



LWD MEMORY LOG

Gamma Ray

Scale: Company: Noble Energy

1:1200 MD Well: Bison Ridge Y22-741

Depth Reference: Field: Weld County

Driller's Depth County: Weld State: Colorado Country: United States

Status: Final Print Surface Location: Other Services:

API No: 05-123-45374-00 Latitude: Longitude: Wellbore Surveys

Job ID: 8782689 SEC: 10 TWN: 2N RGE: 64W Elev. KB: N/A

Permanent Datum (P.D.): Ground Level Elevation: 4924.00 ft Elev. DF: 4954.00 ft

Log Measured From: Rig Floor Above P.D. Elev. GL: 4924.00 ft

Dates Interval Logged Magnetic Field Reference

Date From: 2017-12-18 Top: (ft) 2064.00 Azi Reference North: Grid Dip Angle: (deg) 66.65

Date To: 2017-12-22 Bottom: (ft) 16764.97 Total Magnetic Field Strength: (nT) 52246

Spud Date: 2017-12-18 Mag to Reference North Correction: (deg) 7.44 E

Borehole Record

Casing Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
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13.500	30.00	2064.00	9.625	36.00	30.00	2054.00
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8.500	2064.00	16764.00				
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Mud Record

Deviation Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc   Az (Start)	Inc   Az (End)
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Oil Based Mud	2064.00	16764.00	8.500	14700.00	0.72   279.48	89.94   177.53
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Software Version

RT4.1

4.1.7763.3

Other

Rig: H&P 524

Contractor: Helmerich & Payne Drilling Co

District: RMD

Unit: D&E

©"4239"Dcmgt"Jwi jgu."c"IG"eqorcp{."NNE"ó"Cnn"tki jvu"tgugt xgf0"Dcmgt"Jwi jgu."c"IG"eqorcp{."NNE"cpf"kvu"chhknkcvgu"\*öDJIGö+"rtq xkfgu"vjku"kphqtocvkqp"qp"cp"öcu"kuö"dcuku"hqt"igpgtcn"kphqtocvkqp" purposes and believes it to be accurate as of the date of publication. BHGE does not make any representation as to the accuracy or completeness of the information and makes no warranties of any kind, specific, implied or oral, to the fullest extent permissible by law, including those of merchantability and fitness for a particular purpose or use. BHGE hereby disclaims any and all liability for any direct, indirect, consequential or special damages, claims for lost profits, or third party claims arising from the use of the information, whether a claim is asserted in contract, tort, or otherwise. The BHGE logo is a trademark of Baker Hughes, a GE company, LLC. GE and the GE monogram are trademarks of General Electric Company used under trademark license.

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
						Top (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	2.00	AutoTrak Curve	2051.07	2644.89	2064.00	2657.82	2017-12-18 23:29	2017-12-19 07:25	4.14
2	2	8.500	PDC	2.00	AutoTrak Curve	2644.34	13812.33	2657.82	13825.81	2017-12-19 16:46	2017-12-21 11:55	38.32
3	3	8.500	PDC	2.00	AutoTrak Curve	13812.00	16752.00	13825.00	16764.00	2017-12-22 00:38	2017-12-22 12:38	12.61

Crew

Name	Arrive	Depart	Name	Arrive	Depart	Name	Arrive	Depart
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	Wellsite	Wellsite		Wellsite	Wellsite		Wellsite	Wellsite
Alex Robinson	2017-12-19	2017-12-22	Steven Cano	2017-12-19	2017-12-22			

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+ (%)
2017-12-18 18:00	1	2064.00	Oil Based Mud	8.8	8	N/A	0.0	83.4/16.6	Active Pit	22500	0.00
2017-12-19 14:00	2	2662.00	Oil Based Mud	8.8	8	N/A	0.0	83.4/16.6	Active Pit	22000	0.00
2017-12-20 03:00	2	6707.00	Oil Based Mud	9.2	42	N/A	0.0	82.7/17.3	Active Pit	27500	0.00
2017-12-20 15:00	2	9924.00	Oil Based Mud	9.1	40	N/A	0.0	84.4/15.6	Active Pit	25500	0.00
2017-12-21 03:00	2	12856.00	Oil Based Mud	9.3	41	N/A	0.0	84.5/15.5	Active Pit	24500	0.00
2017-12-21 18:00	3	13825.00	Oil Based Mud	9.2	43	N/A	0.0	86.5/13.5	Active Pit	28000	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	14169948	Near Bit VSS	5.93	6.76	7.000	4.330
1	ATC_SU	14169948	Near Bit Inclination	5.93	6.76	7.000	4.330
1	ATC_MWD	12211066	Gamma (single)	2.75	12.93	7.000	3.250
1	ATC_MWD	12211066	Directional (mag)	12.27	22.45	7.000	3.250
2	ATC_SU	11747241	Near Bit Inclination	5.93	6.76	7.000	4.330
2	ATC_SU	11747241	Near Bit VSS	5.93	6.76	7.000	4.330
2	ATC_MWD	14131212	Gamma (single)	3.30	13.48	7.000	3.250
2	ATC_MWD	14131212	Directional (mag)	12.27	22.45	7.000	3.250
3	ATC_SU	14279931	Near Bit VSS	5.93	6.76	7.000	4.330
3	ATC_SU	14279931	Near Bit Inclination	5.93	6.76	7.000	4.330
3	ATC_MWD	12599902	Gamma (single)	2.20	12.37	7.000	3.250
3	ATC_MWD	12599902	Directional (mag)	12.27	22.44	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 runs 1, 2, and 3 utilized a 6.75 inch Navigamma service (Gamma Ray and Directional) behind a 8.5 inch bit and rotary steerable from 2064 to 16764 feet MD ( 2063 to 6953 feet TVD).

Remarks

Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	16751.00	8.500	3	The interval from 16751 to 16764 ft MD (7057 to 7056 ft 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	Gamma Ray - Apparent - Memory 3 ft Average	API
GRTX	Gamma Ray - Time Since Drilled - Real-Time	min
TCDM	Downhole Temperature	degF



Company

Well

Interval

Created

Noble Energy  
Bison Ridge Y22-741

Date From: 2017-12-18 16:29:45

Top: 2051.00

Date To: 2017-12-22 05:37:18

Bottom: 16764.00

2018-01-02 12:03:36





























