CF 2473

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

April 5, 1993

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

Yates Petroleum Corporation
105 South Fourth Street
Artesia, NM 88210

Attention: Robert S. Fant

RE: ***Injection Pressure Increase West Loco Hills Unit Tract 1, Well No. 9 Waterflood Project Eddy County, New Mexico***

Dear Mr. Fant:

Reference is made to your request dated March 16, 1993 to increase the surface injection pressure on the above-referenced well. This request is based on a step rate tests conducted on this well on March 5, 1993. The results of the test have been reviewed by my staff and we feel an increase in injection pressure on this well is justified at this time.

You are therefore authorized to increase the surface injection pressure on the following well:

Well and Location	**Maximum Injection Surface Pressure**
WLHU Tract 1 Well No. 9 1980' FNL - 40' FWL Unit E, Section 7, Township 18 South, Range 30 East	1275 PSIG
The well is located in Eddy County, New Mexico.	

The Division Director may rescind this injection pressure increase if it becomes apparent that the injected water is not being confined to the injection zone or is endangering any fresh water aquifers.

Sincerely,

William J. LeMay
Director

WJL/BES/amg

cc: Oil Conservation Division - Artesia
File: Case No. 2473
D. Catanach

NO WAITING PERIOD

COMPANY: YATES PETROLEUM CORPORATION

ADDRESS: 105 SOUTH FOURTH STREET

CITY, STATE, ZIP: ARTESIA, NEW MEXICO 88210

ATTENTION: ROBERT S. FANT

Re: Injection Pressure Increase
WEST LOCO HILLS UNIT
TRACT 1, WELL NO. 9
EDDY County, New Mexico

Dear Sir:

Reference is made to your request dated MARCH 16, 1993, to increase the surface injection pressure on THE ABOVE REFERENCED WELL ~~this~~. This request is based on step rate tests conducted on ~~these~~ well ON MARCH 5, 1993. The results of the tests have been reviewed by my staff and we feel an increase in injection pressure on these wells is justified at this time.

You are therefore authorized to increase the surface injection pressure on the following wells:

Well & Location	Maximum Injection Surface Pressure
WLHU TRACT 1 WELL NO. 9 1980'FNL & 40'FWL "E" 7-18S-30E	1275 PSIG

The Division Director may rescind this injection pressure increase if it becomes apparent that the injected water is not being confined to the injection zone or is endangering any fresh water aquifers.

xc: ~~T. GALLEGOS~~ D. CATANACH FILE-CASE FILE OCD-ARTESIA

2473

Mike Williams - 3/16/93
This is my supporting data for the March 5, 1993 step rate test run on the WLHU 1-9. I believe the data indicates the true fracturing pressure to be 1325 psig. Please review and forward to Mr. Catanach. Call me at 748-1471 ext 185 if you have any questions.
Thanks
Bob Fant

March 16

State of New Mexico
Energy, Minerals and Natural Resources Department
Oil Conservation Division
Attention: David Catanach
P.O. Box 2088
Santa Fe, New Mexico 87504

Re: Request for Injection Pressure Increase, West Loco Hills Unit Tract 1 Well No. 9, Eddy County, New Mexico

Dear Mr. Catanach:

By this letter, Yates Petroleum Corporation is requesting that, based upon the step rate test conducted on the WLHU Tract 1 Well No. 9, Unit E, Section 7, Township 18 South, Range 30 East, Eddy County, New Mexico and the addition information submitted herein, the maximum surface injection pressure for this well be increased to at least 1300 psig.

The test was run by John West Engineering on March 5, 1993, and witnessed by Mr. John Robinson of the Artesia NMOCD Office. Mr. Robinson indicated the day of the test that at least one point on the step rate test needed to be below the current 560 psig surface pressure limitation. However, due to CO_2 gas in the tubing, the shut-in pressure on the well was 601 psig on the morning of the test after the well had been shut-in for 4 days. Analysis of the fall-off test conducted on the well during these 4 days indicates a static reservoir pressure of 368 psig at the surface. After filling the tubing, the test was begun.

The test was begun at an initial rate of 298 bwipd (as limited by the equipment on location). Flow rates below this range are not possible with the equipment of John West Engineering. The pressure at 15 minutes was 566.68 psig (corrected for friction). The next three points on the test show a gentle curve until a constant slope is obtained through points 5 through 8. Another constant slope is obtained through points 10 through 13, indicating a fracture pressure of 1325 psig. Although the pressure for the first rate is slightly above the desired limit of 560 psig and the first 4 points do not show a straight line, I believe the data presented below will clearly demonstrate that the fracture pressure for this well is 1325 psig.

The high pressure during the initial rate is simply due to the inability of the equipment to inject at lower rates and to the presence of CO_2 in the wellbore. CO_2 injection had been ceased only 5 days prior to the shut-in period preceding the step rate test. As a result, some CO_2 (+/- 800 feet of gaseous CO_2) entered the wellbore during the shut-in period. This volume of CO_2 was not displaced from the wellbore until the end of the second rate period. This clearly indicates that there was some CO_2 in the reservoir near the wellbore. As the test proceeded, the CO_2 in and near the wellbore was displaced further into the reservoir. Since CO_2 reduces the relative permeability to water, as the CO_2 was displaced further into the reservoir, the injectivity to water increased. As the CO_2 was displaced further into the reservoir, the incremental injectivity increases became insignificant after the fourth point. This accounts for the increase in injectivity in the first four points of the test. Analysis of the remaining portion of the step rate test clearly shows a fracture pressure of 1325 psig.

Due to a miscommunication, there was a time period in late 1992 when the pressure limit was mistakenly believed to be 1140 psig. When the error was discovered, the situation was immediately corrected. However, important data was gathered during this time. Water injection was almost constant for the first 75 days of injection. Cold weather caused erratic injection for the next 2-3 weeks after which, CO_2 injection was commenced. I have constructed a "Hall Plot" for the first 75 days of injection. The "Hall Plot" is a plot of cumulative injection (on the x-axis) versus the summation of (delta p)*(delta t). Where delta p is the injection pressure above static pressure and delta t is the specific time interval for which delta p is applicable. Mathematically, the slope of this line is inversely proportional to the injectivity of the well. Consequently, if the injectivity is constant, the plot should exhibit a straight line. Early time data (days 1-7) do not exhibit a straight line due to transient effects. There is a hump in the data at a cumulative injection of about 8500 bbl's due to a pressure fall-off test being run. The rest of the data indicates that there is little variance in the slope of the plot indicating that injectivity is not increasing and consequently, the well is not being fractured. This indicates that no fracturing was occurring during the time when a maximum pressure of 1140 psig was utilized.

A "Hall Plot" can also be constructed for a theoretical low compressibility system injecting water. Exhibit 3 shows two curves. The solid curve is the "Hall Plot" for this theoretical system (the parameters used for the theoretical model were taken from the October fall-off test analysis) while the dashed curve is for the WLHU 1-9 during the first 75 days of injection. There is a discrepancy in some of the early data, but the late time data is almost a perfect match. A theoretical model can also be constructed to examine the effect of continuously increasing the fracture length in a well. Exhibit 4 shows two curves. The solid curve is for a well injecting above fracture pressure and extending the fracture length at a rate of 1 foot per day. The dashed curve is again the "Hall Plot" for the WLHU 1-9. Review of these curves clearly indicates that no fracturing occurred in the WLHU 1-9.

Pressure fall-off tests were run in mid October 1992 and early March 1993. The October test was run after injecting at 1140 psig while the March test was run after injecting at 560 psig. Analysis results of both tests are shown below:

	October 1992	March 1993
Max Wellhead Injection Pressure	1140 psig	560 psig
Permeability to Water	14.6 md	14.4 md
Skin Factor	-1.78	-1.60

Calculated permeability is virtually identical and in both cased the skin is slightly negative. This negative skin is due to the hydraulic fracture treatment performed during completion of the well. Linear flow would be attributable to large fractures and neither test exhibited significant linear flow. These test results indicate that no fracturing occurs at 560 or 1140 psig.

The final evidence submitted is well logs on the WLHU 1-9. Exhibits 5 through 7 are portions of the resistivity, porosity, and cement bond logs respectively. The resistivity and porosity logs indicate that there are no porous or permeable zones within 150' of the top of the pay interval (2784'-2824'). The cement bond log indicates excellent bond across the pay zone and up the hole.

Exhibits 8 through 10 are injection profile/channel check logs run after completion (September 1992), the first water cycle (December 1992), and the first CO_2 cycle (February 1993). These logs indicate that fluid is entering the formation through the perf's and dispersing from a top of 2776' to a bottom of 2831'. Surface injection pressures were as high as 1240 psig. These measurements are within 8 feet of the pay interval and the porosity logs show that this portion is essentially zero porosity. This extra interval is most likely due to some small fracture height growth during the fracture stimulation treatment performed during completion. It should be noted that the final survey shows neither an upward nor downward channelling of fluid.

In summary, the following points have been demonstrated:

1. Static surface pressure at the end of shut-in period was 370 psig from the fall-off test.
2. The step rate test is slightly curved in the initial points due to changing permeability to water as a result of decreasing CO_2 saturations near the wellbore.
3. Analysis of the higher pressure region of the step rate indicates fracturing occurs 1325 psig surface injection pressure.
4. Analysis of the "Hall Plot" for the WLHU 1-9 while injection at a maximum surface injection pressure of 1140 indicates no fracturing.
5. Analyses of pressure transient tests performed after injecting at 560 and 1140 psig yield almost identical results and show no evidence of large fractures.
6. Profile logs show no channeling up or down with surface injection pressures as high as 1240 psig.

Consequently, fracturing is not occurring at surface injection pressures below at least 1240 psig and based upon the March 5, 1993, step rate test, fracturing occurs at a surface pressure of 1325 psig.

On the basis of this, Yates Petroleum Corporation requests that the maximum surface injection pressure for the West Loco Hills Unit Tract 1 Well No. 9 be increased to at least 1300 psig.

If you have any question regarding my analysis or data, please contact me at (505) 748-1471 extension 185.

Robert S. Fant
Engineer

RSF/rsf

JOHN WEST ENGINEERING COMPANY

Hobbs, New Mexico

STEP RATE INJECTION TEST

DATE: March 5, 1993

CLIENT: Yates Petroleum Corporation

WO#: 93-14-0349

WELL NAME: West Loco Hills Unit Well No. 1-9
Eddy County, New Mexico

MID-PERFS. =

PACKER DEPTH =

BHP GAUGE DEPTH = 2800

STEP NO. & REMARKS	TIME	(1) SURFACE TUBING PRESS. (psig)	(2) CUMMULATIVE VOL. INJECTED (bbls)	(3) INJECTION RATE (bbls/day)	(4) FRICTION HEAD LOSS (psi)	(5) CORRECTED TUBING PRESS. (psi) (1)-(4)	(6) INJECTION RATE (gpm) (3)/34.2857	(7) MEASURED BHP (psi)
	9:55	528.6		316.8	2.880	525.7	9.24	
	10:00	551.4	1.0	288.0	2.415	549.0	8.40	
	10:05	559.0	2.1	316.8	2.880	556.1	9.24	
1	10:10	569.2	3.1	288.0	2.415	566.8	8.40	
				297.6				
	10:15	655.2	4.5	403.2	4.500	650.7	11.76	
	10:20	670.4	6.0	432.0	5.113	665.3	12.60	
2	10:25	689.4	7.4	403.2	4.500	684.9	11.76	
				412.8				
	10:30	775.4	9.3	547.2	7.917	767.5	15.96	
	10:35	802.0	11.2	547.2	7.917	794.1	15.96	
3	10:40	803.3	13.1	547.2	7.917	795.4	15.96	
				547.2				
	10:45	895.6	15.6	720.0	13.154	882.4	21.00	
	10:50	917.2	18.1	720.0	13.154	904.0	21.00	
4	10:55	919.8	20.6	720.0	13.154	906.6	21.00	
				720.0				
	11:00	1004.5	23.8	921.6	20.769	983.7	26.88	
	11:05	1033.7	27.0	921.6	20.769	1012.9	26.88	
5	11:10	1038.8	30.2	921.6	20.769	1018.0	26.88	
				921.6				
	11:15	1128.7	34.3	1180.8	32.850	1095.9	34.44	
	11:20	1145.2	38.2	1123.2	29.947	1115.3	32.76	
6	11:25	1155.3	42.2	1152.0	31.383	1123.9	33.60	
				1152.0				
	11:30	1211.0	46.8	1324.8	40.643	1170.4	38.64	
	11:35	1224.9	51.4	1324.8	40.643	1184.3	38.64	
7	11:40	1242.6	56.0	1324.8	40.643	1202.0	38.64	
				1324.8				

Exhibit 1

Hall Plot WLHU CO2 Pilot

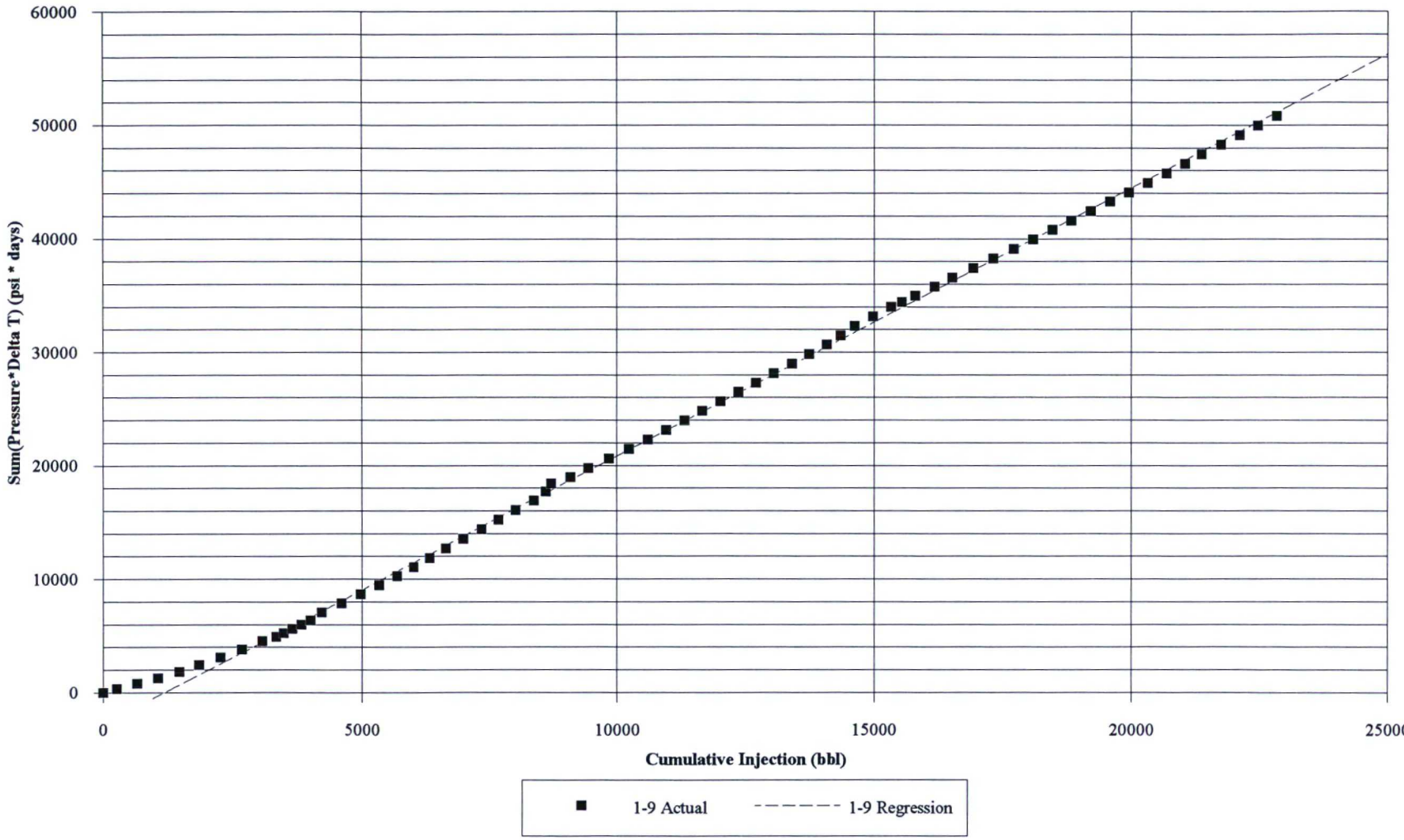


Exhibit 2

Ideal Transient System vs Actual Field Data

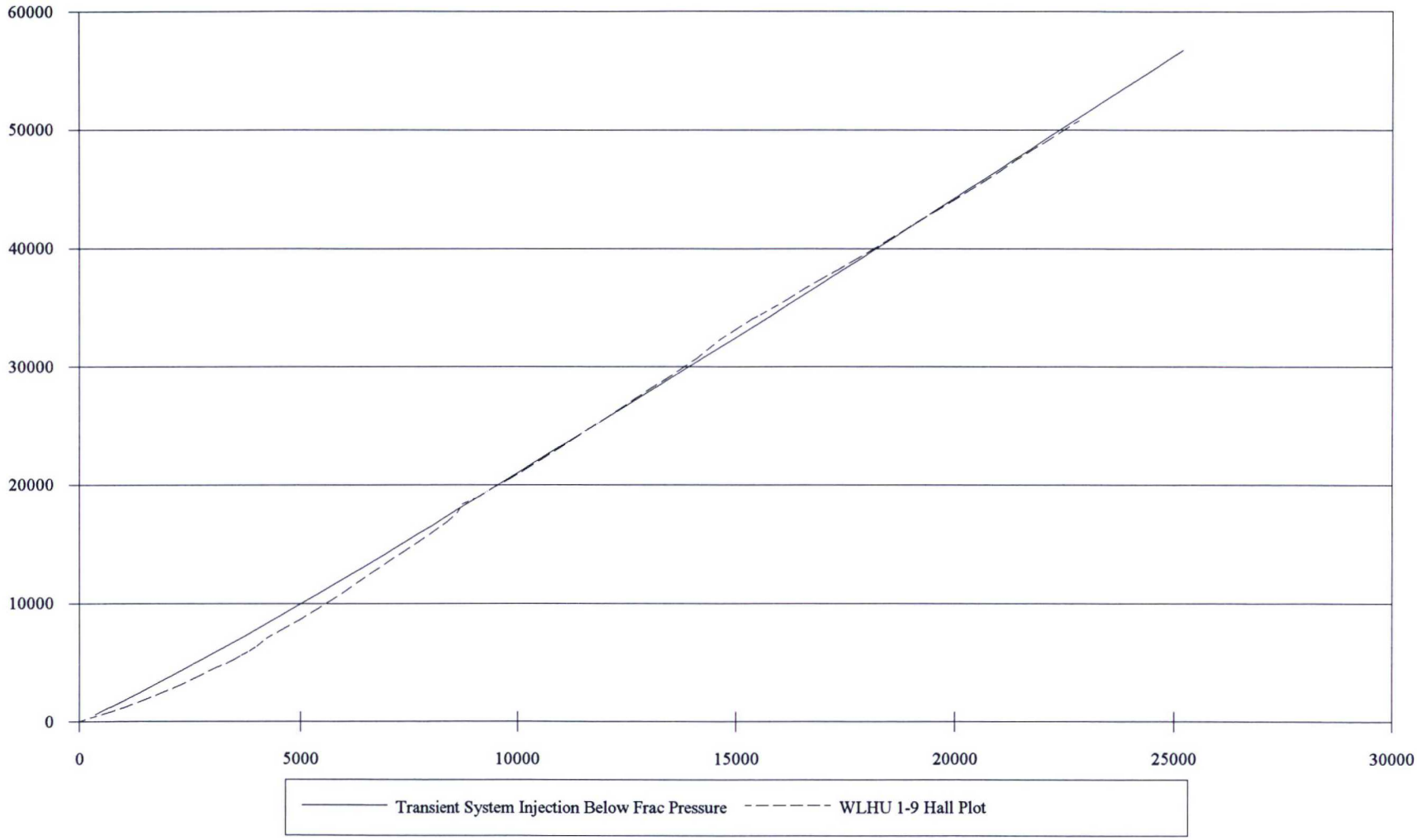


Exhibit 3

Hall Plot for System Injection Above Frac Pressure (75 Days)

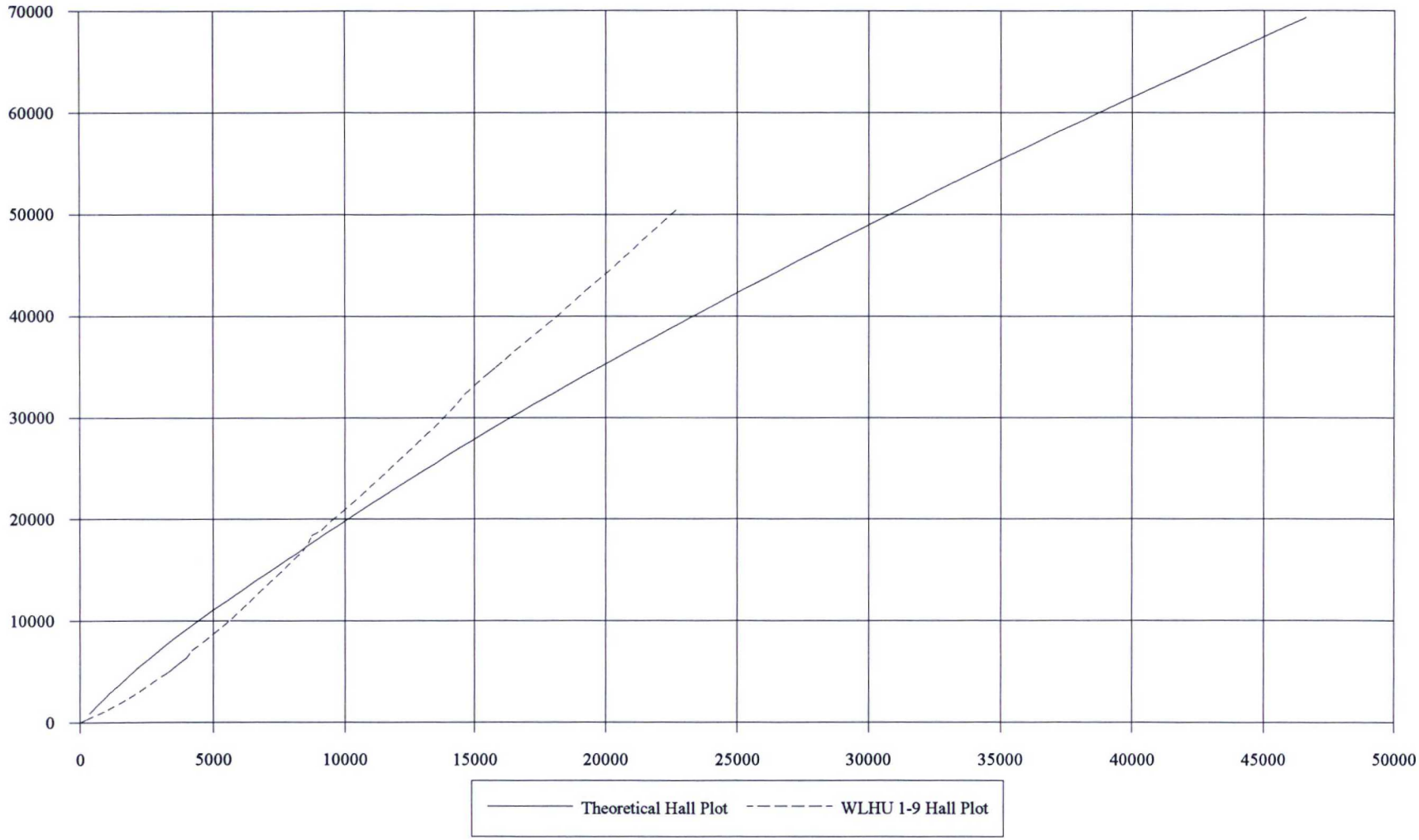


Exhibit 4

COMPANY: **YATES PETROLEUM**

WELL: **WEST LOCO HILLS UNIT #1-9**

FIELD: **WEST LOCO HILLS**

COUNTY: **EDDY** STATE: **NEW MEXICO**

COUNTY: EDDY
Field: WEST LOCO HILLS
Location: 1980 FNL & 40 FWL
Well: WEST LOCO HILLS UNIT #1-9
Company: YATES PETROLEUM

Schlumberger

DUAL LATEROLOG
MICRO SFL

LOCATION

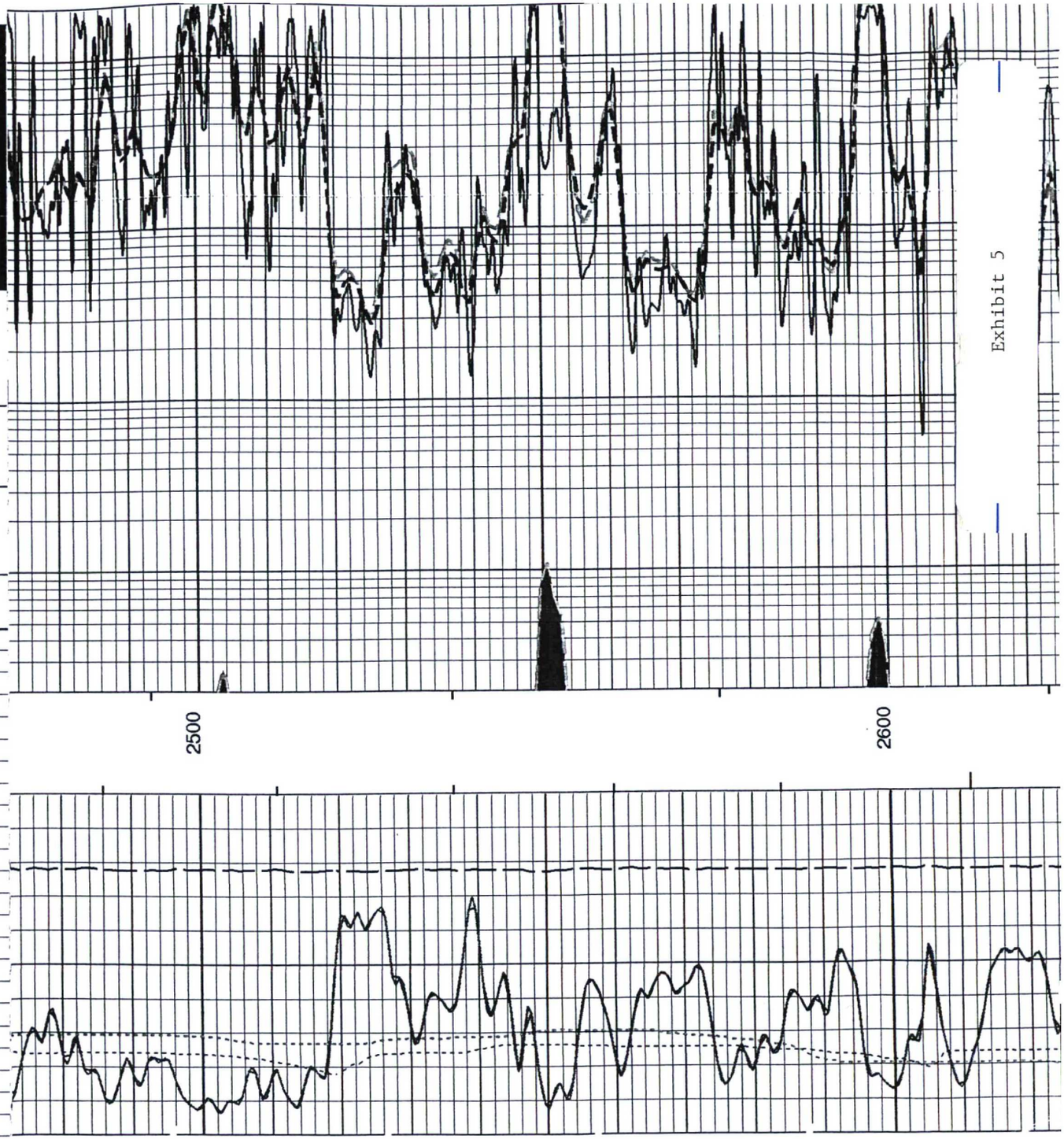
1980 FNL & 40 FWL
SEC 7 18S 30E

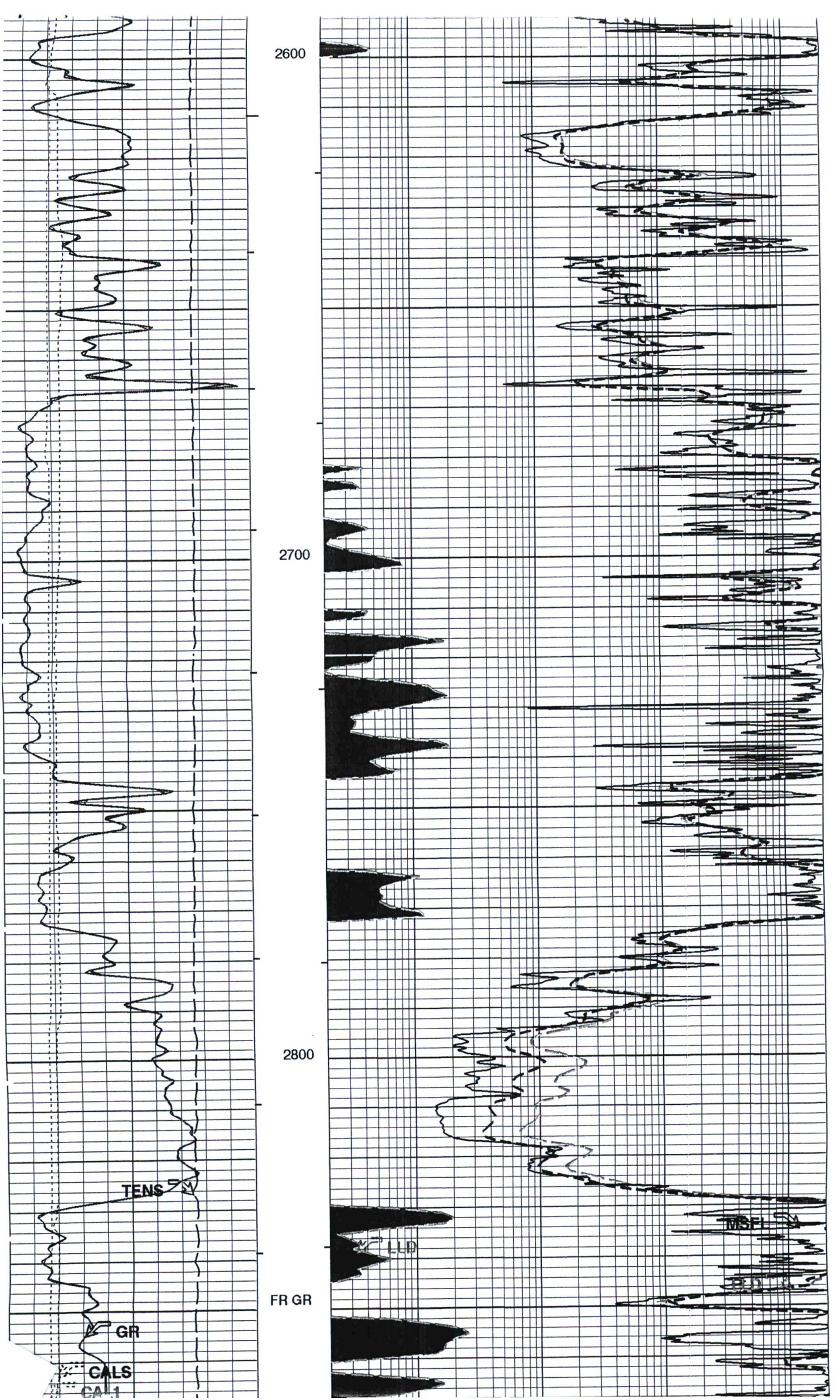
Elev.: K.B. 3537 F
G.L. 3529 F
D.F. 3536 F

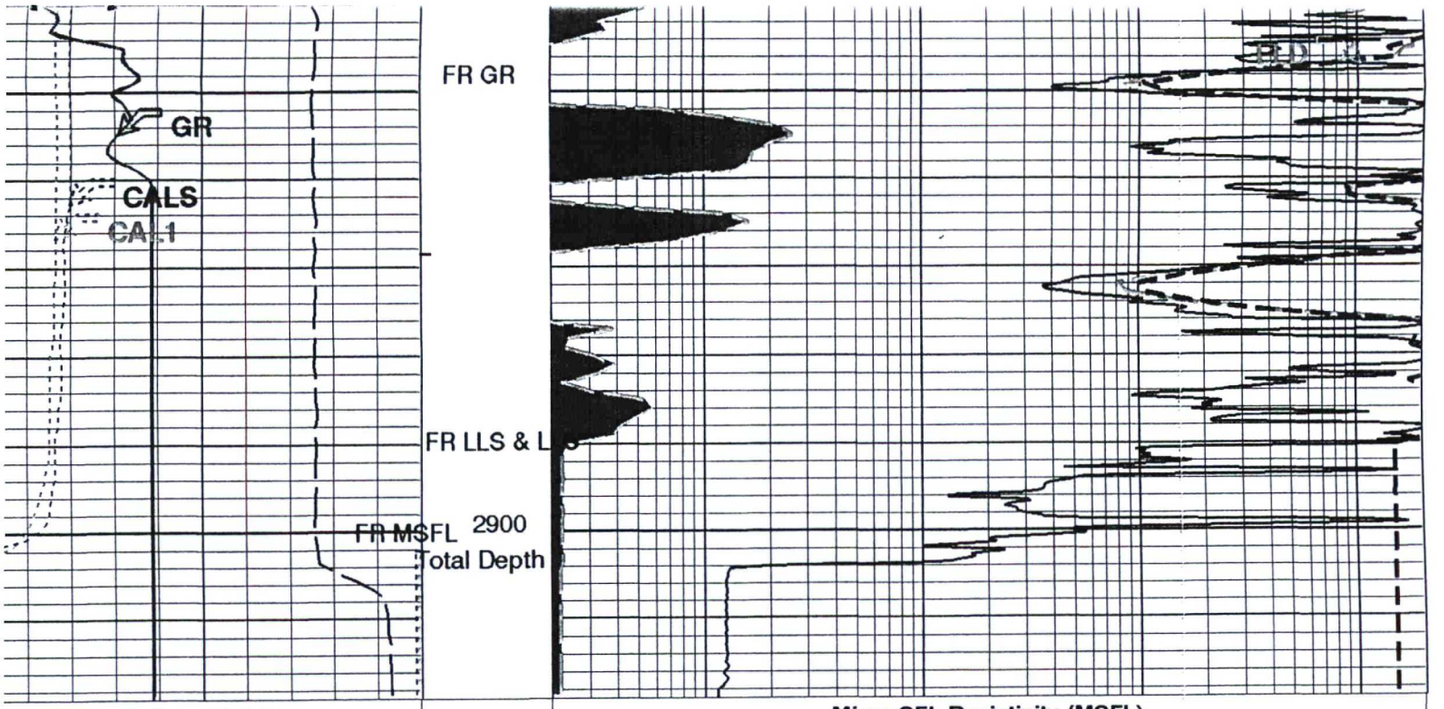
Permanent Datum: GROUND LEVEL — Elev.: 3529 F
Log Measured From: KB — 8.0 F above Perm. Datum
Drilling Measured From: KB

API Serial No.	SECTION	TOWNSHIP	RANGE
NA	7	18S	30E

Logging Date		19-JULY-1992					
Run Number		1					
Depth Driller		2900 F					
Schlumberger Depth		2904 F					
Bottom Log Interval		2901 F					
Top Log Interval		200 F					
Casing Driller Size @ Depth		8.625 IN	@	385 F		@	
Casing Schlumberger		390 F					
Bit Size		7.875 IN					
Type Fluid In Hole		BRINE					
MUD Density	Viscosity	10 LB/G	28 S				
MUD Fluid Loss	PH		8				
Source Of Sample		PIT					
RM @ Measured Temperature		0.051 OHMM	@	76 DEGF		@	
RMF @ Measured Temperature		0.038 OHMM	@	75 DEGF		@	
RMC @ Measured Temperature			@			@	
Source RMF	RMC	CALC					
RM @ BHT	RMF @ BHT	0.043 @ 91	0.031	@ 91	@		@
Maximum Recorded BHT		90 DEGF	91	91			
Circulation Stopped	Time	19-JUL-1992					
Logger On Bottom	Time	19-JULY-1992					
Unit Number	Location	2030	HOBBS				
Recorded By		BILL BILLINGSLEY					
Witnessed By		BRENT MAY					




2600
2700
2800
TENS
GR
CALS
CAL
LLD
MSFL
FR GR



Caliper (CALS)
.0 (IN) 16.0

Primary Caliper (CAL1)
.0 (IN) 16.0

Gamma Ray (GR)
.0 (GAPI) 100.0

Gamma Ray 1 (GR)
00.0 (GAPI) 200.0

Tension (TENS)
0000.0 (LBF) 0.0

GAMMA RAY BACKUP
From T1 to GR1

Micro SFL Resistivity (MSFL)
0.2 (OHMM) 2000.0

Laterolog Deep Resistivity (LLD)
0.2 (OHMM) 2000.0

Laterolog Shallow Resistivity (LLS)
0.2 (OHMM) 2000.0

Laterolog Deep Resistivity (LLD)
2000.0 (OHMM) 200000.0

LLD BACKUP
From T2 to LLD_7

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10.0 F3
- Integrated Hole Volume Major Pip Every 100.0 F3
- Integrated Cement Volume Minor Pip Every 10.0 F3
- Integrated Cement Volume Major Pip Every 100.0 F3

Time Mark Every 60.0 S

ormat: DSTE5 Vertical Scale: 5.0" per 100.0' Graphics File Created: 19-JUL-1992 22:08

OP System Version: 5B0-325

Output DLIS Files

DEFAULT	DSTE .008	FIELD	19-JUL-1992 22:08		

Output DLIS Files

DEFAULT	DSTE .007	FIELD	19-JUL-1992 21:50	2919.0 FT	2692.0 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 71.19 F3
Cement Volume = 36.79 F3 (assuming 5.50 IN casing O.D.)
Computed from 2900.0 FT to 2692.0 FT using data channel(s) CAL1 CALS

OP System Version: 5B0-325

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10.0 F3
- Integrated Hole Volume Major Pip Every 100.0 F3
- Integrated Cement Volume Minor Pip Every 10.0 F3
- Integrated Cement Volume Major Pip Every 100.0 F3

Time Mark Every 60.0 S

GAMMA RAY BACKUP
From T1 to GR1

Tension (TENS)
(LBF) 0.0

LLD BACKUP
From T2 to LLD_7

REPEAT SECTION

COMPANY: **YATES PETROLEUM**

WELL: **WEST LOCO HILLS UNIT #1-9**

FIELD: **WEST LOCO HILLS**

COUNTY: **EDDY** STATE: **NEW MEXICO**

COUNTY: EDDY
Field: WEST LOCO HILLS
Location: 1980 FNL & 40 FWL
Well: WEST LOCO HILLS UNIT #1-9
Company: YATES PETROLEUM

Schlumberger

COMPENSATED NEUTRON
LITHO-DENSITY

LOCATION

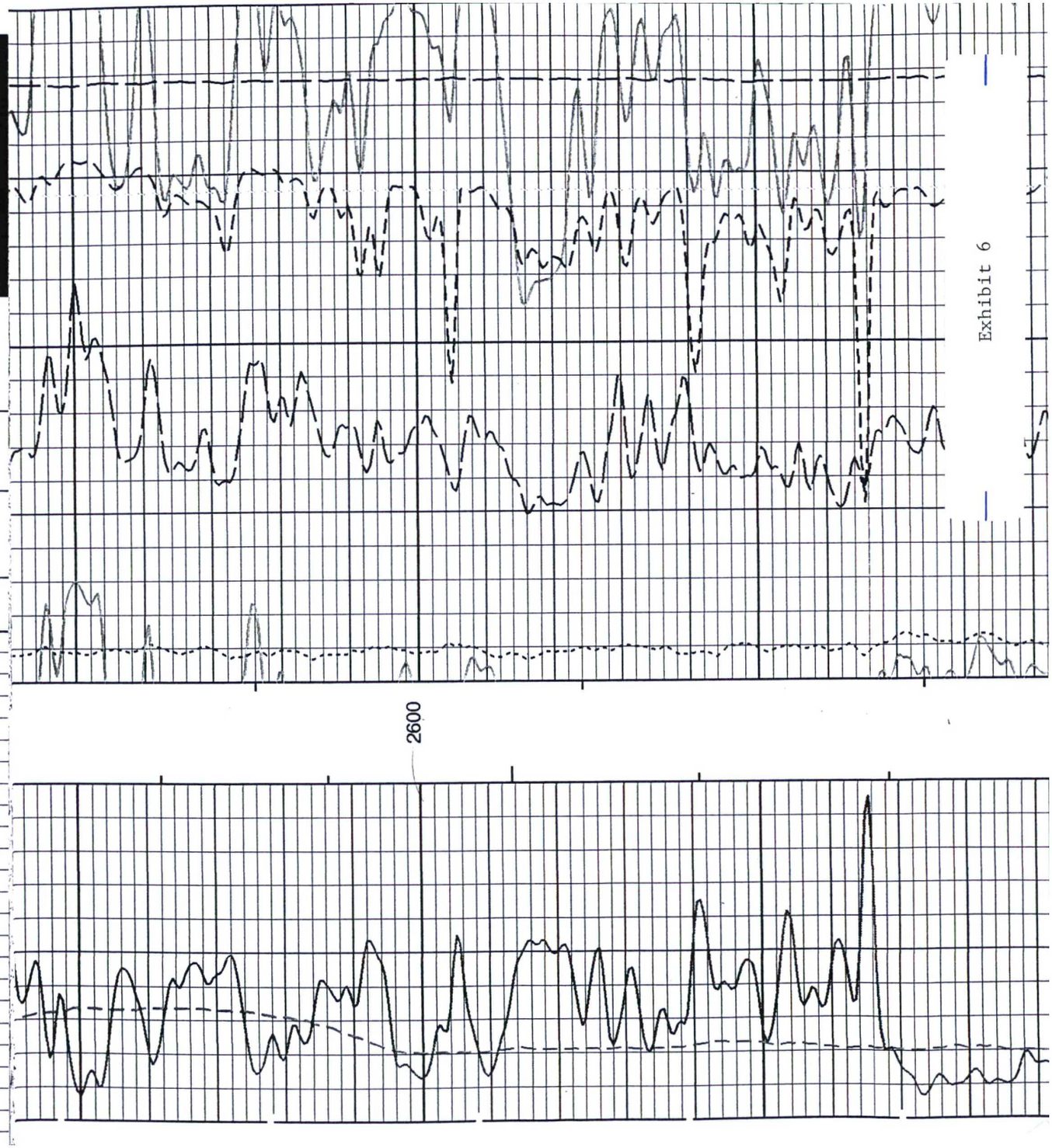
1980 FNL & 40 FWL
SEC 7 18S 30E

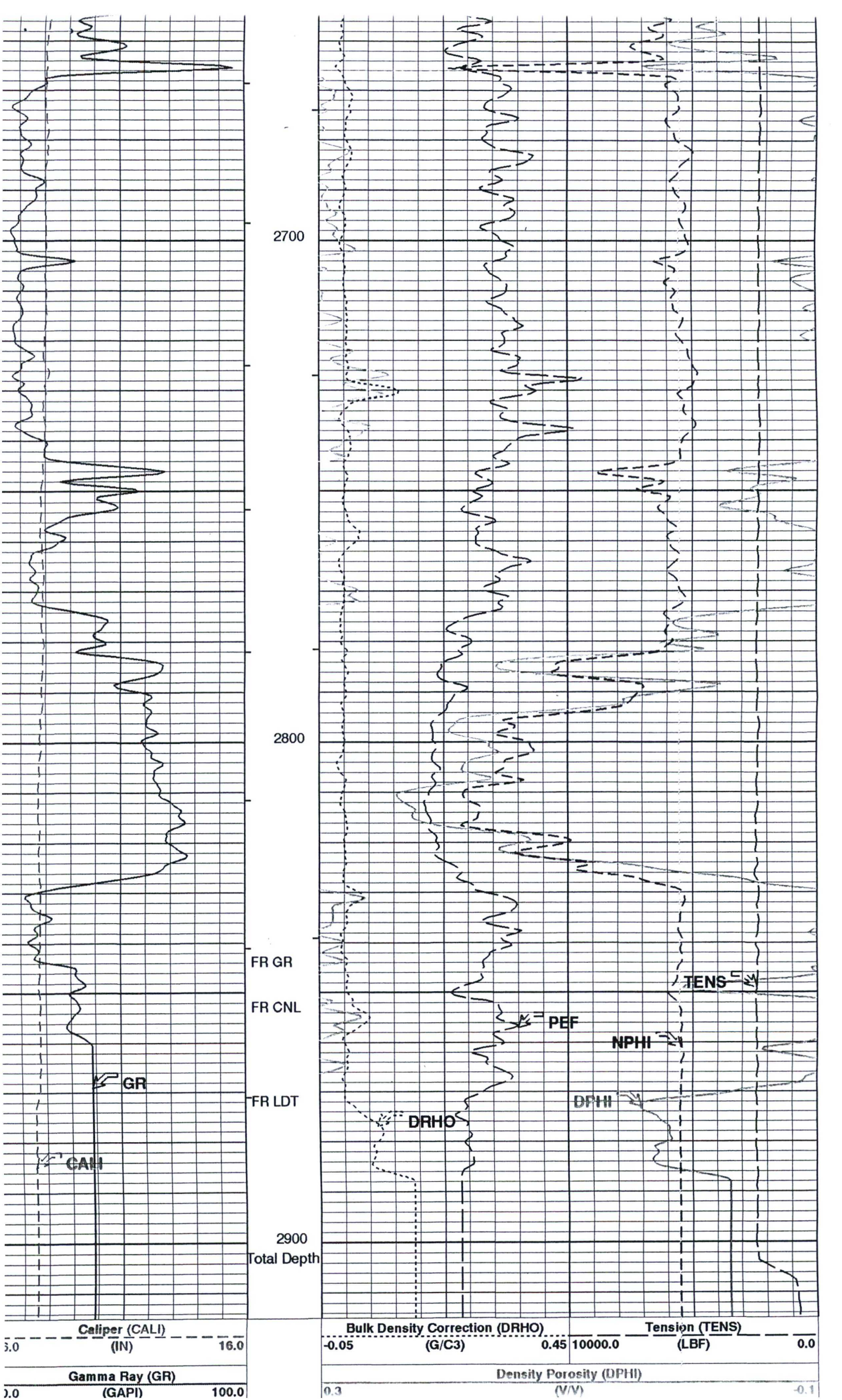
Elev.: K.B. 3537 F
G.L. 3529 F
D.F. 3536 F

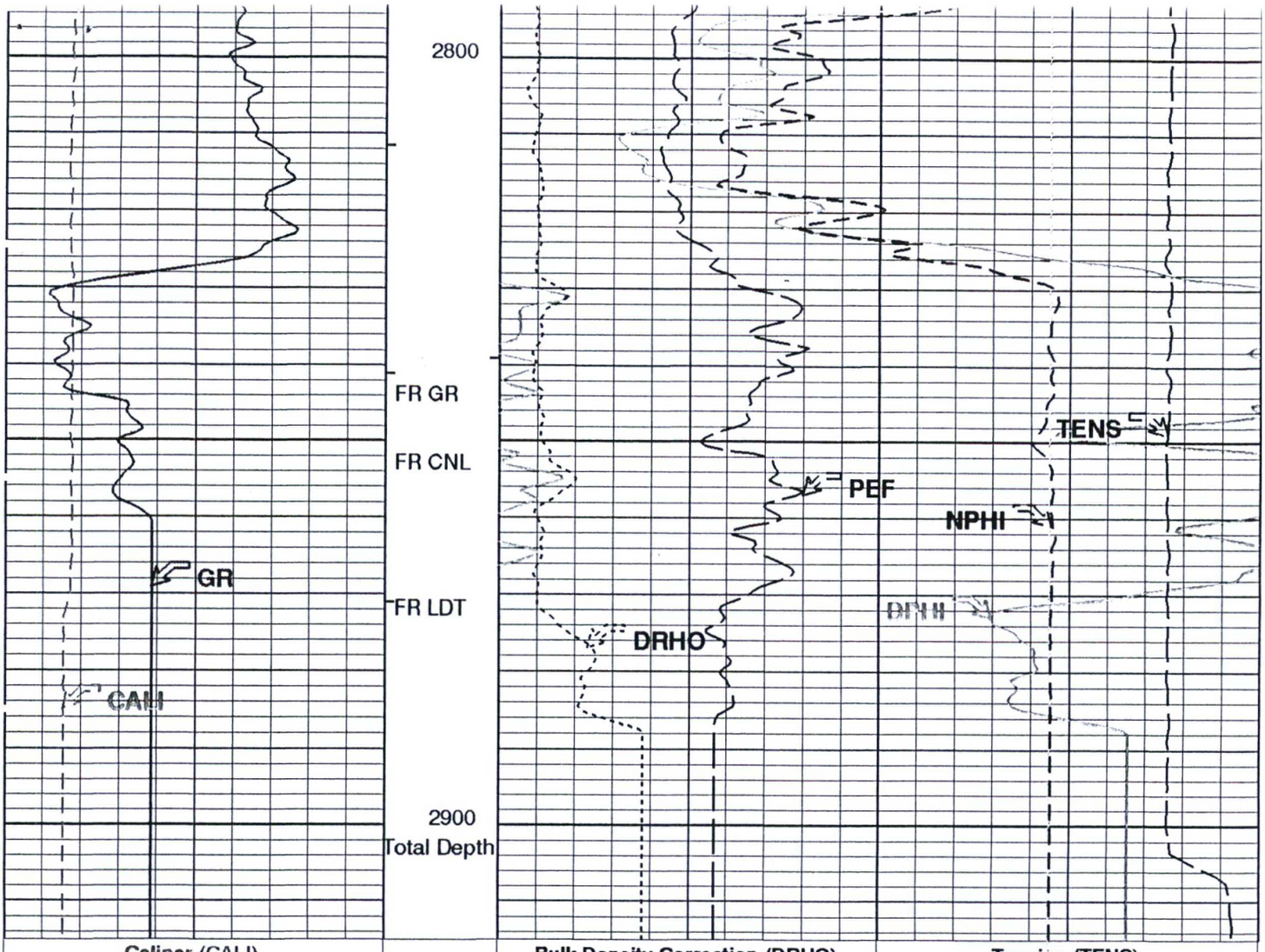
Permanent Datum: GROUND LEVEL Elev.: 3529 F
Log Measured From: KB 8.0 F above Perm. Datum
Drilling Measured From: KB

API Serial No.	SECTION	TOWNSHIP	RANGE
NA	7	18S	30E

Logging Date			19-JULY-1992					
Run Number			1					
Depth Driller			2900 F					
Schlumberger Depth			2904 F					
Bottom Log Interval			2901 F					
Top Log Interval			200 F					
Casing Driller Size @ Depth			8.625 IN	@	385 F		@	
Casing Schlumberger			390 F					
Bit Size			7.875 IN					
Type Fluid In Hole			BRINE					
MUD	Density	Viscosity	10 LB/G	28 S				
	Fluid Loss	PH		8				
	Source Of Sample		PIT					
RM @ Measured Temperature			0.051 OHMM	@	76 DEGF		@	
RMF @ Measured Temperature			0.038 OHMM	@	75 DEGF		@	
RMC @ Measured Temperature				@			@	
Source RMF	RMC		CALC					
RM @ BHT	RMF @ BHT		0.043 @ 91	0.031	@ 91	@		@
Maximum Recorded BHT			90 DEGF	91	91			
Circulation Stopped	Time		19-JUL-1992					
Logger On Bottom	Time		19-JULY-1992					
Unit Number	Location		2030	HOBBS				
Recorded By			BILL BILLINGSLEY					
Witnessed By			BRENT MAY					




2700
2800
FR GR
FR CNL
FR LDT
2900
Total Depth
GR
CALI
DRHO
PEF
NPHI
DPHI
TENS
Caliper (CALI)
(IN)
16.0
Gamma Ray (GR)
(GAPI)
100.0
Bulk Density Correction (DRHO)
-0.05
(G/C3)
0.45
Tension (TENS)
10000.0
(LBF)
0.0
Density Porosity (DPHI)
0.3
(V/V)



Caliper (CALI)		
6.0	(IN)	16.0
Gamma Ray (GR)		
0.0	(GAPI)	100.0
Gamma Ray 1 (GR)		
100.0	(GAPI)	200.0
GAMMA RAY BACKUP From T1 to GR1		

Bulk Density Correction (DRHO)		
-0.05	(G/C3)	0.45
Density Porosity (DPHI)		
0.3	(V/V)	-0.1
Neutron Porosity (NPHI)		
0.3	(V/V)	-0.1
PhotoElectric Factor (PEF)		
0.0	(----)	10.0

Tension (TENS)		
10000.0	(LBF)	0.0

PIP SUMMARY

- Integrated Hole Volume Minor Pip Every 10.0 F3
- Integrated Hole Volume Major Pip Every 100.0 F3
- Integrated Cement Volume Minor Pip Every 10.0 F3
- Integrated Cement Volume Major Pip Every 100.0 F3

Time Mark Every 60.0 S

Format: PORO5 **Vertical Scale: 5.0" per 100.0'** **Graphics File Created: 20-JUL-1992 00:11**

OP System Version: 5B0-325

Input DLIS Files

DEFAULT	DSTE .008	FIELD	19-JUL-1992 22:08	2919.0 FT	200.0 FT

Output DLIS Files

DEFAULT	DSTE .011	FIELD	20-JUL-1992 00:11

Output DLIS Files

DEFAULT	DSTE .007	FIELD	19-JUL-1992 21:50	2919.0 FT	2692.0 FT

Integrated Hole/Cement Volume Summary

Hole Volume = 71.19 F3

Cement Volume = 36.79 F3 (assuming 5.50 IN casing O.D.)

Computed from 2900.0 FT to 2692.0 FT using data channel(s) CAL1 CALS

OP System Version: 5B0-325

PIP SUMMARY

FINAL PRINT
Schlumberger

CEMENT BOND VARIABLE DENSITY LOG

COMPANY YATES PETROLEUM

WELL WEST LOCO HILLS UNIT #1-9

FIELD WEST LOCO HILLS

COUNTY EDDY **STATE** NEW MEXICO

LOCATION: 1980' FNL & 40' FWL

Other Services: NONE

API SERIAL NO.	SECT.	TWP.	RANGE
N/A	7	18-S	30-E

Permanent Datum	GROUND LEVEL	Elev.	3529.0 F	Elev.: K.B.3537.0 F
Log Measured From	KELLY BUSHING	8.0 F	above Perm. Datum	D.F.3536.0 F
Drilling Measured From	KELLY BUSHING			G.L.3529.0 F

Date	04-AUG-1992				
Run No.	ONE				
Depth Driller	2850.0 F				
Depth Logger (Schl.)	2848.0 F				
Btm. Log Interval	2837.0 F				
Top Log Interval	385.0 F				
Type Fluid in Hole	2% KCL WATER				
Salinity NaCl	—				
Density	8.50 LB/G				
Fluid Level	8.0 F				
Max. Rec. Temp.	—				
Deviation	—				
Logger on Bottom	1430 8/4				
Equip. Location	8382	HOBBS			
Recorded By	DONOVAN				
Witnessed By	MR. DODSON				

BOREHOLE RECORD

Bit Size	7 7/8"	—		
Depth	2900.0 F	—		

CASING & TUBING RECORD

Size	5 1/2"	8 5/8"		
Weight	—	—		
Casing Top-Driller	8.0 F	8.0 F		
Casing Top-Logger	8.0 F	8.0 F		
Casing Shoe-Driller	2900.0 F	385.0 F		
Casing-Logger	—	—		

COMPANY YATES PETROLEUM
WELL WEST LOCO HILLS UNIT #1-9
LOCATION 1980 FNL & 40 FWL
FIELD WEST LOCO HILLS
COUNTY EDDY

The well name, location and borehole reference data were furnished by the customer.

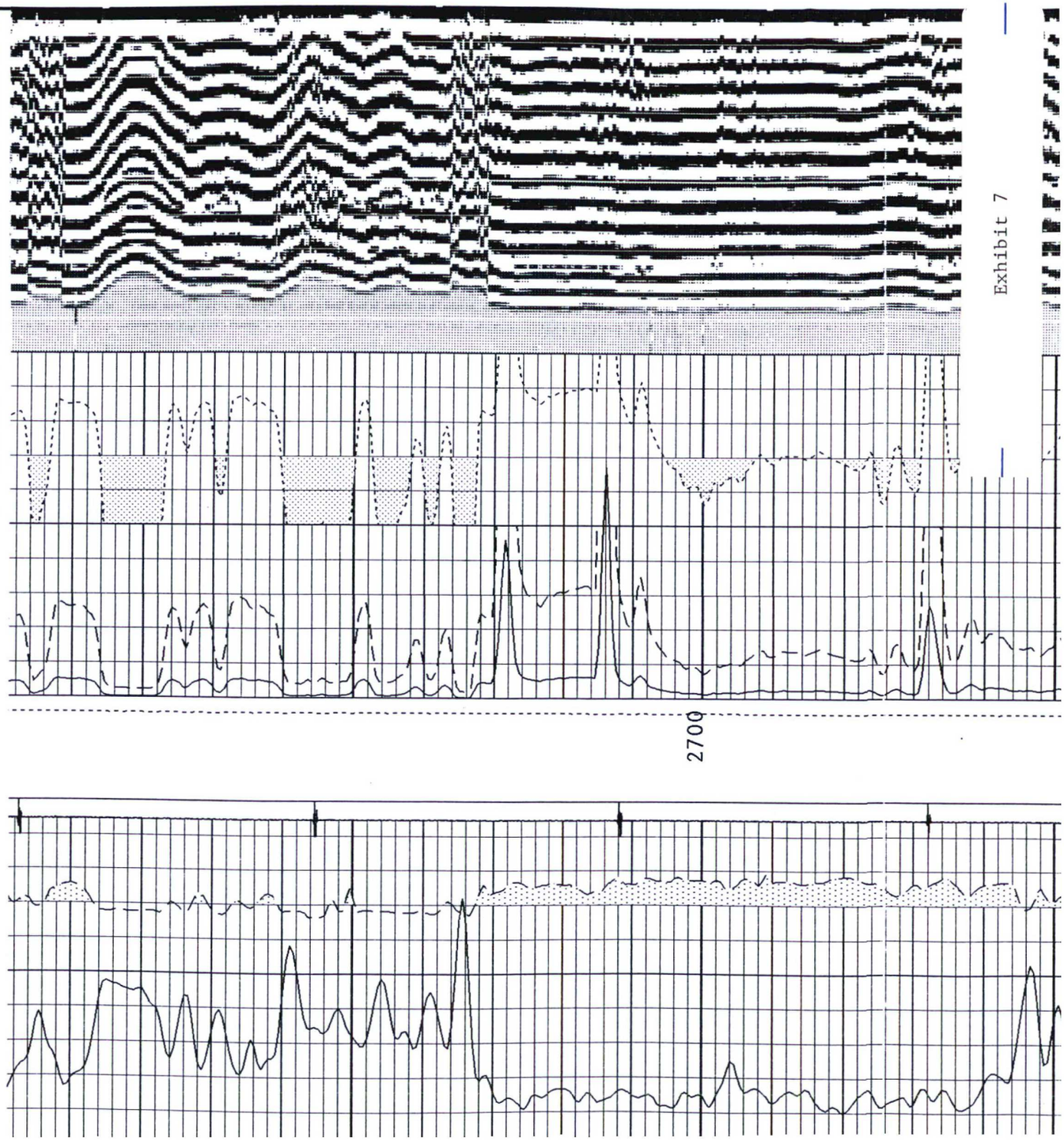
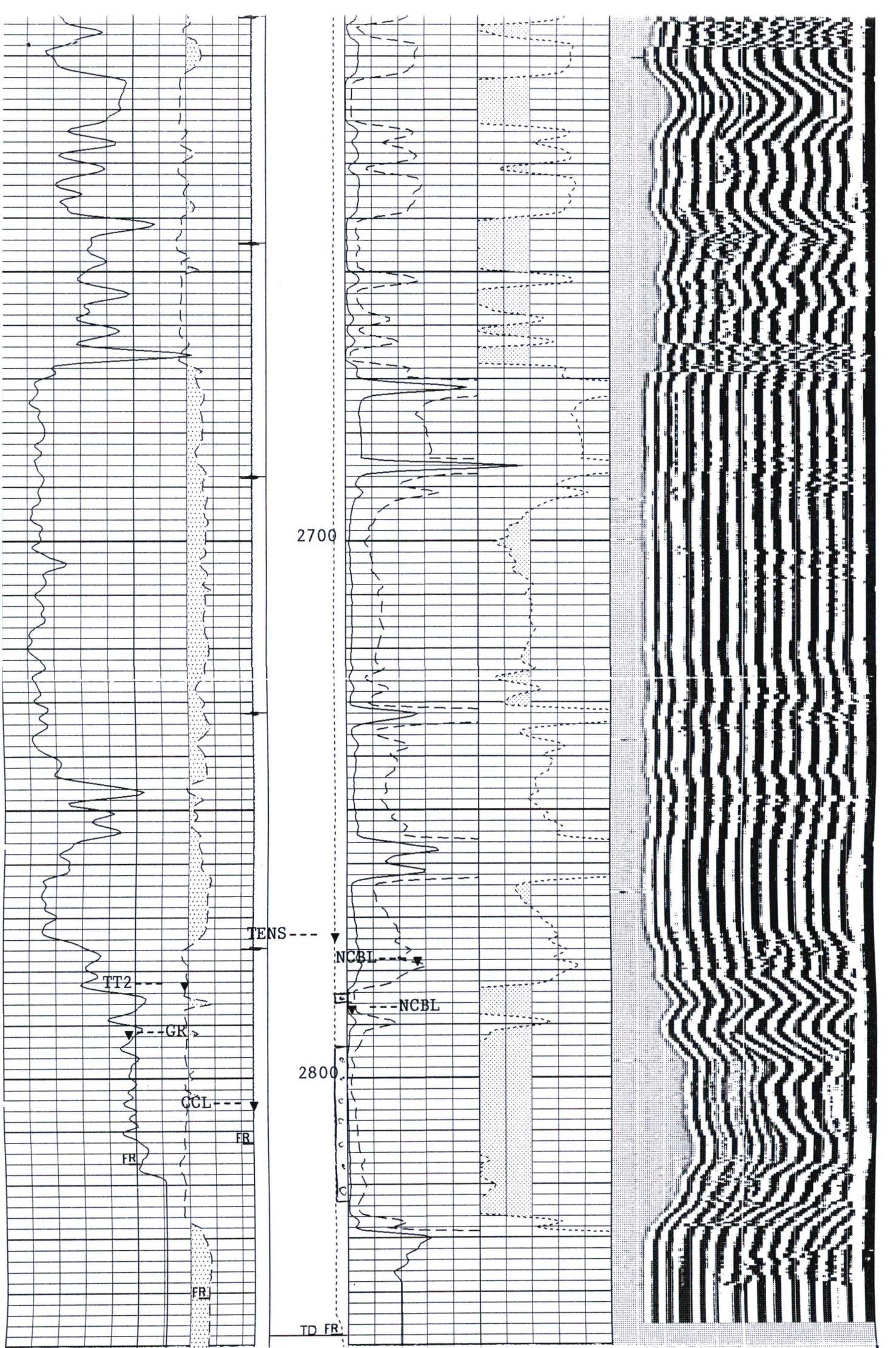


Exhibit 7



CP 32.6 FILE 2 04-AUG-1992 14:47 (UP)

FAST FM

CARDINAL SURVEYS COMPANY

PUMP-IN TRACER

COMPANY YATES PETROLEUM

WELL WEST LOCO HILLS UNIT NO. 1-9

FIELD WEST LOCO HILLS

COUNTY EDDY STATE NM

File No. 11,385

LOCATION: 1980' FNL & 40' FWL

SEC 7 TWP 18-S RGE 30-E

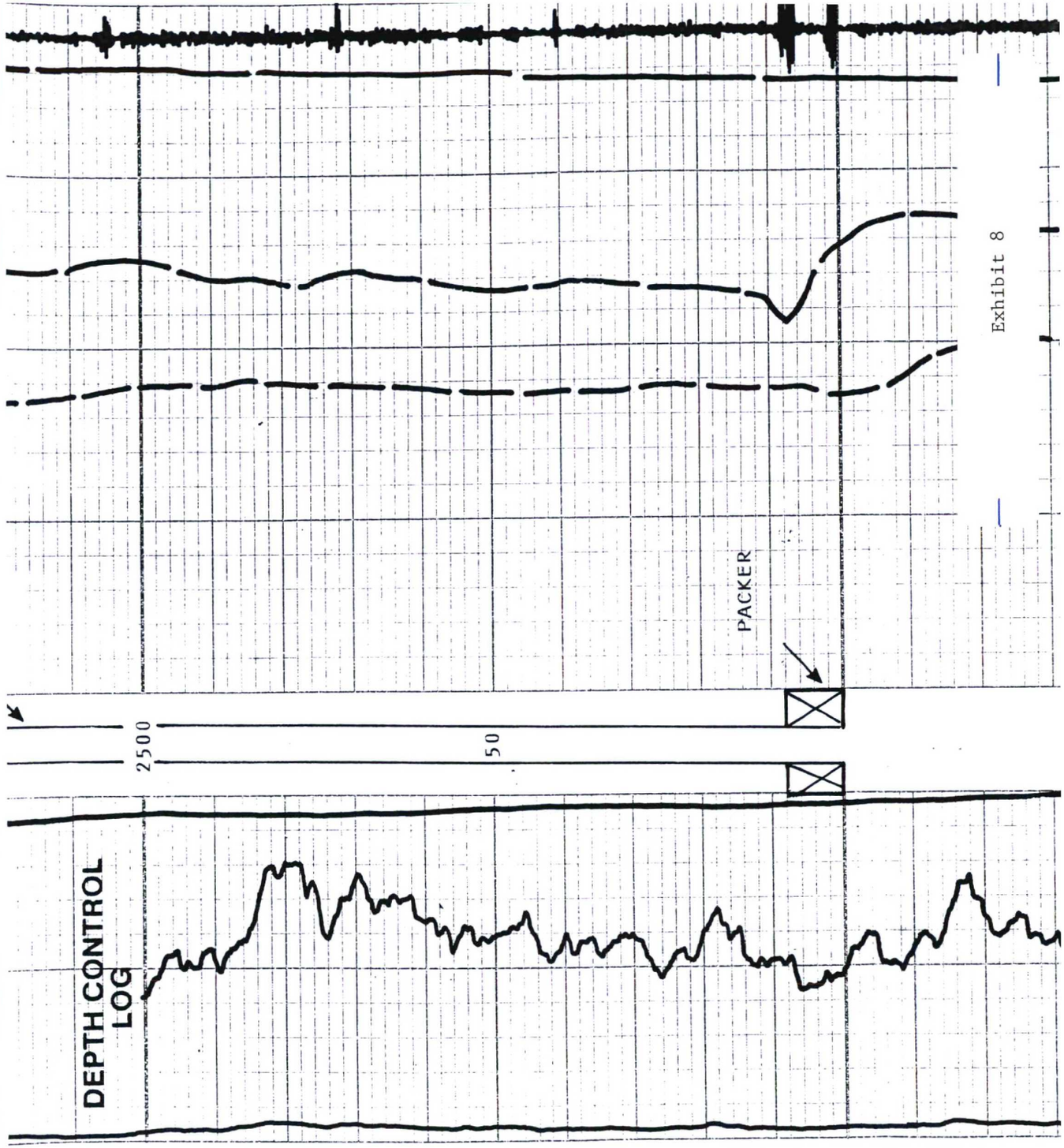
Permanent Datum	G.L.	Elev. 3529'	KB 3537'
Log Measured From	K.B. 8	Ft. Above Perm. Datum	DF 3536'
Drilling Measured From	K.B.		GL 3529'

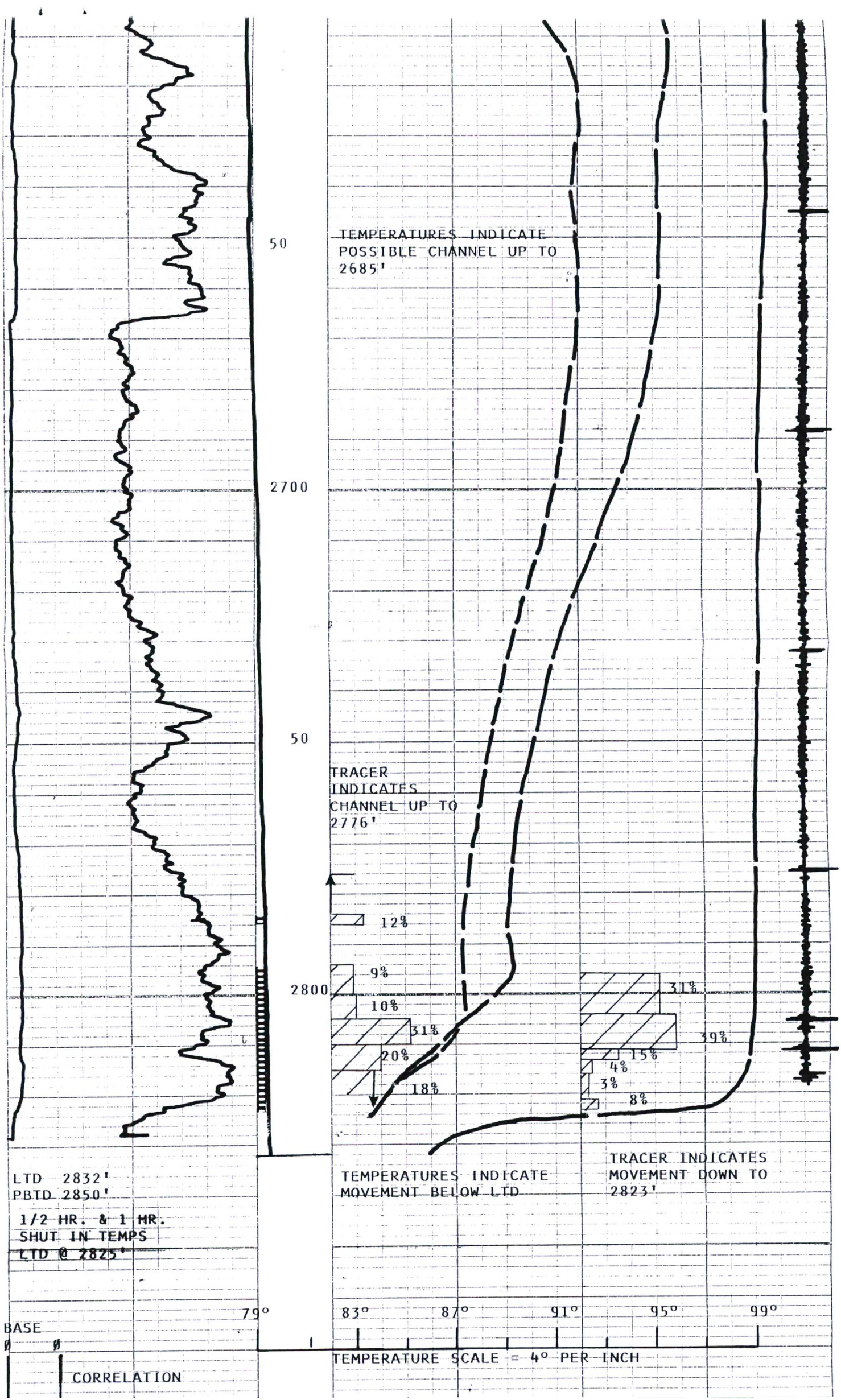
Date	9-2-92	
Depth – Driller	2900'	
Depth – Plug Back	2850'	
Depth – Logger	2832'	
Bottom Logged Interval	2832'	
Top Logged Interval	2400'	
Recorded By	SCOTT	
Witnessed By	FANT / ALLEN	
Base Location	HOBBS, NEW MEXICO	
Unit No.	8723	
Equip. Operator	LAND	

Size Casing	Wgt.	From	To
8 5/8"		SURFACE	385'
5 1/2"	15.5#	SURFACE	2900'
Tubing			
2 7/8"		SURFACE	2600'
Borehole			

Type of Well INJECTION
Status COMPLETING
Type of Fluid WATER
Fluid Level 1050' BASE LOG

Injection Rate
Surface Pressure 1240 PSI
Surface Temp. 85.2°
Bottom Hole Temp. 79.8°




50
2700
50
2800
TEMPERATURES INDICATE
POSSIBLE CHANNEL UP TO
2685'
TRACER
INDICATES
CHANNEL UP TO
2776'
12%
9%
10%
31%
20%
18%
31%
39%
15%
4%
3%
8%
LTD 2832'
PBTD 2850'
1/2 HR. & 1 HR.
SHUT IN TEMPS
LTD @ 2825'
TEMPERATURES INDICATE
MOVEMENT BELOW LTD
TRACER INDICATES
MOVEMENT DOWN TO
2823'
79°
83°
87°
91°
95°
99°
BASE
CORRELATION
TEMPERATURE SCALE = 4° PER INCH

CARDINAL SURVEYS COMPANY

INJECTION PROFILE

COMPANY YATES PETROLEUM CORPORATION

WELL WEST LOCO HILLS UNIT #1-9

FIELD WEST LOCO HILLS

COUNTY EDDY STATE NEW MEXICO

File No. 11,595

LOCATION: 1980' FNL & 40' FWL

SEC 7 TWP 18-S RGE 30-E

Permanent Datum	G.L.	Elev. 3529'	KB 3537'
Log Measured From	K.B.	8 Ft. Above Perm. Datum	DF 3536'
Drilling Measured From	K.B.		GL 3529'

Date	12-09-92
Depth - Driller	2900'
Depth - Plug Back	2850'
Depth - Logger	2831'
Bottom Logged Interval	2831'
Top Logged Interval	2400'
Recorded By	SCOTT
Witnessed By	PERRY
Base Location	HOBBS, NEW MEXICO
Unit No.	8723
Equip. Operator	GRANADOS

Size Casing	Wgt.	From	To
8 5/8"		SURFACE	385'
5 1/2"	15.5#	SURFACE	2900'
Tubing			
2 3/8"	PCID	SURFACE	2768'
Borehole			

Type of Well INJECTION

Status INJECTING

Type of Fluid WATER

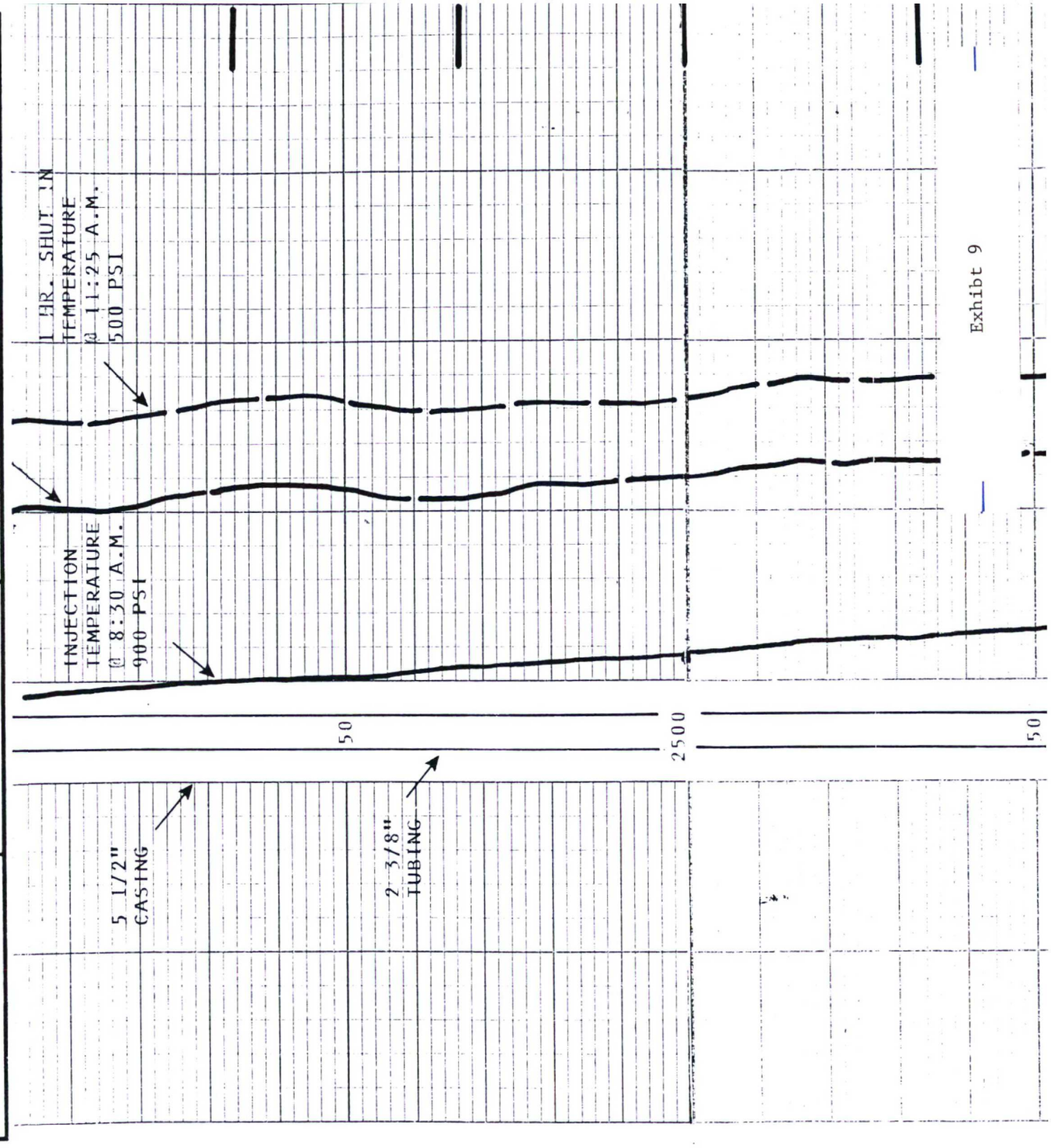
Fluid Level FULL

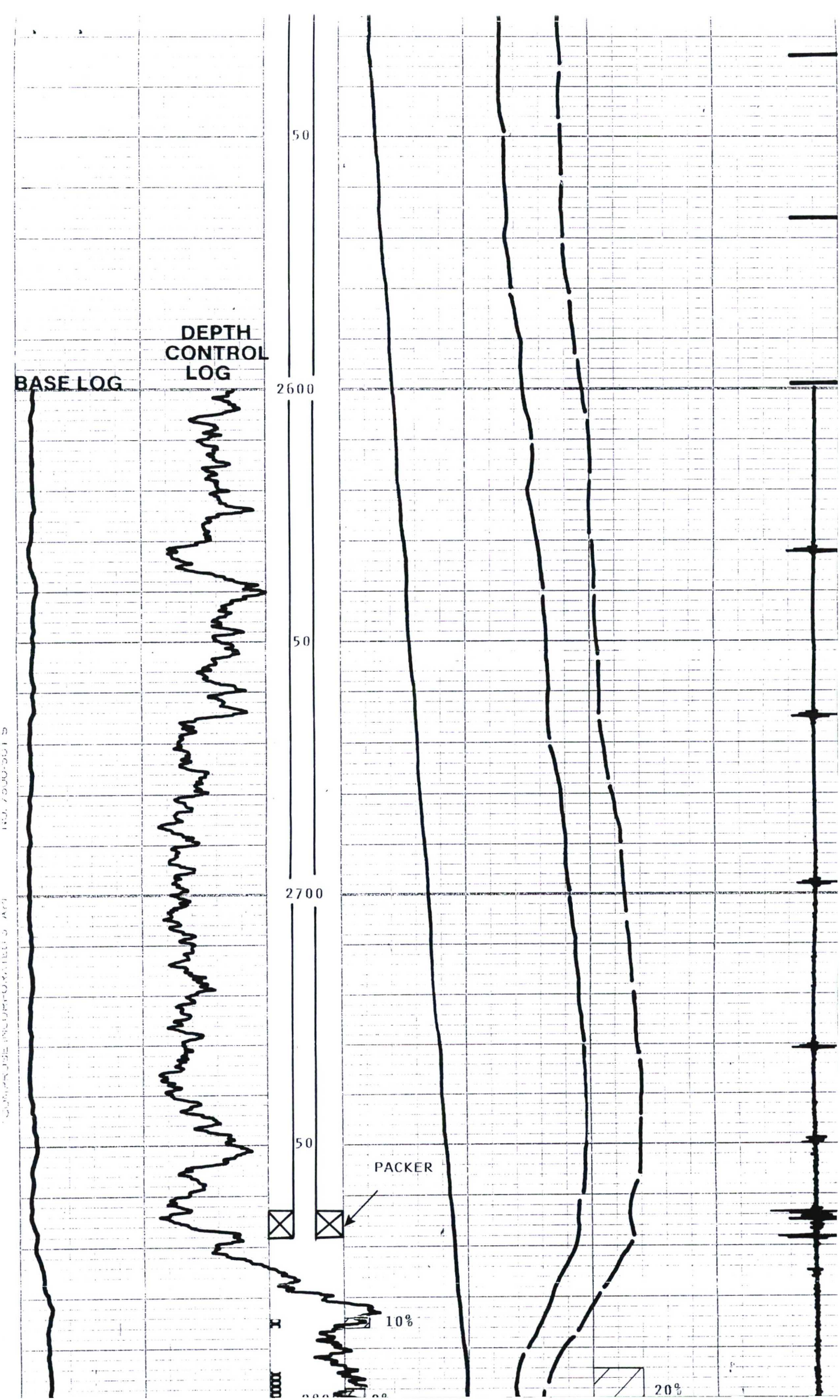
Injection Rate 350 BPD

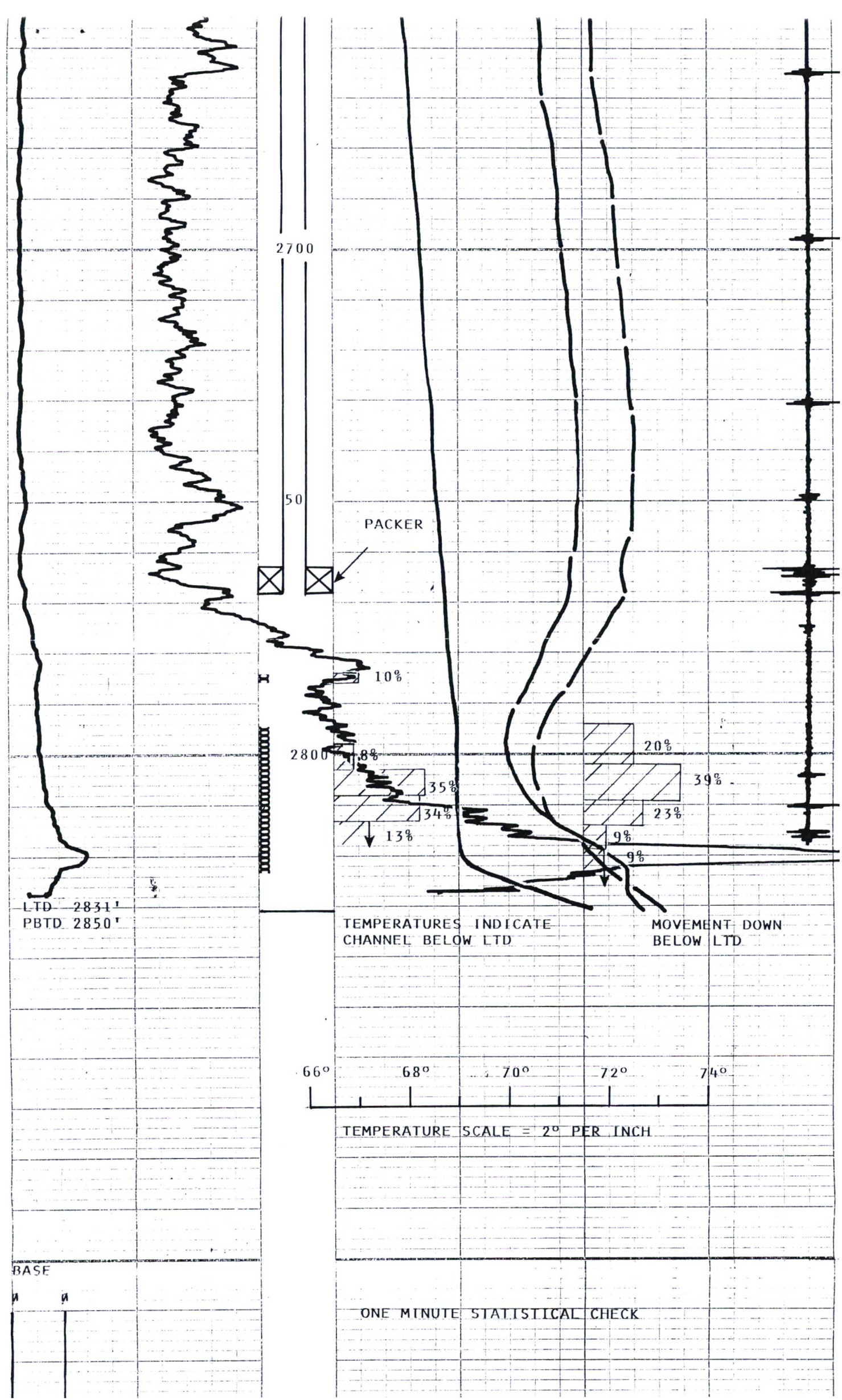
Surface Pressure 900 PSI

Surface Temp. 47.8°

Bottom Hole Temp. 73°




DEPTH CONTROL LOG
BASE LOG
50
2600
50
2700
50
PACKER
10%
20%


2700
50
PACKER
10%
2800
8%
35%
34%
13%
20%
39%
23%
9%
9%
LTD 2831'
PBTD 2850'
TEMPERATURES INDICATE CHANNEL BELOW LTD
MOVEMENT DOWN BELOW LTD
66°
68°
70°
72°
74°
TEMPERATURE SCALE = 2° PER INCH
BASE
ONE MINUTE STATISTICAL CHECK

FOLD HERE

CARDINAL SURVEYS CO.

EJECTO LOG -- Temperature ~~MICRO-CALIPER LOG~~

FILE NO. FAX Copy Rush Info

COMPANY Yates Petroleum Corp

WELL West Loco Hills Unit #1-9

FIELD West Loco Hills

COUNTY Eddy STATE NM

LOCATION:

SEC 7 TWP 18-S RGE 30-E

Other Services

Permanent Datum GL Elev. 3529

Log Measured from KB Ft. Above Permanent Datum

Drilling Measured from

Elevations: KB 3537 DF GL 3525

Date	2-19-93	
Run No.	One	
Type Log	Tracer / Temperature	2850 PBTD
Depth-Driller	2900	
Depth-Logger	2830	
Bottom Logged Interval	2830	
Top Logged Interval	2600	
Type Fluid in Hole	Gel	
Salinity Ppm Cl.		
Density Lb./Gal.		
Level		
Max. Rec. Temp. Deg. F	75°	
Opr. Rig Time		
Recorded By	Scott	
Witnessed By	FANT	

Run No.	Bore Hole Record Bit	From	To	Casing Record Size	Wgt.	From	To
				8 5/8		0	385
				5 1/2	15.5	0	2900
				2 3/8		0	2768

Shut-in Temperatures 930 psi
½ hr SI @ 11:15am
1 hr SI @ 11:45am

Flo Tracking Temperature
Log @ 8:32am
1020 psi

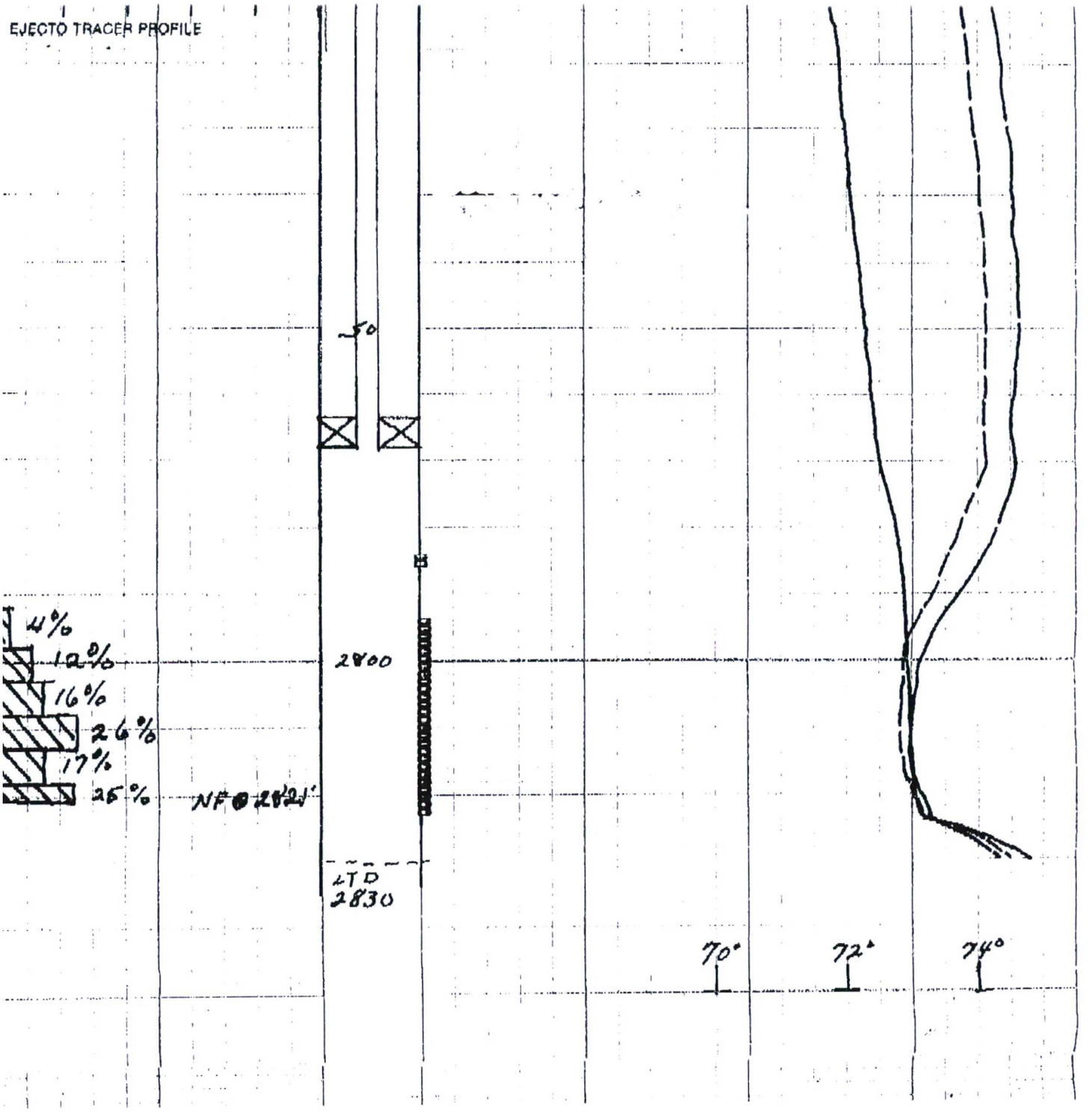
2600 50 2700

PERCENT BASED ON TRACER VELOCITIES 0 20 40 60 80 100

EJECTO TRACER PROFILE

Exhibit 10

CARDINAL SURVEYS P.02



Summary

Yates Petroleum Corp

FB- West Loco Hills 1-9

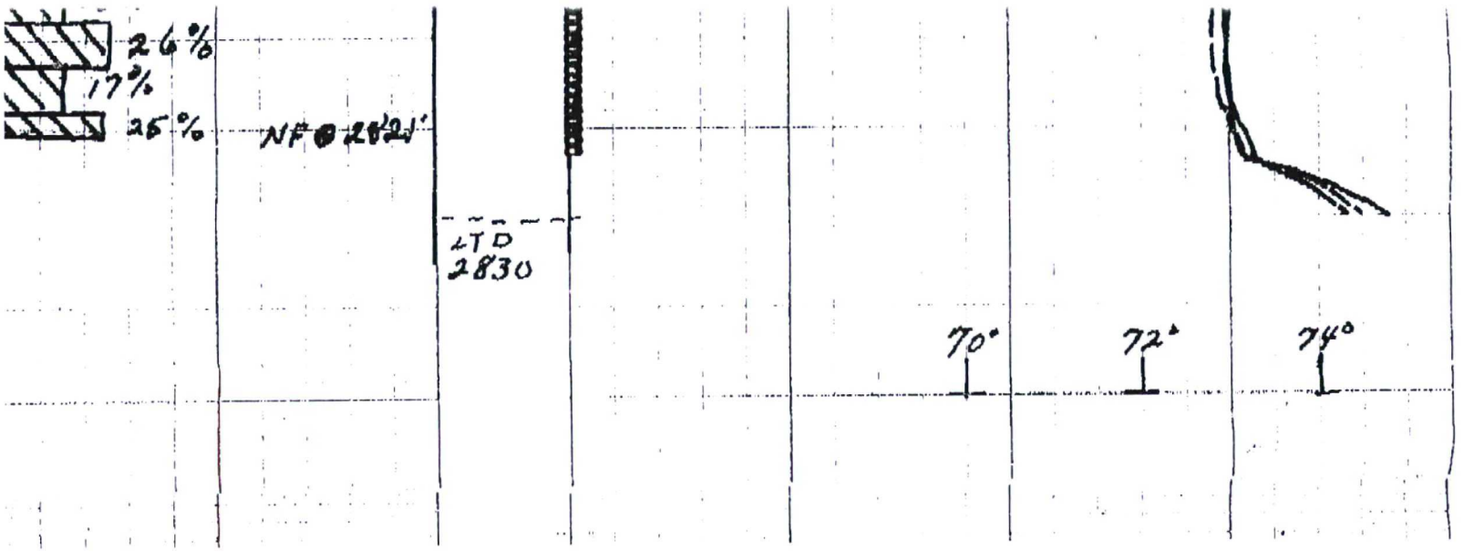
Tubing Velocity Rate Indicated 400 BPD

TD- 2830

Perfs ~~28~~ 2784-86 → No indication of fluid loss

2794-2821- 100% fluid loss

1031 Surface Pressure Injecting



Summary

YATES PETROLEUM CORP

~~FD~~ - WEST LOCO HILLS #9

TUBING VELOCITY RATE INDICATED 400 BPD

TD - 2830

PERFS ~~2~~ 2784-86 → NO INDICATION OF FLUID LOSS

2794-2821 - 100% FLUID LOSS

1031 SURFACE PRESSURE INJECTING

950 SHUT ~~IN~~ - IN PRESSURE 1/2 HOUR & 1 HOUR

NO CHANNEL DOWN INDICATED