

HALLIBURTON

Sperry Drilling Services

LWD End of Well Report

For

Origin Energy Resources Ltd

Rockhopper-1

Rig: Kan Tan IV
Field: Rockhopper-1
Country: Australia
Job No: AU-FE-0006714150
Date: 2 DEC 2009

HALLIBURTON

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General Information

Company:	Origin Energy Resources Ltd
Rig:	Kan Tan IV
Well:	Rockhopper-1
Field:	Rockhopper
Lease Name:	
State:	Tasmania
County:	
Country:	Australia
API Number:	
Sperry Job Number:	AU-FE-0006714150
Job start date:	02-Dec-09
Job end date:	28-Dec-09
North reference:	Grid
Declination:	12.495 deg
Dip angle:	-70.395 deg
Total magnetic field:	60970 nT
Date of magnetic data:	01 December, 2009
Wellhead coordinates N:	39 deg. 47 min 34.18 sec South
Wellhead coordinates E:	145 deg. 26 min 21.47 sec East
Vertical section direction:	358.07 deg
Unit Number:	SSH-40
MWD Engineers:	J. Lau, A. Nijhof, M. Dillon, M. Ward, J. Ma,
Company Representatives:	B. Houston, M. Lanzer
Company Geologist:	D. Archer, D. Archer

Operational Overview

Sperry Drilling was contracted by Origin Energy Resources Ltd to provide Logging While Drilling (LWD) services for the drilling of Rockhopper-1. The well was drilled in permit T/18P by the Maersk MODU Kan Tan IV.

17 1/2" (445mm) Hole Section:

This section was drilled in one bit run using a conventional rotary assembly.

A Pressure Case Directional (PCDC) was run for wellbore surveying.

The section was drilled from 158.0 mMDRT to section TD at 966.0 mMDRT. Pulled out of hole to run 340mm casing.

12 1/4" (311mm) Hole Section:

This section was drilled one bit run using a SperryDrill Motor assembly. LWD tools comprised of the following :

Drilling String Dynamics (DDSR-DGR) for drilling optimisation, Dual Gamma Ray (DGR) and Electromagnetic Wave Resistivity (EWR-P4) for formation evaluation. Additionally a Pressure Case Directional (PCDC) was utilised for wellbore surveying.

The whole section was drilled from 966.0 mMDRT to section TD at 1972.0 mMDRT. Pulled out of hole to run 244mm casing.

8 1/2" (216mm) Hole Section:

This section was drilled in four bit runs using a Geopilot rotary steerable system (RSS) BHA together with a motor BHA.

LWD tools used in the RSS BHA was comprised of the following :

DDS for drilling optimisation, DGR, EWR-P4, Compensated Thermal Neutron (CTN), Azimuthal Litho-Density (ALD) and Bi-Modal Acoustic (BAT) for formation evaluation. Acoustic Caliper (ACAL) was run in recorded mode to determine hole size. Additionally a PCDC for wellbore surveying.

LWD in the Motor BHA was directional only configuration and was comprised mainly of PCDC for directional control

The first run was RSS BHA with PDC bit. It was pulled out of hole after failing to drill out the cement float.

In the second run the motor BHA was pick up and drilled to 2019.0 mMDRT. POOH to pickup the RSS BHA.

In the third run, the same RSS BHA was picked up and run in hole, drilled to 2123.0 mMDRT, pull out for GP failure.

The fourth run was RSS BHA with backup GP tool. It was drilled from 2023.0 mMDRT to section TD at 3522.0 mMDRT. POOH to run wireline.

Summary of MWD runs

[illegible]

Bitrun Summary

RUN TIME DATA

MWD Run	: 100	Run Start	: 02-Dec-09 06:40	BRT Hrs	: 58.33 hr	Circ. Hrs	: 37.26 hr
Rig Bit No	: 2	Run End	: 04-Dec-09 17:00	Hole Size	: 445.00 mm	Oper. Hrs	: 37.26 hr

DRILLING DATA

Start Depth	: 158.00 m	Footage	: 808.00 m	Avg RPM	: 79 rpm	Avg ROP	: 40.00 m/hr
End Depth	: 966.00 m	Avg Flow Rate	: 996.00 gpm	Avg WOB	: 5.0 klb	Avg SPP	: 1761 psig
Drilling Hours	: 29.900 hr						

MUD DATA

Mud Type	: Sea Water						
Weight	: 8.76 ppg	Viscosity	: 0.00 spqt	PV	: 0 cP	YP	: 0.00 lbf/2
Chlorides	: 0.00 ppm	Max Temp.	: 25.60 degC	% Solids	: 0.00 %	% Sand	: 0.00 %
pH	: 0.00 pH	Fluid Loss	: 0 mptm	% Oil	: 0.00 %	O:W	: 0:100

MWD PERFORMANCE

Tool OD	: 9.50 in	Type	: DWD	Min. Inc.	: 0.10 deg	Min. Inc. Depth	: 733.400 m
Final Az.	: 112.45 deg	Max Op. Press.	: 0 psig	Max Inc.	: 0.43 deg	Max Inc. Depth	: 414.830 m
MWD Real-time %	: 95 %	MWD Recorded %	: 0 %				

	Length (m)	Dist From Bit (m)		Length (m)	Dist From Bit (m)
		253.92			
5" X 3" HWDP #49.3 - NC50(IF) 5.00 in OD / 3.00 in ID	141.21				
X-Over Sub 6.75 in OD / 3.00 in ID	1.09	112.71	HOC 9.50 in OD / 4.13 in ID * Positive Pulser - SN : 10796450 * PCM - SN : 10921470 * PCDC - SN : 300454 * PCG		0.00
8 1/4" X 2.8125" - 160.6# Drill Collar 8.25 in OD / 2.81 in ID	18.75	111.62		9.77	7.38
		92.87			
Jar 8.00 in OD / 3.00 in ID	9.70				
		83.17			
8 1/4" X 2.8125" - 160.6# Drill Collar 8.25 in OD / 2.81 in ID	56.51				
X-Over Sub 8.25 in OD / 3.00 in ID	1.15	26.66			
17 1/2" Stabilizer 9.50 in OD / 3.00 in ID	2.47	25.51			
		23.04			
9 1/2" Spiral Drill Collar 9.50 in OD / 3.00 in ID	9.27				
17 1/2" Stabilizer 9.50 in OD / 3.00 in ID	2.73	13.77			
		11.04			
MWD	9.77				
Bit Sub 9.50 in OD / 3.00 in ID	0.83	1.27			
17 1/2" Smith XR + VCPS Mill Tooth Bit 9.50 in OD / 3.00 in ID	0.44	0.44			

COMMENTS

Drill 445mm hole from 158.0 mMDRT to section TD at 966.0 mMDRT. POOH to run 340mm casing.

Bitrun Summary

RUN TIME DATA

MWD Run	: 200	Run Start	: 09-Dec-09 00:53	BRT Hrs	: 85.90 hr	Circ. Hrs	: 58.23 hr
Rig Bit No	: 3	Run End	: 12-Dec-09 14:47	Hole Size	: 311.00 mm	Oper. Hrs	: 85.90 hr

DRILLING DATA

Start Depth	: 966.00 m	Footage	: 1006.00 m	Avg RPM	: 77 rpm	Avg ROP	: 28.62 m/hr
End Depth	: 1972.00 m	Avg Flow Rate	: 917.00 gpm	Avg WOB	: 5.4 klb	Avg SPP	: 1965 psig
Drilling Hours	: 35.140 hr						

MUD DATA

Mud Type	: Polymer						
Weight	: 9.20 ppg	Viscosity	: 63.00 spqt	PV	: 11 cP	YP	: 22.00 lhf2
Chlorides	: 35500.00 ppm	Max Temp.	: 59.20 degC	% Solids	: 3.50 %	% Sand	: 0.25 %
pH	: 9.00 pH	Fluid Loss	: 6 mptm	% Oil	: 0.00 %	O:W	: 0:100

MWD PERFORMANCE

Tool OD	: 8.00 in	Type	: P4M	Min. Inc.	: 0.00 deg	Min. Inc. Depth	: 980.350 m
Final Az.	: 51.65 deg	Max Op. Press.	: 2813 psig	Max Inc.	: 0.91 deg	Max Inc. Depth	: 1934.760 m
MWD Real-time %	: 100 %	MWD Recorded %	: 100 %				

	Length (m)	Dist From Bit (m)		Length (m)	Dist From Bit (m)
15 x 5" Heavy Weight Drill Pipe 5.00 in OD / 3.00 in ID	141.21	252.73	8" HOC w/ Pulser & Directional 8.06 in OD / 2.38 in ID * Positive Pulser - SN : 11160935 * PCM - SN : 11226946 * PCDC - SN : 300454	4.81	20.50
Cross-over Sub 6.75 in OD / 2.81 in ID	1.09	111.52			19.79
		110.43			
2 x 8-1/4" Spiral Drill Collar 8.25 in OD / 2.88 in ID	18.75				18.79
		91.68			
8" Drilling Jar 8.00 in OD / 3.00 in ID	9.70		8" HF HCIM Collar 8.00 in OD / 2.38 in ID * HCIM - SN : 245814	1.75	
		81.98			
6 x 8-1/4" Spiral Drill Collar 8.25 in OD / 2.88 in ID	56.51				
		25.47	8" HF EWR-P4 Collar 8.00 in OD / 2.38 in ID * EWR-P4 - SN : 11131559	3.71	14.84
12-1/8" Integral Blade Stabilizer 8.06 in OD / 2.81 in ID	1.87	23.60			
MWD	12.19				
		11.41			
12-1/8" Integral Blade Stabilizer 8.00 in OD / 2.81 in ID	1.91				
		9.50	8" HF DGR Collar 8.00 in OD / 2.38 in ID * DDS * DGR - SN : 11158407	1.92	12.37
9-5/8" Sperry Drill Lobe 6/7 - 5.0 stg w/ Float 9.63 in OD / 6.14 in ID	9.22				
12-1/4" Reed RSR616M-A21 PDC Bit 12.25 in OD / 3.00 in ID	0.28	0.28			

COMMENTS

Drill 311mm hole from 966.0 to 1972.0mMDRT. POOH to run 9 5/8" casing. All recorded data recovered on surface.

Bitrun Summary

RUN TIME DATA

MWD Run	: 300	Run Start	: 17-Dec-09 21:52	BRT Hrs	: 25.46 hr	Circ. Hrs	: 9.36 hr
Rig Bit No	: 4	Run End	: 18-Dec-09 23:20	Hole Size	: 216.00 mm	Oper. Hrs	: 25.46 hr

DRILLING DATA

Start Depth	: 1972.00 m	Footage	: 0.00 m	Avg RPM	: 40 rpm	Avg ROP	: 0.00 m/hr
End Depth	: 1972.00 m	Avg Flow Rate	: 513.00 gpm	Avg WOB	: 8.0 klb	Avg SPP	: 1597 psig
Drilling Hours	: 6.500 hr						

MUD DATA

Mud Type	: Polymer						
Weight	: 9.55 ppg	Viscosity	: 55.00 spqt	PV	: 11 cP	YP	: 21.00 lbf/ft ²
Chlorides	: 35000.00 ppm	Max Temp.	: 94.60 degC	% Solids	: 4.10 %	% Sand	: 0.15 %
pH	: 9.00 pH	Fluid Loss	: 4 mptm	% Oil	: 0.00 %	O:W	: 0:100

MWD PERFORMANCE

Tool OD	: 6.75 in	Type	: P4M	Min. Inc.	: 0.68 deg	Min. Inc. Depth	: 1951.760 m
Final Az.	: 51.65 deg	Max Op. Press.	: 3140 psig	Max Inc.	: 0.68 deg	Max Inc. Depth	: 1951.760 m
MWD Real-time %	: 96 %	MWD Recorded %	: 100 %				

	Length (m)	Dist From Bit (m)		Length (m)	Dist From Bit (m)
5 x 5" HWDP 5.00 in OD / 3.00 in ID	47.18	211.15	6 3/4" ACAL 6.75 in OD / 1.92 in ID SN : SL 90232559B-6 * ACAL Insert - SN : 138159	1.83	37.31
6 1/2" Jar 6.50 in OD / 2.75 in ID	9.84	163.97	6 3/4" 10ft HOC 6.75 in OD / 1.92 in ID SN : 203846 * Positive Pulser - SN : 11160935 * PCM Sonde - SN : 11055881	3.04	35.00
9 x 5" HWDP 5.00 in OD / 3.00 in ID	84.57	154.13	6 3/4" BAT Collar 6.75 in OD / 1.92 in ID SN : SL90232557O-6 * BAT Insert - SN : 11378929	6.76	30.47
3 x Spiral Drill Collar 6.75 in OD / 2.88 in ID	28.20	69.56	6 3/4" Nukes 6.75 in OD / 1.92 in ID SN : SL9023558N2L2-6 * CTN Insert - SN : 231177 * ALD Insert - SN : 11062362	9.23	25.88
Integral Blade Stabiliser 6.75 in OD / 2.88 in ID	1.70	41.36	6 3/4" RLL 6.75 in OD / 1.92 in ID SN : PA90217460H1WRGV2X-6 * Sleeve Stabilizer * HCIM Insert - SN : 246857 * PWD Insert - SN : 184467440737095 * EWR-P4 Insert - SN : 226817 * DGR Insert - SN : 11109929 * DDSr-DGR - SN : 11109929	8.60	15.38
Float Sub w/ Ported Float 6.75 in OD / 3.00 in ID	0.91	39.66			12.85
MWD	29.46	38.75			10.49
6 3/4" NM Flex Collar 6.75 in OD / 1.92 in ID * PCDC Sonde	2.76	7.73			0.00
Geo-Pilot 7600 6.75 in OD / 1.92 in ID	6.13	6.53			
8 1/2" Security FMF3653Z PDC 8.50 in OD / 2.50 in ID	0.40	0.40			

COMMENTS

RIH with Quad Combo and GP string. Tag cement at 1938mMDRT.
Attempt to drill out shoe track. POOH to change bit at 1940mMDRT.

Bitrun Summary

RUN TIME DATA

MWD Run	: 400	Run Start	: 19-Dec-09 02:00	BRT Hrs	: 24.33 hr	Circ. Hrs	: 7.80 hr
Rig Bit No	: 5	Run End	: 20-Dec-09 02:20	Hole Size	: 216.00 mm	Oper. Hrs	: 7.80 hr

DRILLING DATA

Start Depth	: 1972.00 m	Footage	: 47.00 m	Avg RPM	: 70 rpm	Avg ROP	: 10.00 m/hr
End Depth	: 2019.00 m	Avg Flow Rate	: 552.00 gpm	Avg WOB	: 17.7 klb	Avg SPP	: 1766 psig
Drilling Hours	: 4.700 hr						

MUD DATA

Mud Type	: Polymer						
Weight	: 9.55 ppg	Viscosity	: 64.00 spqt	PV	: 12 cP	YP	: 19.00 lbf/2
Chlorides	: 35000.00 ppm	Max Temp.	: 53.70 degC	% Solids	: 4.10 %	% Sand	: 0.15 %
pH	: 9.50 pH	Fluid Loss	: 4 mptm	% Oil	: 0.00 %	O:W	: 0:100

MWD PERFORMANCE

Tool OD	: 6.75 in	Type	: P4M	Min. Inc.	: 0.69 deg	Min. Inc. Depth	: 1968.420 m
Final Az.	: 20.69 deg	Max Op. Press.	: 3270 psig	Max Inc.	: 4.80 deg	Max Inc. Depth	: 2006.900 m
MWD Real-time %	: 100 %	MWD Recorded %	: 0 %				

	Length (m)	Dist From Bit (m)		Length (m)	Dist From Bit (m)
5 x HWDP 5.00 in OD / 3.00 in ID	47.18	216.73			
6 1/2" Drilling Jar 6.50 in OD / 2.75 in ID	9.84	169.55	6 3/4" HOC 6.75 in OD / 1.92 in ID SN : 203842 * Positive Pulser - SN : 11050290 * PCM - SN : 11226946/557	3.03	14.70
9 x HWDP 5.00 in OD / 3.00 in ID	84.57	159.71			
6 x Spiral Drill Collar 6.75 in OD / 2.88 in ID	56.16	75.14			
8 1/2" Integral Blade Stabiliser 6.50 in OD / 2.88 in ID	1.70	18.98	6 3/4" PM Sub 6.75 in OD / 1.92 in ID SN : 194443 * PCDC - SN : 10993467/351	2.79	11.76
Float Sub with Ported Float 6.75 in OD / 3.00 in ID	0.91	17.28			
MWD	5.82	16.37			
8 1/8" Integral Blade Stabiliser 6.81 in OD / 2.88 in ID	2.03	10.55			
6 3/4" SperryDrill Lobe 6/7 5 Stage Motor 6.75 in OD / 4.50 in ID	8.28	8.52			
8 1/2" Hughes Christensen GT1 Mill Tooth Bit 8.50 in OD / 2.50 in ID	0.24	0.24			

COMMENTS

RIH with Motor and DWD assembly. Drill out shoe from 1940mMDRT. Drill new formation from 1972m to 2019mMDRT.
POOH to change bit and BHA.

Bitrun Summary

RUN TIME DATA

MWD Run	: 500	Run Start	: 20-Dec-09 05:35	BRT Hrs	: 17.00 hr	Circ. Hrs	: 2.82 hr
Rig Bit No	: 6	Run End	: 20-Dec-09 22:35	Hole Size	: 216.00 mm	Oper. Hrs	: 17.00 hr

DRILLING DATA

Start Depth	: 2019.00 m	Footage	: 4.00 m	Avg RPM	: 107 rpm	Avg ROP	: 29.50 m/hr
End Depth	: 2023.00 m	Avg Flow Rate	: 543.00 gpm	Avg WOB	: 13.4 klb	Avg SPP	: 1589 psig
Drilling Hours	: 0.300 hr						

MUD DATA

Mud Type	: Polymer						
Weight	: 9.60 ppg	Viscosity	: 53.00 spqt	PV	: 12 cP	YP	: 20.00 lbf/ft ²
Chlorides	: 35000.00 ppm	Max Temp.	: 80.00 degC	% Solids	: 4.20 %	% Sand	: 0.20 %
pH	: 9.00 pH	Fluid Loss	: 4 mptm	% Oil	: 0.00 %	O:W	: 0:100

MWD PERFORMANCE

Tool OD	: 6.75 in	Type	: P4M	Min. Inc.	: 4.80 deg	Min. Inc. Depth	: 2006.900 m
Final Az.	: 20.69 deg	Max Op. Press.	: 3313 psig	Max Inc.	: 4.80 deg	Max Inc. Depth	: 2006.900 m
MWD Real-time %	: 100 %	MWD Recorded %	: 100 %				

	Length (m)	Dist From Bit (m)		Length (m)	Dist From Bit (m)
5 x 5" HWDP 5.00 in OD / 3.00 in ID	47.18	211.18	6 3/4" ACAL 6.75 in OD / 1.92 in ID SN : SL 90232559B-6 * ACAL - SN : 138159	1.83	38.32
6 1/2" Jar 6.50 in OD / 2.75 in ID	9.84	164.00	6 3/4" 10ft HOC 6.75 in OD / 1.92 in ID SN : 203846 * Positive Pulser - SN : 11160935 * PCM - SN : 11055881	3.04	35.30
9 x 5" HWDP 5.00 in OD / 3.00 in ID	84.57	154.16	6 3/4" BAT Collar 6.75 in OD / 1.92 in ID SN : SL90232557O-6 * BAT - SN : 11378929	6.76	30.50
3 x Spiral Drill Collar 6.75 in OD / 2.88 in ID	28.20	69.59	6 3/4" Nukes 6.75 in OD / 1.92 in ID SN : SL9023558N2L2-6 * CTN - SN : 231177 * ALD - SN : 11062362	9.23	25.91
Integral Blade Stabiliser 6.75 in OD / 2.88 in ID	1.70	41.39	6 3/4" RLL 6.75 in OD / 1.92 in ID SN : PA90217460H1WRGV2X-6 * Sleeve Stabilizer * HCIM - SN : 246857 * PWD - SN : 184467440737095 * EWR-P4 - SN : 226817 * DGR - SN : 11109929 * DDSr-DGR - SN : 11109929	8.60	15.41
Float Sub w/ Ported Float 6.75 in OD / 3.00 in ID	0.91	39.69			12.85
MWD	29.46	38.78			10.52
6 3/4" NM Flex Collar 6.75 in OD / 1.92 in ID * PCDC	2.76	7.76			0.00
Geo-Pilot 7600 6.75 in OD / 1.92 in ID	6.13	6.56			
8 1/2" Security FM3755 PDC 8.50 in OD / 2.50 in ID	0.43	0.43			

COMMENTS

RIH with Quad Combo and GP assembly. Wipe previously drilled directional only section from 1972m to 2019mMDRT.
Drill new formation to 2023mMDRT. POOH for GP failure.

Bitrun Summary

RUN TIME DATA

MWD Run	: 600	Run Start	: 21-Dec-09 02:23	BRT Hrs	: 177.72 hr	Circ. Hrs	: 135.75 hr
Rig Bit No	: 6rr	Run End	: 28-Dec-09 12:07	Hole Size	: 216.00 mm	Oper. Hrs	: 177.72 hr

DRILLING DATA

Start Depth	: 2023.00 m	Footage	: 1499.00 m	Avg RPM	: 140 rpm	Avg ROP	: 15.00 m/hr
End Depth	: 3522.00 m	Avg Flow Rate	: 580.00 gpm	Avg WOB	: 10.0 klb	Avg SPP	: 2650 psig
Drilling Hours	: 89.400 hr						

MUD DATA

Mud Type	: Polymer						
Weight	: 9.55 ppg	Viscosity	: 55.00 spqt	PV	: 18 cP	YP	: 37.00 lhf2
Chlorides	: 29000.00 ppm	Max Temp.	: 111.80 degC	% Solids	: 4.70 %	% Sand	: 0.30 %
pH	: 9.00 pH	Fluid Loss	: 5 mptm	% Oil	: 0.00 %	O:W	: 0:100

MWD PERFORMANCE

Tool OD	: 6.75 in	Type	: P4M	Min. Inc.	: 7.43 deg	Min. Inc. Depth	: 2047.710 m
Final Az.	: 357.89 deg	Max Op. Press.	: 5228 psig	Max Inc.	: 43.48 deg	Max Inc. Depth	: 2857.710 m
MWD Real-time %	: 99 %	MWD Recorded %	: 0 %				

	Length (m)	Dist From Bit (m)		Length (m)	Dist From Bit (m)
5 x 5" HWDP 5.00 in OD / 3.00 in ID	47.18	211.93	6 3/4" ACAL 6.75 in OD / 1.92 in ID SN : SL 90232559B-6 * ACAL - SN : 138159	1.83	31.48
6 1/2" Jar 6.50 in OD / 2.75 in ID	9.84	164.75	6 3/4" 10ft HOC 6.75 in OD / 1.92 in ID SN : 203846 * Positive Pulser - SN : 11160935 * PCM - SN : 11055881	3.04	35.30
9 x 5" HWDP 5.00 in OD / 3.00 in ID	84.57	154.91	6 3/4" BAT Collar 6.75 in OD / 1.92 in ID SN : SL90232557O-6 * BAT - SN : 11378929	6.76	31.48
3 x Spiral Drill Collar 6.75 in OD / 2.88 in ID	27.96	70.34	6 3/4" Nukes 6.75 in OD / 1.92 in ID SN : SL9023558N2L2-6 * CTN - SN : 231177 * ALD - SN : 11062362	9.23	26.89
Integral Blade Stabiliser 6.75 in OD / 2.88 in ID	1.70	42.38	6 3/4" RLL 6.75 in OD / 1.92 in ID SN : PA90217460H1WRGV2X-6 * Sleeve Stabilizer * HCIM - SN : 246857 * PWD - SN : 11222129 * EWR-P4 - SN : 226817 * DGR - SN : 11109929 * DDSr-DGR - SN : 11109929	8.60	16.39
Float Sub w/ Ported Float 6.75 in OD / 3.00 in ID	0.91	40.68			13.86
MWD	29.46	39.77			11.50
6 3/4" NM Flex Collar 6.75 in OD / 1.92 in ID * PCDC	2.81	8.73			0.00
Geo-Pilot 7600 6.75 in OD / 1.92 in ID	7.07	7.50			
8 1/2" Security FM3755 PDC 8.50 in OD / 2.50 in ID	0.43	0.43			

COMMENTS

Continued to drill 216mm hole section to well TD at 3522.0 mMDRT. POOH and all recorded data was recovered at surface.

Directional Survey Data

RT-LAT=26.0 m
Final survey is a projection to TD

Tie-in

0.000	0.00	0.00	0.000	0.000 N	0.000 E	***
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Measured Depth (m)	Inclination (deg)	Direction (deg)	Vertical Depth (m)	Latitude (m)	Departure (m)	Vertical Section (m)	Dogleg (°/30m)
100.300	0.00	0.00	100.300	0.000 N	0.000 E	0.000	0.00
242.360	0.22	278.10	242.360	0.040 N	0.270 W	0.050	0.05
327.420	0.34	318.42	327.420	0.250 N	0.600 W	0.270	0.08
356.380	0.16	310.14	356.380	0.340 N	0.690 W	0.360	0.19
414.830	0.43	334.58	414.830	0.590 N	0.840 W	0.620	0.15
502.130	0.25	356.62	502.130	1.080 N	1.000 W	1.110	0.08
559.330	0.33	356.35	559.330	1.370 N	1.010 W	1.400	0.04
645.930	0.22	77.08	645.920	1.650 N	0.870 W	1.680	0.13
733.400	0.10	264.51	733.390	1.680 N	0.780 W	1.710	0.11
819.330	0.13	204.11	819.320	1.590 N	0.890 W	1.620	0.04
907.200	0.22	337.40	907.190	1.650 N	1.000 W	1.680	0.11
956.770	0.15	112.45	956.760	1.710 N	0.980 W	1.750	0.21
980.350	0.00	258.48	980.340	1.700 N	0.950 W	1.730	0.19
1009.960	0.20	60.48	1009.950	1.730 N	0.900 W	1.760	0.20
1039.180	0.22	57.43	1039.170	1.780 N	0.810 W	1.810	0.02
1068.020	0.25	56.38	1068.010	1.850 N	0.710 W	1.870	0.03
1096.690	0.09	334.71	1096.680	1.900 N	0.670 W	1.920	0.26
1125.200	0.25	23.41	1125.190	1.980 N	0.650 W	2.000	0.21
1153.520	0.31	18.55	1153.510	2.110 N	0.610 W	2.130	0.07
1182.120	0.26	64.52	1182.110	2.210 N	0.520 W	2.230	0.24
1210.690	0.31	28.33	1210.680	2.310 N	0.430 W	2.320	0.19
1239.340	0.36	49.88	1239.330	2.430 N	0.320 W	2.440	0.14
1298.150	0.40	29.51	1298.140	2.730 N	0.080 W	2.730	0.07
1327.530	0.39	32.18	1327.520	2.900 N	0.020 E	2.900	0.02
1356.770	0.31	47.29	1356.760	3.040 N	0.140 E	3.040	0.12
1385.600	0.44	56.10	1385.590	3.160 N	0.290 E	3.150	0.15
1412.810	0.48	46.30	1412.800	3.290 N	0.450 E	3.280	0.10
1441.660	0.57	57.51	1441.650	3.450 N	0.660 E	3.430	0.14
1470.690	0.57	43.73	1470.680	3.640 N	0.880 E	3.600	0.14
1499.950	0.59	47.75	1499.930	3.840 N	1.100 E	3.800	0.05
1529.470	0.61	56.99	1529.450	4.030 N	1.340 E	3.980	0.10
1558.730	0.62	46.69	1558.710	4.220 N	1.590 E	4.170	0.11
1587.900	0.64	49.02	1587.880	4.440 N	1.820 E	4.380	0.03
1616.890	0.68	52.55	1616.870	4.650 N	2.080 E	4.580	0.06
1645.390	0.64	67.47	1645.360	4.810 N	2.360 E	4.730	0.19
1673.840	0.66	56.91	1673.810	4.960 N	2.650 E	4.870	0.13
1702.240	0.67	57.55	1702.210	5.140 N	2.930 E	5.040	0.01
1759.920	0.72	70.24	1759.890	5.450 N	3.550 E	5.320	0.08
1789.630	0.84	75.16	1789.590	5.570 N	3.940 E	5.430	0.14
1848.620	0.80	79.00	1848.580	5.750 N	4.760 E	5.590	0.03
1876.780	0.90	76.63	1876.730	5.840 N	5.170 E	5.670	0.11
1905.300	0.76	78.61	1905.250	5.930 N	5.570 E	5.740	0.15
1934.760	0.91	50.85	1934.710	6.120 N	5.940 E	5.910	0.43

Directional Survey Data

Measured Depth (m)	Inclination (deg)	Direction (deg)	Vertical Depth (m)	Latitude (m)	Departure (m)	Vertical Section (m)	Dogleg (°/30m)
1951.760	0.68	51.65	1951.710	6.270 N	6.130 E	6.060	0.41
1968.420	0.69	57.75	1968.370	6.380 N	6.290 E	6.170	0.13
1992.640	3.64	23.88	1992.570	7.160 N	6.720 E	6.930	3.83
2006.900	4.80	20.69	2006.790	8.130 N	7.120 E	7.890	2.49
2047.710	7.43	22.90	2047.360	12.160 N	8.750 E	11.860	1.94
2076.220	10.04	18.43	2075.540	16.220 N	10.250 E	15.870	2.84
2104.970	12.80	14.68	2103.720	21.680 N	11.850 E	21.270	2.98
2134.780	14.54	10.50	2132.680	28.550 N	13.370 E	28.090	2.01
2164.310	17.43	9.42	2161.070	36.560 N	14.770 E	36.050	2.95
2193.360	20.51	7.83	2188.540	45.900 N	16.180 E	45.330	3.22
2250.020	26.59	5.77	2240.450	68.370 N	18.810 E	67.700	3.25
2278.270	29.06	6.68	2265.440	81.480 N	20.240 E	80.750	2.66
2307.320	31.70	6.12	2290.500	96.080 N	21.870 E	95.290	2.74
2336.990	34.05	2.98	2315.410	112.130 N	23.140 E	111.280	2.93
2366.570	36.34	359.97	2339.590	129.160 N	23.560 E	128.300	2.91
2395.130	37.77	356.94	2362.380	146.360 N	23.090 E	145.500	2.44
2423.370	39.84	355.17	2384.390	164.010 N	21.870 E	163.180	2.49
2452.170	42.32	354.45	2406.090	182.860 N	20.150 E	182.080	2.63
2481.680	43.11	354.88	2427.780	202.790 N	18.290 E	202.060	0.86
2511.390	42.92	354.47	2449.500	222.970 N	16.410 E	222.290	0.34
2540.160	43.10	354.54	2470.540	242.510 N	14.530 E	241.880	0.19
2568.350	43.01	353.48	2491.140	261.650 N	12.520 E	261.070	0.78
2596.310	42.88	354.12	2511.600	280.580 N	10.460 E	280.070	0.49
2626.300	43.28	355.27	2533.510	300.980 N	8.570 E	300.520	0.88
2655.720	43.09	355.77	2554.960	321.050 N	7.000 E	320.630	0.40
2683.980	42.76	356.30	2575.650	340.250 N	5.670 E	339.870	0.52
2712.300	43.19	356.38	2596.370	359.520 N	4.430 E	359.160	0.46
2741.970	43.47	355.92	2617.960	379.830 N	3.070 E	379.510	0.43
2770.220	42.94	356.20	2638.550	399.120 N	1.740 E	398.840	0.60
2799.070	43.15	356.27	2659.630	418.770 N	0.440 E	418.520	0.22
2828.790	42.74	355.82	2681.390	438.970 N	0.950 W	438.760	0.52
2857.710	43.48	356.21	2702.500	458.690 N	2.330 W	458.510	0.82
2886.290	43.02	355.19	2723.320	478.220 N	3.800 W	478.070	0.88
2914.350	43.18	355.63	2743.810	497.330 N	5.330 W	497.220	0.36
2942.960	43.00	355.89	2764.700	516.820 N	6.780 W	516.750	0.27
2972.300	43.13	356.10	2786.130	536.800 N	8.180 W	536.770	0.20
3031.320	43.35	358.13	2829.130	577.180 N	10.210 W	577.200	0.72
3059.740	43.12	357.42	2849.840	596.630 N	10.960 W	596.660	0.57
3116.750	42.91	356.52	2891.520	635.470 N	13.020 W	635.550	0.34
3175.850	42.94	355.93	2934.800	675.630 N	15.670 W	675.770	0.20
3232.850	42.61	354.97	2976.640	714.220 N	18.740 W	714.440	0.38
3261.400	42.02	354.71	2997.750	733.360 N	20.470 W	733.630	0.65
3290.950	42.18	356.09	3019.670	753.110 N	22.060 W	753.420	0.95
3348.870	42.01	356.27	3062.650	791.850 N	24.650 W	792.230	0.11
3377.120	41.91	356.10	3083.660	810.690 N	25.900 W	811.110	0.16
3405.960	41.76	356.10	3105.150	829.880 N	27.210 W	830.330	0.16
3435.820	41.85	357.17	3127.410	849.750 N	28.380 W	850.230	0.72
3494.200	41.35	357.89	3171.060	888.480 N	30.050 W	888.990	0.36

Directional Survey Data

Measured Depth (m)	Inclination (deg)	Direction (deg)	Vertical Depth (m)	Latitude (m)	Departure (m)	Vertical Section (m)	Dogleg (°/30m)
3522.000	41.35	357.89	3191.930	906.830 N	30.730 W	907.350	0.00

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

VERTICAL SECTION RELATIVE TO WELL HEAD

**VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 358.07 DEGREES(GRID)
A TOTAL CORRECTION OF 11.50 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD

HORIZONTAL DISPLACEMENT(CLOSURE) AT 3522.00 METRES

IS 907.35 METRES ALONG 358.06 DEGREES (GRID)