DRILLING HISTORY**CORE HOLE DC-4****HANFORD, WASHINGTON****DECEMBER 1978****MASTER**

**Prepared for Rockwell Hanford Operations,
A Prime Contractor to the U.S. Department of Energy,
Under Contract Number EY-77-C-06-1030**

by

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Under U.S. Department of Energy
Contract Number EY-76-C-06-2175**

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INTRODUCTION

Core hole DC-4 was completed at a depth of 3,998 feet in December, 1978 by Boyles Brothers Drilling Company, Spokane, Washington, under subcontract to Fenix & Scisson, Inc. The hole was cored for the U.S. Department of Energy and the Rockwell Hanford Operations' Basalt Waste Isolation Program. Fenix & Scisson, Inc. furnished the engineering, daily supervision of the cable tool and core drilling activities, and geological core logging for DC-4.

Core hole DC-4 is located on the Hanford Site about 3 miles east of the Yakima Barricade and approximately 103 feet southwest of rotary hole DC-5, which was completed to 3,990 feet in February, 1978. Hanford Site coordinates reported for hole DC-4 are north 49,385.62 feet and west 85,207.63 feet, and Washington State coordinates are north 454,468.73 feet and east 2,209,990.87 feet. No elevation survey is available for hole DC-4, but it is approximately 745 feet above mean sea level based upon the survey of hole DC-5, which has a reported elevation of 745.16 feet on the top of the 3-inch flange. The location of core hole DC-4 is shown in Figure 1.

The purpose of core hole DC-4 was to core drill vertically through the basalt and interbed units for stratigraphic depth determination and core collection, and to provide a borehole for hydrologic testing, cross-hole seismic shear, and pressure wave velocity studies with rotary hole DC-5. Hole DC-4 was drilled through the overburden into basalt bedrock by cable tool methods (0-623 feet) and continuously cored through the final interval (623-3,998 feet). Core recovery was 95.8 percent of the total footage cored.

FIGURE 1

SITE MAP, CORE HOLE DC-4

DRILLING AND CORING SUMMARY

The beginning portion of hole DC-4, through the unconsolidated and poorly consolidated surface sediments on top of the basalts, was drilled by D.V. Wyland and Co., Inc. using a truck-mounted cable tool drilling rig. Drilling commenced the first week of March 1978 and was completed to 623 feet on May 5, 1978.

Surface pipe (12-1/4-inch) was set to 21 feet and the hole was continued at 12-inch diameter to 375 feet. The interval 375-500 feet was drilled at 8-inch diameter. Six-inch inside diameter casing (6-5/8-inch outside diameter) with a 7-3/8-inch outside diameter drive shoe was run to 500 feet and the hole was advanced to a final depth of 623 feet with a 6-inch bit. The 6-inch casing was driven to 617 feet, which is believed to be the top of firm basalt bedrock. The 12-inch portion of the hole was sand-filled to stabilize the 6-inch casing.

Boyles Brothers Drilling Company utilized a Chicago Pneumatic Type 50 coring rig for the cored portion of hole DC-4 (623-3,998 feet). Mobilization of the rig began May 25, 1978. The final depth was reached December 1, 1978 and demobilization of the rig was completed on December 4, 1978. The coring progress curve of hole DC-4 is shown in Figure 2.

The Chicago Pneumatic core drilling rig was assembled over the 6-5/8-inch outside diameter casing set at 617 feet from ground level by the cable tool drilling rig. Coring operations commenced June 1, 1978 using 4.95-inch outside diameter by 2.400-inch inside diameter diamond core bits. Table I is the bit record for the core drilled portion of hole DC-4.

The 4.95-inch hole was cored from 623 to 1,537.9 feet. From 683 to 1,537.9 feet total lost circulation was observed in several places. Lost circulation material and cement plugs were used to correct the lost circulation. On June 13, 1978 during the drilling out of a cement plug at 731 feet, the core barrel, inner tube, and the inner tube over-shot were left in the hole. Fishing operations were started immediately and completed on June 24, 1978.

FIGURE 2
CORING PROGRESS CURVE, CORE HOLE DC-4

Intermediate casing (4-1/2-inch outside diameter and 4-inch inside diameter) was run and cemented at 1,537.9 feet with 260 cubic feet of Type II neat cement. Cement returns were obtained back to the surface. After pumping the cement the pump failed and was unable to displace the cement from the casing. The cement was washed from the casing to a depth of 190 feet and from that point downward a 3-1/8-inch tri-cone rock bit was used to drill the remaining cement out of the casing to 1,537.9 feet.

The hole was advanced from the intermediate casing point to a depth of 2,638.7 feet with NC oversize diamond core bits (3.937-inch outside diameter by 2.400-inch inside diameter). Partial loss of drilling fluid was experienced within the 1,676-1,747 foot interval and total lost circulation occurred at 1,747 feet. The addition of particulate lost circulation material to the drilling mud and the setting of cement plugs restored partial circulation only temporarily, and coring was continued to 2,638.7 feet with 100 percent lost circulation. No significant problems were encountered that affected the coring operations and percentage core recovery. The static fluid level remained within a few feet of surface during coring operations. A Sperry-Sun multishot gyroscopic survey was run on 50-foot stations from surface to 2,550 feet.

NX size (3.500-inch outside diameter and 2.062-inch inside diameter) casing was run to 2,638.7 feet and cemented on October 13, 1978. Type II neat cement (220 cubic feet) was used to cement the casing. The cementing details are presented in Table II. Cement returns to surface were not observed. After pumping of the cement, during removal of the cementing head to permit insertion of the wiper plug into the casing, the casing parted on a threaded joint at 440 feet below surface. The parted 440-foot segment of casing was removed from the hole and the piece with bad threads was replaced with new NX casing. The pulled segment of casing was then run back in the hole and successfully screwed into the main segment, which remained in the hole.

After a 20-hour wait for cement to harden, a 2-15/16-inch tri-cone bit was run in the casing to top of the cement at 380 feet. Cement was then drilled out of the NX casing from 380 to 2,638.7 feet.

NX size (3.032-inch outside diameter and 1.875-inch inside diameter) core bits were then used to drill to the total depth of 3,998 feet.

No significant coring problems were encountered during drilling from the NX casing point to 3,998 feet. A 10 percent loss of mud returns began at 2,823 feet with an increase of up to 90 percent at 3,098 feet. At 3,810 feet, complete lost circulation was observed and continued during coring to total depth, with the exception of partial returns at 3,910-3,998 feet. The static fluid level remained within a few feet of surface during coring operations from 3,810 feet to 3,910 feet.

The coring record of all core runs is presented in Table III. The depths of all core runs were measured from ground level by the drillers. The record of oriented coring is given in Table IV.

The drilling fluid used for the core drilling of DC-4 was a hydroxyethylcellulose polymer type mud. This mud system is classified as a low-solids, nonthixotropic polymer type fluid. The record of daily mud properties recorded is presented in Table V.

Service companies and equipment suppliers who participated in the successful drilling and coring of hole DC-4 are listed in Table VI.

ORIENTED CORING SUMMARY

Several oriented cores were cut in hole DC-4 to facilitate future determination of inclination and direction of remanent magnetism of the basalt.

Oriented coring was directed by Christensen Diamond Products, U.S.A. personnel using the Christensen-Hugel orienting core barrel and method with a Sperry-Sun magnetic multishot camera instrument.

Standard length cores were 10 feet; core run No. 4 was shorter due to core wedging and blockage in the inner barrel. The oriented core runs were drilled in initial increments of one foot, followed by increments of one or two feet. After each increment of drilling the drill was shut down for one to five minutes to allow undisturbed photography of the compass within the survey instrument. The survey camera automatically takes pictures at one-minute intervals throughout the entire procedure.

The nine oriented cores were taken from seven flows of the Grande Ronde Basalt Formation. Oriented cores were taken in the Umtanum unit, in three flows above it and in two flows below it. Seven of the nine oriented core runs were successful (located in six different flows) and only two of the runs were unsuccessful. Details of the oriented runs are summarized in Table IV.

GEOLOGIC SUMMARY

Hole DC-4 was drilled to a depth of 3,998 feet, 3 miles east of the Yakima Barricade and 103 feet southwest of hydrologic hole DC-5, which was drilled to 3,990 feet.

The beginning portion of DC-4, from ground surface to 623 feet, was drilled by cable tool methods under the supervision of Fenix & Scisson, Inc., drilling specialists. From 623 to 3,998 feet, DC-4 was core drilled under the supervision of Fenix & Scisson, Inc., drilling specialists and all core was geologically logged by Fenix & Scisson, Inc., wellsite geologists. Overall core recovery was 95.8 percent.

Core logging data were recorded on two separate forms. Lithology was described on the Fenix & Scisson, Inc., 1 inch = 4 foot scale form entitled Geologic Log. Detailed information on fractures was recorded on the Basalt Core Geo-mechanical Data form of Rockwell Hanford Operations in order to facilitate future entry on punch cards and eventual computer data processing. Copies of these records have been placed in the files of Rockwell Hanford Operations and Fenix & Scisson, Inc. The core is presently stored in the 2101-M building within the 200 East area on the Hanford Site. Most core was photographed in color by the Fenix & Scisson, Inc., wellsite geologists after removal from the core barrel into a core trough and again in color in the core boxes by Pacific Northwest Laboratory personnel.

STRATIGRAPHY

The general stratigraphy of the Pasco Basin is shown in Figure 3 and stratigraphic units penetrated by hole DC-4 are depicted in Figure 4. The main cable tool portion of DC-4 (0-623 feet) penetrated, from top to bottom, glaciofluvial sediments and the Ringold Formation

FIGURE 3

STRATIGRAPHY OF THE PASCO BASIN

FIGURE 4

AS-BUILT DIAGRAM, CORE HOLE DC-4

(clay, silt, sand and conglomerate). Basalt was encountered at 617 feet and cable tool drilling continued to 623 feet.

Preliminary identification of the stratigraphic units through the Umatilla Basalt was accomplished by energy nondispersive X-ray analysis of samples from pertinent basalt flows. Samples were cut into slabs with a diamond saw and compared with the appropriate standard samples. Identification of the stratigraphic units below the Umatilla Basalt was based upon comparison with preliminary identification of stratigraphy in the nearby rotary hole DC-5 since the energy nondispersive X-ray unit was inoperative through this interval.

Coring was started in the Elephant Mountain Member of the Saddle Mountains Basalt Formation and continued downward through the Wanapum Basalt Formation and into the Grande Ronde Basalt Formation. Coring operations were completed at 3,998 feet, which is 193 feet below the base of the Umtanum unit.

The stratigraphic sequence of basalt flow units and interbeds encountered in DC-4 is generally similar to that found in DC-8, about 15 miles to the southeast, and DC-2, 7 miles to the east of DC-4.

The Umtanum unit was found to be 204.7 feet thick in the depth interval 3,600.3 to 3,805.0 feet. The Umtanum unit at DC-4 consists of 48.9 feet of altered flow breccia above 155.8 feet of dense aphanitic basalt, unaltered except for minor alterations along some fractures.

Summarized descriptions of all units penetrated by core drilling from 623 to 3,998 feet are given in Table VII.

STRUCTURE

From a regional structural standpoint, hole DC-4 is located in the western margin of the Pasco Basin midway on the north slope of the east-west trending Cold Creek syncline.

From bedding observed in the interbeds it appears that the strata intersected by DC-4 are generally flat lying, with little evident dip.

Most of the basalt flows exhibit similar internal structural features. An individual flow commonly includes an altered flow top zone

consisting of either altered basalt breccia or altered vesicular basalt overlying a massive basalt that is subdivided into an entablature zone above and a colonnade zone below.

The flow top zones are often porous, usually poorly indurated, and are generally cut by very few fractures. The top of the entablature zone immediately below the flow top is usually characterized by the presence of abundant vesicles, vugs, and amygdules, which decrease downward in size and frequency. Low-angle fractures are relatively common in the upper entablature. Proceeding downward, the low-angle fractures become less common and high-angle and sinusoidal type fractures become more prominent, although these latter types appear with less frequency than those of low angles. No clear cut distinction or contacts between entablature and colonnade zones can be identified in the cores, in contrast to the observation of weathered outcrops where the two are usually readily distinguishable by eye, but attempts have been made to distinguish the two in the geological logs.

One minor normal fault was observed in the core within the Vantage interbed. Approximately 4 inches of vertical displacement occurred on this feature, which roughly parallels the core axis in the depth interval 2,668-2,670 feet. This offset is believed to be the result of shear due to overloading of the clay interbed by the overlying basalts.

A significant amount of "poker chip" type fracturing, or discing of cores, similar to that observed in hole DC-6 was also encountered in hole DC-4. This phenomenon was first noted in the Wanapum Basalt Formation in DC-4 at 1,237.7-1,238.8 feet and becomes quite prevalent in the aphanitic, glassy, massive basalt layers below 2,830 feet, including the massive portion of the Umtanum unit. Approximately horizontal "poker chip" fractured intervals occur with undulatory saddle-shaped surfaces normal to the core axis. These fractures appear to be fresh breaks with no discernible alteration or weathering having affected the surfaces.

It is theorized that the "poker chip" fracturing is due to stress relief caused by the coring process. Coring causes rapid reduction of the stress acting upon the rock and the liberated core tends to expand slightly. Brittle rock is unable to withstand this expansion and splits apart at regular short intervals along the plane of least resistance, roughly normal to the core axis.

Rock Quality Designation (RQD) values were measured on the cores and recorded on the Geologic Log. The RQD is a rapid method for describing the relative structural quality of a rock mass. The RQD measurement gives values reflective of the structural competency of the rock in terms of open fractures in the rock. RQD is determined by summing up the cumulative lengths of all pieces of sound core greater than four inches long, dividing this total by the length of the core run, and multiplying by 100. The general correlation between RQD values and the rock quality description is given below.

<u>RQD Index</u>	<u>Rock Quality Description</u>
90 - 100	Excellent
75 - 90	Good
50 - 75	Fair
25 - 50	Poor
0 - 25	Very Poor

ROCK DESCRIPTION

Table VII shows the depth position of stratigraphic units penetrated by hole DC-4 and gives summarized descriptions of all individual basalt flows and interbeds. The assignment of strata to various formation members is based upon preliminary data. The names of flows and interbeds are in accordance with the Pasco Basin Stratigraphic Nomenclature chart BGS-GD-001-D of Rockwell Hanford Operations, published in May 1978.

Definitions of terms used to describe the rock's state of alteration and average fracture spacing are given here for a frame of reference.

1. State of Alteration - Rock is assigned to one of the following five subdivisions:

- Unaltered - No visible sign of alteration;
- Slightly altered - Alteration developed on open discontinuity but only slight or no effects are noted within the rock mass;
- Moderately altered - Alteration extends throughout the rock mass, but the rock is not friable;

- Highly altered - Alteration extends throughout the rock mass and the rock material is partly friable;
 - Completely altered - Rock is wholly decomposed in a friable condition; texture and structure may or may not be preserved.
2. Average fracture spacing - Rock is described according to the following classification.

<u>Spacing Designation</u>	<u>Average Fracture Spacing</u>
Very wide	Greater than 10 feet
Wide	3-10 feet
Moderately close	1-3 feet
Close	0.2-1 foot
Very close	Less than 0.2 foot

HYDROLOGIC OBSERVATIONS

Observation of the loss or gain of drilling fluid and water during drilling operations gives some very useful crude information on the permeability of rock formations encountered and the presence of artesian pressured aquifers. Within the stratigraphic section penetrated by hole DC-4, all of the sedimentary interbeds and the flow top units of most of the basalt flows are highly porous and some have variable primary permeability. The dense portions of the basalt flows have very low porosity, little or no primary permeability, and, in some cases, may exhibit variable secondary (fracture) permeability.

Two drill holes, McGee hole and DB-11, within five miles to the west of DC-4 encountered artesian flows to the surface from the Mabton-Wanapum contact zone. This was not observed in DC-4, nor was any other artesian flow to the surface encountered.

Several permeable horizons were indicated by the loss of drilling fluid. Most of the significant loss occurred in the interbeds and in the brecciated basalt flow top zones, often in open matrix fissures.

Following is a summary of the major fluid losses noted, with mention of the rock units believed responsible for the losses.

Total loss of drilling fluid occurred at 681.5 feet in the vesicular and vuggy zone at the base of the Elephant Mountain flow just above the Rattlesnake Ridge interbed. Circulation was regained at 684 feet by the addition of lost circulation material.

Circulation problems were encountered in the Rattlesnake Ridge interbed. Total loss occurred at 685 feet; 50 percent circulation was regained by using lost circulation material. At 707 feet total circulation was lost again. Full circulation was regained at 729 feet by utilization of lost circulation material. The Rattlesnake Ridge interbed consists of poorly indurated volcanic sandstone and poorly indurated conglomerate. The matrix was washed away by drilling. The hole was cemented with 17 sacks of cement and 2 percent CaCl_2 at 749.4 feet to control running sand.

All circulation was lost at 914 feet in vesicular, vuggy Pomona basalt. It was regained with lost circulation material and drilled to 916 feet. At 916 feet, 100 percent circulation was lost. Cementing at 916 feet failed to restore circulation and drilling was continued well into the Selah interbed to 961.9 feet without circulation.

The top Selah contact is at 929.4 feet. The Selah is tuffaceous siltstone, volcanic arenite, and conglomerate. Circulation was regained at 961.9 feet by cementing the hole. High drilling fluid losses again occurred near the base of the Selah. Losses of 60-100 percent were reported through the interval 961.9-1,047 feet. At 1,047 feet, while in the Esquazel basalt, the drilling fluid was changed from a polymer type mud to a bentonite base mud to attempt to control circulation problems. Circulation was not restored, so the hole was cemented at 1,074 feet with a total of 19 bags of cement. Between 40 and 50 percent of the circulation was regained.

Total circulation was lost in the siltstone of the Cold Creek interbed at 1,155 feet. The hole was cemented at 1,176 feet with 30 sacks of cement and 2 percent CaCl_2 ; 40 percent of the circulation was regained.

The hole was cemented again at 1,314 feet while in the Umatilla basalt, to control caving of the Cold Creek above. Fluid losses were 0-40 percent through the remainder of the Umatilla and the Mabton interbed. Casing was set through the Mabton to 1,537.9 feet. Circulation was totally lost at 1,676 feet in a moderately altered basalt rubble and breccia with clay on fracture surfaces. The flow contact between the 10th and 11th of the Wanapum Basalt flows penetrated occurs at 1,678.4 feet. Fluid losses were 85-90 percent at 1,678.4 feet. Losses were reduced to 20-30 percent by adding lost circulation material.

At 1,747 feet, the contact between the 9th and 10th flows of the tested portion of the Wanapum Basalt, all circulation was lost. The addition of lost circulation material and multiple cementing jobs failed to restore circulation, and the hole was advanced without fluid returns to the final casing point at 2,638.7 feet.

At 2,980 feet, near the base of a flow top breccia unit in the Grande Ronde Basalt, 60 percent lost circulation occurred. Fluid losses increased to 80 percent a short distance below that point and throughout the remainder of hole DC-4, to 3,998 feet, losses varied between 80 and 100 percent.

TABLE I
BIT RECORD

HOLE: DC-4

CONTRACTOR: BOYLES BROTHERS DRILLING COMPANY

DATE	RUN NO.	DEPTH (FT)		FOOTAGE	SIZE (IN.)	TYPE	SERIAL NO.	REMARKS
		IN	OUT					
6-01	1	623.0	749.4	126.4	4.95	Core	8S23377	90.58 ct.wt., 15 Sel
6-12	2	749.4	749.4	0	4.95	Core	8S23385	Stuck in hole wash over
6-19	3	623.0	718.0	95.0	5-7/8	Cone	M88F621211	Reaming, Tri-Cone Rock Bit
6-22	4	619.0	722.0	103.0	4.937	Casing	8S04347	Reaming to core bbl.
6-23	5	722.0	734.0	12.0	5.65	Casing	8S04349	Wash over core bbl.
6-26	6	734.0	741.0	7.0	3.65	Core	8S13148	47.80 ct.wt., Sel 25
6-30	7	749.4	750.0	0.6	5-7/8	Cone	M88F621211	Tri-Cone Rock Bit
7-07	8	750.0	832.7	82.7	4.95	Core	8S23374	90.58 ct.wt., Sel 15
7-11	9	832.7	916.3	83.6	4.95	Core	8S23384	58.77 ct.wt., Sel 40
7-18	10	916.3	1046.9	130.6	4.95	Core	8S23381	81.88 ct.wt., Sel 25
7-27	11	1046.9	1257.7	210.8	4.95	Core	8S23383	81.88 ct.wt., Sel 25
8-10	12	1257.7	1537.9	280.2	4.95	Core	8S23380	81.88 ct.wt., Sel 25
8-14	13	1537.9	1537.9	0	4.5	Casing	7S25513	Ran on 4-1/2-IN. csg.-No tag
8-29	14	1537.9	1548.3	10.4	3.937	Core	8S35037	Impregnated bit, No tag
8-30	15	1548.3	1648.5	100.2	3.937	Core	8S37760	47.35 ct.wt., Sel 25
8-31	16	1648.5	1760.7	112.2	3.937	Core	8S37759	47.35 ct.wt., Sel 25
9-08	17	1760.7	1911.7	151.0	3.937	Core	8S40974	47.55 ct.wt., Sel 25
9-18	18	1911.7	1977.7	66.0	3.937	Core	8S40976	47.55 ct.wt., Sel 25
9-20	19	1977.7	2058.7	81.0	3.937	Core	8S40978	47.55 ct.wt., Sel 25
9-21	20	2058.7	2221.7	163.0	3.937	Core	8S42746	47.55 ct.wt., Sel 25, No tag
9-26	21	2221.7	2247.0	25.3	3.937	Core	8S42748	48.00 ct.wt., Sel 25
9-27	22	2247.0	2339.0	92.0	3.937	Core	8S42747	48.00 ct.wt., Sel 25
10-02	23	2339.0	2445.5	106.5	3.937	Core	8S37762	47.55 ct.wt., Sel 25
10-04	24	2445.5	2460.7	15.2	3.937	Core	8S40973	47.55 ct.wt., Sel 25
10-04	25	2460.7	2542.7	82.0	3.937	Core	8S41252	47.55 ct.wt., Sel 25
10-06	26	2542.7	2598.7	56.0	3.937	Core	8S31264	47.55 ct.wt., Sel 25
10-10	27	2598.7	2638.7	40.0	3.937	Core	8S37763	47.55 ct.wt., Sel 25
10-17	28	830.0	1260.0	430.0	2-15/16	Cone	B56062	Drilling Cement
10-19	29	1260.0	2280.0	1020.0	2-15/16	Cone	B56103	Drilling Cement
10-24	30	2280.0	2638.0	358.0	2-15/16	Cone	B56063	Drilling Cement
10-24	31	2638.7	3056.0	417.3	3.032	Core	8S31589	Impregnated
11-02	32	3056.0	3145.0	89.0	3.032	Core	8S31589	Re-run No. 31
11-06	33	3145.0	3200.0	55.0	3.032	Core	8S31585	Impregnated
11-08	34	3200.0	3232.0	32.0	3.032	Core	8S31589	Re-run No. 31
11-09	35	3232.0	3711.0	479.0	3.032	Core	8S31587	Impregnated
11-18	36	3711.0	3752.6	41.6	3.032	Core	8S22400	Impregnated
11-27	37	3752.6	3861.0	108.4	3.032	Core	8S25787	Impregnated
11-29	38	3861.0	3998.0	137.0	3.032	Core	8S22398	Impregnated

TABLE II
CEMENTING DETAILS

	<u>8-25-78</u>	<u>10-13-78</u>
CASING SIZE (inch)	4-1/2	NX-3.5
CASING DEPTH (feet)	1537.9	2638.7
CEMENT UTILIZED	Type II	Type II
CEMENT VOLUME (cubic feet)	260	220
DISPLACEMENT VOLUME (cubic feet)	None	None
SLURRY YIELD (cubic feet per sack)	1.47	1.47
SLURRY WEIGHT (pounds per gallon)	14.5	14.5
ADMIXTURES	None	None
CEMENT METHOD	Positive Displacement	Positive Displacement
CEMENT STAGES	1	1
WAIT ON CEMENT TIME (hours)	None	20

TABLE III
CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT.	FT.	%		FT. CORED	CORE REC'D	
6-01	1	1	623.0	634.0	11.0	9.6	87	180	11.0	9.6	
6-01	1	2	634.0	639.0	5.0	5.0	100	75	16.0	14.6	
6-01	1	3	639.0	645.0	6.0	6.0	100	90	22.0	20.6	
6-01	2	4	645.0	654.0	9.0	9.6	107	270	31.0	30.2	
6-01	2	5	654.0	664.0	10.0	10.0	100	315	41.0	40.2	
6-02	1	6	664.0	674.0	10.0	10.0	100	300	51.0	50.2	
6-02	1	7	674.0	683.0	9.0	8.2	91	225	60.0	58.4	
6-02	2	8	683.0	684.0	1.0	1.0	100	30	61.0	59.4	
6-06	2	9	684.0	694.0	10.0	6.7	67	150	71.0	66.1	50% Fluid Loss
6-07	1	10	694.0	704.0	10.0	3.5	35	30	81.0	69.6	
6-07	1	11	704.0	714.0	10.0	0	0	45	91.0	69.6	100% Fluid Loss
6-07	2	12	714.0	722.0	8.0	1.0	13	120	99.0	70.6	100% Fluid Loss
6-08	1	13	722.0	726.1	4.1	1.4	34	120	103.1	72.0	100% Fluid Loss
6-08	2	14	726.1	729.0	2.9	1.9	66	75	106.0	73.9	
6-08	2	15	729.0	731.0	2.0	1.0	50	90	108.0	74.9	
6-08	2	16	731.0	732.0	1.0	1.0	100	60	109.0	75.9	
6-08	2	17	732.0	734.0	2.0	0	0	60	111.0	75.9	
6-09	1	18	734.0	741.7	7.7	2.9	38	90	118.7	78.8	
6-09	1	19	741.7	744.3	2.6	1.3	50	75	121.3	80.1	
6-09	1	20	744.3	749.4	5.1	0.1	22	60	126.4	80.2	
7-07	1	-	749.4	750.0	-	-	-	-	-	-	Drilled with Rock Bit
7-07	2	21	750.0	760.8	10.8	9.0	83	240	137.2	89.2	
7-07	2	22	760.8	766.2	5.4	5.4	100	210	142.6	94.6	
7-07	2	23	766.2	768.3	2.1	2.1	100	90	144.7	96.7	
7-10	1	24	768.3	771.1	2.8	1.8	64	60	147.5	98.5	
7-10	1	25	771.1	774.5	3.4	3.4	100	75	150.9	101.9	
7-10	1	26	774.5	779.3	4.8	4.6	96	120	155.7	106.5	
7-10	1	27	779.3	789.3	10.0	10.0	100	240	165.7	116.5	
7-10	2	28	789.3	793.3	4.0	2.9	73	90	169.7	119.4	
7-10	2	29	793.3	803.3	10.0	10.0	100	375	179.7	129.4	
7-11	1	30	803.3	811.7	8.4	7.8	93	330	188.1	137.2	
7-11	1	31	811.7	819.3	7.6	7.6	100	285	195.7	144.8	
7-11	1	32	819.3	825.7	6.4	6.4	100	195	202.1	151.2	
7-11	2	33	825.7	832.7	7.0	6.8	97	210	209.1	158.0	
7-11	2	34	832.7	842.7	10.0	10.0	100	300	219.1	168.0	
7-12	1	35	842.7	852.7	10.0	10.0	100	240	229.1	178.0	
7-12	1	36	852.7	862.0	9.3	9.3	100	210	238.4	187.3	
7-12	2	37	862.0	872.0	10.0	10.0	100	240	248.4	197.3	
7-12	2	38	872.0	874.0	2.0	2.0	100	60	250.4	199.3	
7-12	2	39	874.0	876.0	2.0	2.0	100	75	252.4	201.3	
7-12	2	40	876.0	886.0	10.0	10.0	100	275	262.4	211.3	
7-12	1	41	886.0	892.7	6.7	6.7	100	210	269.1	218.0	
7-13	1	42	892.7	902.7	10.0	10.0	100	240	279.1	228.0	
7-13	1	43	902.7	912.7	10.0	10.0	100	285	289.1	238.0	
7-13	2	44	912.7	915.3	2.6	2.2	85	60	291.7	240.2	
7-13	2	45	915.3	916.3	1.0	1.0	100	60	292.7	241.2	
7-14	1	46	916.3	920.0	3.7	3.4	92	30	296.4	244.6	
7-19	1	47	920.0	923.0	3.0	2.6	87	50	299.4	247.2	
7-19	1	48	923.0	927.9	4.9	4.7	96	90	304.3	251.9	
7-19	2	49	927.9	932.7	4.8	4.8	100	75	309.1	256.7	

TABLE III (continued)

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT.	FT.	%		FT. CORED	CORE REC'D	
7-19	2	50	932.7	943.9	11.2	1.7	15	75	320.3	258.4	
7-19	2	51	943.9	952.7	8.8	3.9	44	45	329.1	262.3	
7-19	2	52	952.7	961.9	9.2	0	0	135	338.3	262.3	
7-25	1	53	961.9	962.9	1.0	0.5	50	15	339.3	262.8	
7-25	1	54	962.9	972.7	9.8	9.8	100	60	349.1	272.6	
7-25	1	55	972.7	982.7	10.0	0	0	60	359.1	272.6	
7-25	2	56	982.7	992.7	10.0	10.0	100	195	369.1	282.6	
7-25	2	57	992.7	1002.7	10.0	8.5	85	165	379.1	291.1	
7-26	1	58	1002.7	1008.5	5.8	5.0	86	75	384.9	296.1	
7-26	1	59	1008.5	1012.2	3.7	3.7	100	60	388.6	299.8	
7-26	1	60	1012.2	1018.7	6.5	6.5	100	165	395.1	306.3	60% Fluid Loss
7-26	1	61	1018.7	1028.7	10.0	10.0	100	165	405.1	316.3	60% Fluid Loss
7-26	2	62	1028.7	1038.7	10.0	9.7	97	330	415.1	326.0	100% Fluid Loss
7-26	2	63	1038.7	1046.9	8.2	6.6	80	285	423.3	332.6	100% Fluid Loss
7-27	1	64	1046.9	1052.7	5.8	5.8	100	75	429.1	338.4	100% Fluid Loss
7-27	1	65	1052.7	1062.7	10.0	9.7	97	285	439.1	348.1	100% Fluid Loss
7-27	2	66	1062.7	1072.7	10.0	10.0	100	375	449.1	358.1	100% Fluid Loss
7-28	1	67	1072.7	1073.7	1.0	1.0	100	120	450.1	359.1	100% Fluid Loss
7-31	2	68	1073.7	1083.3	9.6	9.6	100	300	459.7	368.7	60% Fluid Loss
7-31	2	69	1083.3	1092.3	9.0	9.0	100	315	468.7	377.7	60% Fluid Loss
8-01	1	70	1092.3	1100.9	8.6	8.2	95	120	477.3	385.9	50% Fluid Loss
8-01	1	71	1100.9	1105.7	4.8	4.8	100	60	482.1	390.7	50% Fluid Loss
8-01	1	72	1105.7	1112.7	7.0	7.0	100	60	489.1	397.7	50% Fluid Loss
8-01	1	73	1112.7	1122.7	10.0	10.0	100	105	499.1	407.7	50% Fluid Loss
8-01	1	74	1122.7	1130.7	8.0	8.0	100	90	507.1	415.7	50% Fluid Loss
8-01	2	75	1130.7	1138.0	7.3	7.3	100	135	514.4	423.0	50% Fluid Loss
8-01	2	76	1138.0	1140.6	2.6	2.6	100	75	517.0	425.6	50% Fluid Loss
8-01	2	77	1140.6	1150.4	9.8	6.6	67	225	526.8	432.2	50% Fluid Loss
8-02	1	78	1150.4	1153.2	2.8	2.6	93	90	529.6	434.8	90% Fluid Loss
8-02	1	79	1153.2	1154.7	1.5	1.5	100	45	531.1	436.3	90% Fluid Loss
8-02	1	80	1154.7	1158.7	4.0	3.0	75	153	535.1	439.3	100% Fluid Loss
8-02	1	81	1158.7	1169.7	11.0	7.5	68	120	546.1	446.8	100% Fluid Loss
8-02	1	82	1169.7	1172.7	3.0	3.0	100	45	549.1	449.8	100% Fluid Loss
8-02	1	83	1172.7	1176.4	3.7	3.7	100	75	552.8	453.5	60% Fluid Loss
8-07	2	84	1176.4	1177.4	1.0	1.0	100	60	553.8	454.5	40% Fluid Loss
8-07	2	85	1177.4	1182.1	4.7	4.7	100	135	558.5	459.2	40% Fluid Loss
8-08	1	86	1182.1	1188.7	6.6	6.6	100	135	565.1	465.8	40% Fluid Loss
8-08	1	87	1188.7	1196.7	8.0	8.0	100	150	573.1	473.8	40% Fluid Loss
8-08	1	88	1196.7	1205.0	8.3	8.3	100	165	581.4	482.1	40% Fluid Loss
8-08	2	89	1205.0	1206.0	1.0	0	0	60	582.4	482.1	Mismatch
8-08	2	90	1206.0	1214.4	8.4	8.4	100	270	590.8	490.5	40% Fluid Loss
8-09	1	91	1214.4	1224.4	10.0	10.0	100	240	600.8	500.5	40% Fluid Loss
8-09	1	92	1224.4	1229.2	4.8	4.8	100	120	605.6	505.3	40% Fluid Loss
8-09	1	93	1229.2	1238.4	9.2	9.2	100	315	614.8	514.5	60% Fluid Loss
8-09	2	94	1238.4	1248.4	10.0	10.0	100	405	624.8	524.5	40% Fluid Loss
8-09	2	95	1248.4	1257.7	9.3	9.3	100	435	634.1	533.8	40% Fluid Loss
8-10	2	96	1257.7	1267.7	10.0	10.3	103	225	644.1	544.1	40% Fluid Loss
8-10	2	97	1267.7	1277.7	10.0	10.0	100	315	654.1	554.1	40% Fluid Loss
8-11	1	98	1277.7	1287.7	10.0	10.3	103	330	664.1	564.4	40% Fluid Loss
8-11	1	99	1287.7	1297.7	10.0	9.3	93	195	674.1	573.7	40% Fluid Loss

TABLE III (continued)

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT.	FT.	%		FT. CORED	CORE REC'D	
8-11	1	100	1297.7	1303.4	5.7	6.2	109	155	679.8	579.9	40% Fluid Loss
8-11	2	101	1303.4	1310.0	6.6	7.5	114	180	686.4	587.4	40% Fluid Loss
8-11	2	102	1310.0	1313.7	3.7	3.7	100	75	690.1	591.1	40% Fluid Loss
8-16	2	103	1313.7	1320.9	7.2	7.2	100	240	697.3	598.3	25% Fluid Loss
8-16	2	104	1320.9	1330.7	9.8	9.8	100	285	707.1	608.1	25% Fluid Loss
8-17	1	105	1330.7	1338.7	8.0	8.0	100	315	715.1	616.1	5% Fluid Loss
8-17	1	106	1338.7	1348.7	10.0	10.0	100	240	725.1	626.1	5% Fluid Loss
8-17	1	107	1348.7	1353.7	5.0	5.0	100	165	730.1	631.1	5% Fluid Loss
8-17	2	108	1353.7	1362.7	9.0	8.4	93	315	739.1	639.5	5% Fluid Loss
8-17	2	109	1362.7	1370.7	8.0	8.0	100	235	747.1	647.5	40% Fluid Loss
8-18	1	110	1370.7	1379.7	9.0	9.2	102	240	756.1	656.7	40% Fluid Loss
8-18	1	111	1379.7	1389.7	10.0	10.0	100	240	766.1	666.7	40% Fluid Loss
8-18	1	112	1389.7	1395.6	5.9	6.6	95	105	772.0	672.3	40% Fluid Loss
8-18	2	113	1395.6	1406.0	10.4	10.2	98	110	782.4	682.5	40% Fluid Loss
8-18	2	114	1406.0	1416.0	10.0	10.0	100	105	792.4	692.5	40% Fluid Loss
8-19	2	115	1416.0	1418.7	2.7	2.1	78	70	795.1	694.6	40% Fluid Loss
8-19	2	116	1418.7	1428.7	10.0	10.1	101	155	805.1	704.7	40% Fluid Loss
8-21	1	117	1428.7	1430.7	2.0	0	0	30	807.1	704.7	50% Fluid Loss
8-21	1	118	1430.7	1437.7	7.0	7.0	100	75	814.1	711.7	50% Fluid Loss
8-21	1	119	1437.7	1448.8	11.1	10.0	90	150	825.2	721.7	50% Fluid Loss
8-22	1	120	1448.8	1454.7	5.9	5.9	100	90	831.1	727.6	
8-22	2	121	1454.7	1464.7	10.0	10.0	100	165	841.1	737.6	
8-22	2	122	1464.7	1474.7	10.0	1.0	10	240	851.1	738.6	
8-22	2	123	1474.7	1477.3	2.6	2.6	100	120	853.7	741.2	
8-22	2	124	1477.3	1481.7	4.4	4.4	100	255	858.1	745.6	100% Returns
8-23	1	125	1481.7	1490.7	9.0	9.0	100	180	867.1	754.6	100% Returns
8-23	1	126	1490.7	1494.7	4.0	4.0	100	90	871.1	758.6	100% Returns
8-23	1	127	1494.7	1498.5	3.8	1.9	50	135	874.9	760.5	10% Fluid Loss
8-23	2	128	1498.5	1507.5	9.0	9.0	100	270	883.9	769.5	10% Fluid Loss
8-23	2	129	1507.5	1517.5	10.0	10.0	100	210	893.9	779.5	10% Fluid Loss
8-24	1	130	1517.5	1524.5	7.0	7.0	100	150	900.9	786.5	5% Fluid Loss
8-24	1	131	1524.5	1526.5	2.0	2.0	100	75	902.9	788.5	
8-24	1	132	1526.5	1536.9	10.4	10.0	96	240	913.3	798.5	
8-24	1	133	1536.9	1537.9	1.0	1.0	100	30	914.3	799.5	
8-30	1	134	1537.9	1548.3	10.4	10.0	96	210	924.7	809.5	
8-30	1	135	1548.3	1553.0	4.7	5.0	106	45	929.4	814.5	
8-30	1	136	1553.0	1563.7	10.7	10.0	93	75	940.1	824.5	
8-30	1	137	1563.7	1573.7	10.0	10.0	100	90	950.1	834.5	
8-30	2	138	1573.7	1583.7	10.0	10.0	100	120	960.1	844.5	
8-30	2	139	1583.7	1594.4	10.7	9.6	90	120	970.8	854.1	
8-30	2	140	1594.4	1603.3	8.9	10.2	115	120	979.7	864.3	
8-30	2	141	1603.3	1613.7	10.4	10.2	98	120	990.1	874.5	
8-31	1	142	1613.7	1623.3	9.6	9.6	100	135	999.7	884.1	
8-31	1	143	1623.3	1633.3	10.0	10.0	100	180	1009.7	894.1	
8-31	1	144	1633.3	1643.2	9.9	9.9	100	165	1019.6	904.0	
8-31	1	145	1643.2	1648.5	5.3	5.6	106	90	1024.9	909.6	
8-31	2	146	1648.5	1653.7	5.2	5.2	100	75	1030.1	914.8	
8-31	2	147	1653.7	1663.7	10.0	10.0	100	131	1040.1	924.8	
9-01	1	148	1663.7	1673.7	10.0	10.0	100	105	1050.1	934.8	
9-01	1	149	1673.7	1683.7	10.0	9.4	94	120	1060.1	944.2	

TABLE III (continued)

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT.	FT.	%		FT. CORED	CORE REC'D	
9-01	1	150	1683.7	1693.7	10.0	10.0	100	90	1070.1	954.2	
9-01	1	151	1693.7	1699.7	6.0	6.0	100	60	1076.1	960.2	
9-01	1	152	1699.7	1706.7	7.0	7.8	111	60	1083.1	968.0	
9-01	1	153	1706.7	1713.7	7.0	7.0	100	90	1090.1	975.0	
9-01	2	154	1713.7	1723.7	10.0	10.0	100	180	1100.1	985.0	
9-01	2	155	1723.7	1733.7	10.0	10.0	100	180	1110.1	995.0	
9-01	2	156	1733.7	1738.4	4.7	4.7	100	90	1114.8	999.7	
9-05	1	157	1738.4	1745.7	8.3	8.0	96	135	1123.1	1007.7	
9-05	1	158	1746.7	1753.7	7.0	6.7	96	90	1130.1	1014.4	Lost All Returns @ 1747 FT.
9-05	1	159	1753.7	1760.7	7.0	7.0	100	135	1137.1	1021.4	100% Fluid Loss
9-05	1	160	1760.7	1763.7	3.0	3.0	100	120	1140.1	1024.4	100% Fluid Loss
9-14	1	161	1763.7	1773.7	10.0	10.0	100	255	1150.1	1034.4	100% Fluid Loss
9-14	1	162	1773.7	1783.7	10.0	10.0	100	120	1160.1	1044.4	100% Fluid Loss
9-14	1	163	1783.7	1793.7	10.0	10.0	100	135	1170.1	1054.4	100% Fluid Loss
9-14	1	164	1793.7	1803.7	10.0	10.0	100	120	1180.1	1064.4	100% Fluid Loss
9-15	2	165	1803.7	1813.7	10.0	10.0	100	135	1190.1	1074.4	100% Fluid Loss
9-15	2	166	1813.7	1823.7	10.0	10.0	100	135	1200.1	1084.4	100% Fluid Loss
9-15	2	167	1823.7	1833.7	10.0	10.0	100	120	1210.1	1094.4	100% Fluid Loss
9-15	2	168	1833.7	1840.7	7.0	7.0	100	120	1217.1	1101.4	100% Fluid Loss
9-16	1	169	1840.7	1850.7	10.0	10.0	100	135	1227.1	1111.4	100% Fluid Loss
9-16	1	170	1850.7	1860.7	10.0	10.0	100	120	1237.1	1121.4	100% Fluid Loss
9-16	1	171	1860.7	1868.7	8.0	8.0	100	120	1245.1	1129.4	100% Fluid Loss
9-16	1	172	1868.7	1878.7	10.0	10.0	100	150	1255.1	1139.4	100% Fluid Loss
9-16	2	173	1878.7	1882.7	4.0	4.0	100	75	1259.1	1143.4	100% Fluid Loss
9-16	2	174	1882.7	1891.7	9.0	9.0	100	240	1268.1	1152.4	80% Fluid Loss
9-16	2	175	1891.7	1899.7	8.0	8.0	100	120	1276.1	1160.4	100% Fluid Loss
9-18	1	176	1899.7	1909.7	10.0	10.0	100	180	1286.1	1170.4	100% Fluid Loss
9-18	1	177	1909.7	1911.7	2.0	2.0	100	45	1288.1	1172.4	100% Fluid Loss
9-18	1	178	1911.7	1913.7	2.0	2.5	125	30	1290.1	1174.9	100% Fluid Loss
9-18	1	179	1913.7	1916.7	3.0	2.6	87	30	1293.1	1177.5	100% Fluid Loss
9-18	1	180	1916.7	1916.7	0	0	-	-	1293.1	1177.5	No Advance
9-18	2	181	1916.7	1918.7	2.0	1.0	50	60	1295.1	1178.5	100% Fluid Loss
9-19	2	182	1918.7	1927.7	9.0	10.0	111	195	1304.1	1188.5	100% Fluid Loss
9-19	2	183	1927.7	1937.7	10.0	10.0	100	165	1314.1	1198.5	100% Fluid Loss
9-19	1	184	1937.7	1944.7	7.0	7.0	100	90	1321.1	1205.5	100% Fluid Loss
9-19	1	185	1944.7	1951.4	6.7	6.7	100	120	1327.8	1212.2	100% Fluid Loss
9-19	1	186	1951.4	1951.4	10.0	10.0	100	135	1337.8	1222.2	100% Fluid Loss
9-19	1	187	1961.4	1966.9	5.5	5.5	100	75	1343.3	1227.7	100% Fluid Loss
9-19	1	188	1966.9	1973.7	6.8	6.8	100	105	1350.1	1234.5	100% Fluid Loss
9-19	2	189	1973.7	1977.7	4.0	2.4	60	95	1354.1	1236.0	100% Fluid Loss
9-19	2	190	1977.7	1987.7	10.0	10.0	100	195	1364.1	1246.9	100% Fluid Loss
9-20	2	191	1987.7	1993.7	6.0	6.0	100	105	1370.1	1252.9	100% Fluid Loss
9-20	1	192	1993.7	1999.2	5.5	5.5	100	90	1375.6	1258.4	100% Fluid Loss
9-20	1	193	1999.2	2008.7	9.5	9.5	100	165	1385.1	1267.9	100% Fluid Loss
9-20	1	194	2008.7	2018.7	10.0	10.0	100	135	1395.1	1277.9	100% Fluid Loss
9-20	2	195	2018.7	2026.7	8.0	8.0	100	150	1403.1	1285.9	100% Fluid Loss
9-20	2	196	2026.7	2033.7	7.0	7.0	100	180	1410.1	1292.9	100% Fluid Loss
9-20	2	197	2033.7	2043.7	10.0	10.0	100	270	1420.1	1302.9	100% Fluid Loss
9-21	1	198	2043.7	2050.4	6.7	6.7	100	150	1426.8	1309.6	100% Fluid Loss
9-21	1	199	2050.4	2058.7	8.3	8.3	100	180	1435.1	1317.9	100% Fluid Loss

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT.	FT.	%		FT. CORED	CORE REC'D	
9-21	1	200	2058.7	2068.7	10.0	10.0	100	150	1445.1	1327.9	100% Fluid Loss
9-21	2	201	2068.7	2078.7	10.0	10.0	100	240	1455.1	1337.9	100% Fluid Loss
9-22	2	202	2078.7	2081.7	3.0	2.7	90	45	1458.1	1340.6	100% Fluid Loss
9-22	2	203	2081.7	2091.7	10.0	10.0	100	240	1468.1	1350.6	100% Fluid Loss
9-22	1	204	2091.7	2101.7	10.0	10.0	100	165	1478.1	1360.6	100% Fluid Loss
9-22	1	205	2101.7	2106.4	4.7	4.7	100	90	1482.8	1365.3	100% Fluid Loss
9-22	1	206	2106.4	2113.7	7.3	7.3	100	120	1490.1	1372.6	100% Fluid Loss
9-22	1	207	2113.7	2121.4	7.7	7.7	100	90	1497.8	1380.3	100% Fluid Loss
9-22	2	208	2121.4	2128.7	7.3	7.0	96	150	1505.1	1387.3	100% Fluid Loss
9-22	2	209	2128.7	2138.7	10.0	10.0	100	195	1515.1	1397.3	100% Fluid Loss
9-22	2	210	2138.7	2148.7	10.0	10.0	100	210	1525.1	1407.3	100% Fluid Loss
9-25	1	211	2148.7	2149.7	1.0	1.2	120	60	1526.1	1408.5	100% Fluid Loss
9-25	1	212	2149.7	2153.7	4.0	4.1	103	60	1530.1	1412.6	100% Fluid Loss
9-25	1	213	2153.7	2163.7	10.0	10.2	102	135	1540.1	1422.8	100% Fluid Loss
9-25	1	214	2163.7	2173.7	10.0	10.0	100	165	1550.1	1432.8	100% Fluid Loss
9-25	2	215	2173.7	2183.7	10.0	10.0	100	165	1560.1	1442.8	100% Fluid Loss
9-26	2	216	2183.7	2193.7	10.0	10.0	100	165	1570.1	1452.8	100% Fluid Loss
9-26	1	217	2193.7	2203.7	10.0	10.0	100	210	1580.1	1462.8	100% Fluid Loss
9-26	1	218	2203.7	2213.7	10.0	10.0	100	195	1590.1	1472.8	100% Fluid Loss
9-26	1	219	2213.7	2221.7	8.0	8.0	100	150	1598.1	1480.8	100% Fluid Loss
9-26	2	220	2221.7	2231.7	10.0	10.0	100	180	1608.1	1490.8	100% Fluid Loss
9-26	2	221	2231.7	2241.7	10.0	10.0	100	180	1618.1	1500.8	100% Fluid Loss
9-26	2	222	2241.7	2247.0	5.3	5.1	96	90	1623.4	1505.9	100% Fluid Loss
9-27	1	223	2247.0	2252.7	5.7	5.7	100	60	1629.1	1511.6	100% Fluid Loss
9-27	1	224	2252.7	2258.7	6.0	5.8	97	120	1635.1	1517.4	100% Fluid Loss
9-27	1	225	2258.7	2265.2	6.5	6.2	95	120	1641.6	1523.6	100% Fluid Loss
9-27	2	226	2265.2	2273.7	8.5	8.5	100	165	1650.1	1532.1	100% Fluid Loss
9-27	2	227	2273.7	2283.7	10.0	10.0	100	210	1660.1	1542.1	100% Fluid Loss
9-27	2	228	2283.7	2293.5	9.8	9.8	100	180	1669.9	1551.9	100% Fluid Loss
9-28	1	229	2293.5	2303.5	10.0	10.2	102	225	1679.9	1562.1	100% Fluid Loss
9-28	1	230	2303.5	2306.5	3.0	2.9	97	60	1682.9	1565.0	100% Fluid Loss
9-28	1	231	2306.5	2313.7	7.2	7.2	100	150	1690.1	1572.2	100% Fluid Loss
9-28	2	232	2313.7	2323.7	10.0	10.0	100	180	1700.1	1582.2	100% Fluid Loss
9-28	2	233	2323.7	2332.9	9.2	9.2	100	270	1709.3	1591.4	100% Fluid Loss
9-28	2	234	2332.9	2340.1	7.2	7.2	100	210	1716.5	1598.6	100% Fluid Loss
10-02	1	235	2340.1	2350.1	10.0	10.0	100	195	1726.5	1608.6	100% Fluid Loss
10-02	1	236	2350.1	2360.7	10.6	10.6	100	90	1737.1	1619.2	100% Fluid Loss
10-02	1	237	2360.7	2370.7	10.0	10.0	100	90	1747.1	1629.2	100% Fluid Loss
10-02	2	238	2370.7	2380.7	10.0	10.0	100	270	1757.1	1639.2	100% Fluid Loss
10-02	2	239	2380.7	2390.7	10.0	10.0	100	300	1767.1	1649.2	100% Fluid Loss
10-03	1	240	2390.7	2400.7	10.0	10.0	100	210	1777.1	1659.2	100% Fluid Loss
10-03	1	241	2400.7	2410.7	10.0	10.0	100	120	1787.1	1669.2	100% Fluid Loss
10-03	1	242	2410.7	2420.7	10.0	10.0	100	120	1797.1	1679.2	100% Fluid Loss
10-03	1	243	2420.7	2430.7	10.0	10.0	100	135	1807.1	1689.2	100% Fluid Loss
10-03	2	244	2430.7	2440.7	10.0	10.0	100	150	1817.1	1699.2	100% Fluid Loss
10-04	2	245	2440.7	2445.5	4.8	4.8	100	120	1821.9	1704.0	100% Fluid Loss
10-04	1	246	2445.5	2453.2	7.7	7.7	100	120	1829.6	1711.7	100% Fluid Loss
10-04	1	247	2453.2	2460.7	7.5	4.8	64	120	1837.1	1716.5	100% Fluid Loss
10-05	1	248	2460.7	2463.7	3.0	3.0	100	90	1840.1	1719.5	100% Fluid Loss
10-05	1	249	2463.7	2473.7	10.0	9.9	99	120	1850.1	1729.4	100% Fluid Loss
10-05	1	250	2473.7	2483.7	10.0	10.0	100	105	1860.1	1739.4	100% Fluid Loss
10-05	1	251	2483.7	2493.7	10.0	10.0	100	90	1870.1	1749.4	100% Fluid Loss
10-05	2	252	2493.7	2503.7	10.0	9.9	99	165	1880.1	1759.3	100% Fluid Loss

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT	FT	%		FT. CORED	CORE REC'D	
10-05	2	253	2503.7	2513.7	10.0	10.0	100	180	1890.1	1769.3	100% Fluid Loss
10-05	2	254	2513.7	2523.7	10.0	8.5	85	210	1900.1	1777.8	100% Fluid Loss
10-06	1	255	2523.7	2532.7	9.0	10.2	113	150	1909.1	1788.0	100% Fluid Loss
10-06	1	256	2532.7	2534.7	2.0	2.0	100	40	1911.1	1790.0	100% Fluid Loss
10-06	1	257	2534.7	2541.7	7.0	7.8	111	135	1918.1	1797.8	100% Fluid Loss
10-06	1	258	2541.7	2542.7	1.0	1.0	100	15	1919.1	1798.8	100% Fluid Loss
10-06	2	259	2542.7	2551.3	8.6	8.6	100	180	1927.7	1807.4	100% Fluid Loss
10-06	2	260	2551.3	2561.3	10.0	10.0	100	180	1937.7	1817.4	100% Fluid Loss
10-09	1	261	2561.3	2571.3	10.0	10.0	100	165	1947.7	1827.4	100% Fluid Loss
10-09	1	262	2571.3	2581.3	10.0	10.0	100	150	1957.7	1837.4	100% Fluid Loss
10-09	2	263	2581.3	2591.3	10.0	10.0	100	285	1967.7	1847.4	100% Fluid Loss
10-09	2	264	2591.3	2597.7	6.4	6.4	100	195	1974.1	1853.8	100% Fluid Loss
10-10	1	265	2597.7	2598.7	1.0	0.2	20	30	1975.1	1854.0	100% Fluid Loss
10-10	1	266	2598.7	2608.7	10.0	10.0	100	120	1985.1	1864.0	100% Fluid Loss
10-10	2	267	2608.7	2618.5	9.8	9.8	100	180	1994.9	1873.8	100% Fluid Loss
10-10	2	268	2618.5	2628.5	10.0	10.0	100	150	2004.9	1883.8	100% Fluid Loss
10-10	2	269	2628.5	2638.7	10.2	10.0	98	180	2015.1	1893.8	Ran NX casing - 2638.7 FT.
10-10	2	270	2638.7	2651.2	12.5	10.0	80	210	2027.6	1903.8	No Fluid Loss
10-24	1	271	2651.2	2663.0	11.8	11.7	99	60	2039.4	1915.5	No Fluid Loss
10-24	1	272	2663.0	2683.0	20.0	18.8	94	105	2059.4	1934.3	No Fluid Loss
10-24	1	273	2683.0	2703.0	20.0	19.8	99	160	2079.4	1954.1	No Fluid Loss
10-24	1	274	2703.0	2723.0	20.0	20.0	100	75	2099.4	1974.1	No Fluid Loss
10-25	2	275	2723.0	2741.0	18.0	16.2	90	150	2117.4	1990.3	No Fluid Loss
10-25	2	276	2741.0	2761.0	20.0	19.8	99	135	2137.4	2010.1	No Fluid Loss
10-25	2	277	2761.0	2771.0	10.0	10.0	100	135	2147.4	2020.1	No Fluid Loss
10-26	1	278	2771.0	2775.0	4.0	4.0	100	45	2151.4	2024.1	No Fluid Loss
10-26	1	279	2775.0	2783.0	8.0	8.0	100	60	2159.4	2032.1	No Fluid Loss
10-26	1	280	2783.0	2803.0	20.0	20.0	100	105	2179.4	2052.1	No Fluid Loss
10-26	1	281	2803.0	2823.0	20.0	20.0	100	105	2199.4	2072.1	No Fluid Loss
10-26	1	282	2823.0	2833.0	10.0	10.0	100	45	2209.4	2082.1	10% Fluid Loss
10-27	1	283	2833.0	2843.0	10.0	10.0	100	75	2219.4	2092.1	10% Fluid Loss
10-30	1	284	2843.0	2844.0	1.0	0.2	20	30	2220.4	2092.3	10% Fluid Loss
10-30	1	285	2844.0	2863.0	19.0	19.0	100	105	2239.4	2111.3	10% Fluid Loss
10-30	1	286	2863.0	2882.0	19.0	19.0	100	105	2258.4	2130.3	No Fluid Loss
10-30	1	287	2882.0	2887.0	5.0	5.5	110	60	2263.4	2135.8	10% Fluid Loss
10-30	1	288	2887.0	2889.0	2.0	2.0	100	75	2265.4	2137.8	10% Fluid Loss
10-30	2	289	2889.0	2900.0	11.0	10.5	95	90	2276.4	2148.3	10% Fluid Loss
10-31	1	290	2900.0	2901.0	1.0	1.0	100	15	2277.4	2149.3	No Fluid Loss
10-31	1	291	2901.0	2913.0	12.0	12.0	100	105	2289.4	2161.3	No Fluid Loss
10-31	1	292	2913.0	2923.0	10.0	10.0	100	45	2299.4	2171.3	No Fluid Loss
10-31	1	293	2923.0	2929.0	6.0	6.0	100	75	2305.4	2177.3	No Fluid Loss
10-31	1	294	2929.0	2931.0	2.0	2.0	100	45	2307.4	2179.3	
10-31	2	295	2931.0	2943.0	12.0	10.8	90	135	2319.4	2190.1	
10-31	2	296	2943.0	2949.1	6.1	9.0	148	90	2325.5	2199.1	
10-31	2	297	2949.1	2952.0	2.9	2.9	100	30	2328.4	2202.0	
10-31	2	298	2952.0	2963.0	11.0	11.0	100	150	2339.4	2213.0	
11-01	1	299	2963.0	2976.0	13.0	12.4	95	135	2352.4	2225.4	10% Fluid Loss
11-01	1	300	2976.0	2983.0	7.0	7.7	110	60	2359.4	2233.1	60% Fluid Loss @ 2980 FT.
11-01	1	301	2983.0	3003.0	20.0	20.0	100	120	2379.4	2253.1	80% Fluid Loss @ 3003 FT.
11-01	1	302	3003.0	3005.0	2.0	2.0	100	15	2381.4	2255.1	
11-01	1	303	3005.0	3018.0	13.0	13.0	100	105	2394.4	2268.1	
11-01	2	304	3018.0	3018.3	0.3	0.3	100	45	2394.7	2268.4	
11-01	2	305	3018.3	3023.0	4.7	4.7	100	120	2399.4	2273.1	

TABLE III (continued)

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT	FT	%		FT. CORED	CORE REC'D	
11-01	2	306	3023.0	3024.0	1.0	1.0	100	60	2400.4	2274.1	
11-02	1	307	3024.0	3043.0	19.0	19.7	104	225	2419.4	2293.8	
11-02	1	308	3043.0	3056.0	13.0	12.5	96	90	2432.4	2306.3	
11-02	2	309	3056.0	3061.6	5.6	6.2	111	30	2438.0	2312.5	
11-02	2	310	3061.6	3080.6	19.0	18.4	97	210	2457.0	2330.9	
11-02	2	311	3080.6	3098.6	18.0	18.5	103	180	2475.0	2349.4	
11-03	1	312	3098.6	3116.8	18.2	18.2	100	90	2493.2	2367.6	90% Fluid Loss
11-03	1	313	3116.8	3121.0	4.2	4.0	95	60	2497.4	2371.6	Corrected 0.4 FT. measurement error
11-03	1	314	3121.0	3123.0	2.0	1.9	95	30	2499.4	2373.5	90% Fluid Loss
11-03	1	315	3123.0	3138.0	15.0	14.4	96	90	2514.4	2387.9	90% Fluid Loss
11-03	1	316	3138.0	3139.0	1.0	0.1	10	45	2515.4	2388.0	90% Fluid Loss
11-03	2	317	3139.0	3139.5	0.5	0.3	60	30	2515.9	2388.3	90% Fluid Loss
11-03	2	318	3139.5	3145.0	5.5	0.2	4	105	2521.4	2388.5	Mismatch, 90% Fluid Loss
11-06	1	319	3145.0	3148.0	3.0	3.4	113	45	2524.4	2391.9	90% Fluid Loss
11-06	1	320	3148.0	3161.0	13.0	13.4	103	90	2537.4	2405.3	90% Fluid Loss
11-07	2	321	3161.0	3166.0	5.0	5.5	110	150	2542.4	2410.8	90% Fluid Loss
11-07	2	322	3166.0	3179.0	13.0	12.9	99	210	2555.4	2423.7	90% Fluid Loss
11-07	2	323	3179.0	3180.0	1.0	0.8	80	45	2556.4	2424.5	90% Fluid Loss
11-07	2	324	3180.0	3181.0	1.0	0.9	90	45	2557.4	2425.4	90% Fluid Loss
11-07	1	325	3181.0	3184.0	3.0	1.8	60	30	2560.4	2427.2	
11-07	1	326	3184.0	3185.0	1.0	0.2	20	30	2561.4	2427.4	
11-07	1	327	3185.0	3198.0	13.0	13.0	100	90	2574.4	2440.4	
11-07	1	328	3198.0	3200.8	2.8	2.4	86	30	2577.2	2442.8	Mismatch, Oriented Core #1
11-08	1	329	3200.8	3202.0	1.2	1.7	142	15	2578.4	2444.5	90% Fluid Loss
11-08	1	330	3202.0	3212.0	10.0	9.9	99	170	2588.4	2454.4	Oriented Core #2
11-08	1	331	3212.0	3214.0	2.0	2.0	100	30	2590.4	2456.4	90% Fluid Loss
11-09	1	332	3214.0	3219.0	5.0	4.9	98	60	2595.4	2461.3	90% Fluid Loss
11-09	1	333	3219.0	3232.0	13.0	13.8	106	75	2608.4	2475.1	Mismatch
11-10	1	334	3232.0	3242.0	10.0	10.0	100	90	2618.4	2485.1	90% Fluid Loss
11-10	1	335	3242.0	3260.6	18.6	18.6	100	105	2637.0	2503.7	90% Fluid Loss
11-10	1	336	3260.6	3279.2	18.6	18.8	101	120	2655.6	2522.5	
11-13	1	337	3279.2	3290.0	10.8	11.1	103	90	2666.4	2533.6	
11-14	1	338	3290.0	3302.0	12.0	11.6	97	105	2678.4	2545.2	
11-14	1	339	3302.0	3309.6	7.6	7.2	95	75	2686.0	2552.4	90% Fluid Loss
11-14	1	340	3309.6	3313.0	3.4	2.8	82	30	2689.4	2555.2	90% Fluid Loss
11-14	1	341	3313.0	3316.0	3.0	2.2	73	30	2692.4	2557.4	90% Fluid Loss
11-14	2	342	3316.0	3319.0	3.0	2.0	67	45	2695.4	2559.4	90% Fluid Loss
11-14	2	343	3319.0	3326.0	7.0	5.7	81	105	2702.4	2565.1	90% Fluid Loss
11-14	2	344	3326.0	3342.0	16.0	14.6	91	180	2718.4	2579.7	90% Fluid Loss
11-15	1	345	3342.0	3360.2	18.2	18.2	100	210	2736.6	2597.9	90% Fluid Loss
11-15	1	346	3360.2	3367.0	6.8	6.7	99	60	2743.4	2604.6	90% Fluid Loss
11-15	1	347	3367.0	3372.0	5.0	5.2	104	60	2748.4	2609.8	90% Fluid Loss
11-15	2	348	3372.0	3382.0	10.0	10.3	103	75	2758.4	2620.1	90% Fluid Loss
11-15	2	349	3382.0	3400.0	18.0	19.7	104	150	2776.4	2638.8	90% Fluid Loss
11-15	2	350	3400.0	3418.0	18.0	19.4	102	135	2794.4	2657.2	90% Fluid Loss
11-16	1	351	3418.0	3419.0	1.0	1.0	100	75	2795.4	2658.2	90% Fluid Loss
11-16	1	352	3419.0	3430.0	11.0	11.2	102	75	2806.4	2669.4	90% Fluid Loss
11-16	1	353	3430.0	3440.0	10.0	10.2	102	90	2816.4	2679.6	90% Fluid Loss Oriented Core #3
11-16	1	354	3440.0	3458.0	18.0	17.4	97	105	2834.4	2697.0	90% Fluid Loss
11-16	2	355	3458.0	3477.0	19.0	18.9	99	135	2853.4	2715.9	90% Fluid Loss
11-16	2	356	3477.0	3495.0	18.0	18.6	103	120	2871.4	2734.5	90% Fluid Loss
11-16	2	357	3495.0	3512.0	17.0	17.2	101	120	2888.4	2751.7	90% Fluid Loss
11-16	2	358	3512.0	3522.0	10.0	10.8	108	60	2898.4	2762.5	90% Fluid Loss

CORING RECORD

DATE	SHIFT	CORE NO.	INTERVAL			RECOVERY		CORE TIME MIN	CUMULATIVE		REMARKS
			FROM	TO	FT	FT	%		FT. CORED	CORE REC'D	
11-17	1	359	3522.0	3535.4	13.4	13.0	97	105	2911.8	2775.5	90% Fluid Loss
11-17	1	360	3535.4	3540.4	5.0	5.4	108	60	2916.8	2780.9	90% Fluid Loss
11-17	1	361	3540.4	3543.0	2.6	2.9	112	45	2919.4	2783.8	90% Fluid Loss
11-17	1	362	3543.0	3546.0	3.0	2.5	83	30	2922.4	2786.3	90% Fluid Loss
11-17	2	363	3546.0	3552.0	6.0	5.8	97	90	2928.4	2792.1	90% Fluid Loss Oriented Core #4
11-17	2	364	3552.0	3570.0	18.0	19.2	107	180	2946.4	2811.3	90% Fluid Loss
11-17	2	365	3570.0	3582.0	12.0	13.4	112	105	2958.4	2824.7	90% Fluid Loss
11-18	1	366	3582.0	3600.6	18.6	18.5	99	180	2977.0	2843.2	90% Fluid Loss
11-18	1	367	3600.6	3608.4	7.8	7.8	100	60	2984.8	2851.0	90% Fluid Loss
11-18	1	368	3608.4	3622.0	13.6	13.1	96	90	2998.4	2864.1	90% Fluid Loss
11-18	1	369	3622.0	3640.6	18.6	18.1	97	105	3017.0	2882.2	90% Fluid Loss
11-18	2	370	3640.6	3659.6	19.0	18.6	98	120	3036.0	2900.8	90% Fluid Loss
11-18	2	371	3659.6	3678.0	18.4	18.4	100	150	3054.4	2919.2	90% Fluid Loss
11-18	2	372	3678.0	3690.0	12.0	10.7	89	120	3066.4	2929.9	90% Fluid Loss
11-18	1	373	3690.0	3700.0	10.0	10.0	100	180	3076.4	2939.9	90% Fluid Loss Oriented Core #5
11-18	2	374	3700.0	3710.0	10.0	10.0	100	150	3086.4	2949.9	90% Fluid Loss Oriented Core #6
11-18	2	375	3710.0	3711.0	1.0	0.9	90	30	3087.4	2950.8	90% Fluid Loss
11-20	1	376	3711.0	3712.0	1.0	0.2	20	30	3088.4	2951.0	90% Fluid Loss
11-20	1	377	3712.0	3718.0	6.0	5.6	93	90	3094.4	2956.6	90% Fluid Loss
11-20	1	378	3718.0	3720.0	2.0	1.8	90	75	3096.4	2958.4	90% Fluid Loss
11-20	2	379	3720.0	3722.0	2.0	2.0	100	60	3098.4	2960.4	90% Fluid Loss
11-20	2	380	3722.0	3732.0	10.0	9.7	97	120	3108.4	2970.1	90% Fluid Loss
11-21	2	381	3732.0	3743.0	11.0	11.2	102	150	3119.4	2981.3	90% Fluid Loss
11-21	1	382	3743.0	3752.0	9.0	9.3	103	150	3128.4	2990.6	90% Fluid Loss
11-21	1	383	3752.0	3752.6	0.6	0.1	17	30	3129.0	2990.7	90% Fluid Loss
11-27	1	384	3752.6	3754.0	1.4	1.4	100	60	3130.4	2992.1	90% Fluid Loss
11-27	1	385	3754.0	3758.0	4.0	4.6	115	90	3134.4	2996.7	90% Fluid Loss
11-27	2	386	3758.0	3770.0	12.0	10.7	89	90	3146.4	3007.4	90% Fluid Loss
11-27	2	387	3770.0	3780.0	10.0	10.6	106	120	3156.4	3018.0	90% Fluid Loss Oriented Core #7
11-28	1	388	3780.0	3789.0	9.0	8.8	98	75	3165.4	3026.8	95% Fluid Loss
11-28	1	389	3789.0	3797.0	8.0	7.1	89	75	3173.4	3033.9	95% Fluid Loss
11-28	1	390	3797.0	3810.0	13.0	12.5	96	105	3186.4	3046.4	95% Fluid Loss
11-28	1	391	3810.0	3826.0	16.0	15.5	97	90	3202.4	3061.9	100% Fluid Loss @ 3810.0
11-28	2	392	3826.0	3842.0	16.0	16.0	100	60	3218.4	3077.9	100% Fluid Loss
11-28	2	393	3842.0	3852.0	10.0	10.3	103	60	3228.4	3088.2	100% Fluid Loss Oriented Core #8
11-28	2	394	3852.0	3858.0	6.0	5.8	97	30	3234.4	3094.0	100% Fluid Loss
11-28	2	395	3858.0	3861.0	3.0	2.3	77	15	3237.4	3096.3	100% Fluid Loss
11-29	1	396	3861.0	3872.0	11.0	12.3	112	90	3248.4	3108.6	100% Fluid Loss
11-29	1	397	3872.0	3891.0	19.0	18.7	98	135	3267.4	3127.3	100% Fluid Loss
11-29	2	398	3891.0	3910.0	19.0	18.8	99	105	3286.4	3146.1	100% Fluid Loss
11-29	2	399	3910.0	3928.0	18.0	18.4	102	120	3304.4	3164.5	75% Fluid Loss
11-29	2	400	3928.0	3946.0	18.0	16.5	92	105	3322.4	3181.0	75% Fluid Loss
11-29	2	401	3946.0	3962.0	16.0	17.5	109	90	3338.4	3198.5	75% Fluid Loss
11-30	1	402	3962.0	3972.0	10.0	9.4	94	75	3348.4	3207.9	99% Fluid Loss
11-30	1	403	3972.0	3981.0	9.0	8.2	91	75	3357.4	3216.1	99% Fluid Loss
11-30	1	404	3981.0	3988.0	7.0	6.4	91	90	3364.4	3222.5	99% Fluid Loss
11-30	1	405	3988.0	3998.0	10.0	10.1	101	105	3374.4	3232.6	99% Fluid Loss Oriented Core #9
T. D. @ 3998.0											
Core Diameter = 2.4-IN. from intervals 623.0 - 749.4 FT. and 750.0 - 2638.7 FT.											
Core Diameter = 1.875-IN. from interval 2638.7 - 3998.0 FT.											
All core depth intervals were determined by Boyles Brothers Drilling Company Drillers.											
These depths were measured from ground level.											

TABLE IV
ORIENTED CORING RECORD

ORIENTED CORE RUN NO.	SEQUENTIAL CORE RUN NO.	INTERVAL FT.	LENGTH OF RUN FT.	CORE RECOVERED FT.	REMARKS
1	328	3198.0-3200.8	2.8	2.4	NOT USABLE, MISLATCH
2	330	3202.0-3212.0	10.0	9.9	USABLE
3	353	3430.0-3440.0	10.0	10.2	USABLE
4	363	3546.0-3552.0	6.0	5.8	USABLE
5	373	3690.0-3700.0	10.0	10.0	UMTANUM, NOT USABLE, "POKER CHIPPED," BROKEN ROCK
6	374	3700.0-3710.0	10.0	10.0	UMTANUM, USABLE
7	387	3770.0-3780.0	10.0	10.6	UMTANUM, USABLE
8	393	3842.0-3852.0	10.0	10.3	USABLE
9	405	3988.0-3998.0	10.0	10.1	USABLE

TABLE V

MUD RECORD

<u>DATE</u> <u>1978</u>	<u>WEIGHT</u>	<u>VISCOSITY</u>		<u>YP</u>	<u>GELS</u> <u>(10 sec/10 min)</u>	<u>pH</u>
		<u>Sec</u>	<u>PV</u>			
6-01	8.5	33	10	2	0/1	9.0
6-02	8.5	31	8	0	1/1	9.0
6-05	8.5	34	9	1	1/1	9.0
6-06	8.6	42	14	0	1/1	9.5
6-07	8.6	48	21	1	1/1	9.0
6-08	8.6	38	13	1	1/2	9.0
6-09	8.7	38	13	1	1/2	9.0
6-14	8.4	43	16	22	2/3	8.5
6-15	8.4	40	14	23	2/3	9.0
6-16	8.4	38	13	20	2/3	9.0
6-20	8.4	42	16	22	1/2	9.0
6-22	8.4	41	15	22	2/3	9.0
6-23	8.4	41	15	22	2/3	9.0
6-24	8.4	41	15	22	2/2	9.0
6-25	8.4	31	9	8	0/1	9.0
6-30	8.4	40	14	23	2/3	9.0
7-07	8.4	38	13	20	2/3	9.0
7-10	8.4	58	18	27	2/3	9.0
7-11	8.5	46	16	23	2/2	9.0
7-12	8.5	41	15	23	1/2	9.0
7-13	8.4	44	15	22	2/3	9.0
7-14	8.5	60	19	30	2/3	9.0
7-19	8.5	62	20	30	3/3	9.0
7-25	8.5	61	23	46	3/4	9.0
7-26	8.5	61	20	42	2/3	9.0
7-27	8.6	45	20	1	1/1	9.0
8-01	8.5	45	16	25	0/1	8.5
8-02	8.6	43	15	22	1/2	8.5
8-08	8.4	49	17	26	1/1	8.5
8-09	8.4	41	15	23	1/2	8.5
8-10	8.4	44	15	22	1/2	8.5
8-11	8.4	36	11	15	1/1	8.5
8-15	8.4	41	15	23	1/2	8.5

TABLE V (continued)

MUD RECORD

DATE 1978	WEIGHT	VISCOSITY		YP	GELS (10 sec/10 min)	pH
		Sec	PV			
8-16	8.5	44	15	22	2/3	8.5
8-17	8.5	40	13	20	1/2	8.5
8-18	8.4	46	16	29	2/3	8.5
8-21	8.5	45	16	28	1/2	8.5
8-22	8.6	50	17	32	2/3	8.5
8-23	8.6	42	14	20	2/2	8.5
8-24	8.6	45	16	28	1/2	8.5
8-25	8.6	44	15	28	1/3	8.5
8-30	8.4	37	12	16	1/2	8.5
8-31	8.5	37	12	16	1/2	9.0
9-01	8.5	38	12	17	1/2	9.0
9-05	8.4	44	15	28	1/2	8.5
9-07	8.4	40	14	23	1/2	8.5
9-08	8.3	31	5	7	0/0	8.5
9-11	8.4	36	8	12	1/1	8.5
9-12	8.4	46	16	25	1/2	8.5
9-14	8.4	44	15	22	1/2	8.5
9-15	8.5	61	22	32	2/3	8.5
9-18	8.5	58	18	28	2/3	8.5
9-19	8.4	58	18	28	2/3	8.5
9-20	8.5	69	27	42	3/4	8.5
9-21	8.4	58	18	28	2/3	8.5
9-22	8.4	50	17	27	2/3	8.5
9-25	8.5	63	24	34	3/4	8.5
9-26	8.5	64	23	36	2/3	8.5
9-27	8.4	60	20	32	2/3	8.5
9-28	8.4	55	16	27	2/2	8.5
9-29	8.4	55	16	25	1/2	8.5
10-02	8.4	46	16	23	2/3	8.5
10-03	8.4	82	36	74	3/4	8.5
10-04	8.4	52	19	29	2/3	8.5
10-05	8.4	52	19	29	2/3	8.5

TABLE V (continued)

MUD RECORD

<u>DATE</u> <u>1978</u>	<u>WEIGHT</u>	<u>VISCOSITY</u>		<u>YP</u>	<u>GELS</u> <u>(10 sec/10 min)</u>	<u>pH</u>
		<u>Sec</u>	<u>PV</u>			
10-06	8.4	66	25	40	2/3	8.5
10-09	8.5	84	38	72	3/6	8.5
10-10	8.5	77	30	51	3/3	8.5
10-25	8.4	33	8	9	0/1	8.5
10-26	8.4	36	13	20	1/1	8.5
10-27	8.4	37	12	17	1/1	8.5
10-30	8.4	35	10	10	1/1	8.5
10-31	8.4	34	10	10	1/1	8.5
11-01	8.4	34	6	8	0/1	8.5
11-02	8.4	37	12	17	1/0	8.5
11-03	8.4	55	16	25	2/2	8.5
11-06	8.4	36	10	12	1/1	8.5
11-08	8.4	36	10	12	1/1	8.5
11-09	8.4	34	7	9	0/1	8.5
11-10	8.4	37	12	16	1/2	8.5
11-13	8.4	36	10	12	1/2	8.5
11-14	8.4	35	10	11	1/1	8.5
11-15	8.4	31	6	8	0/1	8.5
11-16	8.4	34	10	11	1/1	8.5
11-17	8.4	36	10	12	1/1	8.5
11-18	8.4	38	11	14	1/1	8.5
11-19	8.4	42	15	23	2/3	8.5
11-20	8.4	37	12	17	1/2	8.5
11-21	8.4	37	12	17	1/2	8.5
11-27	8.4	34	10	10	1/1	8.4
11-28	8.4	37	14	21	1/2	8.5
11-29	8.4	34	9	10	0/1	8.5
11-30	8.4	37	14	21	1/2	8.5

TABLE VI

SERVICE COMPANIES AND EQUIPMENT SUPPLIERS

Boyles Brothers Drilling Company, Spokane, Washington -

Core rig, water truck, and casing

Christensen Diamond Products, U.S.A., Salt Lake City, Utah -

Reamers and oriented coring

Drilling Fluid Specialists, Inc., El Segundo, California -

Mud products and services

D. V. Wyland and Company, Inc., Lake Oswego, Oregon -

Cable tool drill rig and casing

J. A. Jones Construction Services Company, Richland, Washington -

Site construction

Western Building Supply Company, Pasco, Washington -

Cement

TABLE VII
GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.			
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION
Hanford (Informal)	(0-?) Contact not identified		Glaciofluvial sediments
Ringold	(? - 617.0)		Clay, silt, sand, gravel, and conglomerate
Saddle Mountains Basalt	Elephant Mountain (617.0-	1st Flow Present (Top not (684.2)	617.0 - 623.0 Assumed basalt, drilled with churn drill
			623.0 - 654.0 Basalt, slightly altered; wide fracture spacing, aphanitic with microlites of plagioclase; vesicular and vuggy 15% to 2-3/8 in.
			654.0 - 684.2 Basalt, slightly altered; aphanitic
		Rattlesnake Ridge Mem- ber (Inter- bed) (684.2- 796.6)	684.2 - 689.2 Siltstone, buff, massive
			689.2 - 714.0 Volcanic sandstone; poor- ly indurated; green
			714.0 - 738.0 Conglomerate, moderately weathered cobbles and pebbles; green sand matrix
			738.0 - 741.7 Silty sandstone; varves of mudstone and sand- stone; crossbedding
			741.7 - 796.6 Conglomerate; well- sorted pebbles and cob- bles of basalt, chert, and granite
	Pomona (796.6 - 929.4)	One Flow (796.6 - 929.4)	796.6 - 807.0 Basalt, slightly altered, vesicular - 20%, close low angle fractures.
			807.0 - 825.7 Basalt; porphyritic with 1/16 in. plagioclase phenocrysts

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.				
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION	
Saddle Mountains Basalt			825.7 - 904.5	Basalt, porphyritic with 1/4-in. plagioclase phenocrysts
			904.5 - 929.4	Basalt, moderately altered, aphanitic, vesicular 30%, vugs 2-18 in.
		Selah Member (Interbed) (929.4 - 983.7)	929.4 - 933.5	Tuffaceous siltstone, bedding dipping 75-82 degrees from core axis. Micaceous
			933.5 - 983.7	Volcanic arenite, very well sorted sandstone. Approximately 34 feet of core were unrecovered from interval 933.5-983.7
	Esquatzel 983.7 - 1101.0	One Flow (983.7 - 1101.1)	983.7 - 1012.4	Basalt flow breccia, brown clay matrix
			1012.4 - 1053.3	Basalt, aphanitic, vesicular 8%
			1053.3 - 1073.7	Basalt, aphanitic, colonnade fractures
			1073.7 - 1101.0	Basalt, aphanitic, slightly vesicular
		Cold Creek Bed (Interbed) (1101.0 - 1169.7)	1101.0 - 1109.7	Well-sorted, grey volcanic sandstone
			1109.7 - 1122.1	Conglomerate with basalt cobbles and pebbles
			1122.1 - 1123.7	Green, well sorted basalt lithic arenite
			1123.7 - 1142.0	Conglomerate with basalt cobbles, lithic wacke matrix

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.				
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION	
Salle Mountains Basalt			1142.0 - 1169.7	Siltstone and siltstone breccia, green
	Umatilla (1169.7 - 1383.9)	2nd Flow (1169.7 - 1209.9)	1169.7 - 1175.5	Basalt flow breccia, highly altered green clay matrix
			1175.5 - 1209.9	Basalt, aphanitic, vesicular 2%, vugs to 2 in.
		1st Flow (1209.9 - 1383.9)	1209.9 - 1210.9	Basalt flow breccia, well indurated matrix of volcanic glass
			1210.8 - 1307.3	Basalt, slightly altered, aphanitic. Breccia zone from 1237.7 - 1238.8
			1307.3 - 1310.3	Basalt, breccia, splay fracture pattern, glass filled shear zone
			1310.3 - 1383.9	Basalt, aphanitic, colonnade fractures
		Mabton Member (Interbed) (1383.9 - 1515.0)	1383.9 - 1386.1	Tuffstone, lapilli
			1836.1 - 1400.6	Massive bedded green mudstone
			1400.6 - 1448.8	Volcanic sandstone, green, sorted
			1448.8 - 1515.0	Volcanic siltstone, highly altered ash
Wanapum Basalt	11 Flows Present (1515.0 - 2663.2)	11th Flow (1515.0 - 1678.4)	1515.0 - 1519.7	Basalt, moderately altered, red, aphanitic
			1519.7 - 1637.8	Basalt, coarsely phaneritic zones occurring at 1567.8 ft. to 1568.4 ft. and 1571.8 ft. to 1573.7 ft. Colonnade type fractures

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.			
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION
Wanapum Basalt			1637.8 - 1369.0 Basalt, flow unit breccia, green gouge matrix and clay
			1639.0 - 1676.5 Basalt, medium-grained phaneritic, colonnade
			1676.5 - 1678.4 Basalt rubble, moderately altered, breccia and rubble
		10th Flow (1678.4 - 1747.3)	1678.4 - 1678.8 Basalt flow breccia, highly altered
			1678.8 - 1684.3 Basalt, aphanitic, vesicular 30%
			1684.3 - 1700.3 Basalt, rubble, highly altered, vesicular 30%, aphanitic
			1700.6 - 1704.2 Basalt, medium phaneritic, vesicular - 5%
			1704.2 - 1747.3 Basalt, finely phaneritic, diktytaxitic
		9th Flow (1747.3 - 1916.4)	1747.3 - 1750.5 Basalt flow breccia; black volcanic glass matrix
			1750.5 - 1764.0 Basalt, moderately altered, porphyritic 1/8 in. plagioclase phenocrysts, vesicular - 10%
			1764.0 - 1805.0 Basalt, slightly altered, porphyritic, 3/8 in. laths and clots of plagioclase
			1805.0 - 1916.4 Basalt, medium phaneritic, porphyritic, 1/4 in. laths of plagioclase, colonnade

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.			
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION
Wanapum Basalt		8th Flow (1916.4 - 2100.1)	1916.4 - 1922.6 Basalt, poorly developed flow breccia, friable
			1922.6 - 1968.0 Basalt aphanitic, vesicular 10%
			1968.0 - 2025.0 Basalt, aphanitic, micro- vesicular 10%
			2025.0 - 2100.1 Basalt, aphanitic to finely phaneritic, colonnade
		7th Flow (2100.1 - 2201.8)	2100.1 - 2112.3 Basalt, flow breccia, red, clay matrix
			2112.3 - 2199.9 Basalt, aphanitic to finely phaneritic, micro- vesicular
			2199.9 - 2201.8 Basalt, black, moderately altered, vesicular and vuggy - 5% to 1-1/4 in.
		6th Flow (2201.8 - 2245.3)	2201.8 - 2205.3 Basalt flow breccia, matrix of green clay
			2205.3 - 2245.3 Basalt, aphanitic, vesicular 8%, entabla- ture type fractures
		5th Flow (2245.3 - 2285.5)	2245.3 - 2247.0 Basalt, highly altered, vesicular
			2247.0 - 2247.3 Saprolite - silt and clay, well indurated
			2247.3 - 2250.7 Basalt flow breccia, green matrix of clay, vesicular - high porosity and permeability
			2250.7 - 2285.5 Basalt, aphanitic with glomeroporphyritic clots of plagioclase, vesicular 30%

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.			
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION
		4th Flow (2285.5 - 2350.5	2285.5 - 2292.6 Basalt, flow breccia, poorly developed matrix of quartz and clay. Poor permeability and poro- sity
			2292.6 - 2350.5 Basalt, aphanitic, glomeroporphyrific clots of plagioclase, vesicular 10%
		3rd Flow (2350.5 - 2468.6	2350.5 - 2351.0 Basalt, flow breccia, poorly developed breccia, matrix of glass
			2351.0 - 2357.0 Basalt, altered vesicular zone, aphanitic
			2357.0 - 2361.7 Tuff, black, altered air fall tuff
			2361.7 - 2367.5 Basalt, moderately altered, finely phanerit- tic, vesicular
			2367.5 - 2373.7 Basalt, highly altered flow unit, breccia, vuggy matrix
			2373.7 - 2421.0 Basalt, finely phanerit- tic, vesicular 5%
			2421.0 - 2468.6 Basalt, aphanitic, "po- ker chip" fractures at 2444 - 2448 ft., glomer- oporphyrific clots of plagioclase, 3/8 in.
		2nd Flow (2468.6 - 2595.5	2468.6 - 2502.8 Basalt flow breccia, black, vesicular - 30%
			2502.8 - 2527.0 Basalt, aphanitic, vesi- cular - 10%, glomeropor- phyrific

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.			
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION
Wanapum Basalt		1st Flow (2595.5 - 2663.2)	2527.0 - 2595.5 Basalt, aphanitic, glomeroporphyritic, colonnade type fractures
			2595.5 - 2597.7 Basalt, moderately altered, poorly developed breccia, thin matrix of quartz
			2597.7 - 2599.2 Poorly indurated tuff or saprolite, black
			2599.2 - 2609.7 Basalt, slightly altered, medium phaneritic, vesic- ular - 10%
			2609.7 - 2648.8 Basalt, medium phaneritic, colonnade type fractures
			2648.8 - 2651.4 Basalt flow unit, moder- ately altered, vesicular - 5%, finely phaneritic, clay seam at 2650.2, 3/4 in.
			2651.4 - 2656.4 Basalt, aphanitic
			2656.4 - 2663.2 Basalt, aphanitic, moderately altered, vesic- ular - 10%, vugs to 1-1/4 in.
Grande Ronde Basalt	Upper 11 Penetrated (2676.0 - 3998.0) Base of for- mation not reached.	Vantage Mem- ber (Inter- bed) (2663.2 2767.0)	2663.2 - 2676.0 Sandstone, massive bedding with crossbeds, well sorted, shear paral- lel to core axis at 2668 ft. to 2670 ft., 0.3 ft. of displacement
		11th Flow (2676.0 - 2741.0)	2676.0 - 2677.7 Basalt, moderately altered, black, aphanitic, vesicular - 15%
			2677.7 - 2696.0 Basalt, aphanitic, diktytaxitic, vesicles and vugs to 3/8 in. 15%

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.			
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION
Grande Ronde Basalt			2696.0 - 2735.2 Basalt, aphanitic, diktytaxitic
			2735.2 - 2741.0 Basalt, aphanitic, vesicular 15%, vugs, to 5/8 in.
		10th Flow (2741.0 - 2795.5)	2741.0 - 2751.0 Basalt, thin flow breccia at 2739.3 ft. - red, aphanitic, vesicular and vuggy to 1-3/8 in. 10%
			2751.0 - 2795.5 Basalt, very close fracture spacing, aphanitic
		9th Flow (2795.5 - 2968.0)	2795.5 - 2813.8 Basalt flow breccia, poorly brecciated, vesicular 10%, poorly developed matrix
			2813.8 - 2877.0 Basalt, moderately altered, aphanitic, slightly vesicular 2%
			2877.0 - 2968.0 Basalt, aphanitic, poker chip fractures
		8th Flow (2968.0 - 3234.0)	2968.0 - 2981.1 Basalt flow breccia, quartz and clay matrix
			2981.0 - 2983.0 Basalt, slightly altered, black, aphanitic, vesicular - 20%
			2983.0 - 3234.0 Basalt, aphanitic, poker chip fracturing
		7th Flow (3234.0 - 3348.0)	3234.0 - 3242.0 Basalt flow breccia, poorly developed matrix of volcanic glass and clay
			3242.0 - 3244.7 Basalt flow breccia, green, well developed matrix of quartz and clay

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.				
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION	
Grande Ronde Basalt			3244.7 - 3252.0	Basalt, highly altered, black slightly brecciated
			3252.0 - 3302.0	Basalt, black, aphanitic, vesicular 8%
			3302.0 - 3348.0	Basalt, black aphanitic, poker chips
		6th Flow (3348.0 - 3389.5)	3348.0 - 3348.6	Basalt flow breccia, matrix of quartz and volcanic glass
			3348.6 - 3351.9	Basalt, black, aphanitic, vesicular 15%
			3351.9 - 3389.5	Basalt, black, finely phaneritic
		5th Flow (3389.5 - 3457.5)	3389.5 - 3390.7	Basalt flow breccia, black, quartz and volcanic matrix
			3390.7 - 3404.0	Basalt, black, finely phaneritic, vesicular 20%
			3404.0 - 2457.5	Basalt, black, finely phaneritic, vesicular 5%
		4th Flow (3457.5 - 3600.3)	3457.5 - 3463.9	Basalt flow breccia, black, clay and volcanic glass matrix
			3463.9 - 3523.0	Basalt, black, aphanitic, vesicular
			3523.0 - 3600.3	Basalt, black, aphanitic
	Low MgO	Umtanum 3rd Flow (3600.3 - 3805.0)	3600.3 - 3649.2	Basalt flow breccia, poorly developed breccia with a volcanic glass and quartz matrix
			3649.2 - 3805.0	Basalt, black, very aphanitic, "poker chip" fractures

TABLE VII (continued)

GEOLOGIC CORE LOG

DEPTH INTERVALS IN FT.				
FORMATION	MEMBER	INDIVIDUAL FLOW OR INTERBED	DESCRIPTION	
Grande Ronde Basalt	Low K_2O	2nd Flow (3805.0 - 3879.0)	3805.0 - 3824.9	Basalt flow breccia, black matrix of clay.
			3824.9 - 3879.0	Basalt, black, aphanitic, slightly vesicular.
	Low MgO	1st Flow (3879.0 - 3898.0) Base of flow not reached. Base of for- mation not reached	3879.0 - 3891.5	Basalt flow breccia, red, poorly developed breccia, vesicular - 30%.
			3891.5 - 3898.5	Basalt, highly altered, black aphanitic, vesi- cular - 10%.
			3898.5 - 3962.0	Basalt, massive, black, aphanitic, vesicular - 5%.
			3962.0 - 3998.0	Basalt, black, aphanitic, "poker chip" fractures.

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