

8/12/16

API#30-039-30079

JIC 29-2-4 #143

JIC 29-2-4 #143

04
SURF900 FS
10122145 FE (4)
5590

1912 FS

7735 FE (4)

-5289/2

-5238/2

2472 FE (5)

814

OPERATOR: BLACKHILLS GAS RESOURCES
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County, NM

JIC 29-2-4 #143

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	T
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tie in	0.0	0.0	0.0	C PC TOP
1	434.0	0.2	23.8	43 @ 4242'
2	529.0	0.2	345.5	52
3	624.0	0.7	319.6	624.0 1.6
4	718.0	0.7	307.3	718.0 2.4
5	813.0	0.6	310.1	813.0 3.1
6	906.0	0.4	354.7	906.0 3.7
7	1000.0	0.5	357.6	1000.0 4.4
8	1094.0	0.4	357.4	1094.0 5.2
9	1189.0	0.3	346.1	1189.0 5.7
10	1283.0	0.2	355.0	1283.0 6.2
11	1378.0	0.3	319.1	1378.0 6.5
12	1472.0	0.3	347.5	1472.0 6.9
13	1565.0	0.5	351.3	1565.0 7.6
14	1627.0	0.3	266.6	1627.0 7.8
15	1718.0	0.4	278.7	1718.0 7.9
16	1809.0	0.5	349.5	1809.0 8.3
17	1898.0	0.6	286.8	1898.0 8.8
18	1989.0	0.7	276.3	1989.0 9.0
19	2079.0	0.6	268.2	2078.9 9.1
20	2170.0	0.5	328.9	2169.9 9.4
21	2259.0	0.4	345.7	2258.9 10.0
22	2344.0	0.2	291.2	2343.9 10.4
23	2433.0	0.4	306.5	2432.9 10.6
24	2523.0	0.3	255.9	2522.9 10.7
25	2613.0	0.3	215.0	2612.9 10.5
26	2760.0	0.3	182.3	2759.9 9.8
27	2791.0	1.8	272.2	2790.9 9.7

SURF: 900 FS 2145 FE (4)
175 930
1075 FS 3075 FE (4)
5289
2214 FWA

Target Line TVD

DIP AZ

DIP DEG

Target Line TVD

DIP AZ

DIP DEG

3746.91

280.00

-0.79

PROPOSED

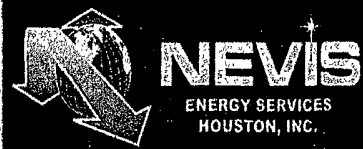
FINAL

ANGLE

89.21

target LINE	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
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434	3746.9	3312.9	3746.9	3312.9	23.80	0.74
95	3746.9	3217.9	3746.9	3217.9	18.23	1.05
95	3746.9	3122.9	3746.9	3122.9	356.92	1.57
94	3746.9	3028.9	3746.9	3028.9	339.06	2.20
95	3746.9	2934.0	3746.9	2934.0	330.17	2.71
93	3746.9	2841.0	3746.9	2841.0	329.74	3.27
94	3747.0	2747.0	3747.0	2747.0	333.56	3.99
94	3747.0	2653.0	3747.0	2653.0	336.60	4.71
95	3747.0	2558.0	3747.0	2558.0	338.07	5.26
94	3747.0	2464.0	3747.0	2464.0	338.78	5.64
95	3747.0	2369.0	3747.0	2369.0	338.48	5.96
94	3747.0	2275.0	3747.0	2275.0	338.15	6.34
93	3747.0	2182.0	3747.0	2182.0	339.08	6.95
62	3747.0	2120.0	3747.0	2120.0	338.42	7.17
91	3747.0	2029.0	3747.0	2029.0	335.10	7.11
91	3747.0	1938.0	3747.0	1938.0	334.07	7.47
89	3747.0	1849.0	3747.0	1849.0	332.69	7.89
91	3747.0	1758.1	3747.0	1758.1	328.33	7.91
90	3747.0	1668.1	3747.0	1668.1	324.02	7.78
91	3747.0	1577.1	3747.0	1577.1	322.28	7.98
89	3747.0	1488.1	3747.0	1488.1	323.05	8.56
85	3747.0	1403.1	3747.0	1403.1	323.21	8.86
89	3747.0	1314.1	3747.0	1314.1	322.47	9.03
90	3747.1	1224.1	3747.1	1224.1	321.21	9.07
90	3747.1	1134.1	3747.1	1134.1	319.39	8.76
147	3747.1	987.1	3747.1	987.1	316.68	8.03
31	3747.1	956.1	3747.1	956.1	315.01	7.88



OPERATOR: BLACKHILLS GAS RESOURCES
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County,NM

START: 11/4/08

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6	SECT. ft	DLS %/100 ft	BR %/100 ft
28	2822.0	3.8	281.9	2821.9	9.9	-11.2	12.8	6.6	6.5
29	2854.0	5.8	287.6	2853.8	10.7	-13.8	15.4	6.4	6.3
30	2885.0	8.0	288.7	2884.5	11.8	-17.3	19.1	7.1	7.1
31	2916.0	10.1	287.8	2915.2	13.3	-22.0	23.9	6.8	6.8
32	2947.0	12.0	285.7	2945.6	15.0	-27.6	29.8	6.3	6.1
33	2979.0	14.2	282.8	2976.8	16.8	-34.7	37.1	7.2	6.9
34	3011.0	16.4	280.6	3007.6	18.5	-42.9	45.5	7.1	6.9
35	3042.0	18.5	281.1	3037.2	20.3	-52.1	54.8	6.8	6.8
36	3074.0	20.5	281.6	3067.4	22.4	-62.5	65.5	6.3	6.3
37	3106.0	22.5	281.5	3097.1	24.7	-74.0	77.2	6.3	6.3
38	3137.0	24.2	282.2	3125.6	27.2	-86.1	89.5	5.6	5.5
39	3167.0	26.0	282.8	3152.7	30.0	-98.5	102.2	6.1	6.0
40	3199.0	27.2	282.1	3181.4	33.1	-112.5	116.5	3.9	3.8
41	3230.0	28.1	280.4	3208.8	35.9	-126.6	130.9	3.9	2.9
42	3262.0	29.9	279.9	3236.8	38.6	-141.9	146.4	5.7	5.6
43	3293.0	31.7	279.5	3263.4	41.3	-157.5	162.3	5.8	5.8
44	3323.0	33.6	279.5	3288.7	44.0	-173.5	178.5	6.3	6.3
45	3354.0	35.4	279.5	3314.2	46.9	-190.8	196.0	5.8	5.8
46	3386.0	37.6	279.7	3340.0	50.0	-209.5	215.1	6.9	6.9
47	3417.0	39.9	279.7	3364.1	53.3	-228.7	234.5	7.4	7.4
48	3449.0	41.8	280.0	3388.3	56.9	-249.3	255.4	6.0	5.9
49	3481.0	43.6	280.0	3411.9	60.7	-270.7	277.1	5.6	5.6
50	3512.0	45.8	279.8	3433.9	64.4	-292.1	298.9	7.1	7.1
51	3543.0	48.3	279.8	3455.0	68.3	-314.5	321.6	8.1	8.1
52	3575.0	50.4	280.0	3475.9	72.4	-338.4	345.9	6.6	6.6
53	3607.0	52.1	280.2	3495.9	76.8	-363.0	370.8	5.3	5.3
54	3638.0	53.9	280.5	3514.5	81.3	-387.3	395.6	5.9	5.8
55	3669.0	55.8	280.9	3532.4	86.0	-412.2	420.9	6.2	6.1

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

FINAL

ANGLE 89.21

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

PROPOSED

FINAL

ANGLE 89.21

C.L.	target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
31	3747.1	925.2	3747.1	925.2	311.60	7.85
32	3747.1	893.3	3747.1	893.3	307.71	8.10
31	3747.2	862.6	3747.2	862.6	304.31	8.63
31	3747.2	832.1	3747.2	832.1	301.29	9.33
31	3747.3	801.7	3747.3	801.7	298.56	10.02
32	3747.4	770.7	3747.4	770.7	295.87	10.54
32	3747.5	739.9	3747.5	739.9	293.33	10.78
31	3747.7	710.5	3747.7	710.5	291.27	10.92
32	3747.8	680.5	3747.8	680.5	289.68	11.17
32	3748.0	650.9	3748.0	650.9	288.47	11.49
31	3748.1	622.6	3748.1	622.6	287.57	11.89
30	3748.3	595.6	3748.3	595.6	286.94	12.45
32	3748.5	567.2	3748.5	567.2	286.39	13.06
31	3748.7	539.9	3748.7	539.9	285.83	13.37
32	3748.9	512.1	3748.9	512.1	285.23	13.41
31	3749.1	485.7	3749.1	485.7	284.69	13.32
30	3749.4	460.7	3749.4	460.7	284.22	13.18
31	3749.6	435.4	3749.6	435.4	283.80	13.03
32	3749.9	409.9	3749.9	409.9	283.43	12.90
31	3750.1	386.0	3750.1	386.0	283.12	12.79
32	3750.4	362.1	3750.4	362.1	282.86	12.74
32	3750.7	338.9	3750.7	338.9	282.63	12.74
31	3751.0	317.1	3751.0	317.1	282.43	12.70
31	3751.3	296.3	3751.3	296.3	282.25	12.62
32	3751.7	275.8	3751.7	275.8	282.08	12.58
32	3752.0	256.1	3752.0	256.1	281.95	12.62
31	3752.4	237.8	3752.4	237.8	281.85	12.78
31	3752.7	220.3	3752.7	220.3	281.78	13.09



OPERATOR: BLACKHILLS GAS RESOURCES START: 11/4/08
 WELL: Jicarilla 29-02-04 # 143
 LOCATION: Rio Arriba County, NM

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6	SECT. ft	DLS %/100 ft	BR %/100 ft
56	3701.0	57.8	281.2	3549.9	91.1	-438.5	447.7	6.3	6.3
57	3733.0	59.5	281.3	3566.6	96.4	-465.3	475.0	5.3	5.3
58	3764.0	60.9	280.8	3582.0	101.6	-491.7	501.9	4.7	4.5
59	3796.0	62.3	280.6	3597.2	106.8	-519.4	530.0	4.4	4.4
60	3827.0	62.9	280.5	3611.4	111.9	-546.4	557.6	2.0	1.9
61	3858.0	64.1	279.3	3625.3	116.6	-573.8	585.3	5.2	3.9
62	3889.0	65.8	278.8	3638.4	121.0	-601.5	613.4	5.7	5.5
63	3921.0	67.1	278.4	3651.2	125.4	-630.5	642.7	4.2	4.1
64	3952.0	68.5	278.8	3662.9	129.7	-658.9	671.4	4.7	4.5
65	3984.0	69.9	279.8	3674.3	134.6	-688.4	701.3	5.3	4.4
66	4016.0	71.7	279.5	3684.8	139.6	-718.2	731.5	5.7	5.6
67	4047.0	73.7	279.3	3694.0	144.5	-747.4	761.1	6.5	6.5
68	4078.0	75.6	279.0	3702.2	149.2	-776.9	791.0	6.2	6.1
69	4110.0	77.2	279.1	3709.7	154.1	-807.6	822.1	5.0	5.0
70	4142.0	79.5	279.6	3716.2	159.2	-838.5	853.4	7.3	7.2
71	4173.0	80.7	279.8	3721.5	164.3	-868.6	884.0	3.9	3.9
72	4205.0	81.4	279.7	3726.5	169.7	-899.8	915.6	2.2	2.2
X 73	4236.0	83.1	279.8	3730.7	174.9	-930.1	946.3	5.5	5.5
74	4268.0	83.8	280.0	3734.3	180.4	-961.4	978.1	2.3	2.2
75	4300.0	84.1	280.0	3737.7	185.9	-992.7	1009.9	0.9	0.9
76	4331.0	84.6	279.9	3740.8	191.2	-1023.1	1040.8	1.6	1.6
77	4362.0	84.2	280.0	3743.8	196.6	-1053.5	1071.6	1.3	1.3
78	4394.0	84.2	279.8	3747.0	202.0	-1084.9	1103.5	0.6	0.0
79	4426.0	84.4	279.3	3750.2	207.3	-1116.3	1135.3	1.7	0.6
80	4458.0	85.0	279.6	3753.2	212.5	-1147.7	1167.2	2.1	1.9
81	4489.0	84.9	279.5	3755.9	217.7	-1178.1	1198.0	0.5	0.3
X 82	4521.0	85.0	279.3	3758.7	222.9	-1209.6	1229.9	0.7	0.3
83	4608.0	85.5	279.5	3765.9	237.0	-1295.1	1316.6	0.6	0.6

Target Line TVD 3746.91
 DIP AZ 280.00 FINAL
 DIP DEG -0.79 ANGLE 89.21

Target Line TVD 3746.91 PROPOSED
 DIP AZ 280.00 FINAL
 DIP DEG -0.79 ANGLE 89.21

C.L.	target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
32	3753.1	203.2	3753.1	203.2	281.74	13.58
32	3753.5	186.9	3753.5	186.9	281.71	14.18
31	3753.8	171.9	3753.8	171.9	281.67	14.67
32	3754.2	157.0	3754.2	157.0	281.62	15.01
31	3754.6	143.2	3754.6	143.2	281.57	15.28
31	3755.0	129.7	3755.0	129.7	281.49	15.23
31	3755.4	117.0	3755.4	117.0	281.38	14.76
32	3755.8	104.6	3755.8	104.6	281.25	14.04
31	3756.2	93.3	3756.2	93.3	281.14	13.34
32	3756.6	82.3	3756.6	82.3	281.06	12.98
32	3757.0	72.2	3757.0	72.2	281.00	12.79
31	3757.4	63.4	3757.4	63.4	280.94	12.48
31	3757.8	55.6	3757.8	55.6	280.87	12.04
32	3758.2	48.5	3758.2	48.5	280.80	11.52
32	3758.7	42.5	3758.7	42.5	280.75	11.17
31	3759.1	37.6	3759.1	37.6	280.71	11.01
32	3759.5	33.0	3759.5	33.0	280.68	10.87
31	3760.0	29.3	3760.0	29.3	280.65	10.74
32	3760.4	26.1	3760.4	26.1	280.63	10.68
32	3760.8	23.1	3760.8	23.1	280.61	10.68
31	3761.3	20.5	3761.3	20.5	280.59	10.65
31	3761.7	17.9	3761.7	17.9	280.57	10.63
32	3762.1	15.1	3762.1	15.1	280.55	10.57
32	3762.6	12.4	3762.6	12.4	280.52	10.32
32	3763.0	9.8	3763.0	9.8	280.49	10.01
31	3763.4	7.5	3763.4	7.5	280.47	9.77
32	3763.9	5.2	3763.9	5.2	280.44	9.44
87	3765.1	-0.8	3765.1	-0.8	280.37	8.53



OPERATOR: BLACKHILLS GAS RESOURCES
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County, NM

START: 11/4/08

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6	SECT. ft	DLS %/100 ft	BR %/100 ft
84	4656.0	86.9	281.0	3769.1	245.6	-1342.3	1364.5	4.3	2.9
85	4688.0	88.7	281.8	3770.3	251.9	-1373.6	1396.5	6.2	5.6
86	4719.0	89.4	281.9	3770.8	258.2	-1403.9	1427.4	2.3	2.3
87	4750.0	89.8	281.9	3771.0	264.6	-1434.3	1458.4	1.3	1.3
88	4782.0	89.7	281.9	3771.2	271.2	-1465.6	1490.4	0.3	0.3
89	4813.0	90.4	281.7	3771.2	277.6	-1495.9	1521.4	2.3	2.3
90	4844.0	90.8	282.0	3770.8	283.9	-1526.3	1552.4	1.6	1.3
91	4876.0	90.9	281.6	3770.4	290.5	-1557.6	1584.4	1.3	0.3
92	4907.0	89.8	280.8	3770.2	296.5	-1588.0	1615.3	4.4	3.5
93	4938.0	89.9	280.9	3770.3	302.3	-1618.4	1646.3	0.5	0.3
94	4970.0	90.5	280.8	3770.1	308.4	-1649.9	1678.3	1.9	1.9
95	5002.0	88.9	280.6	3770.3	314.3	-1681.3	1710.3	5.0	5.0
96	5033.0	88.7	280.9	3771.0	320.1	-1711.8	1741.3	1.2	0.6
97	5064.0	89.0	281.0	3771.6	326.0	-1742.2	1772.3	1.0	1.0
98	5096.0	89.2	281.1	3772.1	332.1	-1773.6	1804.3	0.7	0.6
99	5127.0	89.7	281.3	3772.4	338.1	-1804.0	1835.3	1.7	1.6
100	5158.0	90.2	281.7	3772.4	344.3	-1834.4	1866.3	2.1	1.6
101	5189.0	90.5	281.6	3772.2	350.6	-1864.7	1897.3	1.0	1.0
102	5221.0	90.8	282.0	3771.9	357.1	-1896.1	1929.3	1.6	0.9
103	5252.0	90.9	280.6	3771.4	363.2	-1926.4	1960.2	4.5	0.3
104	5282.0	91.3	280.3	3770.8	368.6	-1955.9	1990.2	1.7	1.3
105	5314.0	89.9	279.9	3770.5	374.2	-1987.4	2022.2	4.6	4.4
106	5345.0	90.0	279.8	3770.5	379.5	-2018.0	2053.2	0.5	0.3
107	5377.0	89.4	280.3	3770.7	385.1	-2049.5	2085.2	2.4	1.9
108	5406.0	88.1	279.9	3771.3	390.2	-2078.0	2114.2	4.7	4.5
109	5437.0	88.4	279.9	3772.3	395.5	-2108.6	2145.2	1.0	1.0
110	5468.0	88.9	279.6	3773.0	400.8	-2139.1	2176.2	1.9	1.6
111	5498.0	89.1	279.6	3773.5	405.8	-2168.7	2206.2	0.7	0.7

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

FINAL

ANGLE 89.21

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

PROPOSED

FINAL

ANGLE 89.21

C.L.	target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
48	3765.7	-3.4	3765.7	-3.4	280.37	8.74
32	3766.2	-4.1	3766.2	-4.1	280.39	9.52
31	3766.6	-4.2	3766.6	-4.2	280.42	10.52
31	3767.0	-4.0	3767.0	-4.0	280.45	11.55
32	3767.5	-3.7	3767.5	-3.7	280.48	12.61
31	3767.9	-3.3	3767.9	-3.3	280.51	13.58
31	3768.3	-2.5	3768.3	-2.5	280.54	14.59
32	3768.8	-1.6	3768.8	-1.6	280.56	15.59
31	3769.2	-1.0	3769.2	-1.0	280.58	16.24
31	3769.6	-0.6	3769.6	-0.6	280.58	16.70
32	3770.1	-0.1	3770.1	-0.1	280.59	17.17
32	3770.5	0.2	3770.5	0.2	280.59	17.56
31	3770.9	0.0	3770.9	0.0	280.59	17.97
31	3771.3	-0.2	3771.3	-0.2	280.60	18.48
32	3771.8	-0.3	3771.8	-0.3	280.61	19.07
31	3772.2	-0.2	3772.2	-0.2	280.62	19.72
31	3772.6	0.2	3772.6	0.2	280.63	20.53
31	3773.1	0.9	3773.1	0.9	280.65	21.42
32	3773.5	1.7	3773.5	1.7	280.67	22.43
31	3773.9	2.5	3773.9	2.5	280.68	23.13
30	3774.4	3.5	3774.4	3.5	280.67	23.37
32	3774.8	4.3	3774.8	4.3	280.66	23.42
31	3775.2	4.7	3775.2	4.7	280.65	23.34
32	3775.7	5.0	3775.7	5.0	280.64	23.37
29	3776.1	4.8	3776.1	4.8	280.63	23.42
31	3776.5	4.2	3776.5	4.2	280.62	23.37
31	3776.9	3.9	3776.9	3.9	280.61	23.23
30	3777.3	3.8	3777.3	3.8	280.60	23.02



OPERATOR: BLACKHILLS GAS RESOURCES **START:** 11/4/08
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County,NM

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6	SECT. ft	DLS %/100 ft	BR %/100 ft
112	5528.0	89.7	279.3	3773.8	410.7	-2198.3	2236.2	2.2	2.0
113	5558.0	90.4	280.5	3773.8	415.9	-2227.8	2266.2	4.6	2.3
114	5589.0	90.2	279.4	3773.6	421.2	-2258.4	2297.2	3.6	0.6
115	5620.0	89.6	279.6	3773.7	426.3	-2288.9	2328.2	2.0	1.9
116	5650.0	88.1	280.9	3774.3	431.7	-2318.4	2358.2	6.6	5.0
117	5710.0	87.8	280.7	3776.4	442.9	-2377.3	2418.1	0.6	0.5
118	5740.0	88.1	281.3	3777.5	448.6	-2406.8	2448.1	2.2	1.0
119	5769.0	88.3	281.3	3778.4	454.3	-2435.2	2477.1	0.7	0.7
120	5798.0	88.3	280.8	3779.3	459.9	-2463.7	2506.1	1.7	0.0
121	5828.0	88.6	280.9	3780.1	465.5	-2493.1	2536.1	1.1	1.0
122	5858.0	88.9	281.4	3780.7	471.3	-2522.5	2566.0	1.9	1.0
123	5889.0	88.8	281.1	3781.4	477.4	-2552.9	2597.0	1.0	0.3
124	5918.0	88.5	281.0	3782.1	482.9	-2581.4	2626.0	1.1	1.0
125	5949.0	88.9	281.2	3782.8	488.9	-2611.8	2657.0	1.4	1.3
126	5979.0	89.4	281.6	3783.2	494.8	-2641.2	2687.0	2.1	1.7
127	6009.0	89.3	281.0	3783.5	500.7	-2670.6	2717.0	2.0	0.3
128	6040.0	87.8	280.0	3784.3	506.3	-2701.1	2748.0	5.8	4.8
129	6069.0	87.6	280.3	3785.5	511.4	-2729.6	2777.0	1.2	0.7
130	6099.0	87.7	280.8	3786.7	516.9	-2759.1	2806.9	1.7	0.3
131	6129.0	88.0	280.8	3787.8	522.5	-2788.5	2836.9	1.0	1.0
132	6159.0	88.3	281.0	3788.8	528.2	-2818.0	2866.9	1.2	1.0
133	6189.0	88.1	280.8	3789.8	533.9	-2847.4	2896.9	0.9	0.7
134	6219.0	87.7	280.7	3790.9	539.5	-2876.9	2926.8	1.4	1.3
135	6250.0	87.7	278.4	3792.1	544.6	-2907.4	2957.8	7.4	0.0
136	6282.0	87.6	278.5	3793.4	549.3	-2939.0	2989.8	0.4	0.3
137	6313.0	89.4	277.1	3794.2	553.5	-2969.7	3020.7	7.4	5.8
138	6344.0	89.5	277.0	3794.5	557.3	-3000.5	3051.7	0.5	0.3
139	6376.0	89.9	278.1	3794.7	561.5	-3032.2	3083.7	3.7	1.3

Target Line TVD 3746.91
DIP AZ 280.00 **FINAL**
DIP DEG -0.79 **ANGLE** 89.21

Target Line TVD 3746.91 **PROPOSED**
DIP AZ 280.00 **FINAL**
DIP DEG -0.79 **ANGLE** 89.21

C.L.	target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
30	3777.7	3.9	3777.7	3.9	280.58	22.73
30	3778.2	4.4	3778.2	4.4	280.57	22.68
31	3778.6	5.0	3778.6	5.0	280.57	22.65
31	3779.0	5.3	3779.0	5.3	280.55	22.38
30	3779.4	5.1	3779.4	5.1	280.55	22.52
60	3780.3	3.8	3780.3	3.8	280.55	23.35
30	3780.7	3.2	3780.7	3.2	280.56	23.88
29	3781.1	2.6	3781.1	2.6	280.57	24.53
29	3781.5	2.2	3781.5	2.2	280.57	25.06
30	3781.9	1.8	3781.9	1.8	280.58	25.51
30	3782.3	1.5	3782.3	1.5	280.58	26.11
31	3782.7	1.4	3782.7	1.4	280.59	26.79
29	3783.1	1.1	3783.1	1.1	280.60	27.32
31	3783.5	0.8	3783.5	0.8	280.60	27.91
30	3784.0	0.8	3784.0	0.8	280.61	28.65
30	3784.4	0.8	3784.4	0.8	280.62	29.33
31	3784.8	0.5	3784.8	0.5	280.62	29.60
29	3785.2	-0.3	3785.2	-0.3	280.61	29.67
30	3785.6	-1.1	3785.6	-1.1	280.61	29.96
30	3786.0	-1.8	3786.0	-1.8	280.61	30.38
30	3786.4	-2.4	3786.4	-2.4	280.62	30.85
30	3786.9	-2.9	3786.9	-2.9	280.62	31.32
30	3787.3	-3.6	3787.3	-3.6	280.62	31.71
31	3787.7	-4.4	3787.7	-4.4	280.61	31.47
32	3788.1	-5.3	3788.1	-5.3	280.59	30.61
31	3788.6	-5.7	3788.6	-5.7	280.56	29.42
31	3789.0	-5.5	3789.0	-5.5	280.52	27.82
32	3789.4	-5.3	3789.4	-5.3	280.49	26.45



OPERATOR: BLACKHILLS GAS RESOURCES
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County,NM

START: 11/4/08

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6	SECT. ft	DLS %/100 ft	BR %/100 ft
140	6407.0	89.7	277.7	3794.8	565.8	-3062.9	3114.6	1.4	0.6
141	6439.0	89.6	277.7	3795.0	570.1	-3094.6	3146.6	0.3	0.3
142	6470.0	89.3	277.7	3795.3	574.2	-3125.4	3177.6	1.0	1.0
143	6501.0	89.1	277.6	3795.7	578.4	-3156.1	3208.6	0.7	0.6
144	6533.0	88.6	276.9	3796.4	582.4	-3187.8	3240.5	2.7	1.6
145	6565.0	89.6	276.4	3796.9	586.1	-3219.6	3272.5	3.5	3.1
146	6596.0	89.6	276.7	3797.1	589.6	-3250.4	3303.4	1.0	0.0
147	6628.0	89.6	276.8	3797.3	593.4	-3282.2	3335.3	0.3	0.0
148	6659.0	89.1	276.2	3797.7	596.9	-3313.0	3366.3	2.5	1.6
149	6689.0	89.4	276.8	3798.1	600.3	-3342.8	3396.2	2.2	1.0
150	6721.0	89.3	276.8	3798.4	604.1	-3374.5	3428.2	0.3	0.3
151	6752.0	88.9	275.8	3798.9	607.5	-3405.4	3459.1	3.5	1.3
152	6783.0	88.9	275.9	3799.5	610.6	-3436.2	3490.0	0.3	0.0
153	6815.0	90.6	277.4	3799.6	614.4	-3468.0	3522.0	7.1	5.3
154	6847.0	90.5	276.7	3799.3	618.3	-3499.7	3553.9	2.2	0.3
155	6878.0	90.1	276.1	3799.2	621.7	-3530.5	3584.9	2.3	1.3
156	6910.0	90.1	276.7	3799.1	625.3	-3562.3	3616.8	1.9	0.0
157	6942.0	89.6	276.1	3799.2	628.9	-3594.1	3648.7	2.4	1.6
158	6974.0	89.3	276.5	3799.5	632.4	-3625.9	3680.7	1.6	0.9
159	7006.0	88.8	275.8	3800.0	635.8	-3657.8	3712.6	2.7	1.6
160	7037.0	88.5	275.5	3800.8	638.9	-3688.6	3743.5	1.4	1.0
161	7068.0	88.5	276.9	3801.6	642.2	-3719.4	3774.4	4.5	0.0
162	7099.0	88.9	277.3	3802.3	646.0	-3750.2	3805.4	1.8	1.3
163	7130.0	89.1	278.7	3802.8	650.3	-3780.8	3836.3	4.6	0.6
164	7161.0	89.2	278.9	3803.3	655.1	-3811.5	3867.3	0.7	0.3
165	7191.0	89.8	280.4	3803.5	660.1	-3841.1	3897.3	5.4	2.0
166	7222.0	90.0	281.2	3803.6	665.9	-3871.5	3928.3	2.7	0.6
167	7254.0	90.3	281.2	3803.5	672.1	-3902.9	3960.3	0.9	0.9

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

FINAL

ANGLE 89.21

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

PROPOSED

FINAL

ANGLE 89.21

target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
31	3789.9	-4.9	3789.9	-4.9	280.47 25.32
32	3790.3	-4.7	3790.3	-4.7	280.44 24.03
31	3790.7	-4.6	3790.7	-4.6	280.41 22.79
31	3791.2	-4.6	3791.2	-4.6	280.38 21.52
32	3791.6	-4.8	3791.6	-4.8	280.35 19.98
32	3792.0	-4.8	3792.0	-4.8	280.32 18.11
31	3792.5	-4.6	3792.5	-4.6	280.28 16.25
32	3792.9	-4.4	3792.9	-4.4	280.25 14.43
31	3793.3	-4.3	3793.3	-4.3	280.21 12.54
30	3793.7	-4.3	3793.7	-4.3	280.18 10.71
32	3794.2	-4.2	3794.2	-4.2	280.15 8.92
31	3794.6	-4.3	3794.6	-4.3	280.11 6.92
31	3795.0	-4.5	3795.0	-4.5	280.08 4.68
32	3795.5	-4.2	3795.5	-4.2	280.05 2.81
32	3795.9	-3.4	3795.9	-3.4	280.02 1.16
31	3796.3	-2.8	3796.3	-2.8	279.99 -0.78
32	3796.8	-2.3	3796.8	-2.3	279.96 -2.79
32	3797.2	-2.0	3797.2	-2.0	279.92 -4.80
32	3797.7	-1.8	3797.7	-1.8	279.89 -6.87
32	3798.1	-1.9	3798.1	-1.9	279.86 -9.01
31	3798.5	-2.2	3798.5	-2.2	279.83 -11.36
31	3799.0	-2.6	3799.0	-2.6	279.80 -13.42
31	3799.4	-2.9	3799.4	-2.9	279.77 -14.99
31	3799.8	-3.0	3799.8	-3.0	279.76 -16.07
31	3800.2	-3.0	3800.2	-3.0	279.75 -16.72
30	3800.7	-2.9	3800.7	-2.9	279.75 -16.90
31	3801.1	-2.5	3801.1	-2.5	279.76 -16.47
32	3801.5	-2.0	3801.5	-2.0	279.77 -15.80



OPERATOR: BLACKHILLS GAS RESOURCES
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County, NM

START: 11/4/08

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6 ft	SECT. ft	DLS %/100 ft	BR %/100 ft
168	7285.0	90.4	281.5	3803.3	678.2	-3933.3	3991.3	1.0	0.3
169	7316.0	90.7	281.7	3803.0	684.5	-3963.7	4022.3	1.2	1.0
170	7347.0	89.4	280.3	3803.0	690.4	-3994.1	4053.3	6.2	4.2
171	7379.0	89.4	280.2	3803.3	696.1	-4025.6	4085.3	0.3	0.0
172	7410.0	89.7	279.9	3803.6	701.5	-4056.1	4116.3	1.4	1.0
173	7442.0	90.2	280.9	3803.6	707.3	-4087.6	4148.3	3.5	1.6
174	7474.0	90.3	280.8	3803.5	713.3	-4119.0	4180.3	0.4	0.3
175	7505.0	88.0	281.5	3803.9	719.3	-4149.4	4211.3	7.8	7.4
176	7537.0	87.8	281.5	3805.1	725.7	-4180.7	4243.2	0.6	0.6
177	7567.0	87.6	281.0	3806.3	731.5	-4210.1	4273.2	1.8	0.7
178	7598.0	87.7	281.6	3807.6	737.6	-4240.5	4304.2	2.0	0.3
179	7630.0	88.0	281.9	3808.8	744.1	-4271.8	4336.1	1.3	0.9
180	7661.0	87.9	281.1	3809.9	750.3	-4302.2	4367.1	2.6	0.3
181	7692.0	88.2	282.0	3810.9	756.5	-4332.5	4398.1	3.1	1.0
182	7724.0	88.4	281.8	3811.9	763.1	-4363.8	4430.0	0.9	0.6
183	7756.0	88.4	281.2	3812.8	769.4	-4395.2	4462.0	1.9	0.0
184	7787.0	88.5	281.2	3813.6	775.5	-4425.6	4493.0	0.3	0.3
185	7818.0	88.5	281.8	3814.4	781.6	-4455.9	4524.0	1.9	0.0
186	7850.0	88.3	281.7	3815.3	788.2	-4487.3	4555.9	0.7	0.6
187	7881.0	89.4	281.6	3815.9	794.4	-4517.6	4586.9	3.6	3.5
188	7913.0	89.4	281.6	3816.3	800.9	-4549.0	4618.9	0.0	0.0
189	7944.0	89.4	281.8	3816.6	807.1	-4579.3	4649.9	0.6	0.0
190	7975.0	89.7	282.1	3816.8	813.6	-4609.6	4680.9	1.4	1.0
191	8007.0	89.9	282.0	3817.0	820.2	-4640.9	4712.9	0.7	0.6
192	8038.0	90.1	281.9	3817.0	826.7	-4671.3	4743.8	0.7	0.6
193	8069.0	90.2	282.5	3816.9	833.2	-4701.6	4774.8	2.0	0.3
194	8101.0	90.4	281.9	3816.7	840.0	-4732.8	4806.8	2.0	0.6
195	8133.0	90.6	281.7	3816.4	846.5	-4764.2	4838.8	0.9	0.6

Target Line TVD 3746.91
DIP AZ 280.00 **FINAL**
DIP DEG -0.79 **ANGLE** 89.21

Target Line TVD 3746.91 **PROPOSED**
DIP AZ 280.00 **FINAL**
DIP DEG -0.79 **ANGLE** 89.21

C.L.	target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
31	3801.9	-1.4	3801.9	-1.4	279.78	-15.07
31	3802.4	-0.7	3802.4	-0.7	279.80	-14.20
31	3802.8	-0.2	3802.8	-0.2	279.81	-13.66
32	3803.2	-0.1	3803.2	-0.1	279.81	-13.52
31	3803.7	0.1	3803.7	0.1	279.81	-13.49
32	3804.1	0.5	3804.1	0.5	279.82	-13.27
32	3804.6	1.1	3804.6	1.1	279.82	-12.80
31	3805.0	1.1	3805.0	1.1	279.83	-12.17
32	3805.4	0.3	3805.4	0.3	279.85	-11.34
30	3805.8	-0.5	3805.8	-0.5	279.86	-10.68
31	3806.3	-1.3	3806.3	-1.3	279.87	-9.98
32	3806.7	-2.1	3806.7	-2.1	279.88	-9.00
31	3807.1	-2.8	3807.1	-2.8	279.89	-8.19
31	3807.6	-3.4	3807.6	-3.4	279.90	-7.35
32	3808.0	-3.9	3808.0	-3.9	279.92	-6.29
32	3808.4	-4.3	3808.4	-4.3	279.93	-5.46
31	3808.9	-4.8	3808.9	-4.8	279.94	-4.81
31	3809.3	-5.1	3809.3	-5.1	279.95	-4.00
32	3809.7	-5.6	3809.7	-5.6	279.96	-3.02
31	3810.2	-5.8	3810.2	-5.8	279.97	-2.13
32	3810.6	-5.7	3810.6	-5.7	279.98	-1.23
31	3811.0	-5.6	3811.0	-5.6	280.00	-0.31
31	3811.5	-5.4	3811.5	-5.4	280.01	0.74
32	3811.9	-5.1	3811.9	-5.1	280.02	1.89
31	3812.3	-4.6	3812.3	-4.6	280.04	2.94
31	3812.7	-4.1	3812.7	-4.1	280.05	4.13
32	3813.2	-3.5	3813.2	-3.5	280.06	5.36
32	3813.6	-2.8	3813.6	-2.8	280.08	6.36



OPERATOR: BLACKHILLS GAS RESOURCES
WELL: Jicarilla 29-02-04 # 143
LOCATION: Rio Arriba County, NM

START: 11/4/08

PROPOSED DIRECTION: 280.00

MIN. CURVATURE CALCULATIONS

SUR NUM	MD ft	INCL. °	AZM. °	TVD ft	N-S ft	E-W 17.6 ft	SECT. ft	DLS %/100 ft	BR %/100 ft
196	8164.0	89.1	281.4	3816.5	852.7	-4794.5	4869.8	4.9	4.8
197	8195.0	88.8	281.0	3817.1	858.7	-4824.9	4900.8	1.6	1.0
198	8227.0	89.2	281.5	3817.6	865.0	-4856.3	4932.7	2.0	1.3
199	8258.0	89.4	282.0	3818.0	871.3	-4886.7	4963.7	1.7	0.6
200	8290.0	89.5	281.2	3818.3	877.7	-4918.0	4995.7	2.5	0.3
201	8321.0	89.6	281.5	3818.6	883.8	-4948.4	5026.7	1.0	0.3
202	8352.0	89.9	282.1	3818.7	890.2	-4978.7	5057.7	2.2	1.0
203	8383.0	90.1	282.5	3818.7	896.8	-5009.0	5088.7	1.4	0.6
204	8414.0	90.4	282.4	3818.6	903.5	-5039.3	5119.6	1.0	1.0
205	8444.0	88.7	281.0	3818.8	909.5	-5068.7	5149.6	7.3	5.7
206	8476.0	88.6	280.6	3819.6	915.5	-5100.1	5181.6	1.3	0.3
207	8507.0	88.7	281.2	3820.3	921.4	-5130.5	5212.6	2.0	0.3
208	8538.0	88.6	280.2	3821.0	927.1	-5161.0	5243.6	3.2	0.3
209	8570.0	89.1	280.6	3821.7	932.9	-5192.5	5275.6	2.0	1.6
210	8601.0	89.2	280.8	3822.1	938.7	-5222.9	5306.6	0.7	0.3
211	8632.0	89.5	281.5	3822.5	944.7	-5253.3	5337.6	2.5	1.0
212	8664.0	89.4	280.5	3822.8	950.8	-5284.7	5369.5	3.1	0.3
213	8695.0	89.6	280.7	3823.1	956.5	-5315.2	5400.5	0.9	0.6
214	8727.0	90.0	281.4	3823.2	962.6	-5346.6	5432.5	2.5	1.3
215	8759.0	90.3	281.6	3823.1	969.0	-5378.0	5464.5	1.1	0.9
216	8790.0	90.2	281.7	3822.9	975.3	-5408.3	5495.5	0.5	0.3
217	8821.0	90.3	281.8	3822.8	981.6	-5438.7	5526.5	0.5	0.3
218	8853.0	90.1	281.4	3822.7	988.0	-5470.0	5558.5	1.4	0.6
219	8884.0	90.3	281.6	3822.6	994.2	-5500.4	5589.5	0.9	0.6
220	8916.0	90.6	281.5	3822.3	1000.6	-5531.8	5621.5	1.0	0.9
TD	8975.0	90.6	281.5	3821.7	1012.3	-5589.6	5680.4	0.0	0.0

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

FINAL

ANGLE 89.21

Target Line TVD 3746.91

DIP AZ 280.00

DIP DEG -0.79

PROPOSED

FINAL

ANGLE 89.21

C.L.	target LINE TVD	TVD TO line	target bottom TVD	TVD TO bottom	CLOSURE BEARING	AWAY FROM PROP.
31	3814.1	-2.5	3814.1	-2.5	280.08	7.20
31	3814.5	-2.6	3814.5	-2.6	280.09	7.85
32	3814.9	-2.7	3814.9	-2.7	280.10	8.55
31	3815.4	-2.7	3815.4	-2.7	280.11	9.50
32	3815.8	-2.5	3815.8	-2.5	280.12	10.39
31	3816.2	-2.3	3816.2	-2.3	280.13	11.12
31	3816.7	-2.1	3816.7	-2.1	280.14	12.09
31	3817.1	-1.6	3817.1	-1.6	280.15	13.34
31	3817.5	-1.1	3817.5	-1.1	280.16	14.66
30	3817.9	-0.9	3817.9	-0.9	280.17	15.55
32	3818.4	-1.2	3818.4	-1.2	280.18	16.00
31	3818.8	-1.5	3818.8	-1.5	280.18	16.49
31	3819.2	-1.8	3819.2	-1.8	280.18	16.86
32	3819.7	-2.0	3819.7	-2.0	280.19	17.09
31	3820.1	-2.0	3820.1	-2.0	280.19	17.47
31	3820.5	-2.0	3820.5	-2.0	280.19	18.09
32	3821.0	-1.8	3821.0	-1.8	280.20	18.65
31	3821.4	-1.7	3821.4	-1.7	280.20	18.97
32	3821.8	-1.3	3821.8	-1.3	280.21	19.56
32	3822.3	-0.8	3822.3	-0.8	280.21	20.40
31	3822.7	-0.3	3822.7	-0.3	280.22	21.29
31	3823.1	0.3	3823.1	0.3	280.23	22.24
32	3823.6	0.9	3823.6	0.9	280.24	23.13
31	3824.0	1.4	3824.0	1.4	280.25	23.94
32	3824.4	2.1	3824.4	2.1	280.25	24.81
59	3825.2	3.5	3825.2	3.5	280.27	26.35

-8975
0

2645
2619