

# Noble Energy

Weld County, CO (NAD 83)  
Sec. 29-T9N-R59W (LC29-15-A)  
Trisha LC29-75HNB  
901285296  
Plan A

Design: Field Surveys

## Sperry Drilling Services

### Final Survey Report

03 September, 2014

Surface UWI : 901285296

Well Coordinates: 1,506,808.20 N, 3,415,707.91 E (40° 42' 53.75" N, 104° 00' 01.26" W)  
Ground Level: 4,873.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Trisha LC29-75HNB

RKB=24ft @ 4897.00usft (H&P 273)

N

Grid

API - US Survey Feet - Custom

**HALLIBURTON**

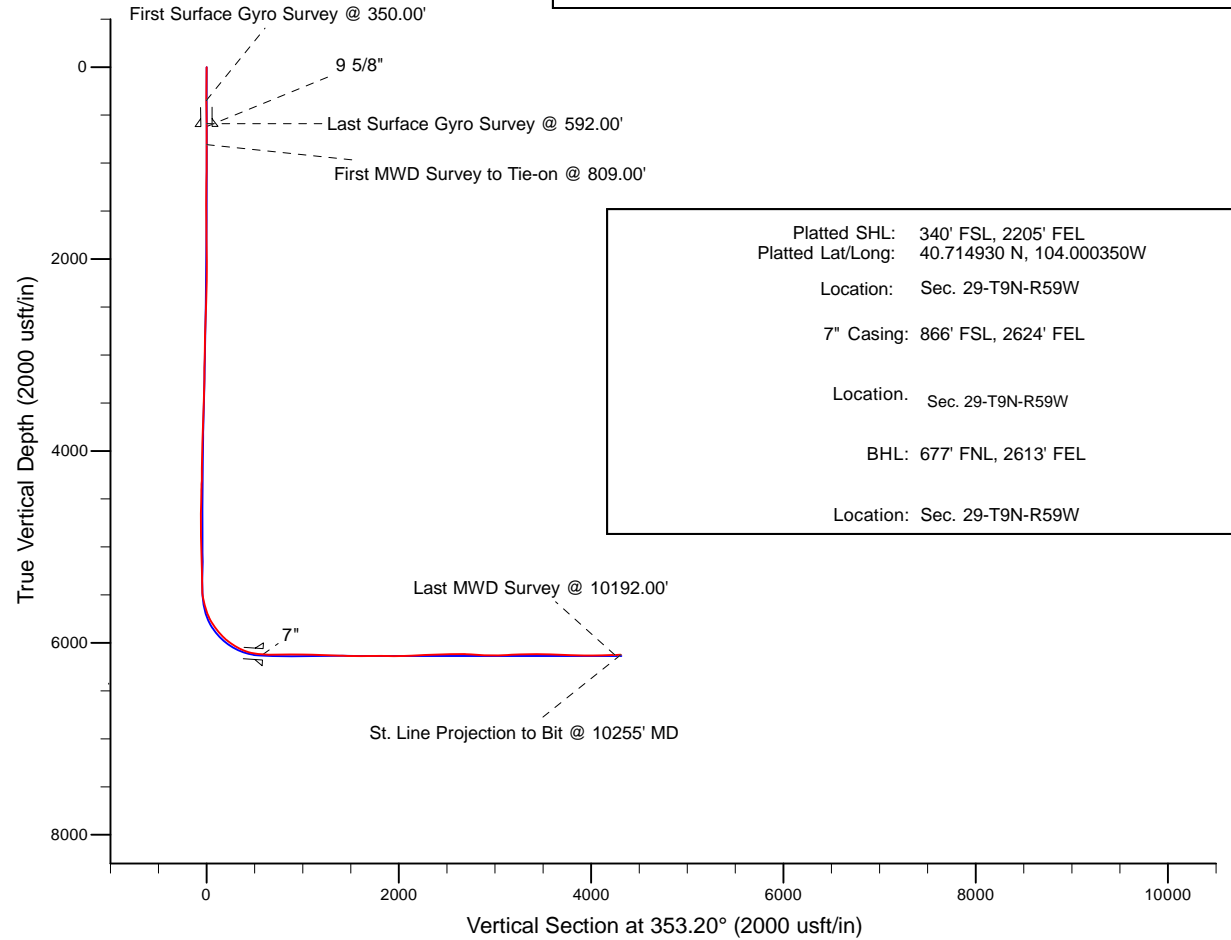
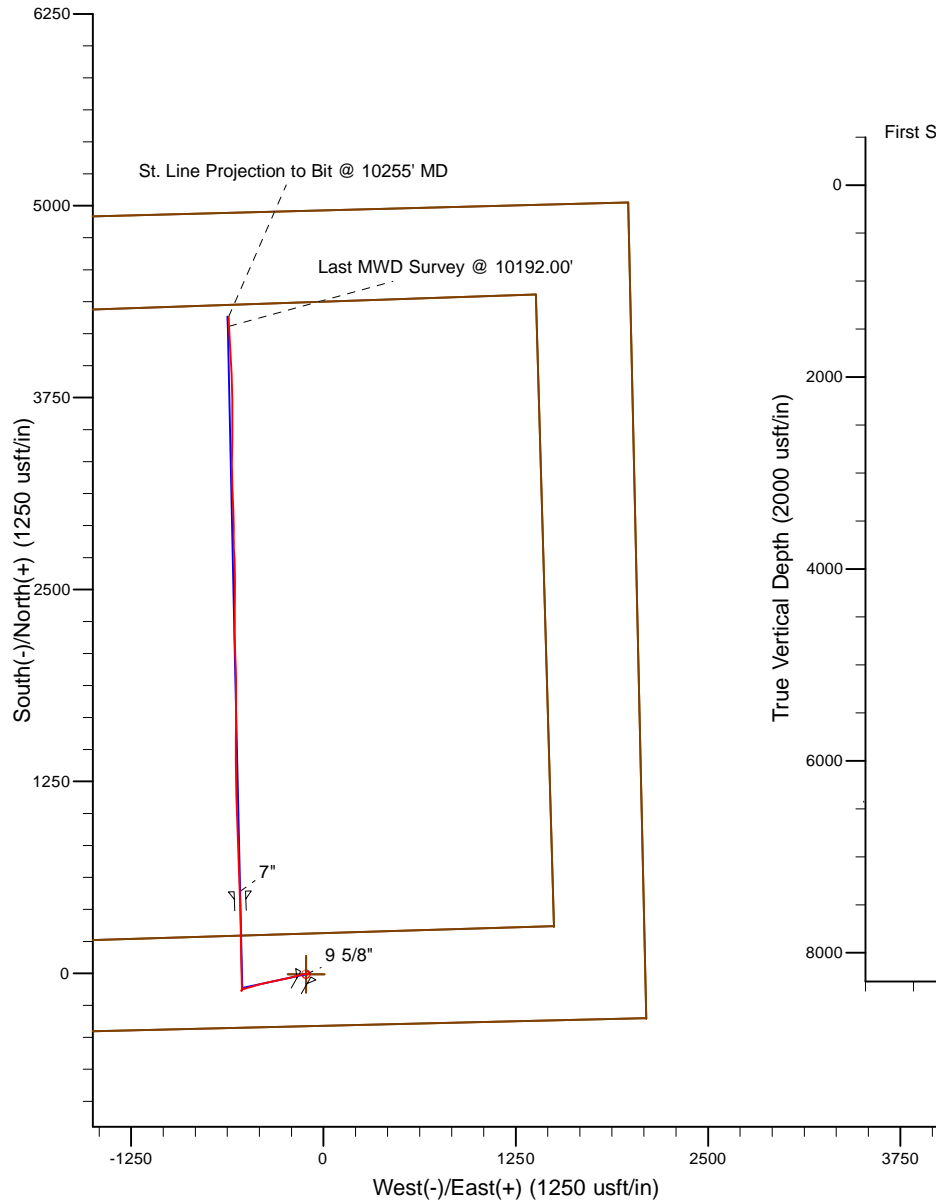
Project: Weld County, CO (NAD 83)  
 Site: Sec. 29-T9N-R59W (LC29-15-A)  
 Well: Trisha LC29-75HNB  
 Wellbore: Plan A  
 Design: Field Surveys

# Noble Energy



## LEGEND

- ▲ Trisha LC29-75HNB, Plan A, Rev A0 - PROPOSAL V0
- Field Surveys



Platted SHL: 340' FSL, 2205' FEL  
 Platted Lat/Long: 40.714930 N, 104.000350W  
 Location: Sec. 29-T9N-R59W  
 7" Casing: 866' FSL, 2624' FEL  
 Location: Sec. 29-T9N-R59W  
 BHL: 677' FNL, 2613' FEL  
 Location: Sec. 29-T9N-R59W

WELL DETAILS: Trisha LC29-75HNB	
Ground Level:	4873.00
RKB=24ft @ 4897.00usft (H&P 273)	
Created By:	Pari Amanlou
Created On:	06/22/2014



Design Report for Trisha LC29-75HNB - Field Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Trisha LC29-75HNB_SHL - Trisha LC29-75HNB_600 - Trisha LC29-75HNB_SL</b>							
350.00	0.20	216.77	350.00	-0.49	-0.37	-0.44	0.06
<b>First Surface Gyro Survey @ 350.00'</b>							
592.00	0.50	9.37	592.00	0.21	-0.45	0.27	0.28
<b>Last Surface Gyro Survey @ 592.00'</b>							
622.00	0.50	29.67	622.00	0.46	-0.36	0.50	0.59
<b>9 5/8"</b>							
809.00	1.27	88.05	808.97	1.23	2.11	0.97	0.59
<b>First MWD Survey to Tie-on @ 809.00'</b>							
995.00	1.23	88.69	994.93	1.35	6.17	0.61	0.02
1,087.00	1.34	98.70	1,086.91	1.21	8.22	0.23	0.27
1,180.00	1.25	85.15	1,179.88	1.13	10.30	-0.10	0.34
1,459.00	1.29	81.24	1,458.82	1.86	16.44	-0.10	0.03
1,737.00	1.33	85.89	1,736.74	2.57	22.75	-0.14	0.04
1,831.00	1.29	276.05	1,830.73	2.76	22.79	0.04	2.78
1,926.00	3.52	276.19	1,925.65	3.19	18.82	0.94	2.35
2,021.00	5.35	273.40	2,020.36	3.76	11.50	2.38	1.94
2,115.00	6.96	262.69	2,113.81	3.30	1.48	3.10	2.10
2,210.00	8.91	263.03	2,207.90	1.67	-11.54	3.03	2.05
2,305.00	11.20	254.67	2,301.44	-1.66	-27.74	1.64	2.85
2,399.00	13.30	253.64	2,393.29	-7.12	-46.92	-1.52	2.25
2,494.00	13.09	255.43	2,485.79	-12.90	-67.82	-4.79	0.48
2,589.00	13.35	256.43	2,578.27	-18.18	-88.89	-7.54	0.36
2,684.00	13.36	256.48	2,670.70	-23.32	-110.22	-10.12	0.02
2,779.00	12.87	256.49	2,763.22	-28.36	-131.18	-12.64	0.52
2,873.00	12.71	257.83	2,854.89	-32.98	-151.47	-14.83	0.36
3,063.00	11.85	257.77	3,040.54	-41.52	-190.97	-18.64	0.45
3,158.00	11.45	259.77	3,133.58	-45.26	-209.78	-20.13	0.60
3,253.00	10.72	260.42	3,226.81	-48.41	-227.77	-21.12	0.78
3,347.00	12.62	256.61	3,318.87	-52.24	-246.38	-22.72	2.18
3,442.00	12.76	255.86	3,411.54	-57.21	-266.65	-25.26	0.23
3,537.00	12.86	255.40	3,504.18	-62.44	-287.06	-28.03	0.15
3,632.00	12.97	253.77	3,596.78	-68.08	-307.52	-31.22	0.40
3,727.00	13.41	253.64	3,689.27	-74.16	-328.33	-34.79	0.46
3,822.00	12.41	255.03	3,781.87	-79.90	-348.76	-38.08	1.10
3,917.00	11.22	255.18	3,874.85	-84.91	-367.56	-40.82	1.25
4,011.00	9.35	249.92	3,967.34	-89.87	-383.57	-43.85	2.22
4,106.00	6.96	257.72	4,061.38	-93.74	-396.45	-46.17	2.77
4,201.00	4.72	255.27	4,155.88	-95.96	-405.85	-47.26	2.37
4,296.00	4.39	253.64	4,250.58	-97.98	-413.12	-48.41	0.37
4,391.00	3.03	217.97	4,345.39	-100.98	-418.16	-50.80	2.75
4,486.00	1.01	172.87	4,440.33	-103.79	-419.60	-53.42	2.55
4,581.00	1.24	169.23	4,535.31	-105.63	-419.30	-55.28	0.25
4,676.00	1.48	192.45	4,630.28	-107.84	-419.38	-57.46	0.63
4,770.00	1.14	192.85	4,724.26	-109.94	-419.85	-59.49	0.36
4,865.00	1.71	28.76	4,819.25	-109.62	-419.37	-59.23	2.97
4,960.00	1.71	14.48	4,914.21	-107.00	-418.34	-56.75	0.45
5,055.00	1.45	7.68	5,009.17	-104.44	-417.82	-54.27	0.34
5,245.00	1.33	359.17	5,199.12	-99.85	-417.53	-49.75	0.13

**Design Report for Trisha LC29-75HNB - Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,339.00	1.37	1.63	5,293.09	-97.64	-417.52	-47.55	0.07
5,434.00	1.23	355.56	5,388.06	-95.48	-417.56	-45.41	0.21
5,526.00	2.86	4.79	5,480.00	-92.21	-417.45	-42.17	1.80
5,544.29	5.63	2.47	5,498.25	-90.86	-417.37	-40.84	15.18
<b>Trisha LC29-75HNB_KOP</b>							
5,574.00	10.14	1.40	5,527.66	-86.79	-417.24	-36.81	15.18
5,621.00	13.39	356.20	5,573.67	-77.22	-417.50	-27.28	7.27
5,669.00	15.26	354.75	5,620.18	-65.38	-418.45	-15.41	3.97
5,716.00	18.63	357.68	5,665.13	-51.72	-419.32	-1.74	7.39
5,764.00	23.28	1.23	5,709.94	-34.56	-419.43	15.31	10.04
5,811.00	27.20	359.50	5,752.45	-14.53	-419.32	35.19	8.49
5,859.00	31.46	359.15	5,794.29	8.98	-419.60	58.56	8.88
5,906.00	35.70	359.98	5,833.43	34.97	-419.79	84.39	9.07
5,954.00	38.85	359.05	5,871.63	64.03	-420.04	113.28	6.67
6,000.00	42.27	358.37	5,906.57	93.93	-420.72	143.05	7.50
6,048.00	45.68	358.09	5,941.11	127.24	-421.76	176.25	7.12
6,078.00	48.29	358.72	5,961.57	149.16	-422.36	198.09	8.83
<b>Trisha LC29-75HNB_Lateral</b>							
6,095.00	49.77	359.06	5,972.72	161.99	-422.61	210.86	8.83
6,143.00	54.77	359.52	6,002.08	199.94	-423.08	248.60	10.44
6,190.00	58.36	359.34	6,027.97	239.16	-423.47	287.58	7.64
6,238.00	61.38	359.39	6,052.06	280.66	-423.93	328.85	6.29
6,285.00	65.70	358.70	6,073.00	322.72	-424.63	370.70	9.28
6,333.00	70.66	358.74	6,090.84	367.26	-425.63	415.04	10.33
6,380.00	76.91	358.81	6,103.95	412.36	-426.59	459.94	13.30
6,428.00	81.15	358.68	6,113.09	459.46	-427.62	506.83	8.84
6,464.00	84.05	358.26	6,117.72	495.14	-428.58	542.37	8.14
6,508.00	86.48	357.98	6,121.35	538.97	-430.02	586.06	5.56
<b>7"</b>							
6,551.00	88.86	357.71	6,123.10	581.90	-431.63	628.88	5.56
6,646.00	90.03	357.06	6,124.02	676.79	-435.97	723.62	1.41
6,741.00	89.57	357.81	6,124.35	771.69	-440.22	818.36	0.93
6,836.00	91.54	358.05	6,123.43	866.62	-443.65	913.03	2.09
6,930.00	88.67	358.07	6,123.26	960.56	-446.83	1,006.68	3.05
7,025.00	89.05	357.74	6,125.15	1,055.48	-450.30	1,101.34	0.53
7,120.00	88.06	0.14	6,127.55	1,150.42	-452.06	1,195.83	2.73
7,215.00	87.84	358.86	6,130.94	1,245.36	-452.89	1,290.19	1.37
7,310.00	87.69	357.75	6,134.65	1,340.24	-455.70	1,384.74	1.18
7,404.00	89.88	0.66	6,136.64	1,434.19	-457.00	1,478.19	3.87
7,499.00	89.97	0.64	6,136.77	1,529.19	-455.92	1,572.39	0.10
7,594.00	89.97	0.72	6,136.82	1,624.18	-454.79	1,666.58	0.08
7,689.00	90.12	0.01	6,136.74	1,719.18	-454.19	1,760.84	0.76
7,784.00	89.11	359.92	6,137.38	1,814.18	-454.25	1,855.18	1.07
7,878.00	90.09	359.08	6,138.04	1,908.17	-455.07	1,948.61	1.37
7,973.00	91.29	358.78	6,136.89	2,003.14	-456.84	2,043.12	1.30
8,068.00	91.45	356.79	6,134.62	2,098.04	-460.51	2,137.79	2.10
8,163.00	94.29	359.87	6,129.86	2,192.86	-463.28	2,232.27	4.41
8,257.00	92.28	359.95	6,124.48	2,286.70	-463.43	2,325.47	2.14
8,352.00	90.37	0.29	6,122.28	2,381.67	-463.23	2,419.75	2.04
8,447.00	92.41	0.53	6,119.98	2,476.63	-462.55	2,513.96	2.16
8,542.00	91.26	0.11	6,116.94	2,571.58	-462.02	2,608.18	1.29

**Design Report for Trisha LC29-75HNB - Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,637.00	86.76	357.78	6,118.58	2,666.52	-463.76	2,702.66	5.33
8,732.00	85.74	356.80	6,124.79	2,761.21	-468.24	2,797.22	1.49
8,826.00	89.01	0.68	6,129.10	2,855.06	-470.30	2,890.65	5.39
8,921.00	89.11	358.54	6,130.65	2,950.04	-470.95	2,985.04	2.25
9,016.00	91.14	358.00	6,130.45	3,044.99	-473.82	3,079.66	2.21
9,110.00	94.38	357.90	6,125.92	3,138.81	-477.18	3,173.22	3.45
9,205.00	92.62	358.31	6,120.12	3,233.57	-480.31	3,267.69	1.90
9,300.00	89.94	359.86	6,118.00	3,328.53	-481.83	3,362.15	3.26
9,394.00	88.80	0.79	6,119.03	3,422.52	-481.30	3,455.42	1.57
9,489.00	89.94	0.73	6,120.08	3,517.50	-480.04	3,549.59	1.20
9,584.00	87.07	0.62	6,122.56	3,612.45	-478.92	3,643.74	3.02
9,679.00	87.35	359.48	6,127.18	3,707.34	-478.83	3,737.95	1.23
9,774.00	88.12	358.54	6,130.94	3,802.25	-480.47	3,832.39	1.28
9,869.00	89.04	356.97	6,133.29	3,897.14	-484.19	3,927.05	1.92
9,963.00	90.49	357.32	6,133.68	3,991.02	-488.88	4,020.83	1.59
10,058.00	92.87	356.88	6,130.89	4,085.85	-493.68	4,115.56	2.55
10,153.00	91.36	357.41	6,127.38	4,180.67	-498.41	4,210.27	1.68
10,192.00	91.66	357.31	6,126.36	4,219.61	-500.20	4,249.15	0.81
<b>Last MWD Survey @ 10192.00'</b>							
10,255.00	91.66	357.31	6,124.53	4,282.51	-503.16	4,311.97	0.00
<b>St. Line Projection to Bit @ 10255' MD - Trisha LC29-75HNB_BHL</b>							

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
350.00	350.00	-0.49	-0.37	First Surface Gyro Survey @ 350.00'
592.00	592.00	0.21	-0.45	Last Surface Gyro Survey @ 592.00'
809.00	808.97	1.23	2.11	First MWD Survey to Tie-on @ 809.00'
10,192.00	6,126.36	4,219.61	-500.20	Last MWD Survey @ 10192.00'
10,255.00	6,124.53	4,282.51	-503.16	St. Line Projection to Bit @ 10255' MD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	+N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Trisha LC29-75HNB_BHL	353.20	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
350.00	592.00	Surface Gyro Surveys	Flexi-Shot
809.00	6,464.00	MWD Surveys-Intermediate	MWD+SC
6,551.00	10,192.00	MWD Surveys-Production	MWD+SC

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
622.00	622.00	9 5/8"	9-5/8	13-3/4
6,508.00	6,121.35	7"	7	8-3/4

**Design Report for Trisha LC29-75HNB - Field Surveys**

**Wellbore Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Trisha LC29-75HNB_ε - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,506,808.20	3,415,707.91	40° 42' 53.748 N	104° 0' 1.260 W
Trisha LC29-75HNB_6 - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,506,808.20	3,415,707.91	40° 42' 53.748 N	104° 0' 1.260 W
Point 1				0.00	4,291.35	-2,565.22	1,511,099.51	3,413,142.71	
Point 2				0.00	191.59	-2,445.75	1,506,999.79	3,413,262.18	
Point 3				0.00	313.22	1,611.86	1,507,121.42	3,417,319.75	
Point 4				0.00	4,427.58	1,493.78	1,511,235.73	3,417,201.67	
Point 5				0.00	4,291.35	-2,565.22	1,511,099.51	3,413,142.71	
Trisha LC29-75HNB_ε - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,506,808.20	3,415,707.91	40° 42' 53.748 N	104° 0' 1.260 W
Point 1				0.00	4,891.36	-3,165.23	1,511,699.51	3,412,542.71	
Point 2				0.00	-408.41	-3,045.76	1,506,399.79	3,412,662.18	
Point 3				0.00	-286.78	2,211.87	1,506,521.42	3,417,919.75	
Point 4				0.00	5,027.58	2,093.78	1,511,835.73	3,417,801.67	
Point 5				0.00	4,891.36	-3,165.23	1,511,699.51	3,412,542.71	
Trisha LC29-75HNB_k - actual wellpath misses target center by 2.57usft at 5544.27usft MD (5498.22 TVD, -90.86 N, -417.37 E) - Circle (radius 35.00)	0.00	0.00	5,498.15	-90.08	-414.92	1,506,718.12	3,415,292.99	40° 42' 52.927 N	104° 0' 6.667 W
Trisha LC29-75HNB_E - actual wellpath misses target center by 14.50usft at 10255.00usft MD (6124.53 TVD, 4282.51 N, -503.16 E) - Point	0.00	0.00	6,137.00	4,283.83	-510.45	1,511,091.98	3,415,197.47	40° 43' 36.156 N	104° 0' 6.948 W
Trisha LC29-75HNB_L - actual wellpath misses target center by 481.06usft at 6078.00usft MD (5961.57 TVD, 149.16 N, -422.36 E) - Polygon	0.00	0.00	6,137.00	0.00	0.00	1,506,808.20	3,415,707.91	40° 42' 53.748 N	104° 0' 1.260 W
Point 1				6,137.00	524.22	-463.40	1,507,332.42	3,415,244.51	
Point 2				6,137.00	524.22	-393.40	1,507,332.42	3,415,314.51	
Point 3				6,137.00	4,283.82	-475.44	1,511,091.98	3,415,232.47	
Point 4				6,137.00	4,283.82	-545.44	1,511,091.98	3,415,162.47	
Point 5				6,137.00	524.22	-463.40	1,507,332.42	3,415,244.51	

**Directional Difficulty Index**

Average Dogleg over Survey:	2.02 °/100usft	Maximum Dogleg over Survey:	15.18 °/100usft at 5,574.00 usft
Net Tortousity applicable to Plans:	0.90 °/100usft	Directional Difficulty Index:	6.229

**Audit Info**

**North Reference Sheet for Sec. 29-T9N-R59W (LC29-15-A) - Trisha LC29-75HNB - Plan A**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to RKB=24ft @ 4897.00usft (H&P 273). Northing and Easting are relative to Trisha LC29-75HNB

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99998962

Grid Coordinates of Well: 1,506,808.20 usft N, 3,415,707.91 usft E

Geographical Coordinates of Well: 40° 42' 53.75" N, 104° 00' 01.26" W

Grid Convergence at Surface is: 0.97°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,255.00usft the Bottom Hole Displacement is 4,311.97usft in the Direction of 353.30° (Grid).

Magnetic Convergence at surface is: -7.14° ( 8 June 2014, , BGGM2013)

Magnetic Model: BGGM2013  
 Date: 08-Jun-14  
 Declination: 8.11°  
 Inclination/Dip: 67.31°  
 Field Strength: 52972

Grid North is 0.97° East of True North (Grid Convergence)  
 Magnetic North is 8.11° East of True North (Magnetic Declination)  
 Magnetic North is 7.14° East of Grid North (Magnetic Convergence)

To convert a True Direction to a Grid Direction, Subtract 0.97°  
 To convert a Magnetic Direction to a True Direction, Add 8.11° East  
 To convert a Magnetic Direction to a Grid Direction, Add 7.14°