



Gamma Ray

Scale:

Company: Noble Energy

1:1200 TVD

Well: Constitution Federal LC21-655

Depth Reference:

Field: Weld County

Driller's Depth

County: Weld Country: United States

State: Colorado

Status:

Final Print

Surface Location:

Latitude:

Longitude:

040° 44' 14.820" N

103° 58' 19.632" E

Other Services:

API No: 05123426320000

Job ID: 8595315

SEC: 22

TWN: 9N

RGE: 59W

Mean Sea Level

Rig Floor

Elevation:

Above P.D.

4907.00 ft

30.00 ft

Elev. KB:

Elev. DF:

Elev. GL:

N/A

4937.00 ft

4907.00 ft

Dates

Interval Logged

Magnetic Field Reference

Date From: 2017-06-13

Date To: 2017-06-15

Spud Date: 2017-06-12

Top: (ft)

Bottom: (ft)

11121.00

Azi Reference North: Grid

Total Magnetic Field Strength: (nT)

Mag to Reference North Correction: (deg)

67.08

52633

6.71 E

Borehole Record

Casing Record

Hole Size (in)

From (ft)

To (ft)

Size (in)

Weight (lb/ft)

From (ft)

To (ft)

8.500

1952.00

11121.00

9.625

36.00

30.00

1942.00

Mud Record

Deviation Record

Type

From (ft)

To (ft)

Hole Size (in)

Interval (ft)

Inc | Az (Start)

Inc | Az (End)

Oil Based Mud

1952.00

11121.00

8.500

9169.00

0.47 | 272.83

90.34 | 267.66

Acquisition System

Software Version

Other

Baker Hughes Cadence

Plot Studio

RT4.1

4.0.7570.8

Rig: H&P 524

Contractor: Helmerich & Payne Drilling Co

District: RMA

Unit: D&E

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Log Run Summary

Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours (h)
						Top (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	2.00	AutoTrak Curve	1929.62	11108.62	1942.00	11121.00	2017-06-13 15:36	2017-06-15 05:08	30.17

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Ryan Wuderlich	2017-06-12	2017-06-15	Steven Cano	2017-06-12	2017-06-15			

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2017-06-13 01:47	1	1900.00	Oil Based Mud	9.0	9	N/A	N/A	77.5/22.5	Active Pit	27000	0.00
2017-06-14 07:20	1	6222.00	Oil Based Mud	9.3	10	N/A	N/A	74.7/25.3	Active Pit	32300	0.00
2017-06-15 13:48	1	10738.00	Oil Based Mud	9.3	11	N/A	N/A	74.8/25.2	Active Pit	25000	0.00

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	ATC_SU	12480108	Near Bit Inclination	5.93	6.76	7.000	4.330
1	ATC_SU	12480108	Near Bit VSS	5.93	6.76	7.000	4.330
1	ATC_MWD	12375741	Gamma (single)	2.18	12.38	7.000	3.250
1	ATC_MWD	12375741	Directional (mag)	12.25	22.45	7.000	3.250

Service and Tool Mnemonics

Mnemonic	Name	Description
ATC_SU	ATC_SU	Auto Trak Curve Steering Unit
ATC_MWD	ATC_MWD	Auto Trak Curve MWD
ATC_LCPM	ATC_LCPM	Auto Trak Curve LCPM

Comments

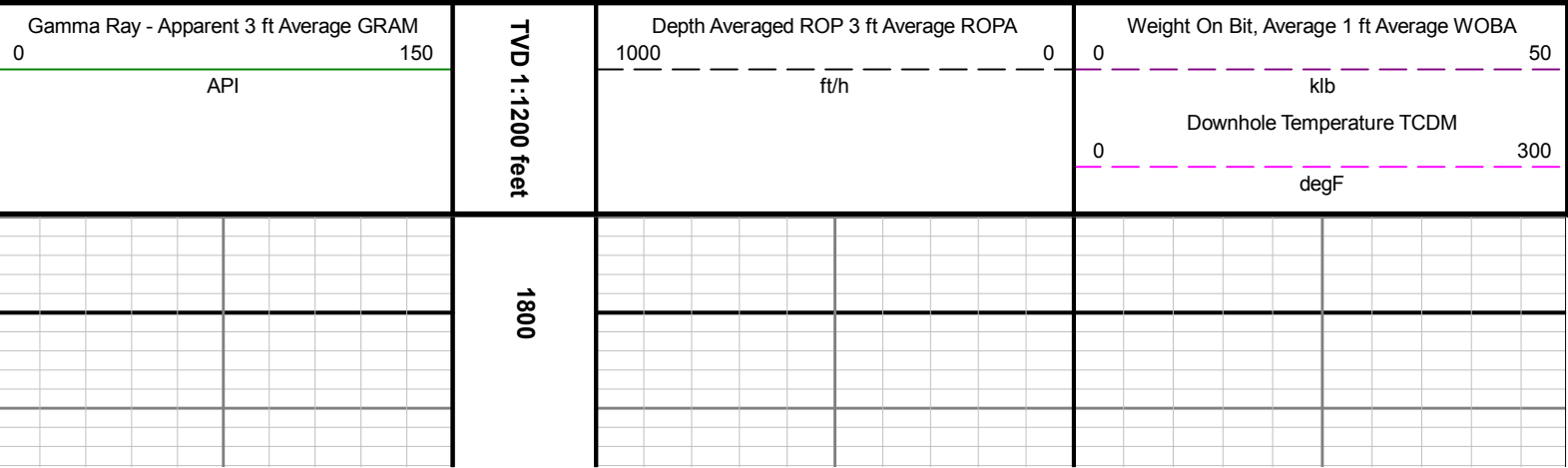
- 1
- Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
- 2
- Baker Hughes LWD run 1 utilized a 6 3/4 inch Navigamma Service (Gamma Ray, and Directional) behind a 8 1/2 inch bit and rotary steerable from 1952 to 11121 feet MD (1952 to 6166 feet TVD).

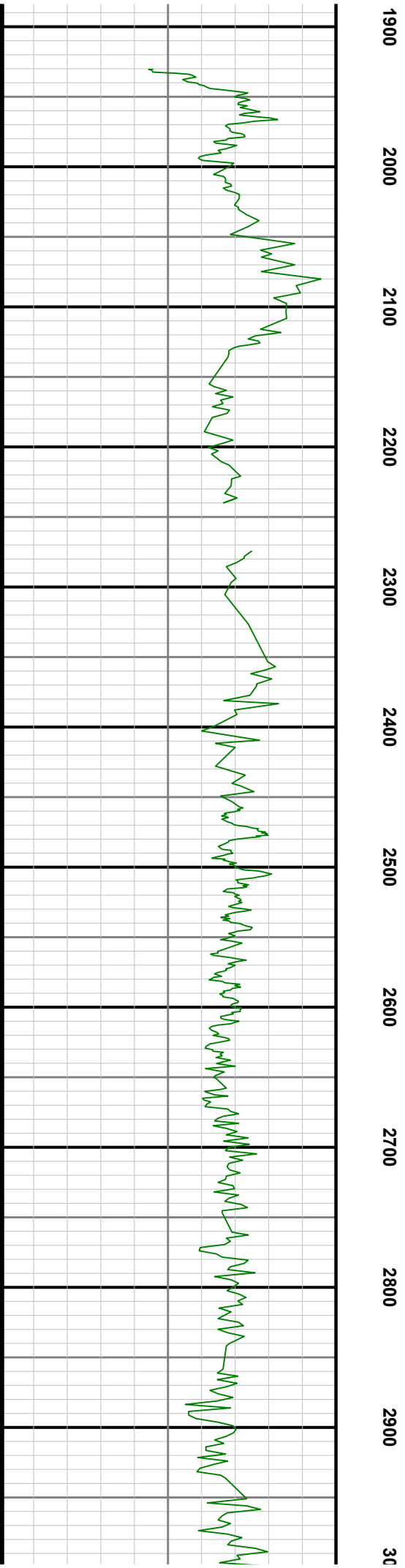
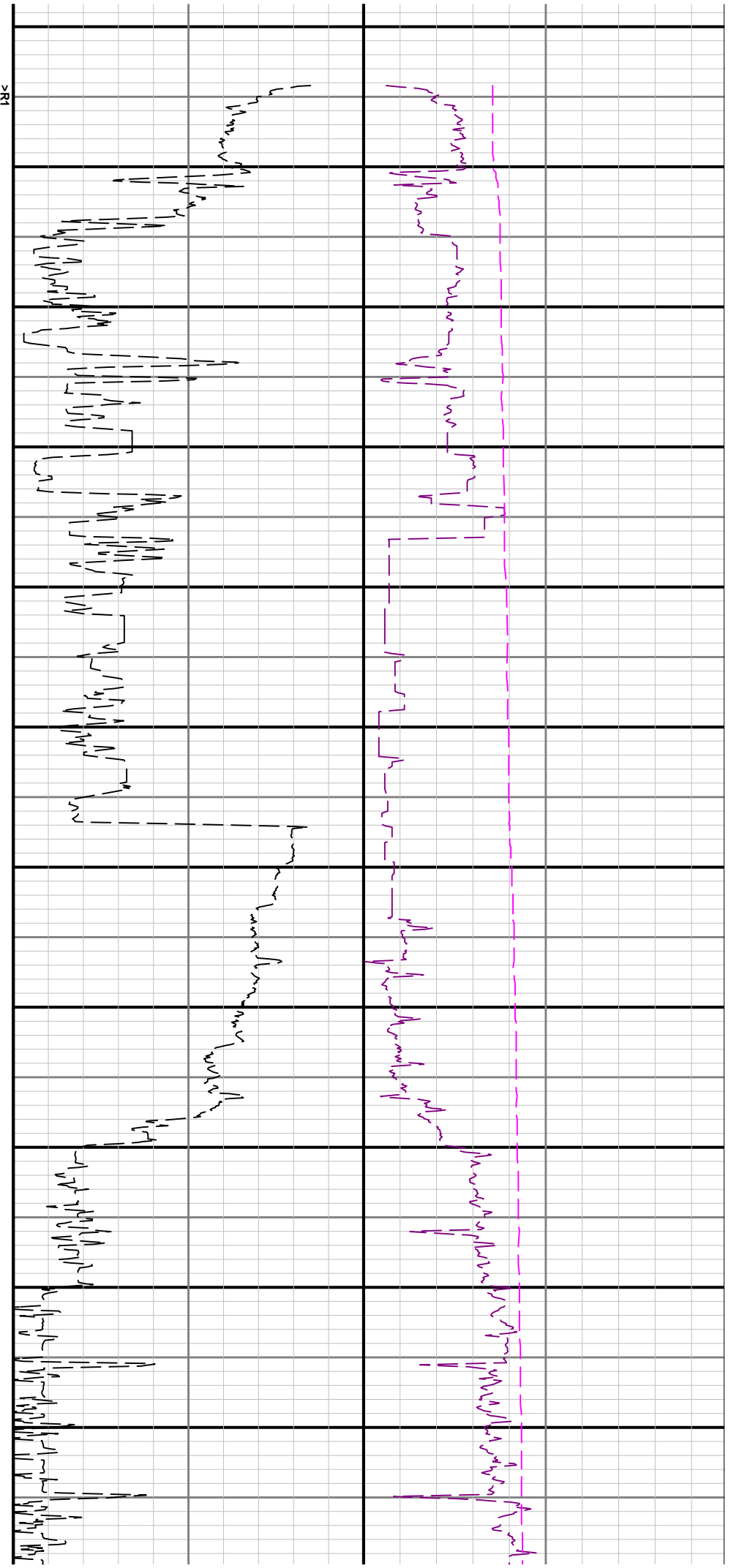
Remarks

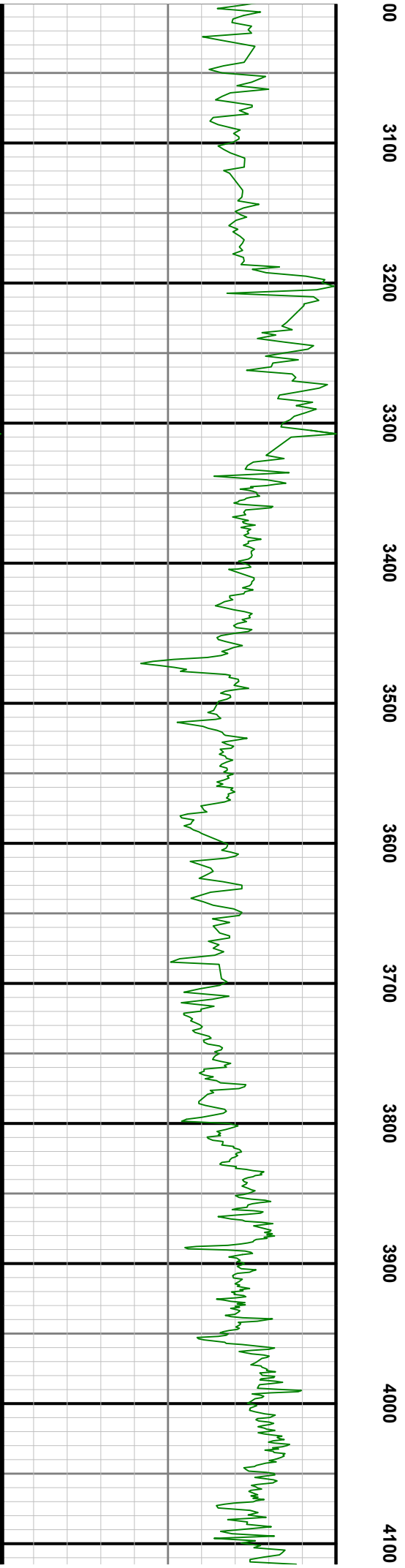
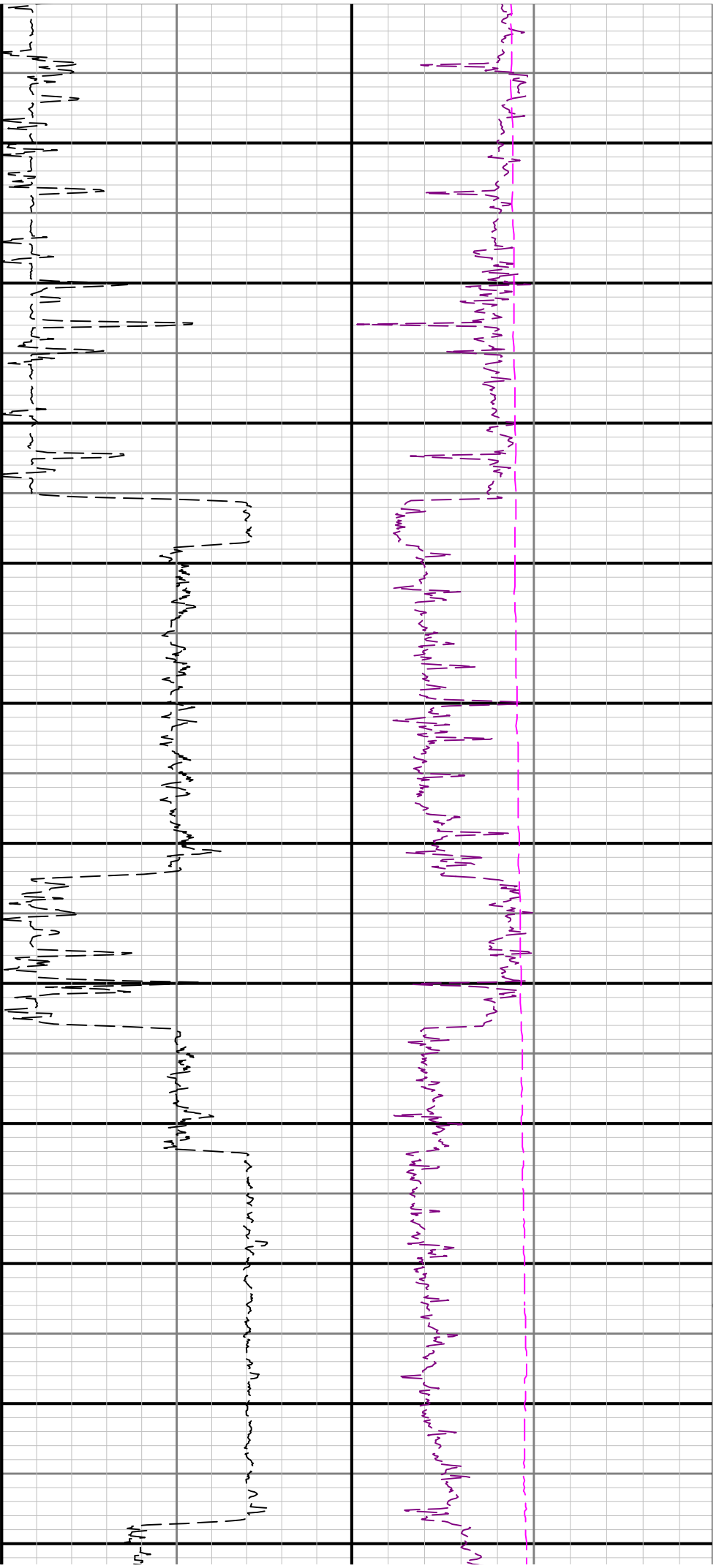
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	11121.00	8.500	1	The interval from 11109 to 11121 feet MD (6115 feet TVD) was not logged due to sensor offset at well TD.

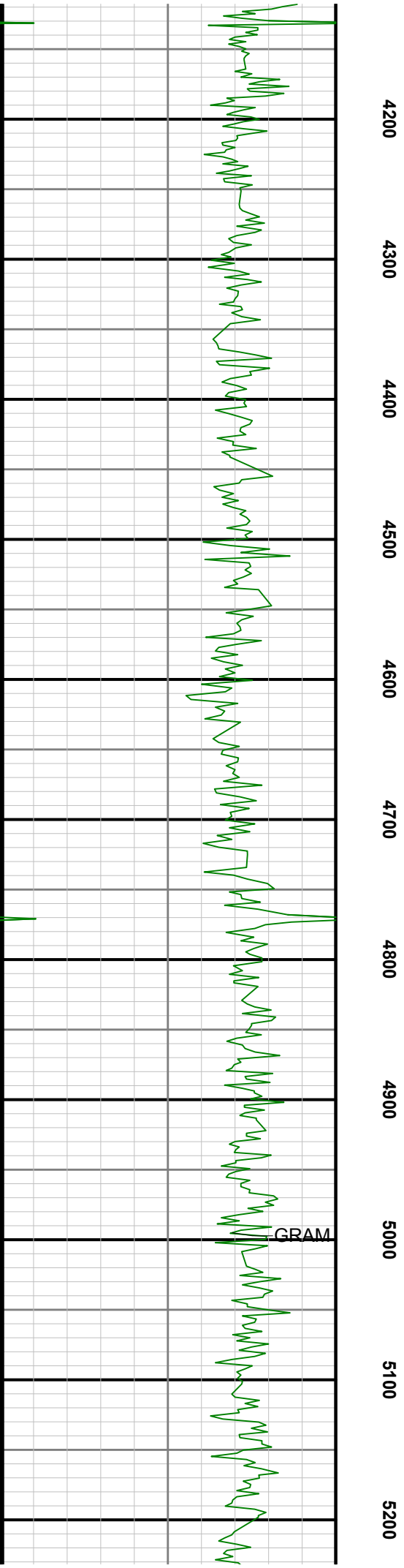
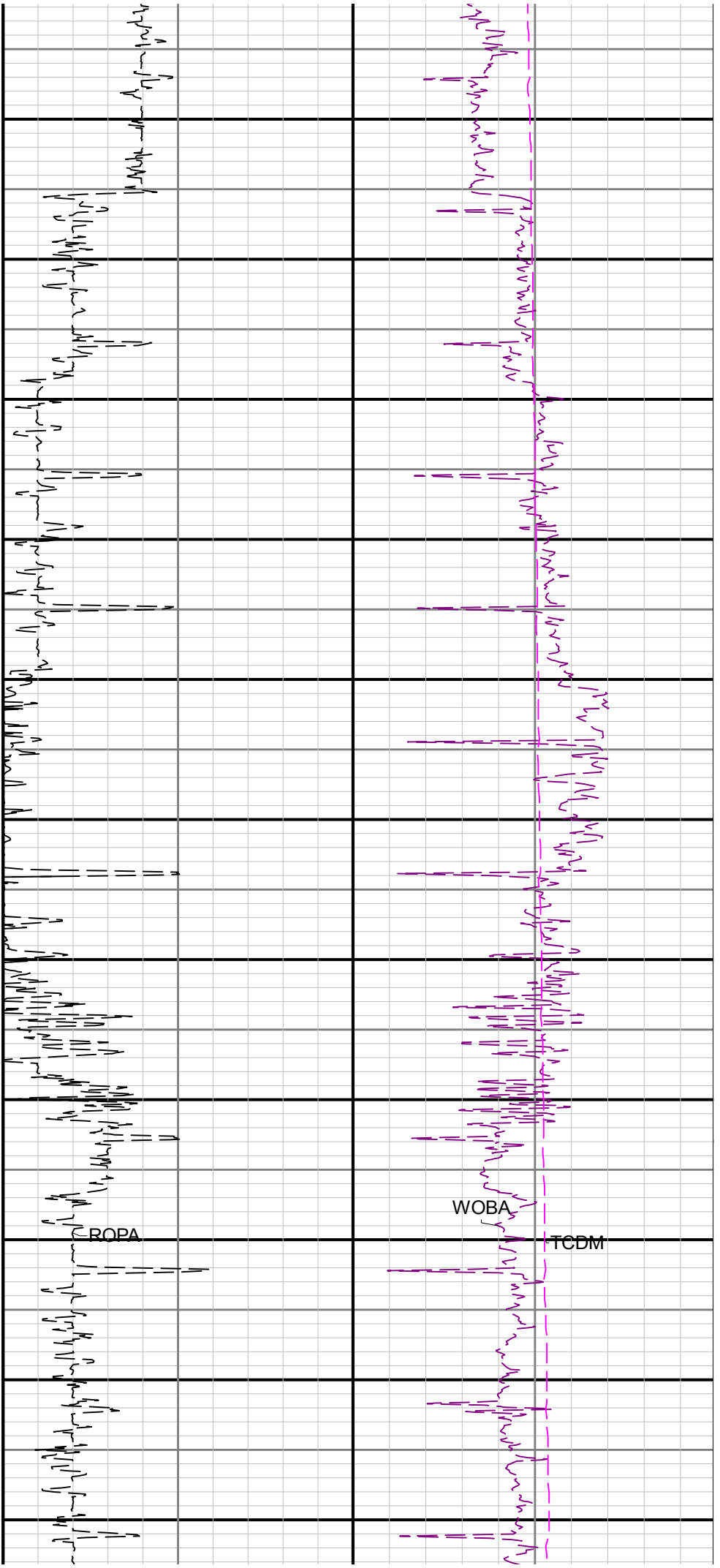
Curve Mnemonics

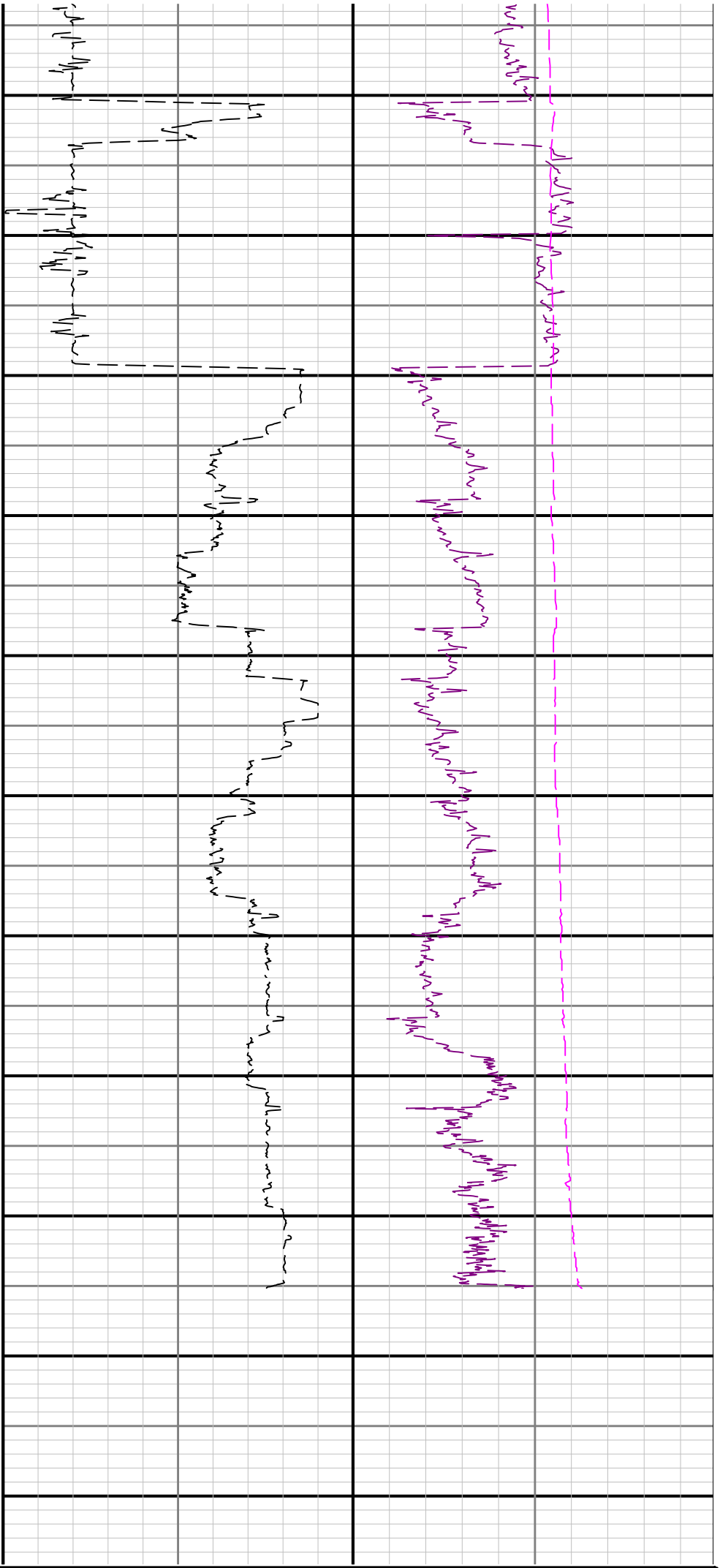
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent 3 ft Average	API
TCDM	Downhole Temperature	degF



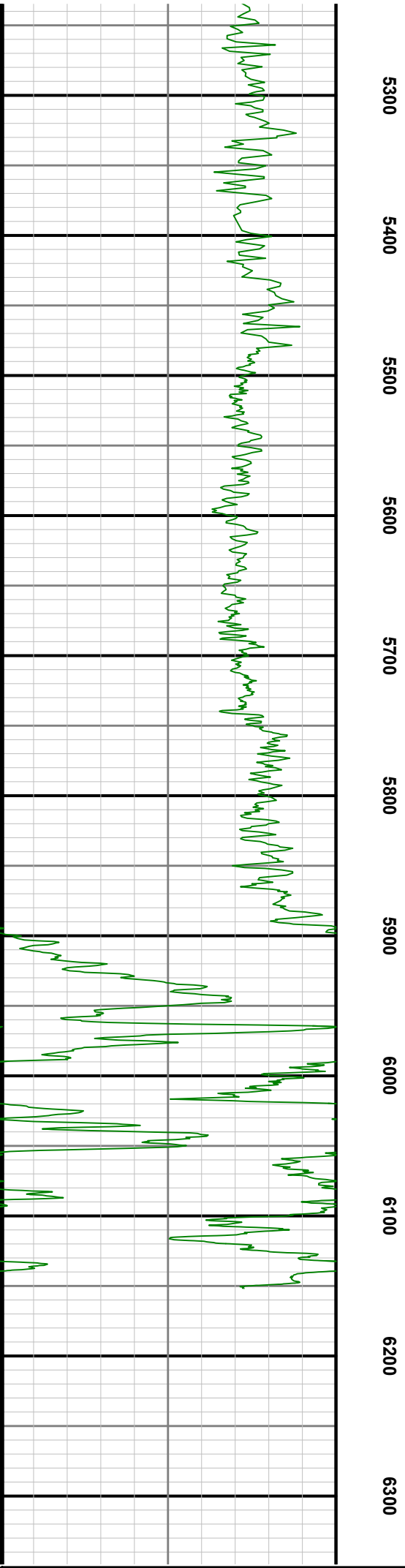








Rt <



Gamma Ray - Apparent 3 ft Average GRAM				TVD 1:1200 feet	Depth Averaged ROP 3 ft Average ROPA				Weight On Bit, Average 1 ft Average WOBA			
0150					10000				050			
API					ft/h				klb			
									Downhole Temperature TCDM			
								0300				
								degF				

Directional Survey Summary												
Latitude:		040° 44' 14.820" N					Longitude:		103° 58' 19.632" E			
North Reference:		Grid					Drill Depth Zero:		Rig Floor			
Vertical Datum is:		Mean Sea Level					Vertical Datum to DDZ: (ft)		30.00			
Vertical Section North: (m)		0.00					Vertical Section East: (m)		0.00			
Vertical Section Azimuth: (deg)		269.02										
Grid Convergence: (deg)		-0.99					Magnetic Declination: (deg)		7.70			
Total Correction: (deg)		6.71					TVD Calculation Method:		Minimum Curvature			
Magnetic Correction:		Off					Local Magnetic Field: (nT)		52633			
Local Magnetic Dip Angle: (deg)		67.08					Local Gravity Field: (m/s2)		9.801			

Tie-In / Projection	Measured Depth (ft)	Inclination (deg)	Azimuth (deg)	Temperature (degF)	North (ft)	East (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Course Length (ft)	Dog Leg Severity (deg/100ft)	Build Rate (deg/100ft)	Turn Rate (deg/100ft)
Tie-In	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	82.00	0.47	272.83	N/A	0.02	-0.34	82.00	0.34	82.00	0.57	0.57	-106.30
	177.00	0.28	275.87	N/A	0.06	-0.96	177.00	0.95	95.00	0.20	-0.20	3.20
	268.00	0.33	284.10	N/A	0.15	-1.43	268.00	1.43	91.00	0.07	0.05	9.04
	362.00	0.33	291.49	N/A	0.31	-1.95	361.99	1.94	94.00	0.05	0.00	7.86
	457.00	0.23	43.43	N/A	0.55	-2.07	456.99	2.06	95.00	0.49	-0.11	117.83
	551.00	0.39	72.59	N/A	0.78	-1.63	550.99	1.62	94.00	0.23	0.17	31.02
	646.00	0.11	169.60	N/A	0.79	-1.31	645.99	1.30	95.00	0.44	-0.29	102.12
	741.00	0.41	112.30	N/A	0.57	-0.98	740.99	0.97	95.00	0.38	0.32	-60.32
	835.00	0.31	121.39	N/A	0.31	-0.45	834.99	0.44	94.00	0.12	-0.11	9.67
	930.00	0.45	148.21	N/A	-0.14	-0.03	929.99	0.04	95.00	0.23	0.15	28.23
	1024.00	0.38	94.13	N/A	-0.48	0.47	1023.98	-0.46	94.00	0.41	-0.07	-57.53
	1119.00	0.27	102.30	N/A	-0.55	1.00	1118.98	-0.99	95.00	0.13	-0.12	8.60
	1213.00	0.11	325.33	N/A	-0.52	1.17	1212.98	-1.16	94.00	0.38	-0.17	-145.71
	1308.00	0.32	83.88	N/A	-0.42	1.38	1307.98	-1.37	95.00	0.41	0.22	124.79
	1403.00	0.49	89.81	N/A	-0.39	2.05	1402.98	-2.04	95.00	0.18	0.18	6.24
	1497.00	0.66	105.40	N/A	-0.53	2.97	1496.97	-2.97	94.00	0.24	0.18	16.59
	1592.00	0.41	109.92	N/A	-0.79	3.82	1591.97	-3.81	95.00	0.27	-0.26	4.76
	1686.00	0.21	128.07	N/A	-1.01	4.27	1685.97	-4.26	94.00	0.23	-0.21	19.31
	1781.00	0.38	109.84	N/A	-1.23	4.71	1780.97	-4.69	95.00	0.20	0.18	-19.19
	1876.00	0.68	126.72	N/A	-1.67	5.46	1875.96	-5.43	95.00	0.35	0.32	17.77
	1903.00	0.83	126.44	N/A	-1.88	5.74	1902.96	-5.71	27.00	0.56	0.56	-1.04
	1980.00	0.62	191.90	N/A	-2.62	6.10	1979.96	-6.06	77.00	1.04	-0.27	85.01
	2074.00	0.69	345.94	N/A	-2.57	5.86	2073.95	-5.82	94.00	1.36	0.07	163.87
	2169.00	0.03	247.44	N/A	-2.02	5.70	2168.95	-5.66	95.00	0.73	-0.69	-103.68
	2263.00	0.04	27.45	N/A	-2.00	5.69	2262.95	-5.66	94.00	0.07	0.01	148.95
	2358.00	0.03	154.03	N/A	-2.00	5.72	2357.95	-5.68	95.00	0.07	-0.01	133.24
	2452.00	0.04	135.37	N/A	-2.04	5.75	2451.95	-5.72	94.00	0.02	0.01	-19.85
	2547.00	2.06	306.77	N/A	-1.04	4.41	2546.93	-4.39	95.00	2.21	2.13	180.42
	2642.00	4.95	308.63	N/A	2.54	-0.16	2641.74	0.12	95.00	3.04	3.04	1.96
	2736.00	5.71	308.99	N/A	8.01	-6.97	2735.34	6.83	94.00	0.81	0.81	0.38
	2831.00	5.62	307.77	N/A	13.83	-14.32	2829.87	14.08	95.00	0.16	-0.09	-1.28
	2925.00	5.68	307.95	N/A	19.51	-21.62	2923.42	21.29	94.00	0.07	0.06	0.19
	3020.00	5.51	308.23	N/A	25.23	-28.91	3017.96	28.48	95.00	0.18	-0.18	0.29
	3115.00	5.52	308.81	N/A	30.91	-36.06	3112.52	35.52	95.00	0.06	0.01	0.61
	3209.00	5.54	312.36	N/A	36.80	-42.93	3206.09	42.30	94.00	0.36	0.02	3.78
	3304.00	6.21	334.12	N/A	44.52	-48.56	3300.60	47.79	95.00	2.43	0.71	22.91
	3398.00	6.32	335.86	N/A	53.81	-52.90	3394.04	51.97	94.00	0.23	0.12	1.85
	3493.00	6.31	328.81	N/A	63.05	-57.74	3488.46	56.65	95.00	0.82	-0.01	-7.42
	3587.00	6.33	315.94	N/A	71.20	-64.02	3581.90	62.79	94.00	1.50	0.02	-13.69
	3682.00	6.54	282.52	N/A	76.13	-72.95	3676.33	71.63	95.00	3.89	0.22	-35.18
	3776.00	6.95	233.28	N/A	73.89	-82.74	3769.75	81.46	94.00	5.98	0.44	-52.38
	3871.00	4.30	204.03	N/A	67.20	-88.80	3864.31	87.64	95.00	4.03	-2.79	-30.79
	3965.00	2.44	202.35	N/A	62.13	-90.99	3958.14	89.92	94.00	1.98	-1.98	-1.79
	4060.00	0.07	301.44	N/A	60.29	-91.81	4053.11	90.77	95.00	2.58	-2.49	104.31
	4155.00	0.03	150.02	N/A	60.30	-91.85	4148.11	90.81	95.00	0.10	-0.04	-159.39
	4249.00	0.03	40.78	N/A	60.30	-91.82	4242.11	90.78	94.00	0.05	0.00	-116.21
	4344.00	0.04	346.15	N/A	60.35	-91.81	4337.11	90.77	95.00	0.04	0.01	-57.51
	4438.00	0.12	64.95	N/A	60.42	-91.73	4431.11	90.69	94.00	0.13	0.09	83.83
	4533.00	0.07	108.30	N/A	60.44	-91.59	4526.11	90.54	95.00	0.09	-0.05	45.63
	4628.00	0.11	50.79	N/A	60.48	-91.46	4621.11	90.41	95.00	0.10	0.04	-60.54
	4722.00	0.26	27.69	N/A	60.73	-91.29	4715.11	90.24	94.00	0.18	0.16	-24.57

	4817.00	0.07	149.52	N/A	60.87	-91.16	4810.11	90.11	95.00	0.32	-0.20	128.24
	4911.00	0.03	175.72	N/A	60.80	-91.13	4904.11	90.08	94.00	0.05	-0.04	27.87
	5006.00	0.04	105.63	N/A	60.76	-91.10	4999.11	90.05	95.00	0.04	0.01	-73.78
	5100.00	0.04	279.57	N/A	60.76	-91.10	5093.11	90.05	94.00	0.08	0.00	185.04
	5195.00	0.06	165.80	N/A	60.72	-91.12	5188.11	90.07	95.00	0.09	0.02	-119.76
	5289.00	0.09	203.47	N/A	60.60	-91.14	5282.11	90.09	94.00	0.06	0.03	40.07
	5384.00	0.04	87.00	N/A	60.53	-91.13	5377.11	90.08	95.00	0.12	-0.05	-122.60
	5478.00	0.10	32.76	N/A	60.61	-91.06	5471.11	90.01	94.00	0.09	0.06	-57.70
	5573.00	7.84	282.81	N/A	62.11	-97.34	5565.81	96.26	95.00	8.29	8.15	-115.74
	5668.00	16.52	288.02	N/A	67.74	-116.54	5658.59	115.36	95.00	9.20	9.14	5.48
	5707.00	18.56	283.81	N/A	70.94	-127.84	5695.78	126.61	39.00	6.16	5.23	-10.79
	5801.00	25.01	264.93	N/A	72.76	-162.24	5783.12	160.97	94.00	10.05	6.86	-20.09
	5896.00	32.58	272.36	N/A	72.03	-207.88	5866.34	206.62	95.00	8.80	7.97	7.82
	5990.00	41.12	271.32	N/A	73.79	-264.17	5941.49	262.87	94.00	9.11	9.09	-1.11
	6085.00	49.84	265.54	N/A	71.68	-331.75	6008.07	330.48	95.00	10.15	9.18	-6.08
	6179.00	58.51	264.99	N/A	65.38	-407.63	6063.03	406.46	94.00	9.24	9.22	-0.59
	6274.00	67.16	266.33	N/A	59.03	-491.83	6106.37	490.75	95.00	9.19	9.11	1.41
	6369.00	77.09	267.57	N/A	54.25	-582.00	6135.49	580.99	95.00	10.53	10.45	1.31
	6463.00	86.06	268.27	N/A	50.88	-674.83	6149.25	673.86	94.00	9.57	9.54	0.74
	6558.00	90.49	269.02	N/A	48.64	-769.74	6152.11	768.80	95.00	4.73	4.66	0.79
	6652.00	90.46	267.83	N/A	46.06	-863.70	6151.33	862.79	94.00	1.27	-0.03	-1.27
	6747.00	90.37	268.39	N/A	42.92	-958.64	6150.64	957.77	95.00	0.60	-0.09	0.59
	6841.00	90.43	269.83	N/A	41.46	-1052.63	6149.99	1051.77	94.00	1.53	0.06	1.53
	6936.00	90.43	270.15	N/A	41.45	-1147.63	6149.27	1146.75	95.00	0.34	0.00	0.34
	7030.00	90.46	269.83	N/A	41.43	-1241.62	6148.54	1240.73	94.00	0.34	0.03	-0.34
	7125.00	90.55	271.42	N/A	42.47	-1336.61	6147.70	1335.69	95.00	1.68	0.09	1.67
	7220.00	90.46	270.71	N/A	44.23	-1431.59	6146.87	1430.62	95.00	0.75	-0.09	-0.75
	7314.00	90.34	269.14	N/A	44.11	-1525.58	6146.21	1524.61	94.00	1.68	-0.13	-1.67
	7408.00	90.28	267.14	N/A	41.06	-1619.53	6145.70	1618.59	94.00	2.13	-0.06	-2.13
	7503.00	90.40	264.52	N/A	34.15	-1714.27	6145.14	1713.43	95.00	2.76	0.13	-2.76
	7597.00	90.46	265.10	N/A	25.65	-1807.88	6144.43	1807.18	94.00	0.62	0.06	0.62
	7692.00	90.40	266.39	N/A	18.60	-1902.61	6143.72	1902.02	95.00	1.36	-0.06	1.36
	7787.00	90.52	267.68	N/A	13.69	-1997.48	6142.96	1996.95	95.00	1.36	0.13	1.36
	7881.00	90.52	267.11	N/A	9.41	-2091.38	6142.10	2090.91	94.00	0.61	0.00	-0.61
	7976.00	90.52	266.71	N/A	4.29	-2186.24	6141.24	2185.84	95.00	0.42	0.00	-0.42
	8071.00	90.37	266.52	N/A	-1.32	-2281.07	6140.50	2280.76	95.00	0.25	-0.16	-0.20
	8165.00	90.18	265.77	N/A	-7.64	-2374.85	6140.05	2374.64	94.00	0.82	-0.20	-0.80
	8260.00	90.46	265.94	N/A	-14.50	-2469.60	6139.52	2469.49	95.00	0.34	0.29	0.18
	8449.00	90.37	267.59	N/A	-25.17	-2658.29	6138.15	2658.33	189.00	0.87	-0.05	0.87
	8544.00	90.43	268.82	N/A	-28.14	-2753.24	6137.49	2753.32	95.00	1.30	0.06	1.29
	8638.00	90.37	268.70	N/A	-30.18	-2847.22	6136.83	2847.32	94.00	0.14	-0.06	-0.13
	8733.00	90.37	268.07	N/A	-32.85	-2942.18	6136.22	2942.31	95.00	0.66	0.00	-0.66
	8827.00	90.55	268.35	N/A	-35.79	-3036.13	6135.47	3036.29	94.00	0.35	0.19	0.30
	8922.00	90.68	268.08	N/A	-38.75	-3131.07	6134.45	3131.28	95.00	0.32	0.14	-0.28
	9112.00	90.62	269.29	N/A	-43.11	-3321.01	6132.29	3321.26	190.00	0.64	-0.03	0.64
	9206.00	90.71	270.79	N/A	-43.04	-3415.00	6131.20	3415.24	94.00	1.60	0.10	1.60
	9301.00	90.80	267.94	N/A	-44.10	-3509.98	6129.95	3510.22	95.00	3.00	0.09	-3.00
	9395.00	90.43	270.10	N/A	-45.70	-3603.95	6128.94	3604.21	94.00	2.33	-0.39	2.30
	9490.00	90.40	270.24	N/A	-45.42	-3698.95	6128.25	3699.18	95.00	0.15	-0.03	0.15
	9584.00	90.40	269.13	N/A	-45.94	-3792.94	6127.59	3793.17	94.00	1.18	0.00	-1.18
	9679.00	90.37	269.06	N/A	-47.44	-3887.93	6126.96	3888.17	95.00	0.08	-0.03	-0.07
	9774.00	90.49	269.51	N/A	-48.62	-3982.92	6126.24	3983.17	95.00	0.49	0.13	0.47
	9963.00	90.49	269.43	N/A	-50.37	-4171.90	6124.63	4172.16	189.00	0.04	0.00	-0.04
	10057.00	90.43	269.39	N/A	-51.34	-4265.90	6123.87	4266.15	94.00	0.08	-0.06	-0.04
	10152.00	90.46	269.03	N/A	-52.65	-4360.88	6123.13	4361.15	95.00	0.38	0.03	-0.38
	10247.00	90.46	268.78	N/A	-54.47	-4455.86	6122.37	4456.14	95.00	0.26	0.00	-0.26
	10341.00	90.46	268.63	N/A	-56.59	-4549.84	6121.62	4550.14	94.00	0.16	0.00	-0.16
	10436.00	90.43	268.80	N/A	-58.72	-4644.81	6120.88	4645.13	95.00	0.18	-0.03	0.18
	10530.00	90.49	268.49	N/A	-60.94	-4738.78	6120.12	4739.13	94.00	0.34	0.06	-0.33
	10719.00	90.34	267.24	N/A	-67.98	-4927.64	6118.76	4928.08	189.00	0.67	-0.08	-0.66
	10814.00	90.40	267.48	N/A	-72.36	-5022.54	6118.14	5023.04	95.00	0.26	0.06	0.25
	10908.00	90.52	267.44	N/A	-76.53	-5116.44	6117.39	5117.00	94.00	0.13	0.13	-0.04
	11003.00	90.40	266.99	N/A	-81.14	-5211.33	6116.62	5211.95	95.00	0.49	-0.13	-0.47
	11097.00	90.34	267.66	N/A	-85.53	-5305.22	6116.02	5305.91	94.00	0.72	-0.06	0.71
Projection	11121.00	90.34	267.66	N/A	-86.51	-5329.20	6115.88	5329.90	24.00	0.00	0.00	0.00