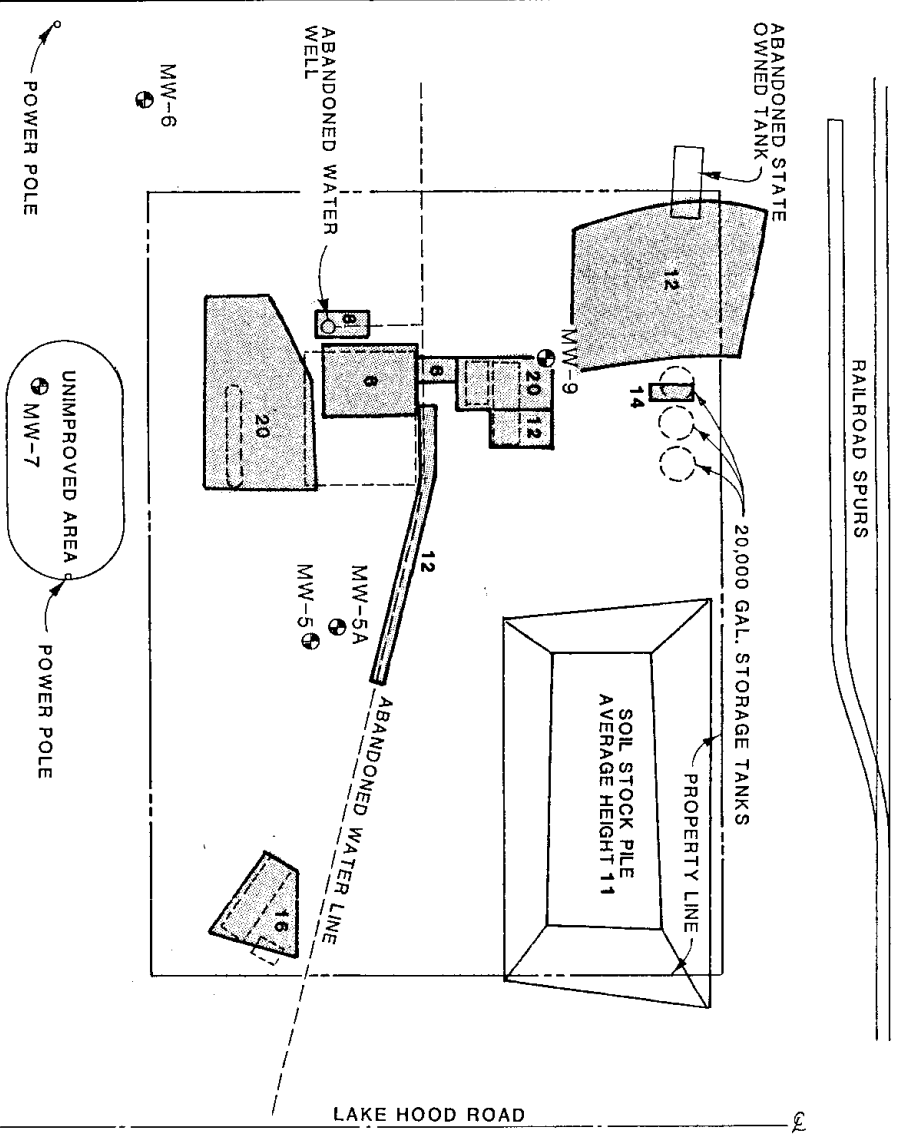


SOIL OR ROCK DESCRIPTION	GRAPHIC LOG	HNU READING	WATER LEVEL	DEPTH (IN FEET)	SOIL SAMPLES	SAMPLE INTERVAL	AS-BUILT
DRILLED BY: <b>Ambler Exploration</b> DRILLING METHOD: <b>HSA/SPT</b> REFERENCE ELEVATION: <b>Not yet surveyed</b> CASING: GROUND:							
Dense, moist, wet, gray-brown, fine sandy SILT LAB SAMPLE #4 Bottom of borehole at 41'		10		40 45 50 55 60 65 70 75	S-8		(continued) 



EXPLANATION

- FORMER STATION FACILITIES REMOVED BY DEMOLITION
- MONITORING WELLS INSTALLED NOVEMBER, 1988
- 16 AREAS EXCAVATED AND BACKFILLED NUMBER INDICATES EXCAVATION DEPTH IN FEET



**SITE EXCAVATION & EXPLORATION PLAN**

FIGURE 1

UNOCAL STATION No. 5057  
ANCHORAGE, ALASKA

W.O. A-1204-4  
BY DSW  
DATE DEC. 1988  
SCALE NOTED

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

