

Noble Energy
Weld County, CO (NAD 83)
Sec. 27-T7N-R64W
Richter USX AB27-65HN

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

30 December, 2012

Well Coordinates: 1,443,186.26 N, 3,265,846.81 E (40° 32' 45.64" N, 104° 32' 36.20" W)
Ground Level: 4,902.00 ft

Local Coordinate Origin:	Centered on Well Richter USX AB27-65HN
Viewing Datum:	KB @ 4926.00ft (H&P 315)
TVDs to System:	N
North Reference:	Grid
Unit System:	API - US Survey Feet - Custom
Geodetic Scale Factor Applied	
Version: 2003.16 Build: 43I	

HALLIBURTON

Design Report for Richter USX AB27-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
888.00	0.46	12.48	887.99	3.48	0.77	0.34	0.05
First MWD Survey							
981.00	0.50	53.88	980.99	4.08	1.18	0.67	0.37
1,072.00	0.72	32.66	1,071.98	4.80	1.81	1.21	0.34
1,348.00	0.69	33.04	1,347.96	7.65	3.65	2.68	0.01
1,443.00	1.19	205.38	1,442.96	7.24	3.54	2.62	1.97
1,538.00	3.23	209.96	1,537.88	4.03	1.78	1.27	2.15
1,632.00	5.25	204.27	1,631.62	-2.19	-1.31	-1.03	2.19
1,727.00	7.11	202.11	1,726.06	-11.59	-5.31	-3.85	1.97
1,822.00	9.17	201.88	1,820.10	-24.07	-10.35	-7.31	2.17
1,916.00	10.00	199.13	1,912.79	-38.73	-15.81	-10.94	1.01
2,011.00	11.15	199.08	2,006.17	-55.20	-21.52	-14.58	1.21
2,105.00	12.13	197.15	2,098.24	-73.23	-27.40	-18.20	1.12
2,200.00	13.02	201.15	2,190.96	-92.75	-34.21	-22.56	1.31
2,297.00	12.21	200.03	2,285.62	-112.58	-41.66	-27.52	0.87
2,392.00	12.30	200.21	2,378.45	-131.51	-48.60	-32.08	0.10
2,488.00	12.46	197.39	2,472.22	-150.99	-55.23	-36.27	0.65
2,584.00	12.39	200.42	2,565.98	-170.53	-61.91	-40.51	0.68
2,679.00	12.64	203.93	2,658.72	-189.58	-69.69	-45.88	0.84
2,775.00	13.32	202.71	2,752.27	-209.38	-78.22	-51.92	0.76
2,870.00	13.49	201.14	2,844.68	-229.81	-86.44	-57.57	0.42
2,966.00	13.66	202.76	2,938.00	-250.71	-94.86	-63.36	0.43
3,062.00	12.53	201.30	3,031.50	-270.86	-103.03	-69.00	1.23
3,158.00	12.02	201.19	3,125.30	-289.89	-110.43	-74.00	0.53
3,254.00	12.26	198.60	3,219.16	-308.87	-117.29	-78.48	0.62
3,349.00	12.19	192.13	3,312.01	-328.23	-122.62	-81.39	1.44
3,445.00	12.55	192.87	3,405.78	-348.31	-127.07	-83.34	0.41
3,540.00	11.99	195.29	3,498.61	-367.89	-131.97	-85.80	0.80
3,636.00	10.76	199.10	3,592.72	-385.98	-137.53	-89.10	1.50
3,731.00	9.73	202.20	3,686.21	-401.79	-143.47	-93.05	1.23
3,825.00	10.21	207.22	3,778.79	-416.56	-150.28	-98.00	1.06
3,921.00	10.19	206.77	3,873.27	-431.70	-158.00	-103.80	0.09
4,016.00	12.69	202.33	3,966.38	-448.86	-165.75	-109.38	2.79
4,112.00	13.90	196.49	4,059.81	-469.67	-173.03	-114.05	1.88
4,208.00	14.23	192.11	4,152.93	-492.27	-178.77	-116.99	1.16
4,304.00	13.12	195.69	4,246.21	-514.29	-184.20	-119.66	1.45
4,400.00	10.66	191.89	4,340.15	-533.48	-188.97	-122.05	2.69
4,495.00	9.07	186.42	4,433.74	-549.52	-191.62	-122.71	1.94
4,591.00	6.87	188.37	4,528.81	-562.72	-193.30	-122.75	2.31
4,687.00	4.60	184.39	4,624.32	-572.24	-194.43	-122.71	2.40
4,782.00	4.75	185.28	4,719.01	-579.95	-195.09	-122.41	0.18
4,877.00	3.77	191.67	4,813.74	-586.93	-196.08	-122.54	1.14
4,972.00	2.01	191.08	4,908.62	-591.62	-197.03	-122.91	1.85
5,068.00	1.00	206.76	5,004.58	-594.02	-197.73	-123.31	1.13
5,355.00	0.70	68.94	5,291.57	-595.63	-197.23	-122.61	0.55
5,641.00	1.42	78.94	5,577.52	-594.32	-192.12	-117.70	0.26
5,928.00	0.79	20.68	5,864.47	-591.79	-187.93	-113.85	0.42
6,216.00	0.76	38.37	6,152.45	-588.43	-186.04	-112.39	0.08
6,281.00	0.73	42.69	6,217.44	-587.79	-185.49	-111.93	0.10

Design Report for Richter USX AB27-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,350.00	3.48	75.03	6,286.39	-586.93	-183.17	-109.73	4.19
6,382.00	6.54	81.69	6,318.26	-586.41	-180.43	-107.07	9.72
6,414.00	10.19	92.38	6,349.92	-586.27	-175.80	-102.49	12.35
6,461.00	13.93	92.91	6,395.87	-586.73	-165.99	-92.70	7.96
6,509.00	16.26	92.18	6,442.21	-587.27	-153.50	-80.24	4.87
6,556.00	18.87	91.63	6,487.02	-587.74	-139.33	-66.11	5.56
6,605.00	22.58	91.09	6,532.84	-588.15	-121.99	-48.86	7.58
6,701.00	28.96	90.67	6,619.25	-588.77	-80.28	-7.39	6.65
6,748.00	32.49	92.88	6,659.65	-589.54	-56.29	16.51	7.88
6,797.00	37.04	91.40	6,699.89	-590.56	-28.38	44.34	9.44
6,844.00	41.56	91.16	6,736.25	-591.22	1.38	73.95	9.62
6,893.00	45.74	92.28	6,771.70	-592.25	35.17	107.62	8.68
6,940.00	50.81	90.93	6,802.97	-593.21	70.23	142.52	11.00
6,988.00	56.26	90.86	6,831.49	-593.82	108.81	180.89	11.35
7,035.00	59.09	90.93	6,856.62	-594.44	148.52	220.37	6.02
7,084.00	61.75	90.36	6,880.80	-594.91	191.12	262.72	5.52
7,131.00	63.45	90.03	6,902.43	-595.05	232.85	304.14	3.67
7,179.00	66.09	87.97	6,922.89	-594.29	276.26	347.13	6.73
7,226.00	70.19	87.82	6,940.39	-592.69	319.84	390.18	8.73
7,273.00	72.26	90.65	6,955.52	-592.10	364.33	434.26	7.20
7,320.00	75.17	91.97	6,968.70	-593.13	409.42	479.14	6.75
7,369.00	80.17	91.93	6,979.16	-594.76	457.25	526.81	10.20
7,401.00	83.31	92.21	6,983.75	-595.91	488.89	558.35	9.85
7,488.00	85.77	91.35	6,992.03	-598.59	575.45	644.59	2.99
7,583.00	86.92	88.87	6,998.09	-598.77	670.25	738.69	2.87
7,679.00	90.55	88.49	7,000.21	-596.56	766.18	833.63	3.80
7,774.00	91.60	88.47	6,998.42	-594.04	861.13	927.55	1.11
7,870.00	90.25	88.79	6,996.87	-591.75	957.09	1,022.50	1.45
7,965.00	90.46	88.79	6,996.29	-589.74	1,052.06	1,116.51	0.22
8,061.00	91.91	88.98	6,994.30	-587.88	1,148.02	1,211.51	1.52
8,156.00	92.00	88.39	6,991.06	-585.70	1,242.94	1,305.45	0.63
8,252.00	89.20	88.95	6,990.05	-583.47	1,338.90	1,400.41	2.97
8,347.00	90.86	89.69	6,990.00	-582.34	1,433.89	1,494.54	1.91
8,442.00	90.56	89.22	6,988.83	-581.44	1,528.88	1,588.70	0.59
8,538.00	90.28	90.41	6,988.12	-581.13	1,624.87	1,683.93	1.27
8,634.00	88.95	89.39	6,988.77	-580.96	1,720.87	1,779.17	1.75
8,729.00	89.20	89.42	6,990.30	-579.97	1,815.85	1,873.32	0.27
8,825.00	90.52	89.83	6,990.54	-579.35	1,911.84	1,968.51	1.44
8,921.00	89.54	88.01	6,990.49	-577.54	2,007.82	2,063.54	2.15
9,016.00	91.23	88.39	6,989.85	-574.55	2,102.77	2,157.40	1.82
9,112.00	88.46	87.55	6,990.11	-571.15	2,198.70	2,252.19	3.02
9,207.00	88.40	87.60	6,992.71	-567.13	2,293.58	2,345.86	0.08
9,302.00	91.42	88.39	6,992.86	-563.81	2,388.51	2,439.66	3.29
9,398.00	91.67	87.95	6,990.27	-560.75	2,484.42	2,534.47	0.53
9,493.00	90.74	88.58	6,988.27	-557.87	2,579.36	2,628.34	1.18
9,589.00	89.75	88.78	6,987.86	-555.66	2,675.33	2,723.31	1.05
9,684.00	88.95	88.57	6,988.94	-553.46	2,770.30	2,817.29	0.87
9,780.00	89.51	88.57	6,990.23	-551.07	2,866.26	2,912.23	0.58
9,875.00	89.72	88.04	6,990.87	-548.26	2,961.22	3,006.12	0.60
9,970.00	90.34	87.83	6,990.82	-544.84	3,056.15	3,099.92	0.69
10,066.00	92.31	87.84	6,988.60	-541.21	3,152.05	3,194.65	2.05

Design Report for Richter USX AB27-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
10,161.00	90.74	89.14	6,986.07	-538.71	3,246.98	3,288.56	2.15
10,257.00	90.34	88.56	6,985.17	-536.78	3,342.96	3,383.57	0.73
10,352.00	89.38	88.63	6,985.40	-534.45	3,437.93	3,477.54	1.01
10,448.00	88.67	88.74	6,987.03	-532.25	3,533.89	3,572.50	0.75
10,544.00	89.08	88.83	6,988.92	-530.21	3,629.85	3,667.48	0.44
10,639.00	88.61	88.52	6,990.83	-528.02	3,724.80	3,761.45	0.59
10,735.00	89.81	88.02	6,992.16	-525.12	3,820.75	3,856.31	1.35
10,831.00	91.29	88.63	6,991.23	-522.31	3,916.70	3,951.19	1.67
10,926.00	92.53	88.49	6,988.07	-519.93	4,011.61	4,045.10	1.31
11,022.00	90.62	87.89	6,985.43	-516.90	4,107.53	4,139.91	2.09
Final MWD Survey							
11,082.00	90.62	87.89	6,984.78	-514.69	4,167.48	4,199.14	0.00
Survey Projection to TD - Estimated BHL: 2564' FNL, 537' FEL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
888.00	887.99	3.48	0.77	First MWD Survey
11,022.00	6,985.43	-516.90	4,107.53	Final MWD Survey
11,082.00	6,984.78	-514.69	4,167.48	Survey Projection to TD
11,082.00	6,984.78	-514.69	4,167.48	Estimated BHL: 2564' FNL, 537' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Richter USX AB27-65HN_PlanA - Rev1_BH L Tgt	97.05	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
888.00	11,082.00	Sperry MWD Surveys	MWD

Design Report for Richter USX AB27-65HN - MWD Survey

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Richter USX	0.00	0.00	0.00	0.00	0.00	1,443,186.26	3,265,846.81	40° 32' 45.636 N	104° 32' 36.204 W
- actual wellpath hits target center									
- Polygon									
Point 1				-119.00	-669.00	1,442,517.28	3,265,727.81		
Point 2				-50.00	1,509.00	1,444,695.21	3,265,796.81		
Point 3				2,118.00	1,552.00	1,444,738.21	3,267,964.75		
Point 4				4,284.00	1,599.00	1,444,785.21	3,270,130.68		
Point 5				4,241.00	-583.00	1,442,603.28	3,270,087.68		
Point 6				4,200.00	-2,765.00	1,440,421.34	3,270,046.68		
Point 7				2,006.00	-2,808.00	1,440,378.34	3,267,852.75		
Point 8				-185.00	-2,848.00	1,440,338.34	3,265,661.82		
Point 9				-119.00	-669.00	1,442,517.28	3,265,727.81		
Richter USX	0.00	0.00	0.00	0.00	0.00	1,443,186.26	3,265,846.81	40° 32' 45.636 N	104° 32' 36.204 W
- actual wellpath hits target center									
- Polygon									
Point 1				-579.00	-669.00	1,442,517.28	3,265,267.83		
Point 2				-510.00	1,969.00	1,445,155.20	3,265,336.83		
Point 3				2,118.00	2,012.00	1,445,198.20	3,267,964.75		
Point 4				4,744.00	2,059.00	1,445,245.20	3,270,590.67		
Point 5				4,701.00	-583.00	1,442,603.28	3,270,547.67		
Point 6				4,660.00	-3,225.00	1,439,961.35	3,270,506.67		
Point 7				2,006.00	-3,268.00	1,439,918.36	3,267,852.75		
Point 8				-645.00	-3,308.00	1,439,878.36	3,265,201.83		
Point 9				-579.00	-669.00	1,442,517.28	3,265,267.83		
Richter USX	0.00	0.00	6,983.22	-515.76	4,169.12	1,442,670.52	3,270,015.81	40° 32' 40.092 N	104° 31' 42.276 W
- actual wellpath misses target center by 2.51ft at 11082.00ft MD (6984.78 TVD, -514.69 N, 4167.48 E)									
- Point									

North Reference Sheet for Sec. 27-T7N-R64W - Richter USX AB27-65HN

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

Vertical Depths are relative to KB @ 4926.00ft (H&P 315). Northing and Easting are relative to Richter USX AB27-65HN

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: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99997009

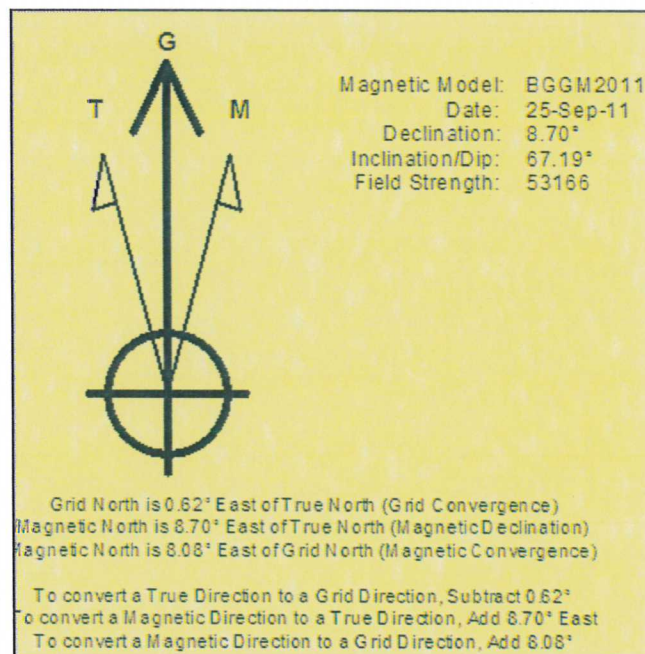
Grid Coordinates of Well: 1,443,186.26 ft N, 3,265,846.81 ft E

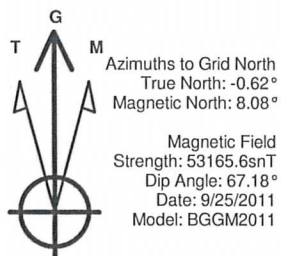
Geographical Coordinates of Well: 40° 32' 45.64" N, 104° 32' 36.20" W

Grid Convergence at Surface is: 0.62°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,082.00ft
the Bottom Hole Displacement is 4,199.14ft in the Direction of 97.04° (Grid).

Magnetic Convergence at surface is: -8.08° (25 September 2011, , BGGM2011)

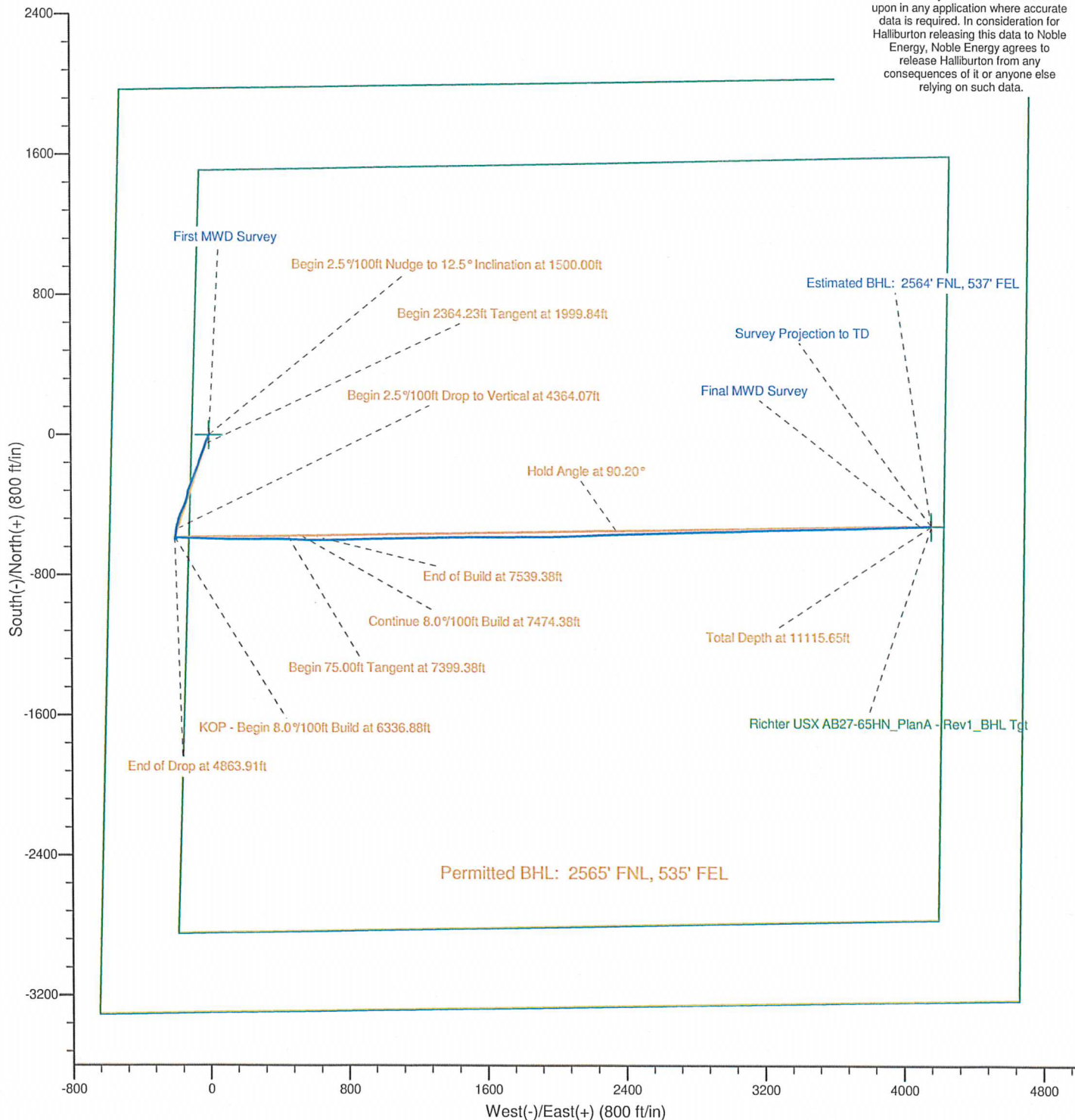




LEGEND

- Richter USX AB27-65HN, Plan A, Plan A - Rev 1 Proposal VC
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Richter USX AB27-65HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.



Project: Weld County, CO (NAD 83)
 Site: Sec. 27-T7N-R64W
 Well: Richter USX AB27-65HN

Noble Energy

HALLIBURTON

Sperry Drilling



Azimuths to Grid North
 True North: -0.62°
 Magnetic North: 8.08°

Magnetic Field
 Strength: 53165.6snT
 Dip Angle: 67.18°
 Date: 9/25/2011
 Model: BGGM2011

LEGEND

- Richter USX AB27-65HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Richter USX AB27-65HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.

