Tucker ENERGY SERVICES

COMPENSATED NEUTRON

PEL DENSITY MICRO LOG

Company BOP WEST
Well HARBIN #3
Field HUNTER NORTH
County SALINE
State KANSAS
Country U.S.A
API No. 15-169-20335

File No : TUL-58102
Company : BOP WEST
Well : HARBIN #3
Field : HUNTER NORTH
County : SALINE
State : KANSAS
Country : U.S.A
API No : 15-169-20335

Location :
2160' FNL & 330' FEL

LSD : **Sect :** 7 **Twp :** 16S **Rge :** 1W

Permanent Datum:	GL	**Elevations:**		**Services:**	
Drilling Measured From:	KB	**KB**	1320.00 Ft	CNP	PIT
Log Measured From:	KB	**DF**	1319.00 Ft	LDT	
Above Permanent Datum:	0.00 Ft	**GL**	1311.00 Ft	MST	

Date	2014-10-11			
Run Number	0			
Depth--Driller	2765.0 Ft			
Depth--Logger	2768.0 Ft			
First Reading	2644.0 Ft			
Last Reading	220.0 Ft			
Casing--Driller	220.0 Ft			
Casing--Logger	220.0 Ft			
Bit Size	7.875 In			
Casing Size	8.625 In			
Hole Fluid Type	WBM			
Density	9.3			
Fluid Loss	8.2			
PH/Viscosity	9.0	51.0		
Sample Source	MEASURED			
RM@Measured Temp.	0.000 @ 0 F			
RMF@Measured Temp	0.000 @ 0 F			
RMC@Measured Temp.	0.000 @ 0 F			
Source RMF/RMC	CALCULATED	CALCULATED		
RM@BHT	0.000 @ 95 F			
Time Circulation Stopped	2014-10-10 09:20			
Max Recorded Temp.	95 F			
Equipment/Base	TRK 127	TULSA		
Recorded By	B.BAILEY			
Witnessed By	F.MIZE			

Bitsize Intervals

Size (In)	Bottom (Ft)
7.875	2765.00

Casing Strings

Size (In)	Weight (Lbs)	Bottom (Ft)	Top (Ft)
8.625	32.00	220.00	0.00

Run Number	0
Date	2014-10-11
Date/Time On Bottom	2014-10-10 08:20
Depth to Fluid	0.0 Ft
Salinity	0.000
RMF@BHT	0.000 @ 95 F
RMC@BHT	0.000 @ 95 F

Run Number 0

Comments

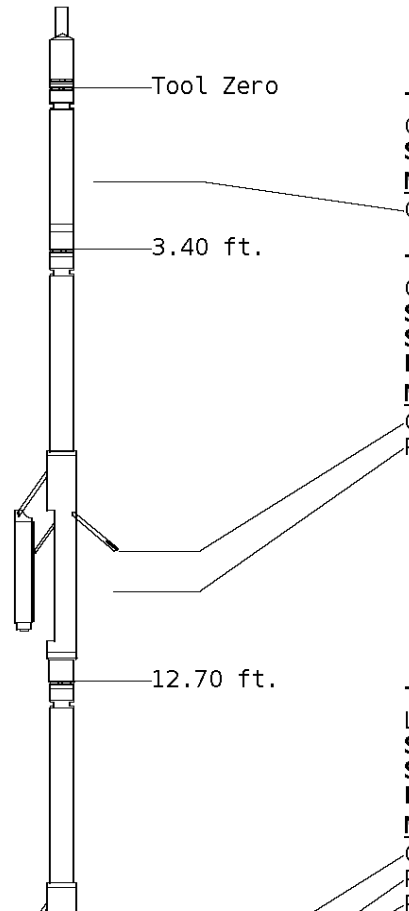
ALL PRESENTATIONS AS PER CUSTOMER REQUEST
GRT, CNT, LDT, MLT AND PIT RUN IN COMBINATION
CALIPERS ORIENTED ON X-Y AXIS
2.71 G/CC USED TO CALCULATE POROSITY
ANNULAR HOLE VOLUME CALCULATED USING 5.5" PRODUCTION CASING
PHIN IS CALIPER CORRECTED

GRT: GRP
CNT: PHIN, CLCNIN
LDT: PORL, LCORN, PECLN, LDENN, PORLLS, CLLDIN
MLT: NOR_RF, INV_RF, MSCLPIN
PIT: ILD, ILM, SPU, SFLAEC, CIRD

OPERATORS:
J.JOHNSON
C.GONZALES

Tool String Schematic

Total Tool Length - 53.15 **ft.**
Maximum Outside diameter - 6.00 **in.**
Net Weight in Air - 943.00 **lbs.**



Tool: GRT-B **Length:** 3.40 **ft.** **O.D.** 3.60 **in.**
Gamma Ray Controller
Sonde ID :GRT-BB-117

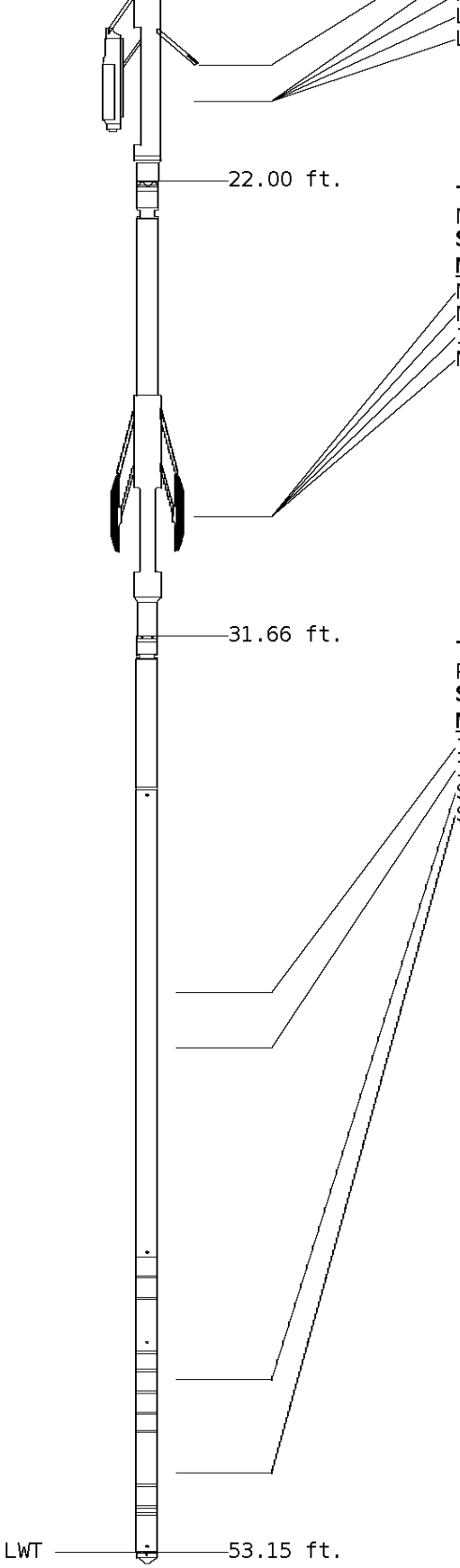
Measure Point	Tool Offset	Stack Offset	Bottom Offset
GRP	2.00	2.00	51.15

Tool: CNT-AA **Length:** 9.30 **ft.** **O.D.** 4.36 **in.**
Compensated Neutron A Pad on NDT-A
Sonde ID :NDT-BB-146
Source ID :N-1044
Pad ID :CNP-AA-115

Measure Point	Tool Offset	Stack Offset	Bottom Offset
CLCN	6.00	9.40	43.75
PHIN	6.80	10.20	42.95

Tool: LDT-DA **Length:** 9.30 **ft.** **O.D.** 4.80 **in.**
Litho Density D Pad on NDT-A
Sonde ID :NDT-AH-152
Source ID :CSV-587
Pad ID :LDP-DA-50

Measure Point	Tool Offset	Stack Offset	Bottom Offset
CLLD	6.00	18.70	34.45
PEL	7.00	19.70	33.45
PES	7.40	20.10	33.05



LDEN	7.20	19.90	33.25
LCOR	7.20	19.90	33.25

Tool: MST-DA **Length:** 9.66 **ft.** **O.D.** 6.00 **in.**
Micro Spherically Focused (IC)
Sonde ID :MST-DA-024

Measure Point	Tool Offset	Stack Offset	Bottom Offset
MSFL	7.60	29.60	23.55
MSCLP	7.60	29.60	23.55
INV	7.60	29.60	23.55
NOR	7.60	29.60	23.55

Tool: PIT-CA **Length:** 21.49 **ft.** **O.D.** 3.62 **in.**
Phased Dual Induction w/ RM & D
Sonde ID :PIT-CA-062

Measure Point	Tool Offset	Stack Offset	Bottom Offset
ILD	8.92	40.58	12.56
ILM	10.10	41.76	11.39
SFLU	17.49	49.15	4.00
SP	20.60	52.26	0.88

Well File: BOP_HAR_3_OCT11_MST **Scale:** 1:240 **Format:** NLD-240
Segment: V1.D2.S10 MAIN **Acquired:** Not Available
Reference: 0 **Processed:** Not Available

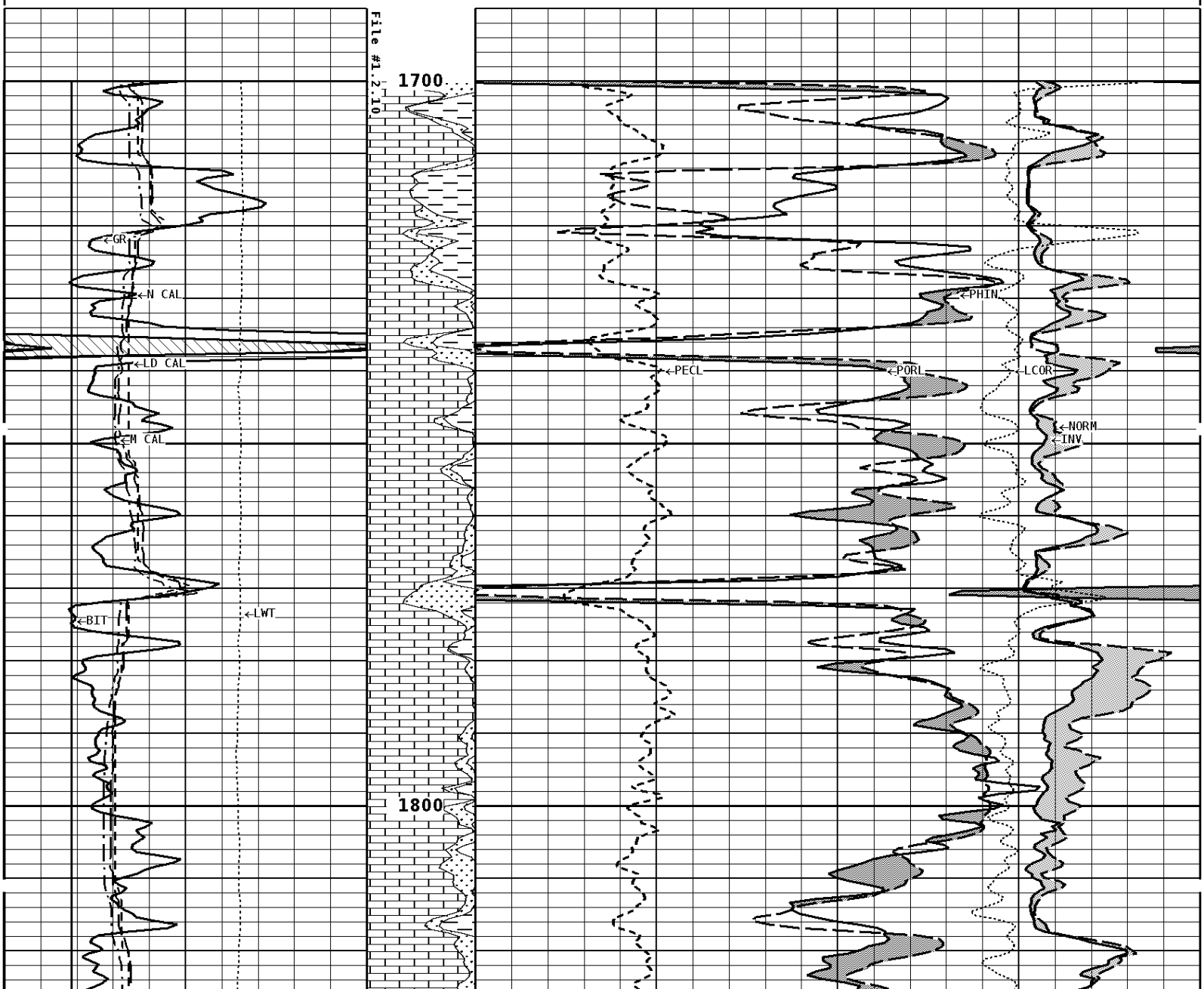
CALIPER MICRO
INCHES (IN)
16 26
6 16

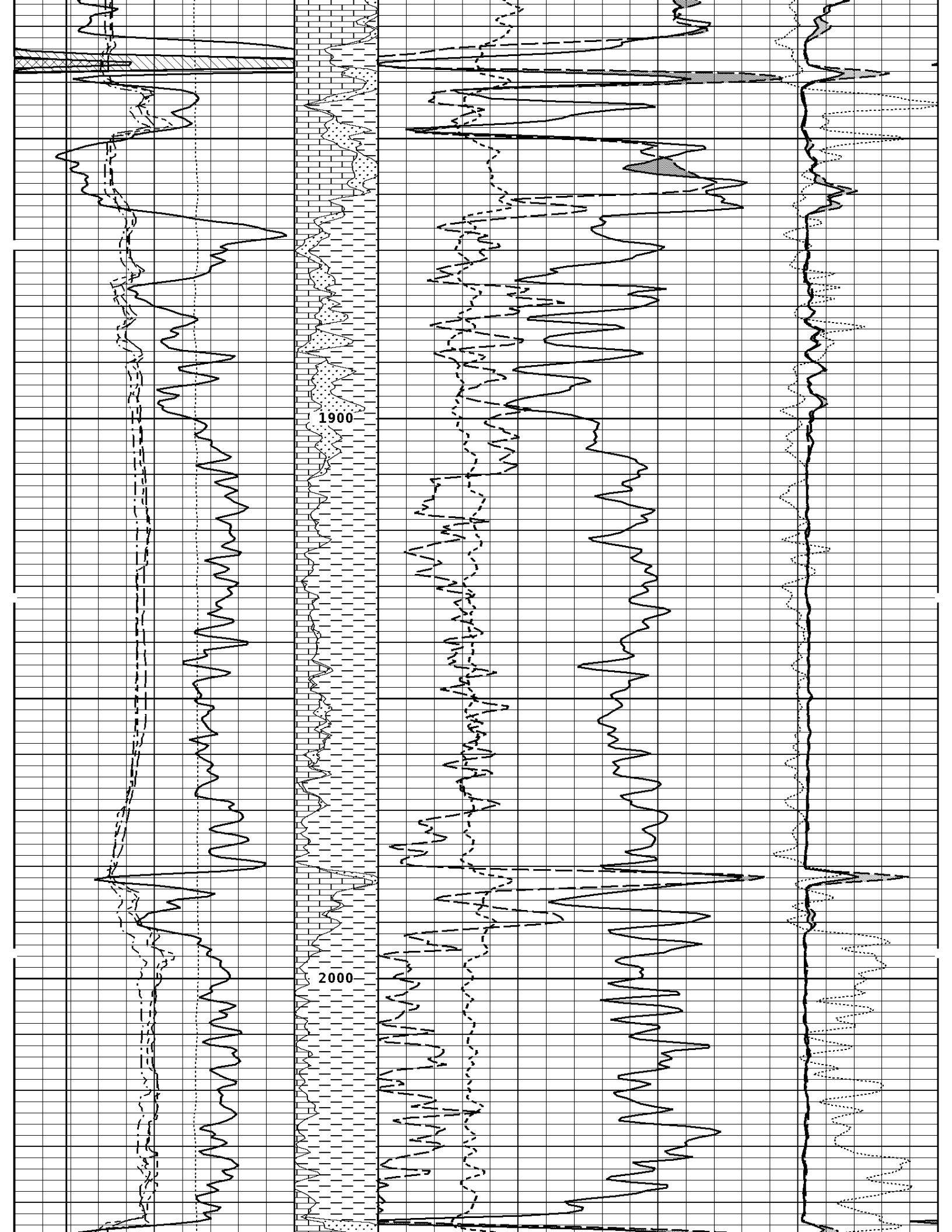
BIT SIZE
INCHES (IN)

NORMAL
OHMM

6 16			0 40
NEUTRON (Y) CALIPER INCHES (IN) 16 26 / 6 16			INVERSE OHMM 0 40
DENSITY (X) CALIPER INCHES (IN) 16 26 / 6 16	Volume Quartz	PE CROSS-SECTION BARNS/ELECTRON 0 10	DENSITY CORRECTION G/CC -0.25 0.25
TENSION LBS 10000 0	Volume Calcite	DENSITY POROSITY (2.71g/cc) PERCENT 70 30 / 30 -10 / -10 -50	
GAMMA RAY API UNITS 150 300 / 0 150	Volume Dolo/Shale	NEUTRON POROSITY (LIMESTONE) PERCENT 30 -10	

1:240 MAIN SECTION

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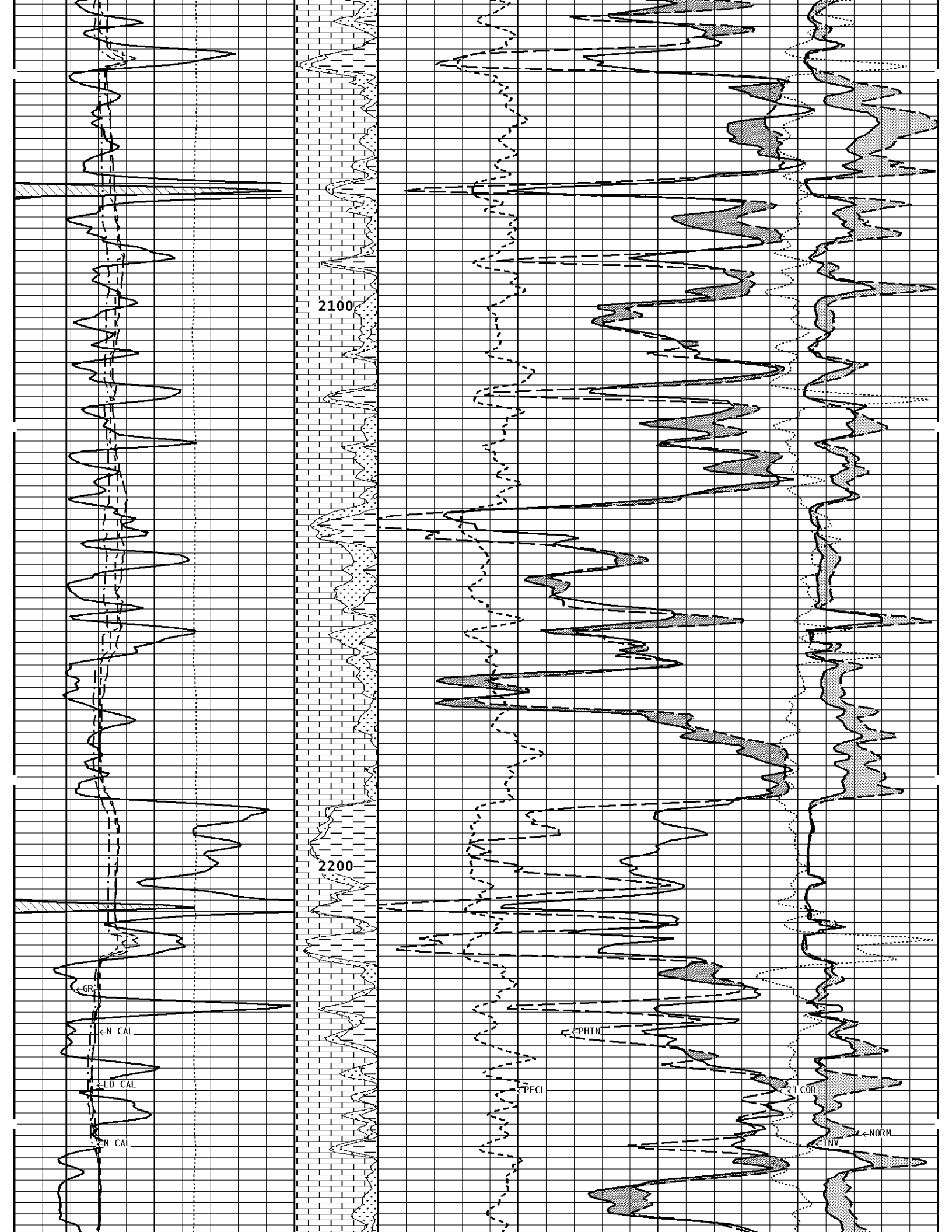
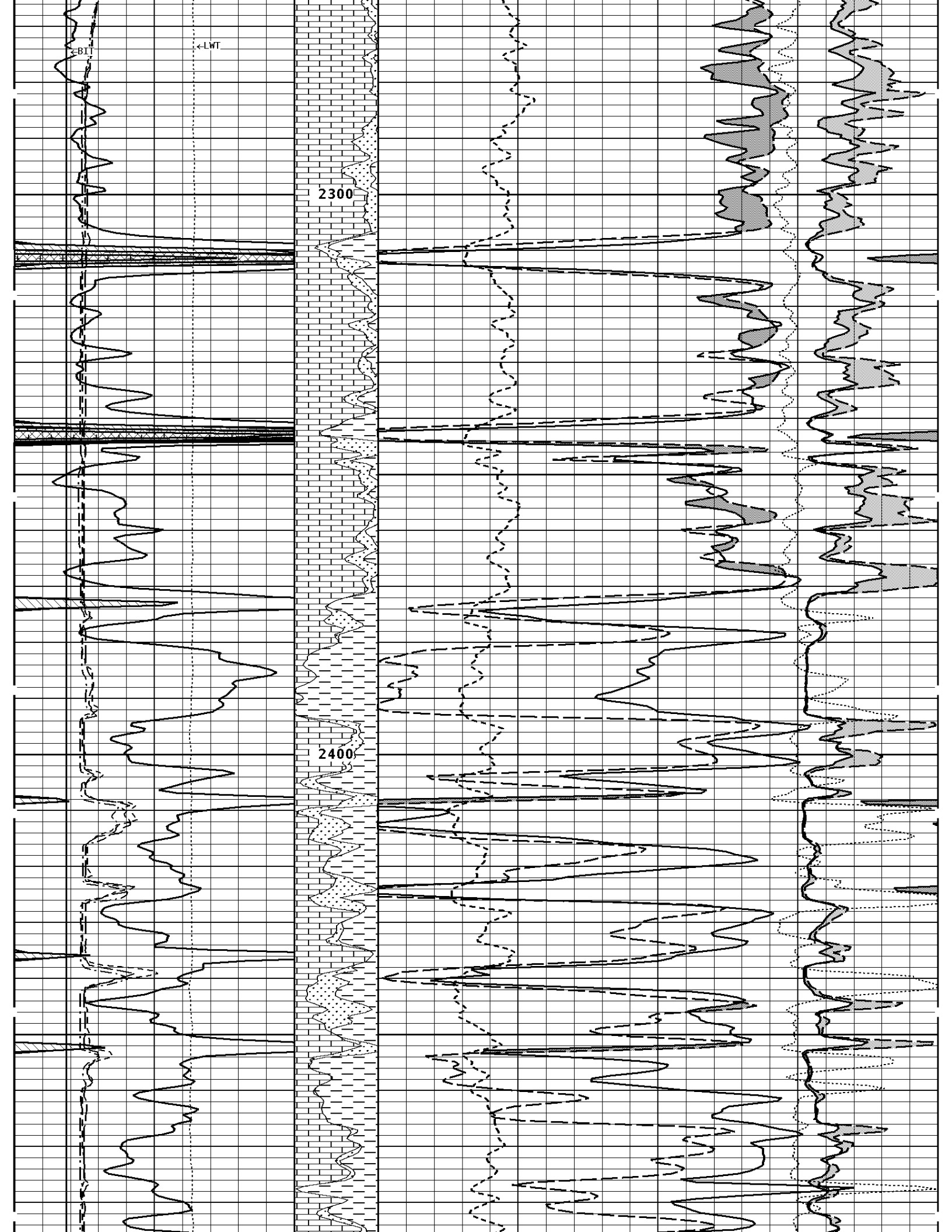
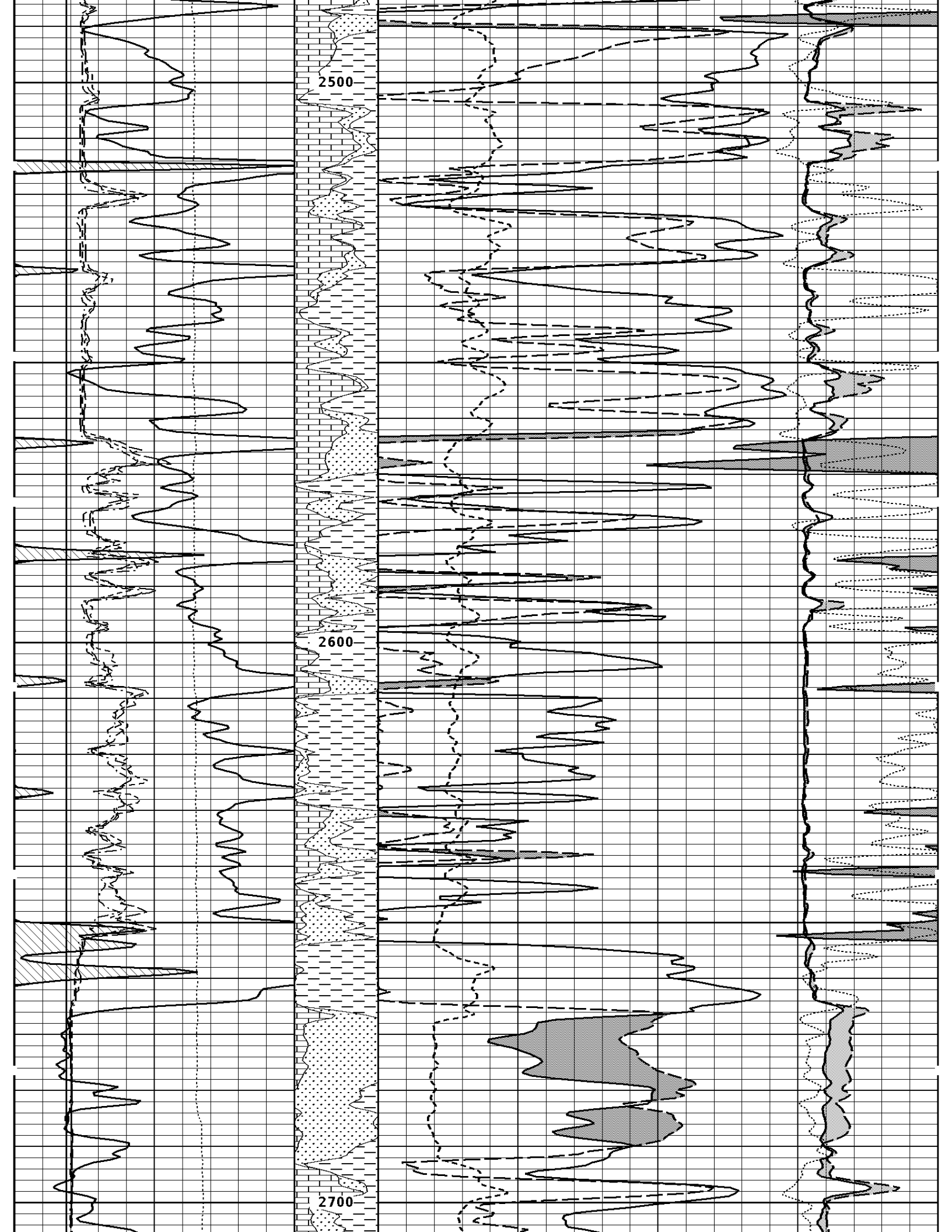
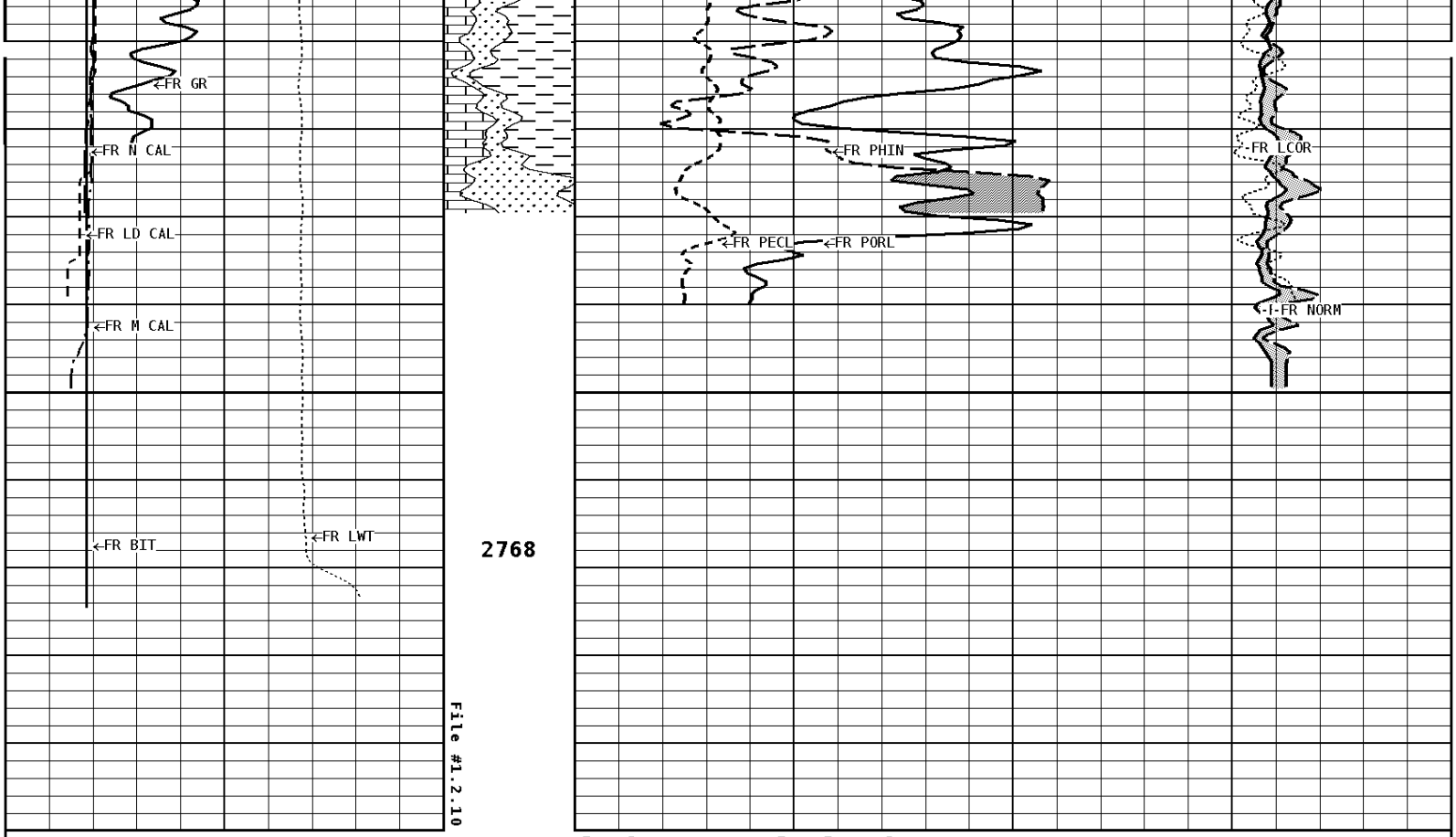
2000


2100
2200
GR
N CAL
LD CAL
M CAL
PHIN
PECL
LCOR
NORM
INV


BIT
←LWT
2300
2400


2500
2600
2700



1:240 MAIN SECTION

GAMMA RAY API UNITS	Volume Dolo/Shale	NEUTRON POROSITY (LIMESTONE) PERCENT
150 300 0 150		30 -10
TENSION LBS	**Volume Calcite**	**DENSITY POROSITY (2.71g/cc) PERCENT**
10000 0		70 30 30 -10 -10 -50
DENSITY (X) CALIPER INCHES (IN)	**Volume Quartz**	**PE CROSS-SECTION BARNS/ELECTRON** / **DENSITY CORRECTION G/CC**
16 26 6 16		0 10 / -0.25 0.25
NEUTRON (Y) CALIPER INCHES (IN)		**INVERSE OHMM**
16 26 6 16		0 40
BIT SIZE INCHES (IN)		**NORMAL OHMM**
6 16		0 40
CALIPER MICRO INCHES (IN)		
16 26 6 16		

*** Borehole Zone Factors ***

Zone 1 99999.0 to 0.0 Feet

Matrix Density	2.71	g/cc
Fluid Density	1.00	g/cc

Formation Matrix	Limestone
Drill Bit Size	7.875 in
Casing Diameter	5.500 in
Casing Thickness	0.250 in
Casing Correction (PHI N)	Disable

Well File: B0P_HAR_3_OCT11_MST **Scale:** 1:240 **Format:** NLD-240
Segment: V1.D2.S4 RE **Acquired:** 2014-10/11 02:52 3.4.0-13115
Reference: 0 **Processed:** 2014-10/11 03:03 3.4.0-13115

CALIPER MICRO
INCHES (IN)
16 26
6 16

BIT SIZE
INCHES (IN)
6 16

NEUTRON (Y) CALIPER
INCHES (IN)
16 26
6 16

NORMAL
OHMM
0 40

INVERSE
OHMM
0 40

DENSITY (X) CALIPER
INCHES (IN)
16 26
6 16

Volume
Quartz

PE CROSS-SECTION
BARNS/ELECTRON
0 10

DENSITY CORRECTION
G/CC
-0.25 0.25

TENSION
LBS
10000 0

Volume
Calcite

DENSITY POROSITY (2.71g/cc)
PERCENT
70 30
30 -10
-10 -50

GAMMA RAY
API UNITS
150 300
0 150

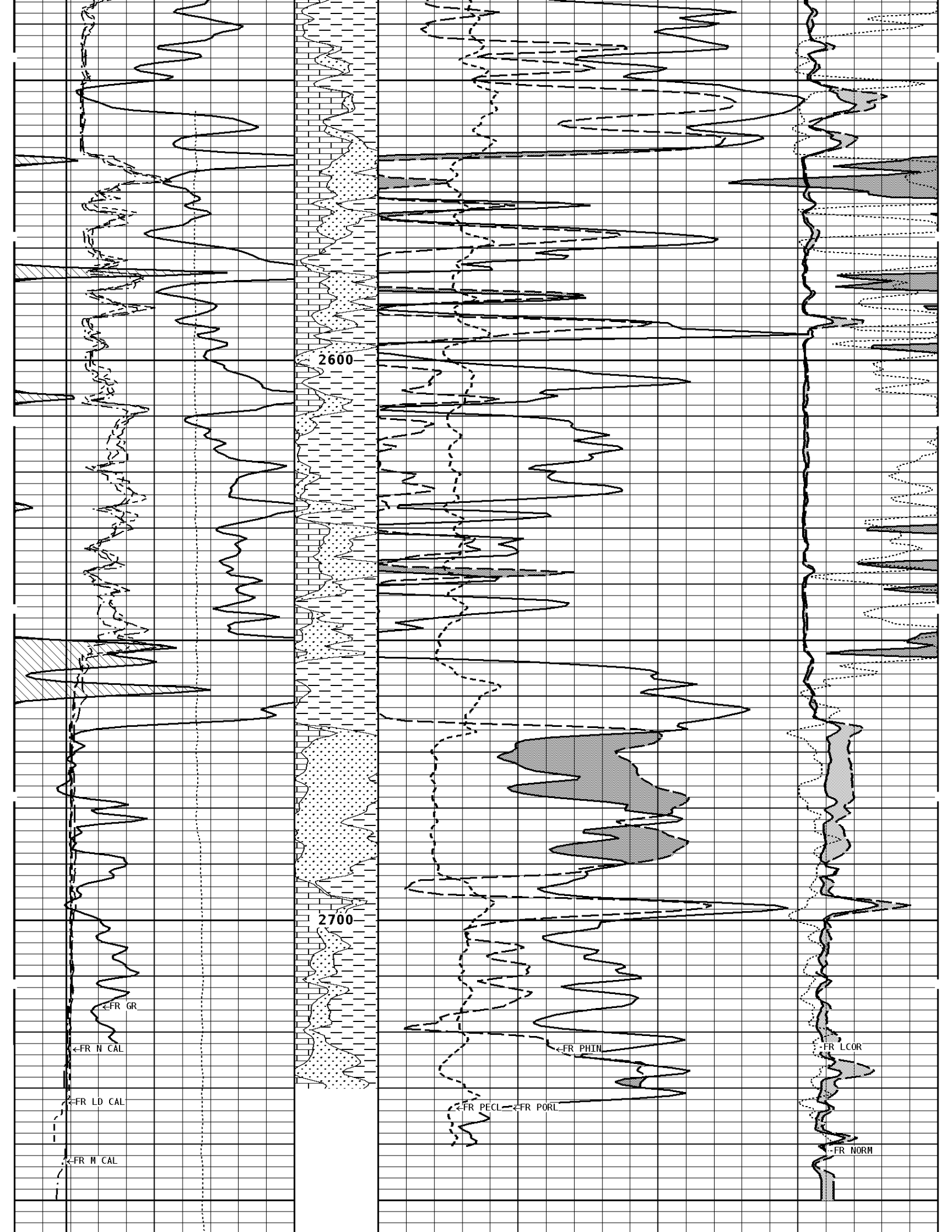
Volume
Dolo/Shale

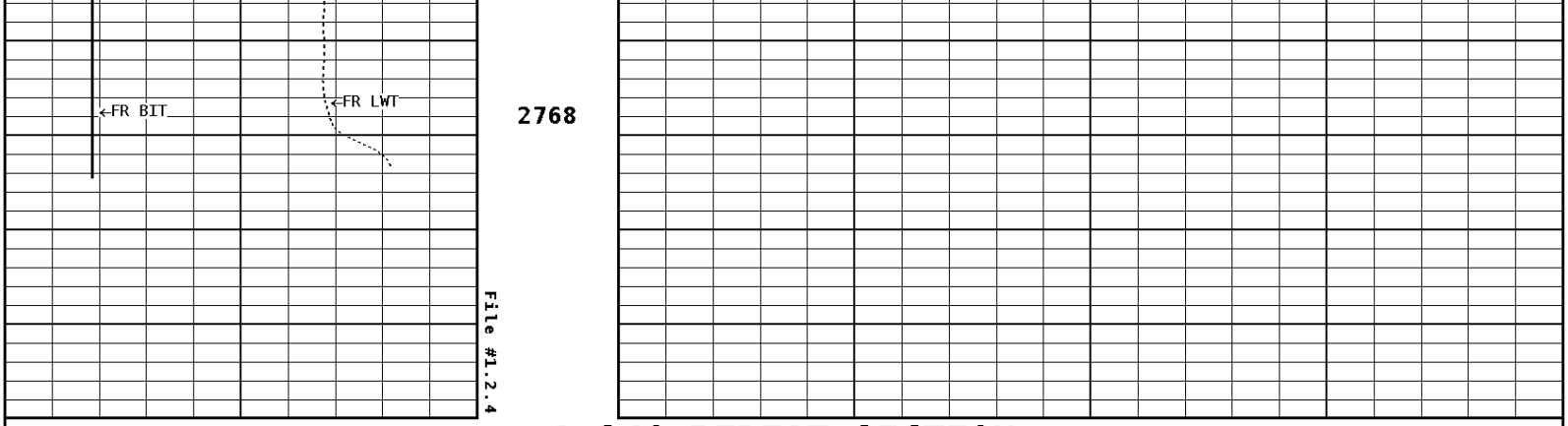
NEUTRON POROSITY (LIMESTONE)
PERCENT
30 -10

1:240 REPEAT SECTION

File #1.2.4

2500


2600
2700
←FR GR
←FR N CAL
←FR LD CAL
←FR M CAL
←FR PHIN
←FR PECL
←FR PORL
←FR LCOR
←FR NORM



1:240 REPEAT SECTION

GAMMA RAY API UNITS	Volume Dolo/Shale	NEUTRON POROSITY (LIMESTONE) PERCENT
150 300 0 150		30 -10

TENSION LBS	Volume Calcite	DENSITY POROSITY (2.71g/cc) PERCENT
10000 0		70 30 30 -10 -10 -50

DENSITY (X) CALIPER INCHES (IN)	Volume Quartz	PE CROSS-SECTION BARNS/ELECTRON	DENSITY CORRECTION G/CC
16 26 6 16		0 10	-0.25 0.25

NEUTRON (Y) CALIPER INCHES (IN)	INVERSE OHMM
16 26 6 16	0 40

BIT SIZE INCHES (IN)	NORMAL OHMM
6 16	0 40

CALIPER MICRO INCHES (IN)
16 26 6 16

*** Borehole Zone Factors ***

Zone 1 99999.0 to 0.0 Feet

Matrix Density	2.71	g/cc
Fluid Density	1.00	g/cc
Formation Matrix	Limestone	
Drill Bit Size	7.875	in
Casing Diameter	5.500	in
Casing Thickness	0.250	in
Casing Correction (PHI N)	Disable	

Well File: B0P_HAR_3_0CT11_MST **Scale:** 1:240 **Format:** LDT-240
Segment: V1.D2.S10 MAIN **Acquired:** Not Available
Reference: 0 **Processed:** Not Available

BIT SIZE INCHES (IN)
6 16

NEUTRON (Y) CALIPER INCHES (IN)
16 26

6		16

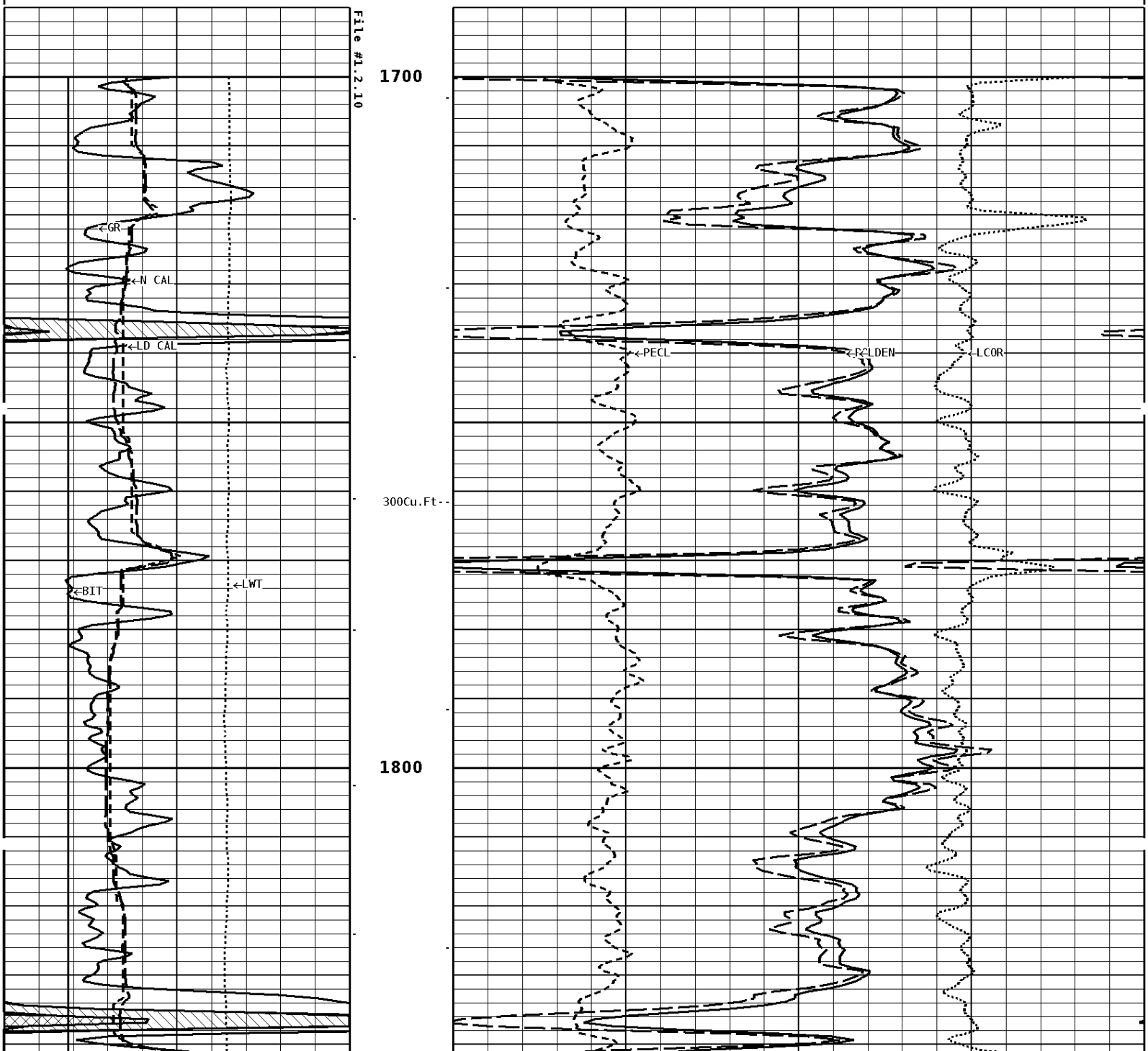
DENSITY (X) CALIPER INCHES (IN)			PE CROSS-SECTION BARNS/ELECTRON		DENSITY CORRECTION G/CC	
16		26				
6		16	0	10	-0.25	0.25

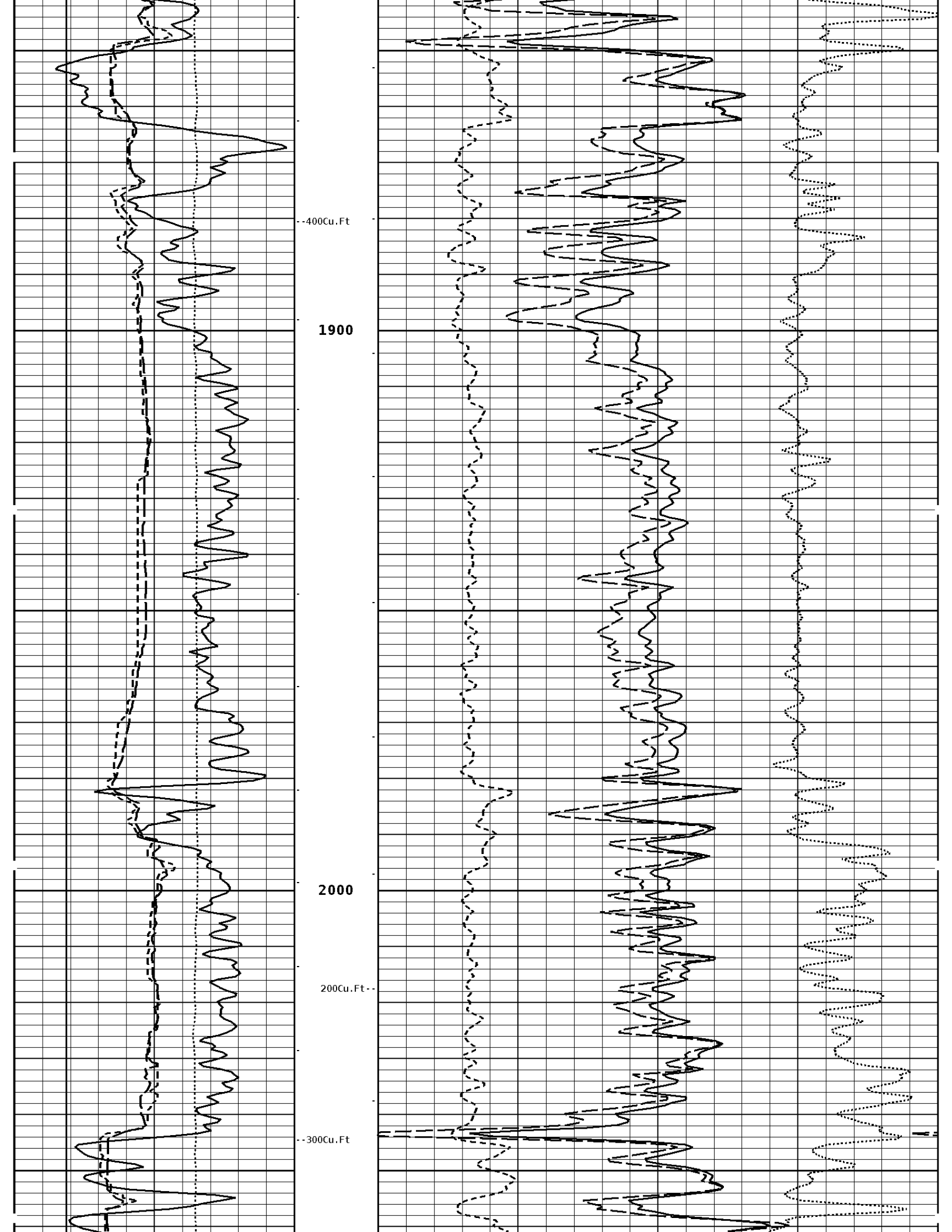
TENSION LBS			COMPENSATED BULK DENSITY G/CC	
			3.0	4.0
10000		0	2.0	3.0
			1.0	2.0

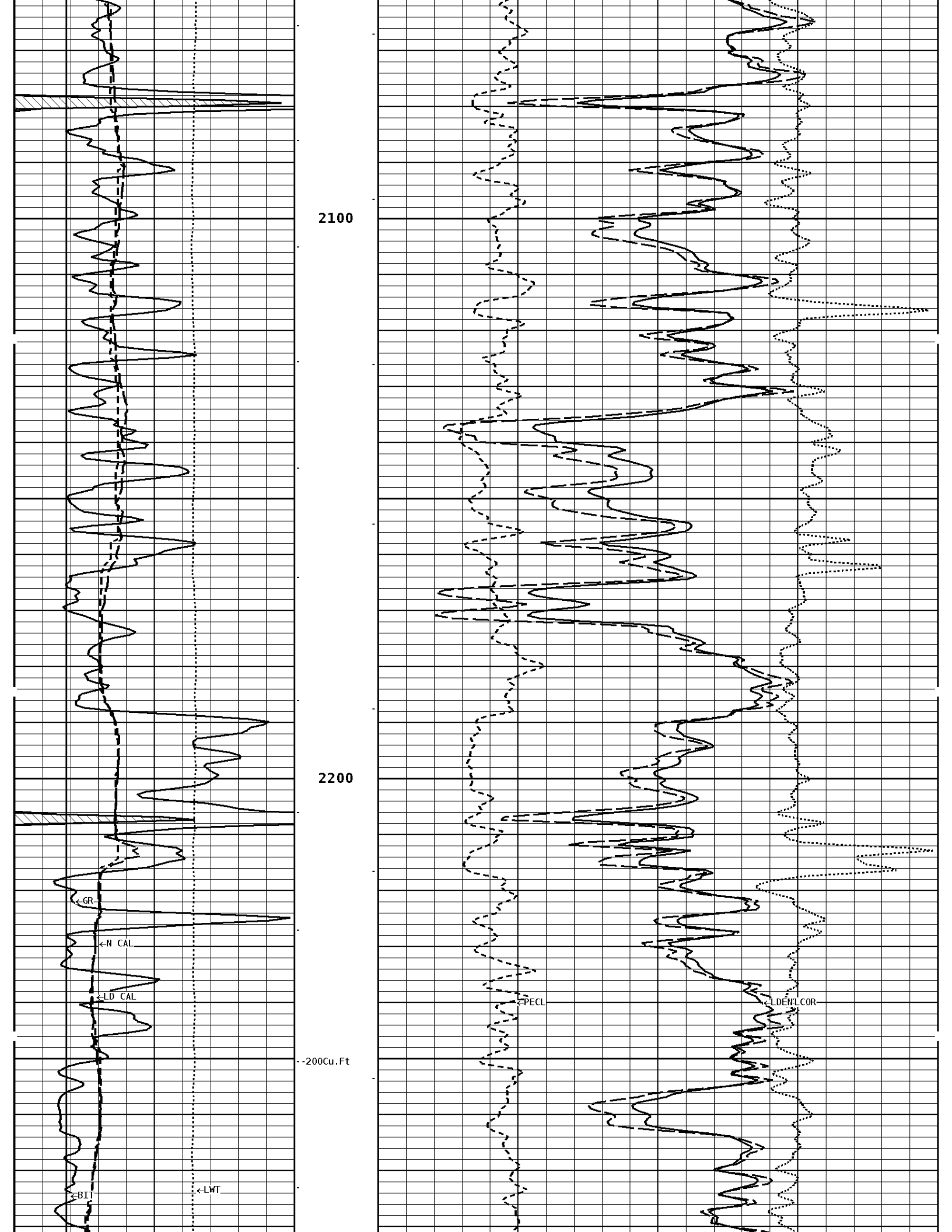
GAMMA RAY API UNITS			-BHV AHV- CU.FT	DENSITY POROSITY (2.71g/cc) PERCENT	
150		300		70	30
0		150		30	-10
				-10	-50

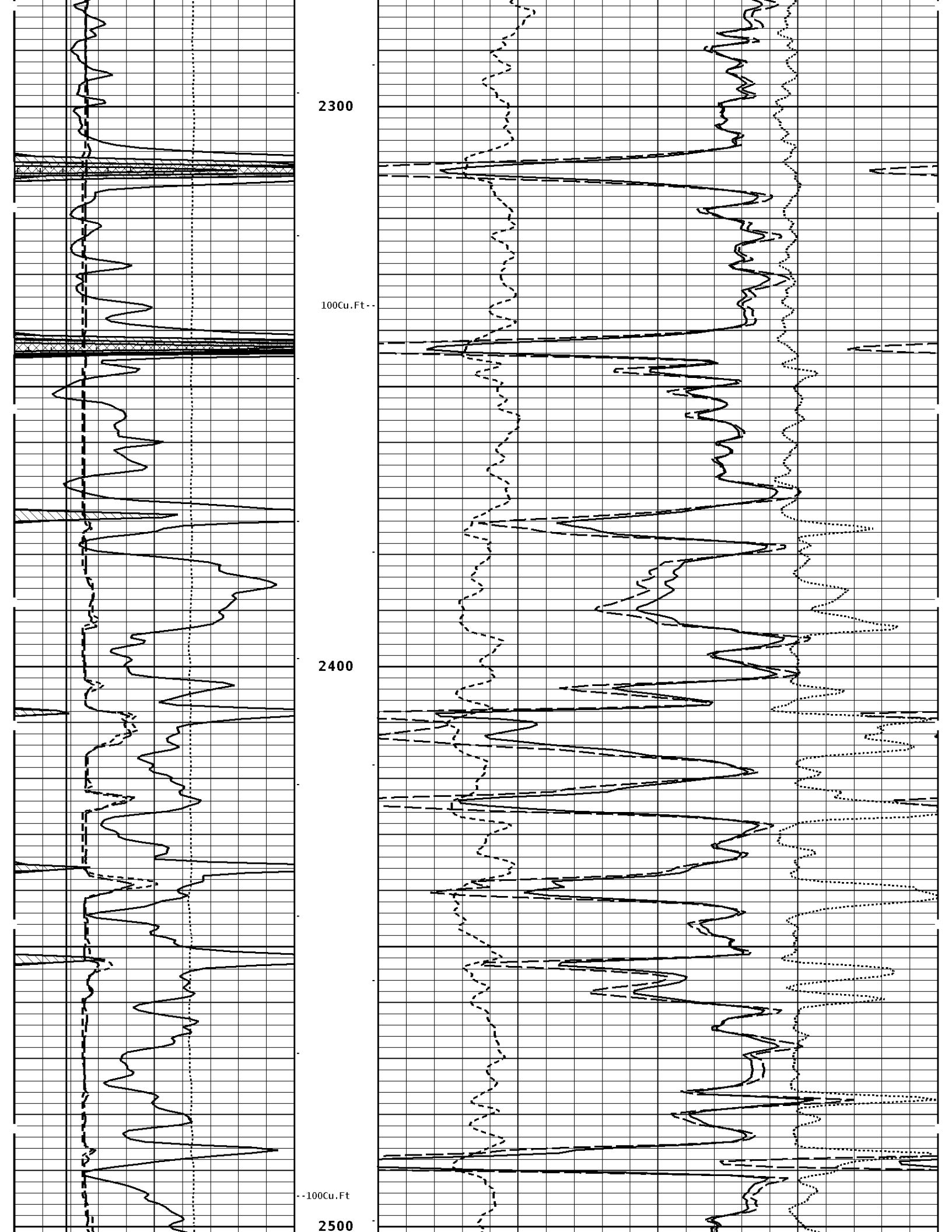
1:240 MAIN SECTION

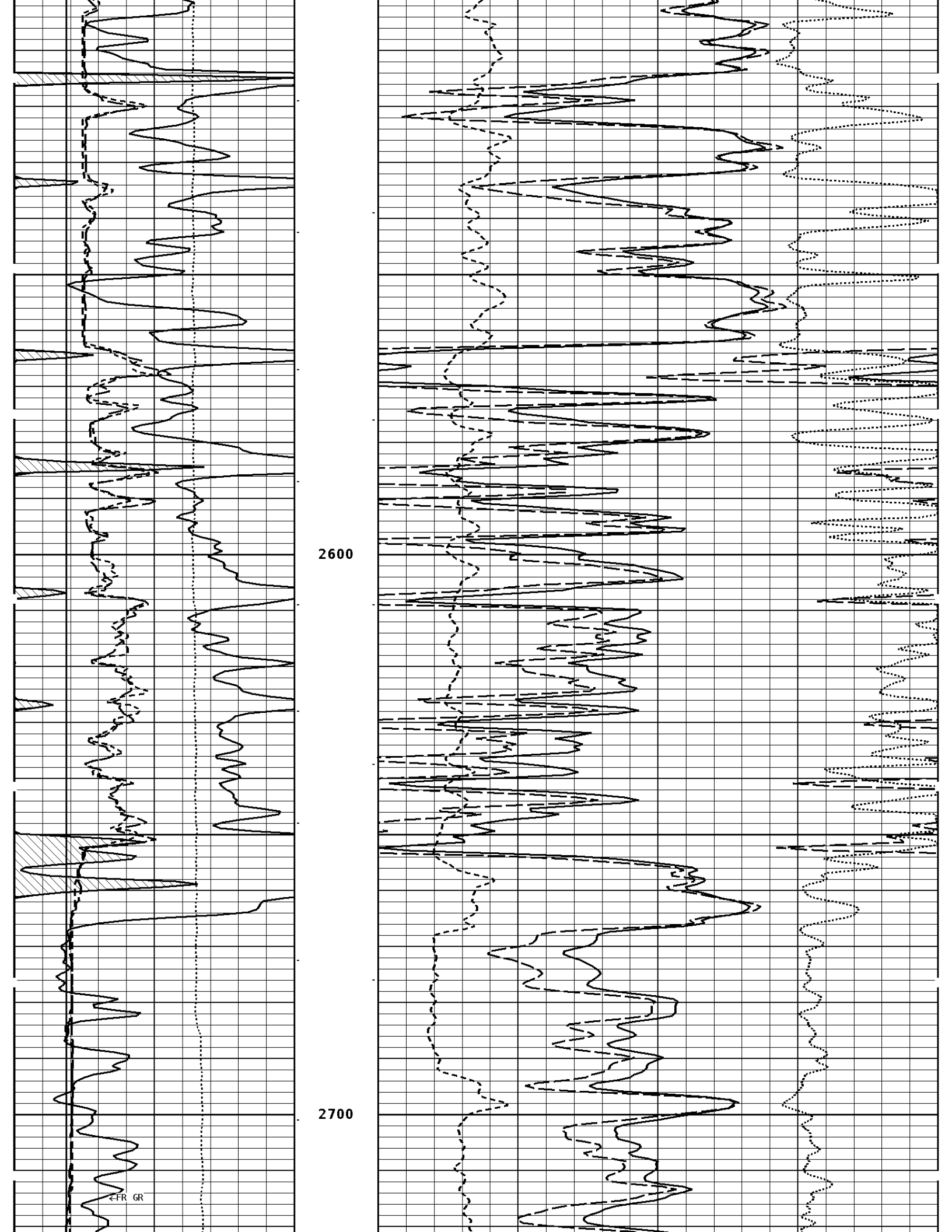
BULK DENSITY

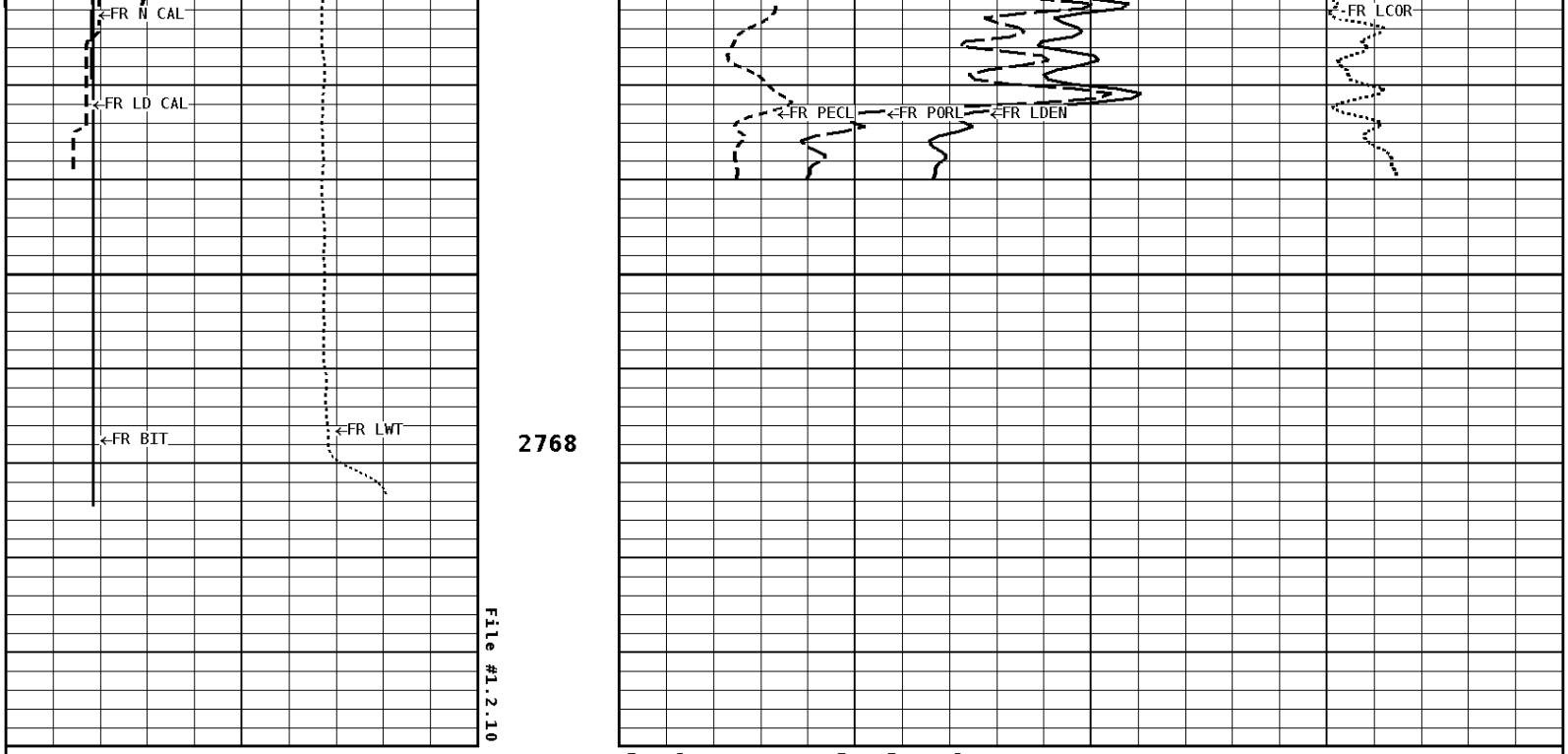



400Cu.Ft
1900
2000
200Cu.Ft
300Cu.Ft


2100
2200
←GR
←N CAL
←LD CAL
←PECL
←LDENLCOR
-200Cu.Ft
←BIT
←LWT


2300
100Cu.Ft
2400
100Cu.Ft
2500


2600
2700
←FR GR



1:240 MAIN SECTION

BULK DENSITY

GAMMA RAY API UNITS	-BHV AHV- CU.FT	DENSITY POROSITY (2.71g/cc) PERCENT
150 300		70 30
0 150		30 -10
		-10 -50

TENSION LBS	COMPENSATED BULK DENSITY G/CC
10000 0	3.0 4.0
	2.0 3.0
	1.0 2.0

DENSITY (X) CALIPER INCHES (IN)	PE CROSS-SECTION BARNS/ELECTRON	DENSITY CORRECTION G/CC
16 26	0 10	-0.25 0.25
6 16		

NEUTRON (Y) CALIPER INCHES (IN)
16 26
6 16

BIT SIZE INCHES (IN)
6 16

*** Borehole Zone Factors ***

Zone 1 99999.0 to 0.0 Feet

Matrix Density	2.71	g/cc
Fluid Density	1.00	g/cc
Formation Matrix	Limestone	
Drill Bit Size	7.875	in
Casing Diameter	5.500	in
Casing Correction (PHI N)	Disable	

*** Calibration Summary ***

Shop Calibration
GRT-B

Performed : 22-SEP-2014 Time : 09:08

Performed : 22-SEP-2014 Time : 09:30
Sensor Suite : GR-GR5 ID : GRT-BB-117

	Measured Background	Measured Jig	Units	Calibrated Jig	Units
GR	43	344	CPS	175	GRAPI

Shop Calibration
CNT-AA

Performed : 18-SEP-2014 Time : 17:15
Sensor Suite : CALI-BCN ID : NDT-BB-146

	Jig - Measured Ring#1	Jig - Measured Ring#2	Jig - Calibrated Ring#1	Jig - Calibrated Ring#2	Units
CL # 1	9.1	13.9	6.0	12.0	IN.

Performed : 18-Sep-2014 Time : 09:49
Sensor Suite : BHC NEUT ID : CNP-AA-115
Source ID : N-1044

	Tank Measured	Tank Calibrated	Verification Jig	Units
N/F	4.0236	3.6893	3.7013	
Porosity	25.9	20.5	20.7	%

Shop Calibration
LDT-DA

Performed : 18-SEP-2014 Time : 16:47
Sensor Suite : CALI-LTH ID : NDT-AH-152

	Jig - Measured Ring#1	Jig - Measured Ring#2	Jig - Calibrated Ring#1	Jig - Calibrated Ring#2	Units
CL # 1	7.4	10.7	6.0	12.0	IN.

Performed : 18-Sep-2014 Time : 11:25
Sensor Suite : BHCPELNG ID : LDP-DA-50
Source ID : CSV-587

Short Space

	BKGD	Al	Mg	Al+Fe	Units
LSW1	72	478	767	325	CPS
LSW2	76	543	860	409	CPS
LSW3	280	1302	2026	1138	CPS
LSW4	340	1235	1702	1115	CPS
LSW5	31	40	41	38	CPS
LSW6	95	95	93	96	CPS
LSW7	56	59	57	59	CPS
LSW8	1	3	3	2	CPS
QS	0.257	0.235	0.239	0.238	
PES			2.778	5.967	
SSDN		2.600	1.680		G/CC

Long Space

	BKGD	Al	Mg	Al+Fe	Units
LLW1	102	567	2352	371	CPS
LLW2	115	888	3622	682	CPS
LLW3	429	1761	6311	1548	CPS
LLW4	547	1061	2629	994	CPS
LLW5	65	69	78	67	CPS
LLW6	169	169	164	171	CPS
LLW7	114	108	109	111	CPS
LLW8	5	6	10	6	CPS
QL	0.196	0.221	0.199	0.212	
PEL			2.697	5.458	
LSDN		2.600	1.680		G/CC

Tucker ENERGY SERVICES

Company: BOP WEST
Well: HARBIN #3
Location: 2160' FNL & 330' FEL
Logged: 2014-10-11
K.B. Elev: 1320.0 Ft