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Directional Survey**



**NM OIL CONSERVATION
ARTESIA DISTRICT**

JAN 22 2019

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Hadaway Consulting & Eng. LLC

Chaves County, NM (NAD 83)

Bandon Dunes 2H

Bandon Dunes 2H

30.005-64297

Wellbore #1

Survey: DrilTech MWD

Standard Survey Report

18 December, 2018



Survey Report

Company: Hadaway Consulting & Eng. LLC
Project: Chaves County, NM (NAD 83)
Site: Bandon Dunes 2H
Well: Bandon Dunes 2H
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well Bandon Dunes 2H
TVD Reference: 3848 + 17' KB @ 3865.00ft (Silver Oak Rig #1)
MD Reference: 3848 + 17' KB @ 3865.00ft (Silver Oak Rig #1)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.14 Single User Db

Project	Chaves County, NM (NAD 83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site		Bandon Dunes 2H			
Site Position:		Northing:	897,679.80 usft	Latitude:	33° 28' 2.848 N
From:	Map	Easting:	604,842.20 usft	Longitude:	104° 7' 30.313 W
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence:	0.11 °

Well	Bandon Dunes 2H					
Well Position	+N/-S	0.00 ft	Northing:	897,679.80 usf	Latitude:	33° 28' 2.848 N
	+E/-W	0.00 ft	Easting:	604,842.20 usf	Longitude:	104° 7' 30.313 W
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	3,848.00 ft	

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	10/29/2018	7.16	61.08	48,467.22949076

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	1,335.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	359.60	

Survey Program	Date 12/18/2018				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
149.00	1,335.00	INVICTVS MWD (Pilot Hole)	MWD	MWD - Standard	
1,346.00	7,050.00	DrilTech MWD (Wellbore #1)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Bulld Rate (°/100ft)	Turn Rate (°/100ft)	
1,335.00	2.20	60.08	1,334.72	8.68	21.74	8.53	0.00	0.00	0.00	
1335'MD: Tie into Pilot Hole Surveys										
1,346.00	1.49	72.09	1,345.71	8.83	22.06	8.67	7.32	-6.45	109.18	
1,391.00	1.49	55.83	1,390.70	9.34	23.10	9.17	0.94	0.00	-36.13	
1391'MD: DrilTech MWD Surveys										
1,406.00	1.49	43.26	1,405.69	9.59	23.39	9.42	2.17	0.00	-83.80	
1,421.00	1.67	27.79	1,420.69	9.92	23.63	9.76	3.07	1.20	-103.13	
1,453.00	2.46	11.62	1,452.67	11.01	23.98	10.84	3.04	2.47	-50.53	
1,483.00	3.43	3.80	1,482.63	12.53	24.17	12.36	3.49	3.23	-26.07	



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Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,513.00	3.87	3.53	1,512.57	14.44	24.29	14.27	1.47	1.47	-0.90
1,544.00	5.28	0.19	1,543.47	16.91	24.36	16.74	4.63	4.55	-10.77
1,575.00	8.00	356.06	1,574.26	20.49	24.22	20.32	8.90	8.77	-13.32
1,606.00	10.11	356.50	1,604.87	25.36	23.91	25.19	6.81	6.81	1.42
1,637.00	11.87	356.06	1,635.30	31.26	23.52	31.09	5.68	5.68	-1.42
1,667.00	14.86	356.15	1,664.48	38.17	23.05	38.01	9.97	9.97	0.30
1,698.00	16.88	355.98	1,694.30	46.63	22.47	46.47	6.52	6.52	-0.55
1,730.00	18.03	356.50	1,724.82	56.21	21.84	56.05	3.63	3.59	1.63
1,761.00	19.79	357.29	1,754.15	66.24	21.30	66.09	5.74	5.68	2.55
1,792.00	21.81	357.21	1,783.13	77.23	20.77	77.09	6.52	6.52	-0.26
1,822.00	23.48	356.77	1,810.82	88.77	20.16	88.62	5.60	5.57	-1.47
1,852.00	25.76	356.06	1,838.09	101.24	19.38	101.10	7.66	7.60	-2.37
1,883.00	28.14	356.85	1,865.72	115.26	18.51	115.13	7.76	7.68	2.55
1,913.00	30.51	357.56	1,891.87	129.94	17.80	129.81	7.98	7.90	2.37
1,943.00	32.54	358.35	1,917.44	145.61	17.24	145.49	6.91	6.77	2.63
1,974.00	34.56	359.05	1,943.28	162.74	16.86	162.62	6.63	6.52	2.26
2,004.00	36.14	359.14	1,967.75	180.09	16.58	179.97	5.27	5.27	0.30
2,035.00	38.25	358.96	1,992.44	198.83	16.27	198.71	6.82	6.81	-0.58
2,065.00	40.63	358.17	2,015.61	217.88	15.79	217.76	8.11	7.93	-2.63
2,096.00	42.82	358.09	2,038.74	238.50	15.12	238.39	7.07	7.06	-0.26
2,126.00	44.76	357.91	2,060.40	259.25	14.39	259.14	6.48	6.47	-0.60
2,158.00	47.40	357.82	2,082.59	282.28	13.53	282.18	8.25	8.25	-0.28
2,166.00	48.10	357.89	2,087.97	288.20	13.31	288.10	8.79	8.77	0.93
2166'MD: 330' FSL Crossing									
2,188.00	50.03	358.09	2,102.38	304.81	12.73	304.71	8.79	8.77	0.89
2,218.00	52.50	358.88	2,121.15	328.20	12.11	328.10	8.49	8.23	2.63
2,248.00	54.52	358.88	2,138.99	352.31	11.64	352.22	6.73	6.73	0.00
2,279.00	56.81	359.14	2,156.48	377.90	11.20	377.81	7.42	7.39	0.84
2,310.00	57.95	359.49	2,173.19	404.01	10.89	403.92	3.80	3.68	1.13
2,342.00	57.86	359.40	2,190.19	431.12	10.63	431.03	0.37	-0.28	-0.28
2,373.00	57.24	359.32	2,206.82	457.28	10.33	457.19	2.01	-2.00	-0.26
2,404.00	56.45	358.88	2,223.78	483.23	9.93	483.14	2.81	-2.55	-1.42
2,436.00	56.10	358.52	2,241.54	509.83	9.32	509.76	1.44	-1.09	-1.13
2,460.00	55.57	358.61	2,255.02	529.69	8.83	529.61	2.23	-2.21	0.38
2,493.00	58.12	358.79	2,273.07	557.30	8.20	557.23	7.74	7.73	0.55
2,530.00	61.11	358.88	2,291.78	589.21	7.55	589.14	8.08	8.08	0.24
2,561.00	64.46	358.96	2,305.96	616.77	7.03	616.71	10.81	10.81	0.26
2,592.00	68.24	359.32	2,318.39	645.16	6.61	645.10	12.24	12.19	1.16
2,620.00	71.67	0.28	2,327.99	671.46	6.52	671.40	12.67	12.25	3.43
2,687.00	80.55	0.28	2,344.05	736.43	6.84	736.37	13.25	13.25	0.00
2,718.00	83.62	1.16	2,348.32	767.13	7.22	767.06	10.29	9.90	2.84
2,748.00	86.26	1.07	2,350.97	797.01	7.80	796.93	8.81	8.80	-0.30
2,779.00	88.29	1.34	2,352.44	827.96	8.46	827.88	6.61	6.55	0.87
2,810.00	89.87	0.46	2,352.94	858.95	8.94	858.87	5.83	5.10	-2.84



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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
2,840.00	89.27	359.95	2,353.16	888.95	9.05	888.87	2.63	-2.00	-1.71
2840'MD: FTP - 940' FSL - 1305' FEL - Bandon Dunes FTP (as Drilled)									
2,841.00	89.25	359.93	2,353.18	889.95	9.05	889.87	2.63	-2.00	-1.71
2,872.00	88.37	358.26	2,353.82	920.94	8.56	920.86	6.09	-2.84	-5.39
2,965.00	90.13	358.79	2,355.04	1,013.90	6.16	1,013.83	1.98	1.89	0.57
3,056.00	90.13	358.70	2,354.83	1,104.87	4.17	1,104.82	0.10	0.00	-0.10
3,148.00	90.57	359.23	2,354.27	1,196.86	2.51	1,196.81	0.75	0.48	0.58
3,240.00	89.52	0.02	2,354.20	1,288.85	1.91	1,288.81	1.43	-1.14	0.86
3,332.00	90.40	0.99	2,354.26	1,380.85	2.72	1,380.80	1.42	0.96	1.05
3,424.00	92.24	1.69	2,352.14	1,472.79	4.87	1,472.72	2.14	2.00	0.76
3,516.00	91.80	2.30	2,348.90	1,564.68	8.07	1,564.59	0.82	-0.48	0.66
3,608.00	90.48	2.57	2,347.07	1,656.58	11.98	1,656.45	1.46	-1.43	0.29
3,700.00	90.75	0.37	2,346.08	1,748.54	14.34	1,748.39	2.41	0.29	-2.39
3,792.00	88.99	0.28	2,346.29	1,840.53	14.86	1,840.38	1.92	-1.91	-0.10
3,884.00	89.08	1.25	2,347.84	1,932.51	16.09	1,932.35	1.06	0.10	1.05
3,976.00	91.36	0.90	2,347.49	2,024.48	17.81	2,024.31	2.51	2.48	-0.38
4,068.00	89.34	358.88	2,346.92	2,116.47	17.64	2,116.30	3.11	-2.20	-2.20
4,162.00	91.80	359.84	2,345.99	2,210.45	16.59	2,210.28	2.81	2.62	1.02
4,255.00	92.59	359.58	2,342.43	2,303.38	16.12	2,303.22	0.89	0.85	-0.28
4,349.00	88.20	355.89	2,341.78	2,397.27	12.40	2,397.12	6.10	-4.67	-3.93
4,443.00	88.72	358.09	2,344.31	2,491.10	7.47	2,490.99	2.40	0.55	2.34
4,537.00	91.54	1.86	2,344.09	2,585.07	7.43	2,584.96	5.01	3.00	4.01
4,672.00	86.61	1.42	2,346.27	2,719.96	11.29	2,719.81	3.67	-3.65	-0.33
4,767.00	87.23	358.88	2,351.38	2,814.81	11.54	2,814.66	2.75	0.65	-2.67
4,861.00	89.43	359.40	2,354.12	2,908.76	10.13	2,908.61	2.40	2.34	0.55
4,955.00	90.66	359.67	2,354.04	3,002.75	9.36	3,002.61	1.34	1.31	0.29
5,050.00	89.08	358.61	2,354.26	3,097.74	7.94	3,097.60	2.00	-1.66	-1.12
5,144.00	89.43	358.88	2,355.48	3,191.70	5.88	3,191.59	0.47	0.37	0.29
5,239.00	90.84	359.40	2,355.26	3,286.69	4.45	3,286.58	1.58	1.48	0.55
5,333.00	88.90	358.52	2,355.47	3,380.67	2.75	3,380.57	2.27	-2.06	-0.94
5,426.00	89.60	359.23	2,356.69	3,473.64	0.92	3,473.55	1.07	0.75	0.76
5,519.00	91.19	358.44	2,356.05	3,566.62	-0.97	3,566.54	1.91	1.71	-0.85
5,611.00	89.25	359.32	2,355.69	3,658.59	-2.77	3,658.52	2.32	-2.11	0.96
5,703.00	91.19	359.32	2,355.34	3,750.58	-3.86	3,750.52	2.11	2.11	0.00
5,795.00	88.20	357.73	2,355.83	3,842.54	-6.23	3,842.49	3.68	-3.25	-1.73
5,887.00	89.43	357.65	2,357.73	3,934.44	-9.93	3,934.41	1.34	1.34	-0.09
5,979.00	90.31	359.58	2,357.94	4,026.41	-12.16	4,026.40	2.31	0.96	2.10
6,071.00	89.96	359.40	2,357.72	4,118.40	-12.98	4,118.40	0.43	-0.38	-0.20
6,163.00	89.34	358.96	2,358.29	4,210.39	-14.29	4,210.39	0.83	-0.67	-0.48
6,255.00	91.36	0.19	2,357.72	4,302.38	-14.97	4,302.38	2.57	2.20	1.34
6,347.00	92.24	0.11	2,354.83	4,394.34	-14.73	4,394.33	0.96	0.96	-0.09
6,439.00	90.84	359.23	2,352.36	4,486.30	-15.26	4,486.29	1.80	-1.52	-0.96
6,531.00	90.57	358.79	2,351.23	4,578.28	-16.85	4,578.28	0.56	-0.29	-0.48

Checked By: _____

Approved By: _____

Date: _____

Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	+N-S Local Coordinates (ft)	+E-W Local Coordinates (ft)	Comment
1,335.00	1,334.72	8.68	21.74	1335'MD: Tie into Pilot Hole Surveys
1,391.00	1,390.70	9.34	23.10	1391'MD: Driltech MWD Surveys
2,166.00	2,087.97	288.20	13.31	2166'MD: 330' FSL Crossing
2,840.00	2,353.16	888.95	9.05	2840'MD: FTP - 940' FSL - 1305' FEL
6,998.00	2,352.49	5,045.17	-15.10	6998'MD: End Driltech MWD Surveys
7,050.00	2,351.58	5,097.13	-13.25	7050'MD: Projection to Total Depth
7,050.00	2,351.58	5,097.13	-13.25	Bottom Hole Location 1301' FEL - 139' FNL

Design Targets

Target Name	- hit/miss target	- Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N-S (ft)	+E-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Bandon Dunes BHL (i	- survey hits target center	- Point	0.00	0.00	2,353.16	888.95	9.05	902,776.92	604,828.96	33° 28' 53.279 N	104° 7' 30.349 W
Bandon Dunes FTP (i	- survey hits target center	- Point	0.00	0.00	2,353.16	888.95	9.05	604,851.25	604,851.25	33° 28' 11.643 N	104° 7' 30.185 W

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (%/100ft)	Build Rate (%/100ft)	Turn Rate (%/100ft)
6,623.00	89.78	358.79	2,350.95	4,670.26	-18.80	4,670.27	0.86	-0.86	0.00
6,715.00	88.55	0.11	2,352.29	4,762.24	-19.68	4,762.26	1.96	-1.34	1.43
6,809.00	90.22	0.28	2,353.30	4,856.23	-19.36	4,856.24	1.79	1.78	0.18
6,903.00	89.87	1.42	2,353.22	4,950.22	-17.96	4,950.22	1.27	-0.37	1.21
6,998.00	91.01	2.04	2,352.49	5,045.17	-15.10	5,045.15	1.37	1.20	0.65
7,050.00	91.01	2.04	2,351.58	5,097.13	-13.25	5,097.09	0.00	0.00	0.00
7050'MD: Projection to Total Depth - Bottom Hole Location 1301' FEL - 139' FNL - Bandon Dunes BHL (as Drilled) - Bani									

Design:

Wellbore #1

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Site:

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Minimum Curvature

Database:

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DrilTech, LLC

Chaves County, NM (NAD 83)
Bandon Dunes 2H
Section 6; T10S R28E
Wellbore #1
Wellbore #1
Silver Oak Rig #1



SURFACE LOCATION

US State Plane 1983
New Mexico Eastern Zone
Elevation: 3848 + 17' KB @ 3865.00ft (Silver Oak Rig #1)
Northing 897679.80 Easting 604842.20 Latitude 33° 28' 2.848 N Longitude 104° 7' 30.313 W

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting
Bandon Dunes BHL (as Drilled)	1.58	5097.13	-13.25	902776.92	604828.95
Bandon Dunes FTP (as Drilled)	1.16	888.95	9.05	898568.75	604851.25

SECTION DETAILS

No plan data is available

Formation Top Detail

No formation data is available

