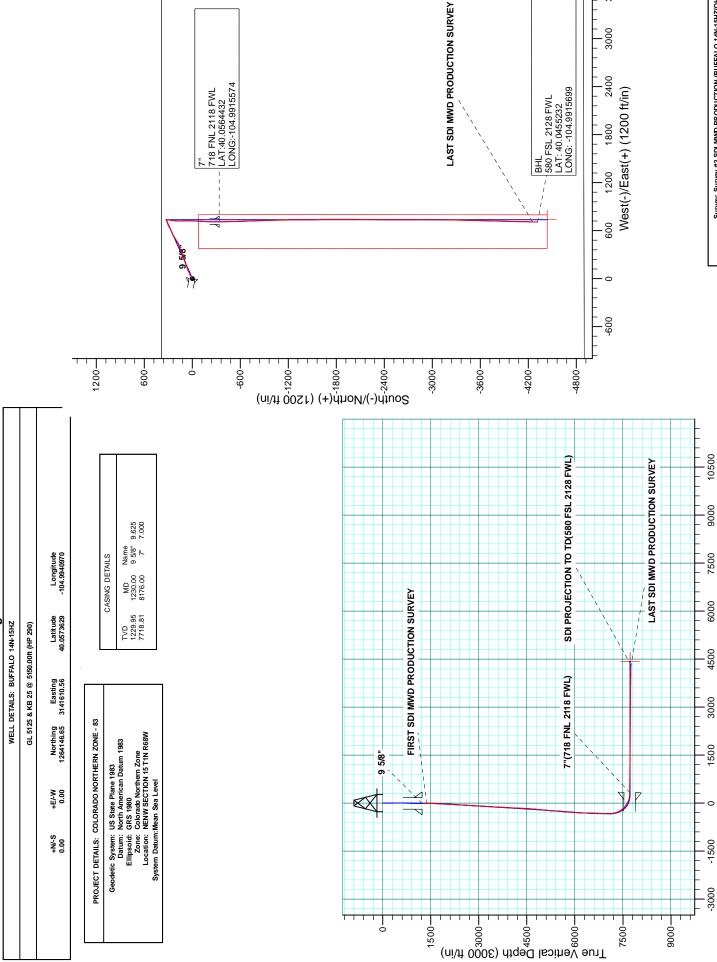
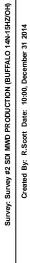


Project: COLORADO NORTHERN ZONE - 83 Site: BUFFALO & BADGER 4-4 PAD Well: BUFFALO 14N-15HZ

Anadarka Metroleum Corporation

Design: OH





Vertical Section at 180.04° (3000 ft/in)

3600

3000



## **US ROCKIES REGION PLANNING**

COLORADO NORTHERN ZONE - 83 BUFFALO & BADGER 4-4 PAD BUFFALO 14N-15HZ

OH

Design: OH

# **Standard Survey Report**

31 December, 2014





**TVD Reference:** 

MD Reference:

Database:



Company: US ROCKIES REGION PLANNING

Project: COLORADO NORTHERN ZONE - 83
Site: BUFFALO & BADGER 4-4 PAD

Well: BUFFALO 14N-15HZ

Wellbore: OH
Design: OH

Site

Local Co-ordinate Reference:

Well BUFFALO 14N-15HZ

GL 5125 & KB 25 @ 5150.00ft (HP 290) GL 5125 & KB 25 @ 5150.00ft (HP 290)

North Reference: True
Survey Calculation Method: Min

Minimum Curvature
Denver Sales

Project COLORADO NORTHERN ZONE - 83, KERR MCGEE OIL & GAS ONSHORE LP

Map System: US State Plane 1983 System Datum:

Geo Datum: North American Datum 1983

Map Zone: Colorado Northern Zone

Mean Sea Level

BUFFALO & BADGER 4-4 PAD, NENW SECTION 15 T1N R68W

1,264,146.69 usft Northing: Site Position: Latitude: 40.0573630 Lat/Long 3,141,610.56 usft -104.9940970 From: Easting: Longitude: 0.00 ft 13.200 in 0.33 ° **Position Uncertainty:** Slot Radius: **Grid Convergence:** 

Well BUFFALO 14N-15HZ, 384' FNL 1409' FWL **Well Position** +N/-S 0.00 ft Northing: 1,264,146.65 usft Latitude: 40 0573629 +E/-W 0.00 ft Easting: 3,141,610.56 usft Longitude: -104.9940970 **Position Uncertainty** 0.00 ft Wellhead Elevation: 0.00 ft Ground Level: 5,125.00 ft

ОН Wellbore Magnetics **Model Name** Sample Date Declination Dip Angle Field Strength (nT) (°) (°) BGGM2014 6/3/2014 8.64 66.63 52,515

Design ОН Audit Notes: ACTUAL Version: 1.0 Phase: Tie On Depth: 0.00 Vertical Section: Depth From (TVD) +N/-S Direction +E/-W (ft) (ft) (ft) (°) 0.00 0.00 0.00 180.04

Survey Program Date 12/31/2014 From То (ft) (ft) Survey (Wellbore) **Tool Name** Description 19.00 1,256.00 Survey #1 CATHEDRAL MWD SURFACE ( **MWD** MWD - Standard 1,369.00 12,155.00 Survey #2 SDI MWD PRODUCTION (OH) SDI MWD+CRUST 1.0 SDI MWD + Crustal anomaly, Version 1.0

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.00	0.00	0.00	19.00	0.00	0.00	0.00	0.00	0.00	0.00
71.00	0.20	144.70	71.00	-0.07	0.05	0.07	0.38	0.38	0.00
161.00	0.20	98.50	161.00	-0.23	0.30	0.23	0.17	0.00	-51.33
258.00	0.30	167.30	258.00	-0.50	0.52	0.50	0.30	0.10	70.93
337.00	0.30	213.60	337.00	-0.87	0.45	0.87	0.30	0.00	58.61
417.00	0.10	172.80	417.00	-1.12	0.35	1.12	0.29	-0.25	-51.00
497.00	0.40	246.90	497.00	-1.29	0.10	1.29	0.48	0.38	92.63
577.00	0.50	272.00	576.99	-1.39	-0.51	1.39	0.27	0.13	31.38
657.00	0.90	299.40	656.99	-1.07	-1.40	1.07	0.64	0.50	34.25





Company: US ROCKIES REGION PLANNING COLORADO NORTHERN ZONE - 83 Project:

BUFFALO & BADGER 4-4 PAD Site:

BUFFALO 14N-15HZ Well:

Wellbore: ОН ОН Design:

Local Co-ordinate Reference:

Well BUFFALO 14N-15HZ

TVD Reference: GL 5125 & KB 25 @ 5150.00ft (HP 290) GL 5125 & KB 25 @ 5150.00ft (HP 290) MD Reference:

North Reference:

**Survey Calculation Method:** Minimum Curvature Denver Sales Database:

Survey									
Manager						Mantiaal	Daulau.	D.::Ud	<b>T</b>
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
737.00	0.40	27.30	736.98	-0.51	-1.82	0.52	1 01	0.62	109.88
817.00	0.40	341.80	816.98	0.06	-1.82 -1.80	-0.06	1.21 0.45	-0.63 0.13	-56.88
897.00	0.80	358.90	896.98	0.95	-1.92	-0.06	0.45	0.13	21.38
977.00	0.60	326.60	976.97	1.86	-1.92	-0.95	0.44	-0.25	-40.38
1,057.00	0.00	31.00	1,056.97	2.63	-2.17 -2.14	-2.63	0.34	0.13	80.50
1,007.00		31.00	1,000.97		-2.14		0.01	0.13	
1,137.00	1.10	44.30	1,136.96	3.60	-1.36	-3.60	0.56	0.50	16.63
1,230.00	0.65	99.23	1,229.95	4.15	-0.21	-4.15	0.97	-0.49	59.06
9 5/8"									
1,256.00	0.70	120.30	1,255.95	4.05	0.07	-4.05	0.97	0.20	81.05
1,369.00	0.79	145.40	1,368.94	3.06	1.11	-3.06	0.30	0.08	22.21
	IWD PRODUCTION								
1,460.00	1.82	58.00	1,459.92	3.31	2.69	-3.31	2.14	1.13	-96.04
1,563.00	4.99	57.43	1,562.72	6.59	7.85	-6.60	3.08	3.08	-0.55
1,654.00	6.34	53.08	1,653.28	11.74	15.21	-11.75	1.56	1.48	-4.78
1,746.00	6.51	60.72	1,744.70	17.34	23.82	-17.36	0.95	0.18	8.30
1,838.00	7.69	63.47	1,835.99	22.64	33.87	-22.66	1.33	1.28	2.99
1,929.00	8.81	63.64	1,926.05	28.46	45.56	-28.49	1.23	1.23	0.19
2,020.00	8.32	63.09	2,016.04	34.53	57.68	-34.57	0.55	-0.54	-0.60
2,112.00	8.31	62.94	2,107.07	40.57	69.54	-40.61	0.03	-0.01	-0.16
2,202.00	9.31	69.81	2,196.01	46.04	82.16	-46.10	1.61	1.11	7.63
2,293.00	9.21	71.47	2,285.82	50.89	95.97	-50.96	0.31	-0.11	1.82
2,383.00	9.06	69.58	2,374.68	55.65	109.44	-55.73	0.37	-0.17	-2.10
2,473.00	8.96	69.14	2,463.57	60.62	122.63	-60.71	0.13	-0.11	-0.49
2,565.00	8.36	69.12	2,554.52	65.56	135.58	-65.65	0.65	-0.65	-0.02
2,656.00	8.63	70.41	2,644.52	70.20	148.19	-70.31	0.36	0.30	1.42
2,746.00	8.81	72.80	2,733.48	74.51	161.14	-74.62	0.45	0.20	2.66
2,838.00	9.93	71.23	2,824.25	79.14	175.38	-79.26	1.25	1.22	-1.71
2,928.00	9.75	71.54	2,912.93	84.05	189.95	-84.18	0.21	-0.20	0.34
3,020.00	8.24	73.24	3,003.80	88.42	203.66	-88.56	1.67	-1.64	1.85
3,111.00	8.48	65.22	3,093.83	93.11	215.99	-93.26	1.31	0.26	-8.81
3,201.00	8.56	62.75	3,182.84	98.96	227.97	-99.12	0.42	0.09	-2.74
3,291.00	9.40	63.18	3,271.74	105.34	240.49	-105.51	0.94	0.93	0.48
3,386.00	8.73	64.59	3,365.55	111.94	253.92	-112.11	0.74	-0.71	1.48
3,480.00	9.50	66.06	3,458.36	118.15	267.45	-118.33	0.86	0.82	1.56
3,575.00	7.26	67.54	3,552.34	123.62	280.17	-123.82	2.37	-2.36	1.56
3,669.00	8.24	76.54	3,645.48	127.46	292.21	-127.66	1.66	1.04	9.57
3,763.00	10.40	82.36	3,738.24	130.16	307.17	-130.37	2.50	2.30	6.19
3,858.00	11.49	69.22	3,831.53	134.65	324.52	-134.88	2.86	1.15	-13.83
3,952.00	10.32	64.41	3,923.83	141.61	340.87	-141.85	1.58	-1.24	-5.12
4,047.00	9.08	59.87	4,017.47	149.05	355.03	-149.30	1.53	-1.31	-4.78
4,141.00	7.50	79.59	4,110.50	153.88	367.48	-154.14	3.44	-1.68	20.98
4,236.00	8.75	82.15	4,204.55	155.99	380.74	-156.26	1.37	1.32	2.69
4,330.00	8.28	72.55	4,297.52	159.00	394.28	-159.27	1.59	-0.50	-10.21





Company: US ROCKIES REGION PLANNING
Project: COLORADO NORTHERN ZONE - 83

Site: BUFFALO & BADGER 4-4 PAD

Well: BUFFALO 14N-15HZ

Wellbore: OH
Design: OH

Local Co-ordinate Reference:

TVD Reference: GL 5125 & KB 25 @ 5150.00ft (HP 290)

MD Reference: GL 5125 & KB 25 @ 5150.00ft (HP 290)

Well BUFFALO 14N-15HZ

North Reference:

Survey Calculation Method: Minimum Curvature

Database: Denver Sales

g										
vey										
	Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
	4,424.00	8.92	68.49	4,390.46	163.70	407.51	-163.98	0.94	0.68	-4.32
	4,519.00	9.20	65.64	4,484.27	169.53	421.28	-169.83	0.56	0.29	-3.00
	4,613.00	9.21	62.11	4,577.07	176.15	434.78	-176.45	0.60	0.01	-3.76
	4,708.00	8.20	61.80	4,670.97	182.91	447.47	-183.22	1.06	-1.06	-0.33
	4,802.00	9.20	55.35	4,763.89	190.35	459.56	-190.67	1.48	1.06	-6.86
	4,897.00	10.51	59.87	4,857.49	199.02	473.30	-199.35	1.60	1.38	4.76
	4,991.00	9.89	58.35	4,950.00	207.56	487.59	-207.90	0.72	-0.66	-1.62
	5,086.00	8.41	56.92	5,043.79	215.63	500.35	-215.98	1.58	-1.56	-1.51
	5,180.00	8.57	58.01	5,136.76	223.09	512.05	-223.45	0.24	0.17	1.16
	5,275.00	9.85	53.51	5,230.53	231.67	524.59	-232.04	1.55	1.35	-4.74
	5,369.00	12.19	61.83	5,322.80	241.14	539.81	-241.52	3.00	2.49	8.85
	5,463.00	12.39	69.61	5,414.65	249.34	558.01	-249.73	1.77	0.21	8.28
	5,558.00	10.61	66.09	5,507.74	256.44	575.56	-256.84	2.01	-1.87	-3.71
	5,652.00	9.43	67.87	5,600.31	262.85	590.61	-263.26	1.30	-1.26	1.89
	5,747.00	9.64	67.81	5,693.99	268.78	605.18	-269.20	0.22	0.22	-0.06
	5,841.00	10.71	64.08	5,786.52	275.57	620.32	-276.01	1.34	1.14	-3.97
	5,936.00	9.55	59.93	5,880.03	283.38	635.08	-283.82	1.44	-1.22	-4.37
	6,030.00	9.14	61.78	5,972.79	290.82	648.41	-291.27	0.54	-0.44	1.97
	6,124.00	9.87	64.58	6,065.50	297.81	662.27	-298.27	0.92	0.78	2.98
	6,219.00	8.10	61.70	6,159.33	304.48	675.51	-304.95	1.92	-1.86	-3.03
	6,313.00	6.67	69.66	6,252.55	309.51	686.46	-309.99	1.87	-1.52	8.47
	6,408.00	5.72	82.94	6,347.00	312.01	696.34	-312.50	1.80	-1.00	13.98
	6,502.00	4.47	76.14	6,440.62	313.47	704.54	-313.96	1.47	-1.33	-7.23
	6,597.00	3.85	69.08	6,535.37	315.49	711.12	-315.99	0.85	-0.65	-7.43
	6,691.00	3.60	66.95	6,629.18	317.77	716.78	-318.27	0.30	-0.27	-2.27
	6,786.00	3.47	55.00	6,724.00	320.59	721.88	-321.09	0.79	-0.14	-12.58
	6,880.00	2.49	56.33	6,817.87	323.35	725.91	-323.86	1.05	-1.04	1.41
	6,974.00	2.28	43.61	6,911.79	325.84	728.90	-326.35	0.60	-0.22	-13.53
	7,069.00	0.17	38.78	7,006.76	327.32	730.29	-327.83	2.22	-2.22	-5.08
	7,163.00	0.44	71.24	7,100.76	327.54	730.72	-328.05	0.33	0.29	34.53
	7,210.00	3.45	177.65	7,147.73	326.19	730.95	-326.70	7.66	6.40	226.40
	7,258.00	8.57	180.07	7,195.45	321.16	731.00	-321.68	10.68	10.67	5.04
	7,305.00	14.58	177.67	7,241.47	311.74	731.24	-312.25	12.83	12.79	-5.11
	7,352.00	19.32	182.50	7,286.42	298.06	731.14	-298.57	10.51	10.09	10.28
	7,399.00	23.12	185.41	7,330.23	281.10	729.93	-281.61	8.39	8.09	6.19
	7,447.00	25.36	186.89	7,373.99	261.51	727.81	-262.01	4.83	4.67	3.08
	7,494.00	30.71	186.73	7,415.46	239.58	725.19	-240.09	11.38	11.38	-0.34
	7,541.00	35.03	184.66	7,454.93	214.20	722.69	-214.71	9.50	9.19	-4.40
	7,588.00	40.52	181.83	7,492.07	185.47	721.10	-185.98	12.25	11.68	-6.02
	7,636.00	45.78	178.91	7,527.08	152.67	720.93	-153.17	11.72	10.96	-6.08
	7,683.00	48.59	177.96	7,559.02	118.21	721.88	-118.71	6.16	5.98	-2.02
	7,730.00	52.87	178.43	7,588.76	81.85	723.02	-82.35	9.14	9.11	1.00
	7,777.00	56.58	181.22	7,615.91	43.49	723.12	-43.99	9.26	7.89	5.94
	7,825.00	60.54	182.74	7,640.94	2.57	721.69	-3.08	8.68	8.25	3.17





GL 5125 & KB 25 @ 5150.00ft (HP 290)

Company: US ROCKIES REGION PLANNING COLORADO NORTHERN ZONE - 83 Project:

BUFFALO & BADGER 4-4 PAD Site:

BUFFALO 14N-15HZ Well:

Wellbore: ОН ОН Design:

Local Co-ordinate Reference:

Well BUFFALO 14N-15HZ TVD Reference: GL 5125 & KB 25 @ 5150.00ft (HP 290)

MD Reference: North Reference:

**Survey Calculation Method:** Minimum Curvature Denver Sales Database:

Surve	у									
	Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
	7,872.00	65.17	182.34	7,662.38	-39.20	719.84	38.70	9.88	9.85	-0.85
	7,919.00	69.39	181.84	7,680.52	-82.51	718.26	82.01	9.03	8.98	-1.06
	7,966.00	74.55	182.63	7,695.07	-127.16	716.52	126.66	11.09	10.98	1.68
	8,014.00	78.93	182.98	7,706.07	-173.81	714.23	173.31	9.15	9.13	0.73
	8,061.00	84.04	182.16	7,713.03	-220.23	712.15	219.73	11.01	10.87	-1.74
	8,123.00	87.98	180.25	7,717.34	-282.05	710.85	281.55	7.06	6.35	-3.08
	8,176.00	88.85	179.68	7,718.81	-335.03	710.88	334.53	1.96	1.63	-1.08
	7"(718 FNL 2	2118 FWL)								
	8,224.00	89.63	179.16	7,719.45	-383.02	711.37	382.52	1.96	1.63	-1.08
	8,319.00	89.30	178.68	7,720.34	-478.00	713.16	477.50	0.61	-0.35	-0.51
	8,414.00	89.40	179.02	7,721.42	-572.97	715.07	572.47	0.37	0.11	0.36
	8,508.00	89.33	178.01	7,722.46	-666.94	717.50	666.43	1.08	-0.07	-1.07
	8,602.00	90.24	177.86	7,722.81	-760.87	720.89	760.37	0.98	0.97	-0.16
	8,697.00	90.67	178.23	7,722.06	-855.81	724.13	855.31	0.60	0.45	0.39
	8,791.00	89.90	177.92	7,721.59	-949.76	727.29	949.25	0.88	-0.82	-0.33
	8,885.00	89.97	178.34	7,721.70	-1,043.71	730.36	1,043.20	0.45	0.07	0.45
	8,979.00	89.83	179.69	7,721.86	-1,137.69	731.97	1,137.18	1.44	-0.15	1.44
	9,074.00	90.40	178.58	7,721.67	-1,232.68	733.41	1,232.17	1.31	0.60	-1.17
	9,168.00	89.77	179.63	7,721.53	-1,326.67	734.87	1,326.15	1.30	-0.67	1.12
	9,262.00	89.46	179.40	7,722.16	-1,420.66	735.67	1,420.15	0.41	-0.33	-0.24
	9,357.00	89.26	178.75	7,723.22	-1,515.64	737.20	1,515.13	0.72	-0.21	-0.68
	9,451.00	89.83	178.59	7,723.97	-1,609.61	739.39	1,609.10	0.63	0.61	-0.17
	9,546.00	89.90	179.25	7,724.19	-1,704.60	741.18	1,704.08	0.70	0.07	0.69
	9,640.00	89.63	180.46	7,724.58	-1,798.59	741.41	1,798.07	1.32	-0.29	1.29
	9,735.00	89.97	179.77	7,724.91	-1,893.59	741.22	1,893.07	0.81	0.36	-0.73
	9,829.00	90.10	180.94	7,724.85	-1,987.59	740.64	1,987.07	1.25	0.14	1.24
	9,924.00	89.87	181.00	7,724.88	-2,082.57	739.03	2,082.06	0.25	-0.24	0.06
	10,018.00	89.26	180.49	7,725.59	-2,176.56	737.81	2,176.05	0.85	-0.65	-0.54
	10,113.00	89.06	179.79	7,726.98	-2,271.55	737.58	2,271.04	0.77	-0.21	-0.74
	10,207.00	90.03	180.26	7,727.73	-2,365.55	737.54	2,365.03	1.15	1.03	0.50
	10,301.00	89.80	180.37	7,727.87	-2,459.55	737.02	2,459.03	0.27	-0.24	0.12
	10,396.00	89.09	179.74	7,728.79	-2,554.54	736.93	2,554.02	1.00	-0.75	-0.66
	10,490.00	89.16	179.78	7,730.22	-2,648.53	737.32	2,648.01	0.09	0.07	0.04
	10,585.00	88.59	179.97	7,732.09	-2,743.51	737.53	2,742.99	0.63	-0.60	0.20
	10,679.00	89.50	180.57	7,733.66	-2,837.49	737.09	2,836.98	1.16	0.97	0.64
	10,773.00	89.03	181.15	7,734.86	-2,931.47	735.68	2,930.96	0.79	-0.50	0.62
	10,868.00	89.73	180.70	7,735.89	-3,026.46	734.14	3,025.94	0.88	0.74	-0.47
	10,962.00	89.50	180.48	7,736.52	-3,120.45	733.18	3,119.94	0.34	-0.24	-0.23
	11,056.00	90.10	180.08	7,736.85	-3,214.45	732.72	3,213.93	0.77	0.64	-0.43
	11,151.00	88.89	180.94	7,737.69	-3,309.44	731.87	3,308.92	1.56	-1.27	0.91
	11,245.00	89.66	181.85	7,738.88	-3,403.40	729.58	3,402.89	1.27	0.82	0.97
	11,340.00	89.26	181.50	7,739.77	-3,498.35	726.81	3,497.85	0.56	-0.42	-0.37
	11,434.00	89.23	181.57	7,741.01	-3,592.31	724.29	3,591.81	0.08	-0.03	0.07





Company: US ROCKIES REGION PLANNING COLORADO NORTHERN ZONE - 83 Project: BUFFALO & BADGER 4-4 PAD Site:

BUFFALO 14N-15HZ Well:

Wellbore: ОН ОН Design:

Local Co-ordinate Reference:

Well BUFFALO 14N-15HZ GL 5125 & KB 25 @ 5150.00ft (HP 290)

TVD Reference: GL 5125 & KB 25 @ 5150.00ft (HP 290) MD Reference:

North Reference:

**Survey Calculation Method:** Minimum Curvature Denver Sales Database:

ey										
	Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
	11,528.00	89.26	182.16	7,742.25	-3,686.25	721.23	3,685.75	0.63	0.03	0.63
	11,623.00	89.40	180.92	7,743.36	-3,781.21	718.68	3,780.71	1.31	0.15	-1.31
	11,717.00	90.20	181.11	7,743.69	-3,875.19	717.01	3,874.69	0.87	0.85	0.20
	11,811.00	88.72	181.73	7,744.57	-3,969.16	714.68	3,968.66	1.71	-1.57	0.66
	11,906.00	87.98	180.80	7,747.31	-4,064.09	712.59	4,063.60	1.25	-0.78	-0.98
	12,000.00	88.52	181.18	7,750.18	-4,158.04	710.96	4,157.54	0.70	0.57	0.40
	12,093.00	88.15	181.32	7,752.88	-4,250.97	708.93	4,250.48	0.43	-0.40	0.15
	LAST SDI MV	VD PRODUCTIO	N SURVEY							
	12,155.00	88.15	181.32	7,754.88	-4,312.93	707.51	4,312.43	0.00	0.00	0.00
	SDI PROJEC	TION TO TD(580	FSL 2128 FWL	.)						

Casing Points						
	Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (in)	Hole Diameter (in)	
	1,230.00 8,176.00	1,229.95 7,718.81	9 5/8" 7"(718 FNL 2118 FWL)	9.625 7.000	13.500 8.750	

Design Annotations				
Measure	ed Vertical	Local (	Coordinates	
Depth (ft)	Depth (ft)	+N/-S	+E/-W	0
(1.5)	(11)	(ft)	(ft)	Comment
1,369	9.00 1,368.9	4 3.06	1.11	FIRST SDI MWD PRODUCTION SURVEY
12,093	3.00 7,752.8	8 -4,250.97	708.93	LAST SDI MWD PRODUCTION SURVEY
12,155	5.00 7,754.8	8 -4,312.93	707.51	SDI PROJECTION TO TD(580 FSL 2128 FWL)

Checked By:	Approved By:	Date: