



LWD MEMORY LOG

Gamma Ray

Scale: **Company: Noble Energy**

1:1200 MD	Well:	Hullabaloo Y21-746
-----------	-------	--------------------

Depth Reference: 11 cm.

Driller's Depth	County: Weld	Country: United States
-----------------	--------------	------------------------

Status:	Surface Location:	Other Services
---------	-------------------	----------------

Final Print

API No: 051244951 Wellbore Surveys

Job ID: 8776777

SEC:	16	TWN:	2N	RGE:	64W
------	----	------	----	------	-----

Permanent Datum (P.D.):	Ground Level	Elevation:	4944.00 ft	Elev. KB:	N/A
-------------------------	--------------	------------	------------	-----------	-----

Log Measured From:	Rig Floor	Above P.D.	30.00 ft	Elev. G.I.:	4944.00 ft
--------------------	-----------	------------	----------	-------------	------------

Dates	Interval Logged	Magnetic Field Reference
1998-01-01	1000	1000
1998-01-02	1000	1000
1998-01-03	1000	1000
1998-01-04	1000	1000
1998-01-05	1000	1000
1998-01-06	1000	1000
1998-01-07	1000	1000
1998-01-08	1000	1000
1998-01-09	1000	1000
1998-01-10	1000	1000
1998-01-11	1000	1000
1998-01-12	1000	1000
1998-01-13	1000	1000
1998-01-14	1000	1000
1998-01-15	1000	1000
1998-01-16	1000	1000
1998-01-17	1000	1000
1998-01-18	1000	1000
1998-01-19	1000	1000
1998-01-20	1000	1000
1998-01-21	1000	1000
1998-01-22	1000	1000
1998-01-23	1000	1000
1998-01-24	1000	1000
1998-01-25	1000	1000
1998-01-26	1000	1000
1998-01-27	1000	1000
1998-01-28	1000	1000
1998-01-29	1000	1000
1998-01-30	1000	1000
1998-01-31	1000	1000
1998-02-01	1000	1000
1998-02-02	1000	1000
1998-02-03	1000	1000
1998-02-04	1000	1000
1998-02-05	1000	1000
1998-02-06	1000	1000
1998-02-07	1000	1000
1998-02-08	1000	1000
1998-02-09	1000	1000
1998-02-10	1000	1000
1998-02-11	1000	1000
1998-02-12	1000	1000
1998-02-13	1000	1000
1998-02-14	1000	1000
1998-02-15	1000	1000
1998-02-16	1000	1000
1998-02-17	1000	1000
1998-02-18	1000	1000
1998-02-19	1000	1000
1998-02-20	1000	1000
1998-02-21	1000	1000
1998-02-22	1000	1000
1998-02-23	1000	1000
1998-02-24	1000	1000
1998-02-25	1000	1000
1998-02-26	1000	1000
1998-02-27	1000	1000
1998-02-28	1000	1000
1998-02-29	1000	1000
1998-03-01	1000	1000
1998-03-02	1000	1000
1998-03-03	1000	1000
1998-03-04	1000	1000
1998-03-05	1000	1000
1998-03-06	1000	1000
1998-03-07	1000	1000
1998-03-08	1000	1000
1998-03-09	1000	1000
1998-03-10	1000	1000
1998-03-11	1000	1000
1998-03-12	1000	1000
1998-03-13	1000	1000
1998-03-14	1000	1000
1998-03-15	1000	1000
1998-03-16	1000	1000
1998-03-17	1000	1000
1998-03-18	1000	1000
1998-03-19	1000	1000
1998-03-20	1000	1000
1998-03-21	1000	1000
1998-03-22	1000	1000
1998-03-23	1000	1000
1998-03-24	1000	1000
1998-03-25	1000	1000
1998-03-26	1000	1000
1998-03-27	1000	1000
1998-03-28	1000	1000
1998-03-29	1000	1000
1998-03-30	1000	1000
1998-03-31	1000	1000
1998-04-01	1000	1000
1998-04-02	1000	1000
1998-04-03	1000	1000
1998-		

Date From:	2017-09-26	Top: (ft)	2033.00	Azi Reference North:	Grid	Dip Angle: (deg)	66.66
------------	------------	-----------	---------	----------------------	------	------------------	-------

Date To:	2017-09-29	Bottom: (ft)	17204.00	Total Magnetic Field Strength: (nT)	52271
----------	------------	--------------	----------	-------------------------------------	-------

Spud Date:	2017-09-25	Mag to Reference North Correction: (deg)	7.45
------------	------------	--	------

Borehole Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
----------------	-----------	---------	-----------	----------------	-----------	---------

8.500	2033.00	17204.00	9.625	36.00	30.00	2023.00
-------	---------	----------	-------	-------	-------	---------

[illegible][illegible][illegible][illegible][illegible]

Mud Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
------	-----------	---------	----------------	---------------	------------------	----------------

Oil Based Mud	30.00	17204.16	8.500	15171.00	0.52	198.53	89.94	179.76
---------------	-------	----------	-------	----------	------	--------	-------	--------

[illegible][illegible][illegible][illegible]

Acquisition System

Baker Hughes Cadence RT4.1 Rigi: H&P 524

Plot Studio 4.1.7763.3 Contractor: Helmerich & Payne Drilling Co

District:	RMD	Unit:	D&E
-----------	-----	-------	-----

"These interpretations and analyses ("Interpretations") are opinions provided by Baker Hughes Oilfield Operations, Inc ("Baker Hughes"), based upon industry practice, empirical relationships, assumptions and measurements, (many of which may be provided by the customer). The Interpretations are not infallible and may be subject to different opinions. Vjwu."Dcmgt"Jwiugu"fggu"pqv"ycttcpv"vjgkt"ceewtce{"."eqttgevgpguu."qt"eqornvgvgpguu."qt"vjcv"vjg"ewuvqogtøu"cpflqt"cp{" "vjktf"rctv{øu"tgnkcpv"qp"uwej"Kpvgrtgvvcvkpgu"yknn"ceegornku"cp{"rctvkewnct"tguwnvu0"Vjg"ewuvqogt"cuuwogu"hwnn" responsibility for the use of the Interpretations and for decisions based thereon and the customer agrees to release, defend and indemnify Baker Hughes, its parent, subsidiaries and affiliated or related entities, and subcontractors, together with its and their officers, directors, employees, agents and invitees against, any and all claims, losses, damages, or expenses sustained by the customer or any third party arising out of reliance upon or use of the Interpretations, without regard to the cause(s) thereof, including without limitation any form of negligence on the part of Baker Hughes. Unless other contract terms have been agreed to by the parties, each party's liabilities and qdnkicvkpgu"ujcnn"dg"igxgtpgf"d{"Dcmgt"Jwiugu"Kpeqtrgtcvvgføu"Ygtmfykfg"Vgtou"cpf"Eqpfkvkpgu0\$""

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	2021.00	17192.00	2033.00	17204.00	2017-09-26 15:31	2017-09-29 06:07	56.30

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Steven Cano	2017-09-25	2017-09-29	TY Jackson	2017-09-25	2017-09-29			

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+ (%)
2017-09-26 05:04	1	2500.00	Oil Based Mud	9.2	8	N/A	17.0	82/18	Active Pit	28500	0.00
2017-09-27 10:01	1	6404.00	Oil Based Mud	9.3	9	N/A	16.0	83/17	Active Pit	29000	0.00
2017-09-28 16:30	1	14135.00	Oil Based Mud	9.2	8	N/A	16.0	85/15	Active Pit	30000	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	14127486	Near Bit VSS	5.93	6.76	7.000	4.330
1	ATC_SU	14127486	Near Bit Inclination	5.93	6.76	7.000	4.330
1	ATC_MWD	12603327	Gamma (single)	2.76	12.94	7.000	3.250
1	ATC_MWD	12603327	Directional (mag)	12.27	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 were obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes, depth calibrations and measurements could not be independently verified.
2	Baker Hughes LWD run 1 utilized a 6.75 inch Navigamma service (Gamma Ray and Directional) behind a 8 1/2 inch bit and rotary steerable from 2033 to 17204 feet MD (2033 to 6980 feet TVD).
3	Periodic gaps in the gamma data are due to memory module issue and drilling ahead while downlinking.

Remarks

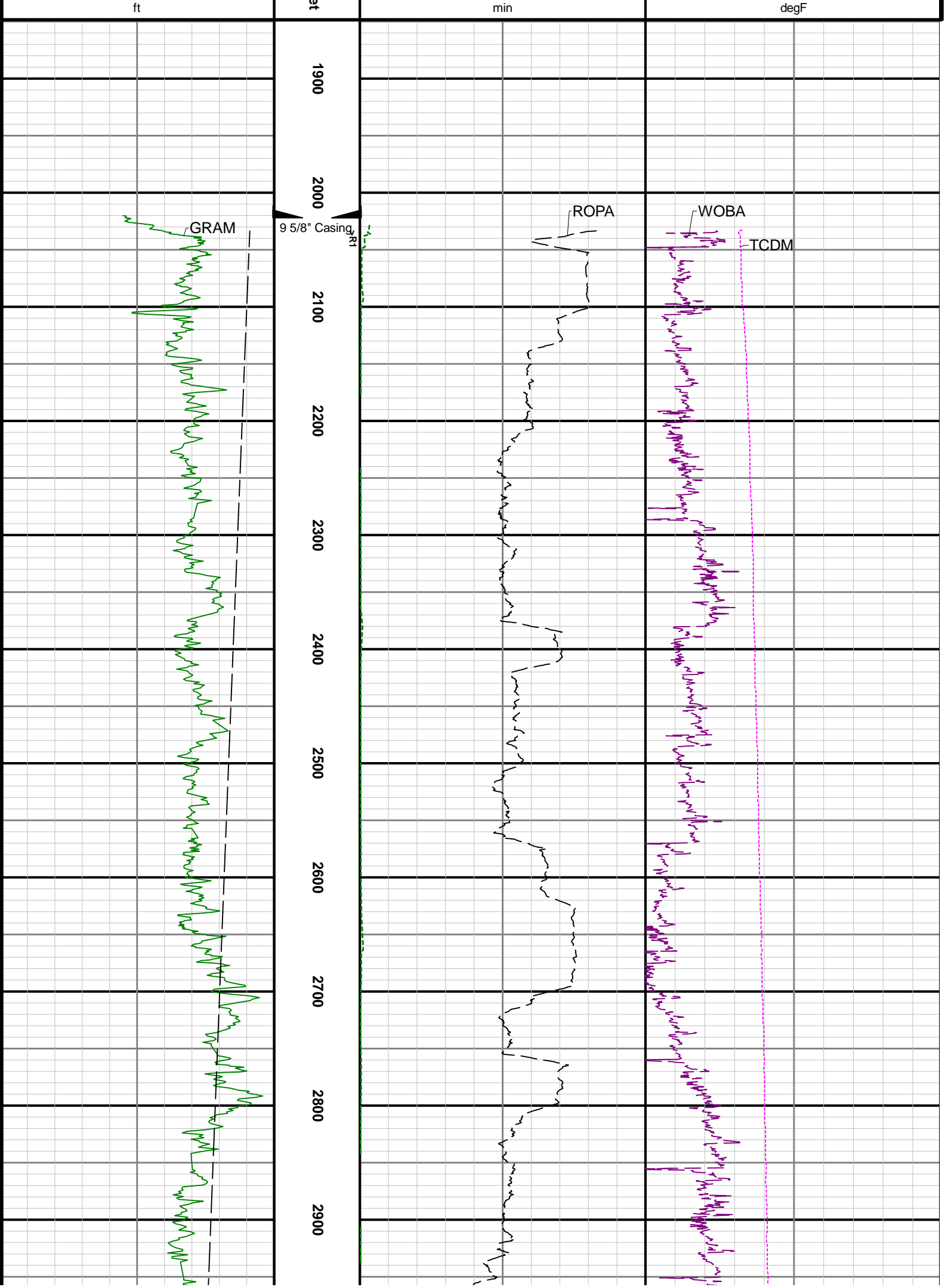
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	17192.00	8.500	1	The interval from 17192 to 17204 feet MD (6980 feet TVD) was not logged due to sensor offset at well TD.

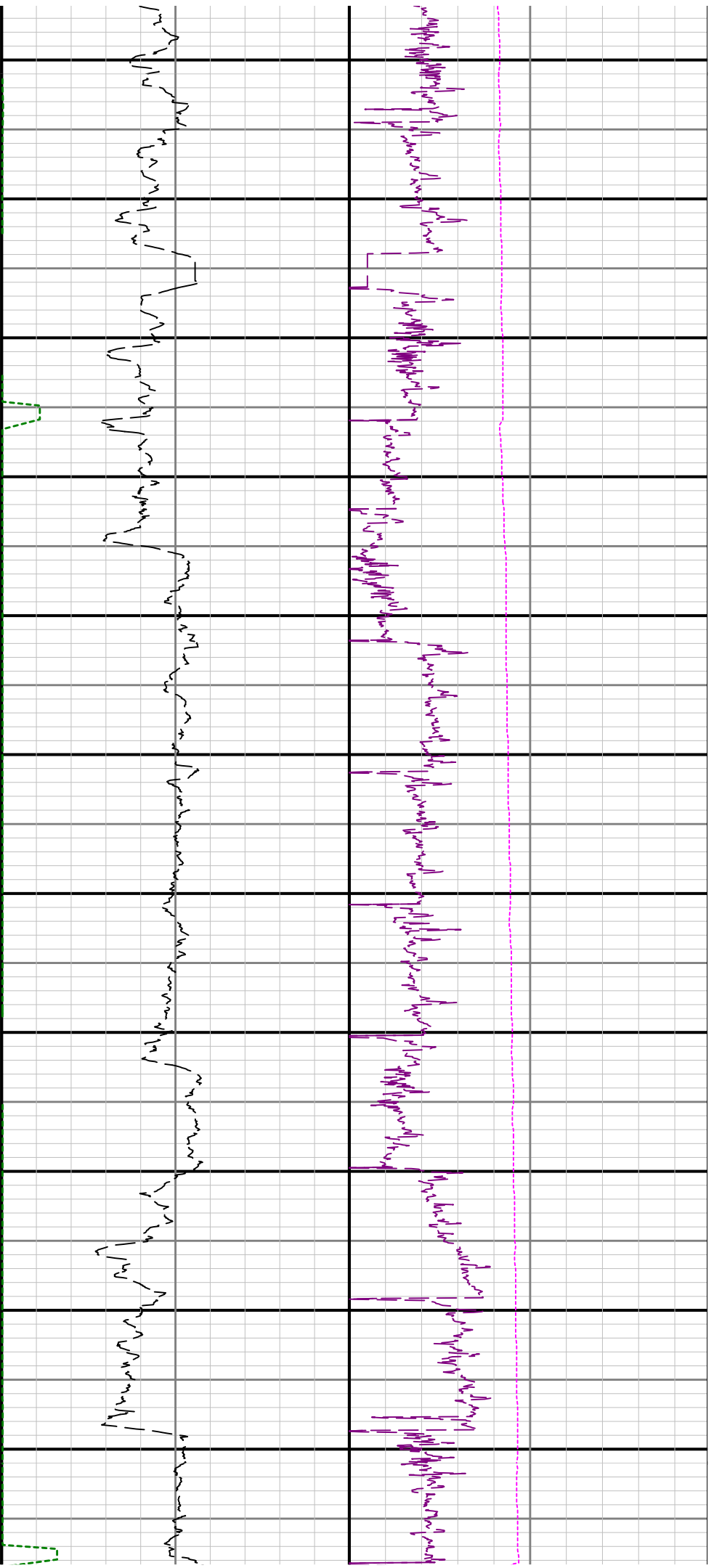
Curve Mnemonics

Presented Curves	Description	Units
ROPA	Depth Averaged ROP 10 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	OnTrak - Gamma Ray - Apparent - Memory 3 ft Average	API
GRTX	OnTrak - Gamma Ray - Time Since Drilled - Real-Time	min
TCDM	Downhole Temperature	degF

	Company	Noble Energy			
	Well	Hullabaloo Y21-746			
	Interval	Date From:	2017-09-26 09:31:06	Top:	2021.00
	Created	Date To:	2017-09-29 00:05:40	Bottom:	17204.00
		2017-09-30 11:20:59			

Gamma Ray - Apparent 3 ft Average GRAM	MD 1:1200 feet	Depth Averaged ROP 10 ft Average ROPA	Weight On Bit, Average 1 ft Average WOBA
0 150		1000 0	0 50
API		ft/h	klb
True Vertical Depth TVD		Gamma Time Since Drilled GRTX	Downhole Temperature TCDM
7500 1500		0 600	0 300





3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000

