

HALLIBURTON

6360 EAST YELLOWSTONE HWY • EVANSVILLE, WY 82636

TEL: 307-472-5757 • FAX: 307-232-2097

Certified Survey Sheet

Customer: **Extraction Oil & Gas**

Well: **NORTHWEST A S20-25-10N – Original Wellbore**

API: 05-014-20790

Legal: Sec. 09-T01S-R68W

County: Broomfield

State: Colorado

RKB (Patterson 901): 29', 5,343.0' MSL

Tie-On (Atlas Surveys): 1,558' MD

First Sperry MWD Survey: 1,642' MD

Last Sperry MWD Survey: 21,862' MD

Straight Line Projection to TD: 21,955' MD

I certify that the attached survey is true and correct to the best of my knowledge.



01-10-19

Kansa Becker
Well Design Senior Technical Professional

HALLIBURTON SPERRY DRILLING SERVICES

CERTIFIED SURVEY WORK SHEET

OPERATOR:	Extraction Oil & Gas
WELL:	NorthWest A S20-25-10N
FIELD:	Wattenberg
RIG:	Patterson UTI rig #901
LEGALS:	Sec. 9-T1S-R68W
COUNTY:	Broomfield
STATE:	Colorado
CAL. METHOD:	Minimum Curvature
MAG. DECL. APPLIED:	8.25° True
VERTICAL SEC. DIR. :	196.73°

SSDS Job Number :	CA-MJ-906084560
Start Date of Job :	12/19/2019
End Date of Job :	12/23/2019
Lead Directional Driller:	Justin Lee Groom
	Arun Menezes
Other SDS DD's :	
SDS MWD Engineers :	Will Melenka
	Scott Browning
	Pedro Herrera

	Main Hole =====>	1st Side Track =====>	2nd Side Track =====>	3rd Side Track =====>	4th Side Track =====>
First Survey Depth	1558.00	Tie On	Tie On	Tie On	Tie On
Last Survey Depth		MWD			
		MWD			
KOP Depth/Sidetrack MD		KOP	KOP-ST1	KOP-ST2	KOP-ST3
First Survey Depth	1642.00	MWD	MWD	MWD	MWD
Last Survey Depth	21862.00	MWD	MWD	MWD	MWD
Bit Extrapolation to TD	21955.00	T.D.	T.D.	T.D.	T.D.

The following Halliburton Sperry Drilling Services personnel listed below, do certify the above survey information to be accurate :

Print Name : Justin Lee Groom Print Name : Print Name :

Sign Name : *Justin Lee Groom* Sign Name : Sign Name :

Print Name : Print Name : Print Name :

Sign Name : Sign Name : Sign Name :

Examples of Survey Types:

TieOn	Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)
MWD	Sperry Drilling Services (SDS) Measurement While Drilling (MWD) Survey's
ESS	Sperry Drilling Services (SDS) Electronic Survey System (ESS) Survey's
Gyro	Gyro Survey's ; Provided by third party vendor, or by Sperry Drilling Services (SDS)
SS	Single Shot (SS) Survey's ; Provided by Sperry Drilling Services (SDS) or third party vendor.

Job# 906084560

Patterson 901

Extraction Oil & Gas

Broomfield County, CO Sec. 09-T01S-R68W (NORTHWEST A S20-25 Pad)

API# 05-014-20790

NORTHWEST A S20-25-10N

SHL: 1289' FNL 814' FWL

OWB_20790

Design: Final Surveys

Sperry Drilling Services

Combo Report

16 January, 2020

Well Coordinates: 39.983158
-105.012918

North American Datum 1983
Colorado Northern Zone
1,237,086.58 N
3,136,490.78 E

Ground Level: 5,314.00 usft

Geodetic Scale Factor Applied

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.15 Build: 91E

Report Version: Midcon Combo v1.15

Centered on Well NORTHWEST A S20-25-10N

KB = 29' @ 5343.00usft (Patterson 901)

N

True

Dec-Deg - API - US Survey Feet - Cust (6 dec)

HALLIBURTON

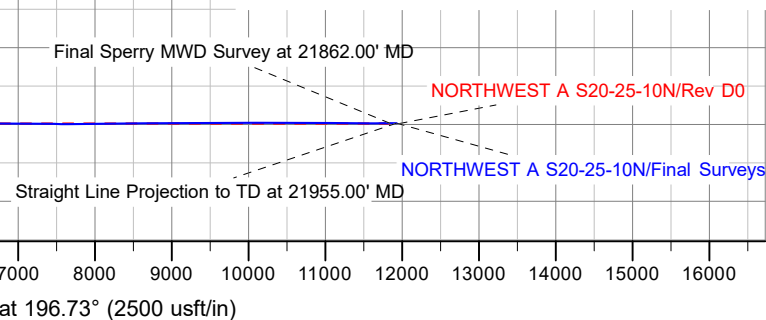
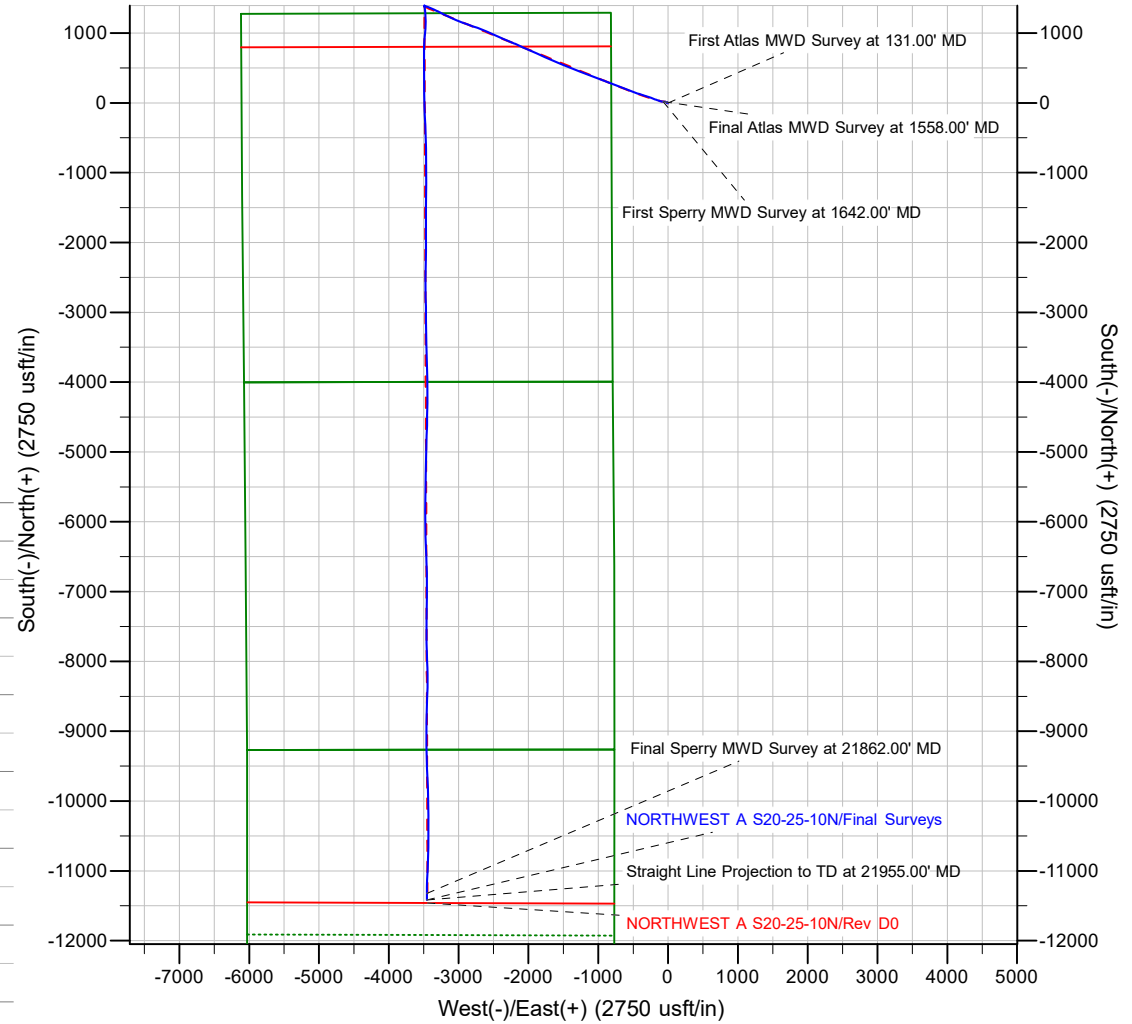
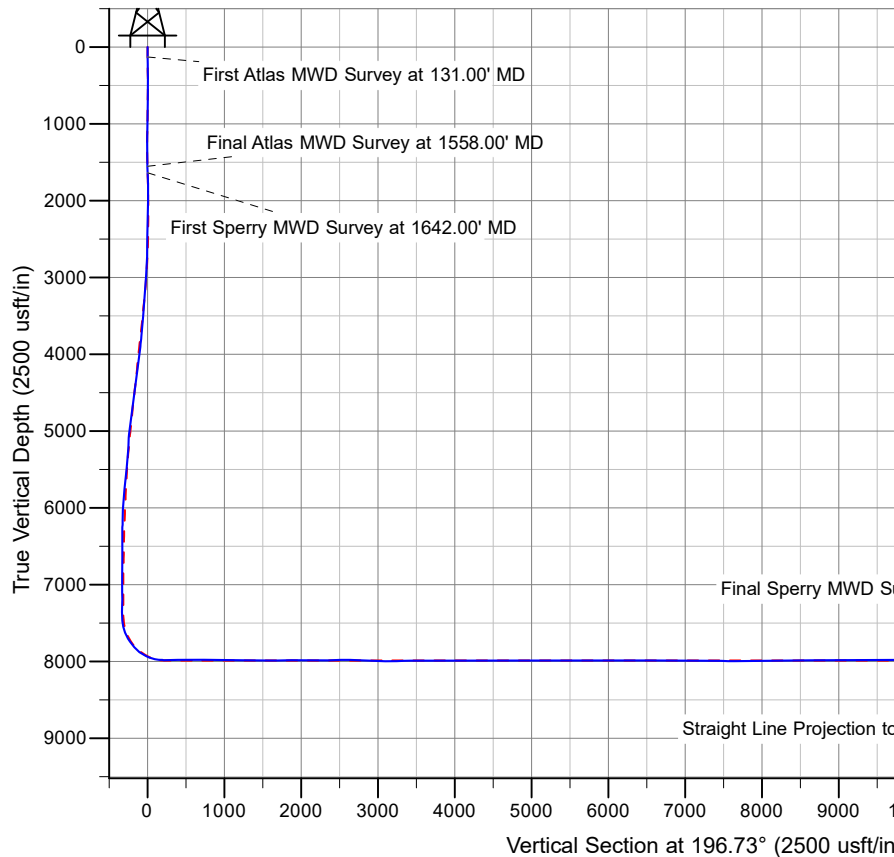
Project: Broomfield County, CO
Site: Sec. 09-T01S-R68W (NORTHWEST A S20-25 Pad)
Well: NORTHWEST A S20-25-10N
Wellbore: OWB_20790
Design: Final Surveys

Extraction Oil & Gas Patterson 901

HALLIBURTON
Sperry Drilling

LEGEND

- NORTHWEST A S20-25-10N, OWB_20790, Rev D0 V0
- Final Surveys



Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
				Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)				
0.00	0.00	0.00	0.00	0.00 N	0.00 E	1,237,086.58	3,136,490.78	0.00	0.00	0.00	
131.00	1.15	175.22	130.99	1.31 S	0.11 E	1,237,085.28	3,136,490.90	0.88	1.22	175.22	First Atlas MWD Survey at 131.00' MD
223.00	1.50	181.61	222.97	3.43 S	0.15 E	1,237,083.15	3,136,490.96	0.41	3.24	26.10	
314.00	0.62	231.28	313.95	4.93 S	0.26 W	1,237,081.65	3,136,490.55	1.31	4.80	156.72	
403.00	0.80	235.90	402.94	5.58 S	1.16 W	1,237,081.00	3,136,489.66	0.21	5.68	19.96	
492.00	0.93	317.51	491.94	5.40 S	2.16 W	1,237,081.18	3,136,488.66	1.28	5.79	125.83	
582.00	1.28	311.13	581.92	4.20 S	3.41 W	1,237,082.37	3,136,487.40	0.41	5.00	-22.58	
672.00	1.28	315.62	671.90	2.82 S	4.87 W	1,237,083.74	3,136,485.93	0.11	4.10	92.24	
761.00	1.24	332.41	760.88	1.25 S	6.01 W	1,237,085.30	3,136,484.78	0.42	2.93	104.53	
851.00	1.33	329.37	850.85	0.51 N	6.99 W	1,237,087.05	3,136,483.79	0.13	1.53	-38.67	
940.00	1.33	328.31	939.83	2.28 N	8.06 W	1,237,088.82	3,136,482.71	0.03	0.14	-90.53	
1,029.00	1.33	326.11	1,028.81	4.01 N	9.18 W	1,237,090.55	3,136,481.58	0.06	-1.20	-91.10	
1,118.00	2.21	302.88	1,117.76	5.80 N	11.20 W	1,237,092.32	3,136,479.56	1.26	-2.33	-51.19	
1,208.00	4.24	289.75	1,207.62	7.87 N	15.79 W	1,237,094.36	3,136,474.96	2.39	-2.99	-26.63	
1,297.00	5.79	287.90	1,296.27	10.36 N	23.16 W	1,237,096.82	3,136,467.57	1.75	-3.25	-6.88	
1,386.00	7.64	282.79	1,384.66	13.05 N	33.20 W	1,237,099.45	3,136,457.52	2.18	-2.94	-20.45	
1,475.00	9.06	277.41	1,472.72	15.26 N	45.92 W	1,237,101.59	3,136,444.79	1.82	-1.40	-31.50	
1,558.00	9.01	276.05	1,554.69	16.79 N	58.86 W	1,237,103.05	3,136,431.84	0.26	0.86	-103.85	Final Atlas MWD Survey at 1558.00' MD
1,642.00	9.40	275.89	1,637.61	18.19 N	72.22 W	1,237,104.37	3,136,418.46	0.47	3.37	-3.83	First Sperry MWD Survey at 1642.00' MD
1,736.00	9.40	273.64	1,730.34	19.46 N	87.52 W	1,237,105.57	3,136,403.16	0.39	6.56	-91.11	
1,831.00	12.40	284.55	1,823.63	22.52 N	105.14 W	1,237,108.52	3,136,385.52	3.82	8.70	39.96	
1,926.00	14.93	288.62	1,915.93	28.99 N	126.62 W	1,237,114.88	3,136,364.02	2.85	8.69	22.80	
2,045.00	16.59	288.41	2,030.46	39.25 N	157.26 W	1,237,124.97	3,136,333.31	1.40	7.68	-2.07	
2,140.00	18.30	292.27	2,121.09	49.19 N	183.94 W	1,237,134.76	3,136,306.59	2.17	5.84	35.94	
2,235.00	21.35	290.59	2,210.45	60.92 N	213.94 W	1,237,146.33	3,136,276.52	3.27	3.24	-11.37	
2,330.00	23.53	290.32	2,298.25	73.59 N	247.91 W	1,237,158.81	3,136,242.48	2.30	0.89	-2.83	
2,426.00	27.00	288.45	2,385.05	87.15 N	286.57 W	1,237,172.15	3,136,203.75	3.71	-0.97	-13.80	
2,520.00	28.14	287.39	2,468.38	100.53 N	327.96 W	1,237,185.30	3,136,162.29	1.32	-1.86	-23.76	
2,614.00	30.02	286.12	2,550.53	113.68 N	371.71 W	1,237,198.22	3,136,118.47	2.10	-1.87	-18.73	
2,711.00	27.60	288.29	2,635.52	127.47 N	416.36 W	1,237,211.76	3,136,073.74	2.72	-2.22	157.58	
2,806.00	32.53	290.30	2,717.71	143.25 N	461.24 W	1,237,227.29	3,136,028.78	5.30	-4.41	12.42	
2,899.00	38.16	290.55	2,793.54	162.02 N	511.64 W	1,237,245.79	3,135,978.28	6.06	-7.88	1.57	
2,993.00	36.20	290.66	2,868.43	182.01 N	564.81 W	1,237,265.49	3,135,925.01	2.09	-11.72	178.10	
3,089.00	37.21	290.23	2,945.39	202.05 N	618.57 W	1,237,285.23	3,135,871.13	1.09	-15.44	-14.45	
3,183.00	39.81	290.43	3,018.94	222.39 N	673.45 W	1,237,305.26	3,135,816.15	2.77	-19.11	2.82	
3,277.00	42.06	291.82	3,089.95	244.60 N	730.89 W	1,237,327.16	3,135,758.59	2.58	-23.85	22.56	

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
3,372.00	44.70	293.30	3,158.99	269.65 N	791.13 W	1,237,351.87	3,135,698.22	2.98	-30.50	21.60	
3,467.00	45.81	289.65	3,225.88	294.32 N	853.90 W	1,237,376.20	3,135,635.31	2.97	-36.06	-68.11	
3,562.00	48.55	290.40	3,290.45	318.19 N	919.36 W	1,237,399.71	3,135,569.72	2.94	-40.07	11.61	
3,656.00	47.08	290.14	3,353.57	342.32 N	984.69 W	1,237,423.48	3,135,504.26	1.58	-44.37	-172.62	
3,752.00	47.06	290.30	3,418.95	366.62 N	1,050.65 W	1,237,447.41	3,135,438.17	0.12	-48.65	99.74	
3,847.00	49.10	291.59	3,482.42	391.89 N	1,116.66 W	1,237,472.33	3,135,372.03	2.37	-53.86	25.63	
3,942.00	46.83	290.13	3,546.03	417.03 N	1,182.58 W	1,237,497.10	3,135,305.97	2.65	-58.95	-154.95	
4,038.00	49.75	292.16	3,609.90	442.91 N	1,249.40 W	1,237,522.61	3,135,239.01	3.43	-64.50	28.11	
4,133.00	48.84	291.33	3,671.86	469.59 N	1,316.29 W	1,237,548.92	3,135,171.98	1.16	-70.80	-145.61	
4,229.00	47.37	291.40	3,735.96	495.62 N	1,382.83 W	1,237,574.59	3,135,105.29	1.53	-76.57	177.99	
4,324.00	45.58	290.59	3,801.38	520.31 N	1,447.14 W	1,237,598.92	3,135,040.86	1.98	-81.70	-162.11	
4,419.00	46.54	293.80	3,867.31	546.15 N	1,510.45 W	1,237,624.42	3,134,977.41	2.63	-88.23	68.56	
4,515.00	47.87	292.74	3,932.53	573.98 N	1,575.16 W	1,237,651.88	3,134,912.54	1.60	-96.24	-30.68	
4,610.00	46.27	292.65	3,997.23	600.81 N	1,639.33 W	1,237,678.36	3,134,848.23	1.69	-103.47	-177.67	
4,706.00	45.36	293.93	4,064.14	628.02 N	1,702.56 W	1,237,705.23	3,134,784.85	1.35	-111.33	135.20	
4,801.00	47.29	294.16	4,129.74	656.02 N	1,765.31 W	1,237,732.88	3,134,721.96	2.04	-120.08	5.01	
4,896.00	45.31	294.03	4,195.38	684.06 N	1,828.00 W	1,237,760.57	3,134,659.11	2.09	-128.89	-177.33	
4,991.00	48.26	294.69	4,260.42	712.62 N	1,891.06 W	1,237,788.79	3,134,595.90	3.15	-138.09	9.49	
5,086.00	45.82	292.98	4,325.16	740.73 N	1,954.64 W	1,237,816.55	3,134,532.17	2.89	-146.70	-153.43	
5,181.00	48.47	294.40	4,389.77	768.73 N	2,018.40 W	1,237,844.19	3,134,468.26	3.00	-155.16	21.93	
5,275.00	45.85	293.35	4,453.68	796.63 N	2,081.41 W	1,237,871.75	3,134,405.10	2.91	-163.75	-163.98	
5,370.00	47.60	294.32	4,518.80	824.59 N	2,144.67 W	1,237,899.36	3,134,341.69	1.99	-172.31	22.31	
5,463.00	44.38	292.80	4,583.41	851.34 N	2,205.96 W	1,237,925.77	3,134,280.25	3.66	-180.29	-161.77	
5,559.00	46.72	293.99	4,650.63	878.56 N	2,268.85 W	1,237,952.65	3,134,217.22	2.59	-188.25	20.37	
5,654.00	48.66	293.97	4,714.58	907.12 N	2,333.03 W	1,237,980.84	3,134,152.88	2.04	-197.12	-0.44	
5,749.00	47.03	292.75	4,778.33	935.05 N	2,397.68 W	1,238,008.42	3,134,088.08	1.96	-205.26	-151.38	
5,843.00	47.78	292.48	4,841.95	961.66 N	2,461.56 W	1,238,034.67	3,134,024.06	0.83	-212.35	-14.93	
5,938.00	51.20	294.53	4,903.66	990.48 N	2,527.76 W	1,238,063.14	3,133,957.70	3.96	-220.90	25.17	
6,033.00	50.64	293.09	4,963.55	1,020.26 N	2,595.23 W	1,238,092.54	3,133,890.08	1.32	-229.99	-117.06	
6,128.00	49.84	292.13	5,024.31	1,048.34 N	2,662.64 W	1,238,120.25	3,133,822.51	1.15	-237.48	-137.62	
6,223.00	48.60	289.34	5,086.36	1,073.82 N	2,729.90 W	1,238,145.36	3,133,755.12	2.58	-242.52	-121.32	
6,319.00	48.26	289.48	5,150.06	1,097.68 N	2,797.64 W	1,238,168.85	3,133,687.25	0.37	-245.88	162.92	
6,413.00	48.01	288.55	5,212.80	1,120.49 N	2,863.82 W	1,238,191.29	3,133,620.95	0.78	-248.67	-110.16	
6,508.00	45.10	289.50	5,278.12	1,142.96 N	2,929.02 W	1,238,213.40	3,133,555.63	3.15	-251.42	166.99	
6,603.00	43.78	293.19	5,345.96	1,167.14 N	2,990.96 W	1,238,237.24	3,133,493.56	3.05	-256.74	118.37	
6,698.00	42.22	292.85	5,415.43	1,192.48 N	3,050.59 W	1,238,262.25	3,133,433.79	1.66	-263.84	-171.67	
6,793.00	37.26	295.17	5,488.47	1,217.12 N	3,106.07 W	1,238,286.59	3,133,378.18	5.45	-271.47	164.24	

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
6,888.00	35.46	295.02	5,564.97	1,241.01 N	3,157.07 W	1,238,310.19	3,133,327.05	1.90	-279.66	-177.23	
6,983.00	34.22	294.44	5,642.94	1,263.71 N	3,206.36 W	1,238,332.63	3,133,277.64	1.35	-287.22	-165.28	
7,078.00	30.74	297.73	5,723.07	1,286.07 N	3,252.19 W	1,238,354.73	3,133,231.69	4.11	-295.44	154.46	
7,174.00	27.89	296.84	5,806.77	1,307.63 N	3,293.95 W	1,238,376.06	3,133,189.81	3.00	-304.07	-171.69	
7,268.00	24.12	295.34	5,891.24	1,325.78 N	3,330.94 W	1,238,394.01	3,133,152.72	4.07	-310.80	-170.78	
7,364.00	21.08	294.06	5,979.86	1,341.22 N	3,364.44 W	1,238,409.26	3,133,119.14	3.21	-315.94	-171.40	
7,459.00	18.96	293.28	6,069.11	1,354.29 N	3,394.22 W	1,238,422.16	3,133,089.29	2.25	-319.88	-173.19	
7,554.00	16.43	292.34	6,159.61	1,365.50 N	3,420.83 W	1,238,433.23	3,133,062.62	2.68	-322.96	-174.00	
7,649.00	14.12	291.49	6,251.25	1,374.85 N	3,444.04 W	1,238,442.45	3,133,039.36	2.44	-325.23	-174.87	
7,744.00	11.26	289.72	6,343.92	1,382.23 N	3,463.55 W	1,238,449.72	3,133,019.80	3.04	-326.68	-173.12	
7,839.00	7.69	286.57	6,437.61	1,387.17 N	3,478.38 W	1,238,454.58	3,133,004.95	3.80	-327.14	-173.29	
7,934.00	4.36	270.57	6,532.07	1,389.02 N	3,488.09 W	1,238,456.38	3,132,995.23	3.89	-326.12	-161.04	
8,029.00	0.92	321.55	6,626.97	1,389.65 N	3,492.18 W	1,238,456.99	3,132,991.14	4.05	-325.55	169.29	
8,125.00	0.94	336.18	6,722.95	1,390.98 N	3,492.97 W	1,238,458.31	3,132,990.34	0.25	-326.59	92.53	
8,220.00	0.97	13.23	6,817.94	1,392.47 N	3,493.10 W	1,238,459.80	3,132,990.20	0.64	-327.98	105.84	
8,314.00	1.07	115.62	6,911.93	1,392.87 N	3,492.13 W	1,238,460.20	3,132,991.17	1.69	-328.64	138.93	
8,409.00	0.86	111.07	7,006.92	1,392.23 N	3,490.67 W	1,238,459.57	3,132,992.64	0.24	-328.45	-162.22	
8,504.00	1.07	109.41	7,101.91	1,391.68 N	3,489.16 W	1,238,459.03	3,132,994.14	0.22	-328.36	-8.41	
8,599.00	0.67	95.44	7,196.90	1,391.33 N	3,487.77 W	1,238,458.69	3,132,995.53	0.47	-328.42	-158.93	
8,694.00	0.80	75.69	7,291.89	1,391.44 N	3,486.58 W	1,238,458.81	3,132,996.73	0.30	-328.87	-72.94	
8,790.00	0.51	62.68	7,387.88	1,391.80 N	3,485.55 W	1,238,459.17	3,132,997.76	0.34	-329.52	-159.25	
8,885.00	6.02	175.68	7,482.71	1,387.02 N	3,484.80 W	1,238,454.40	3,132,998.53	6.57	-325.16	117.30	
8,979.00	16.36	178.63	7,574.80	1,368.82 N	3,484.11 W	1,238,436.21	3,132,999.32	11.01	-307.93	4.63	
9,075.00	28.41	173.52	7,663.41	1,332.48 N	3,481.20 W	1,238,399.88	3,133,002.43	12.70	-273.96	-11.57	
9,170.00	36.44	177.30	7,743.54	1,281.75 N	3,477.31 W	1,238,349.18	3,133,006.60	8.71	-226.50	15.78	
9,264.00	41.15	175.35	7,816.79	1,223.01 N	3,473.49 W	1,238,290.45	3,133,010.75	5.18	-171.34	-15.31	
9,360.00	55.20	180.68	7,880.67	1,151.73 N	3,471.38 W	1,238,219.19	3,133,013.24	15.20	-103.68	17.63	
9,455.00	64.37	184.83	7,928.44	1,069.85 N	3,475.46 W	1,238,137.29	3,133,009.61	10.36	-24.10	22.44	
9,550.00	73.50	184.55	7,962.55	981.59 N	3,482.69 W	1,238,048.99	3,133,002.86	9.61	62.51	-1.69	
9,646.00	85.47	185.15	7,980.04	887.71 N	3,490.67 W	1,237,955.08	3,132,995.41	12.48	154.71	2.88	
9,741.00	90.60	180.78	7,983.30	792.95 N	3,495.57 W	1,237,860.29	3,132,991.02	7.09	246.87	-40.51	
9,835.00	91.55	180.36	7,981.53	698.97 N	3,496.51 W	1,237,766.31	3,132,990.60	1.10	337.14	-23.84	
9,930.00	89.46	180.31	7,980.70	603.98 N	3,497.06 W	1,237,671.33	3,132,990.57	2.20	428.27	-178.63	
10,025.00	90.60	179.22	7,980.65	508.98 N	3,496.67 W	1,237,576.34	3,132,991.48	1.66	519.13	-43.72	
10,121.00	91.75	178.77	7,978.68	413.02 N	3,494.99 W	1,237,480.39	3,132,993.69	1.29	610.55	-21.36	
10,216.00	89.03	179.70	7,978.03	318.04 N	3,493.72 W	1,237,385.42	3,132,995.48	3.03	701.14	161.12	
10,311.00	89.16	180.14	7,979.53	223.05 N	3,493.59 W	1,237,290.44	3,132,996.14	0.48	792.07	73.54	

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
10,405.00	88.92	179.21	7,981.11	129.07 N	3,493.06 W	1,237,196.46	3,132,997.19	1.02	881.93	-104.48	
10,500.00	89.09	178.79	7,982.76	34.10 N	3,491.40 W	1,237,101.50	3,132,999.37	0.48	972.40	-67.96	
10,595.00	89.36	178.58	7,984.04	60.87 S	3,489.22 W	1,237,006.55	3,133,002.07	0.36	1,062.72	-37.87	
10,691.00	89.77	177.55	7,984.77	156.81 S	3,485.98 W	1,236,910.63	3,133,005.83	1.15	1,153.67	-68.30	
10,785.00	90.23	176.05	7,984.77	250.66 S	3,480.73 W	1,236,816.82	3,133,011.60	1.67	1,242.03	-72.95	
10,881.00	88.96	178.04	7,985.45	346.52 S	3,475.78 W	1,236,720.99	3,133,017.07	2.46	1,332.41	122.55	
10,976.00	88.89	176.99	7,987.23	441.42 S	3,471.66 W	1,236,626.12	3,133,021.71	1.11	1,422.10	-93.82	
11,071.00	89.33	179.07	7,988.71	536.34 S	3,468.40 W	1,236,531.22	3,133,025.50	2.24	1,512.07	78.07	
11,165.00	90.13	179.78	7,989.15	630.34 S	3,467.45 W	1,236,437.23	3,133,026.96	1.14	1,601.82	41.59	
11,260.00	90.60	179.24	7,988.55	725.33 S	3,466.64 W	1,236,342.25	3,133,028.29	0.75	1,692.55	-48.96	
11,356.00	91.08	180.07	7,987.14	821.32 S	3,466.06 W	1,236,246.27	3,133,029.40	1.00	1,784.31	59.95	
11,451.00	91.61	179.14	7,984.91	916.29 S	3,465.41 W	1,236,151.31	3,133,030.57	1.13	1,875.07	-60.30	
11,546.00	89.33	180.06	7,984.13	1,011.27 S	3,464.75 W	1,236,056.33	3,133,031.76	2.59	1,965.85	158.02	
11,641.00	89.29	179.95	7,985.27	1,106.27 S	3,464.75 W	1,235,961.34	3,133,032.27	0.12	2,056.82	-109.99	
11,736.00	89.46	178.67	7,986.31	1,201.25 S	3,463.61 W	1,235,866.36	3,133,033.94	1.36	2,147.46	-82.44	
11,832.00	90.34	181.33	7,986.48	1,297.24 S	3,463.61 W	1,235,770.38	3,133,034.46	2.92	2,239.39	71.70	
11,927.00	91.18	182.03	7,985.22	1,392.19 S	3,466.40 W	1,235,675.42	3,133,032.20	1.15	2,331.12	39.80	
12,022.00	91.75	180.63	7,982.79	1,487.13 S	3,468.60 W	1,235,580.47	3,133,030.52	1.59	2,422.67	-67.82	
12,118.00	89.80	180.33	7,981.49	1,583.12 S	3,469.40 W	1,235,484.49	3,133,030.24	2.06	2,514.83	-171.25	
12,213.00	90.13	178.88	7,981.55	1,678.11 S	3,468.75 W	1,235,389.50	3,133,031.42	1.57	2,605.61	-77.18	
12,309.00	87.58	180.13	7,983.47	1,774.08 S	3,467.92 W	1,235,293.54	3,133,032.77	2.96	2,697.28	153.90	
12,404.00	87.78	180.07	7,987.31	1,869.00 S	3,468.09 W	1,235,198.62	3,133,033.13	0.22	2,788.23	-16.69	
12,499.00	87.71	179.88	7,991.05	1,963.93 S	3,468.04 W	1,235,103.70	3,133,033.69	0.21	2,879.13	-110.24	
12,594.00	88.11	179.28	7,994.51	2,058.86 S	3,467.35 W	1,235,008.78	3,133,034.91	0.76	2,969.84	-56.30	
12,690.00	88.36	181.12	7,997.47	2,154.81 S	3,467.68 W	1,234,912.83	3,133,035.10	1.93	3,061.83	82.29	
12,785.00	90.98	180.62	7,998.02	2,249.79 S	3,469.13 W	1,234,817.85	3,133,034.18	2.81	3,153.20	-10.81	
12,881.00	91.51	182.38	7,995.93	2,345.73 S	3,471.64 W	1,234,721.90	3,133,032.20	1.91	3,245.80	73.22	
12,976.00	92.15	180.76	7,992.90	2,440.64 S	3,474.24 W	1,234,626.98	3,133,030.12	1.83	3,337.45	-68.41	
13,071.00	89.83	179.90	7,991.26	2,535.62 S	3,474.79 W	1,234,532.00	3,133,030.09	2.60	3,428.56	-159.65	
13,166.00	89.60	179.94	7,991.73	2,630.62 S	3,474.65 W	1,234,437.01	3,133,030.75	0.25	3,519.50	170.13	
13,261.00	89.80	178.67	7,992.23	2,725.61 S	3,473.50 W	1,234,342.03	3,133,032.42	1.35	3,610.14	-81.05	
13,356.00	90.50	176.79	7,991.98	2,820.53 S	3,469.74 W	1,234,247.13	3,133,036.70	2.11	3,699.96	-69.58	
13,452.00	89.23	180.96	7,992.20	2,916.49 S	3,467.85 W	1,234,151.19	3,133,039.12	4.54	3,791.31	106.94	
13,547.00	89.70	180.66	7,993.09	3,011.47 S	3,469.20 W	1,234,056.20	3,133,038.29	0.59	3,882.66	-32.55	
13,643.00	89.90	180.04	7,993.43	3,107.47 S	3,469.78 W	1,233,960.21	3,133,038.23	0.68	3,974.76	-72.12	
13,737.00	90.34	178.90	7,993.23	3,201.46 S	3,468.91 W	1,233,866.22	3,133,039.62	1.30	4,064.53	-68.89	

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)								
13,833.00	90.51	178.79	7,992.52	3,297.44 S	3,466.98 W	1,233,770.26	3,133,042.08	0.21	4,155.89	-32.90	
13,966.00	90.74	178.11	7,991.07	3,430.38 S	3,463.38 W	1,233,637.34	3,133,046.41	0.54	4,282.17	-71.31	
14,061.00	90.56	178.10	7,989.99	3,525.32 S	3,460.24 W	1,233,542.42	3,133,050.07	0.19	4,372.18	-176.82	
14,156.00	90.25	177.79	7,989.32	3,620.26 S	3,456.83 W	1,233,447.51	3,133,054.00	0.46	4,462.12	-135.00	
14,252.00	90.31	178.07	7,988.85	3,716.20 S	3,453.37 W	1,233,351.60	3,133,057.99	0.30	4,553.00	77.90	
14,441.00	89.88	178.67	7,988.54	3,905.12 S	3,447.99 W	1,233,162.71	3,133,064.41	0.39	4,732.38	125.63	
14,536.00	90.25	178.64	7,988.43	4,000.09 S	3,445.76 W	1,233,067.76	3,133,067.16	0.39	4,822.69	-4.64	
14,632.00	89.75	180.37	7,988.43	4,096.08 S	3,444.93 W	1,232,971.77	3,133,068.52	1.88	4,914.38	106.12	
14,727.00	89.63	181.09	7,988.94	4,191.08 S	3,446.14 W	1,232,876.78	3,133,067.83	0.77	5,005.70	99.46	
14,822.00	90.06	182.10	7,989.20	4,286.04 S	3,448.79 W	1,232,781.81	3,133,065.71	1.16	5,097.40	66.94	
14,918.00	90.31	180.50	7,988.89	4,382.01 S	3,450.96 W	1,232,685.83	3,133,064.05	1.69	5,189.94	-81.12	
15,014.00	90.25	179.88	7,988.42	4,478.01 S	3,451.28 W	1,232,589.83	3,133,064.26	0.65	5,281.96	-95.53	
15,109.00	90.19	180.40	7,988.05	4,573.00 S	3,451.51 W	1,232,494.84	3,133,064.55	0.55	5,373.01	96.58	
15,204.00	90.12	182.18	7,987.80	4,667.98 S	3,453.65 W	1,232,399.86	3,133,062.94	1.88	5,464.57	92.25	
15,300.00	90.06	182.09	7,987.65	4,763.91 S	3,457.23 W	1,232,303.91	3,133,059.89	0.11	5,557.47	-123.69	
15,395.00	90.06	182.04	7,987.55	4,858.85 S	3,460.65 W	1,232,208.96	3,133,056.99	0.05	5,649.38	-90.00	
15,490.00	90.06	181.70	7,987.45	4,953.80 S	3,463.75 W	1,232,114.00	3,133,054.41	0.36	5,741.20	-90.00	
15,680.00	90.19	181.17	7,987.03	5,143.74 S	3,468.51 W	1,231,924.04	3,133,050.69	0.29	5,924.47	-76.22	
15,869.00	90.12	180.95	7,986.52	5,332.70 S	3,472.01 W	1,231,735.06	3,133,048.23	0.12	6,106.45	-107.65	
15,965.00	90.12	180.91	7,986.32	5,428.69 S	3,473.56 W	1,231,639.07	3,133,047.20	0.04	6,198.82	-90.00	
16,060.00	89.88	179.34	7,986.32	5,523.69 S	3,473.77 W	1,231,544.08	3,133,047.52	1.67	6,289.85	-98.69	
16,155.00	90.19	180.74	7,986.26	5,618.68 S	3,473.84 W	1,231,449.09	3,133,047.97	1.51	6,380.85	77.51	
16,251.00	89.51	181.17	7,986.51	5,714.67 S	3,475.44 W	1,231,353.10	3,133,046.90	0.84	6,473.23	147.69	
16,346.00	89.14	181.63	7,987.63	5,809.63 S	3,477.76 W	1,231,258.12	3,133,045.10	0.62	6,564.84	128.82	
16,442.00	89.13	180.37	7,989.08	5,905.61 S	3,479.43 W	1,231,162.15	3,133,043.95	1.31	6,657.24	-90.46	
16,537.00	89.26	179.92	7,990.42	6,000.60 S	3,479.67 W	1,231,067.16	3,133,044.23	0.49	6,748.28	-73.89	
16,632.00	89.26	178.32	7,991.64	6,095.58 S	3,478.22 W	1,230,972.19	3,133,046.22	1.68	6,838.81	-90.01	
16,727.00	89.32	177.26	7,992.82	6,190.50 S	3,474.55 W	1,230,877.30	3,133,050.40	1.12	6,928.66	-86.77	
16,823.00	89.26	177.78	7,994.01	6,286.40 S	3,470.40 W	1,230,781.42	3,133,055.08	0.55	7,019.31	96.59	
16,918.00	89.88	178.66	7,994.72	6,381.35 S	3,467.45 W	1,230,686.49	3,133,058.55	1.13	7,109.39	54.84	
17,013.00	90.00	177.74	7,994.82	6,476.30 S	3,464.46 W	1,230,591.56	3,133,062.06	0.98	7,199.46	-82.57	
17,109.00	90.00	178.48	7,994.82	6,572.25 S	3,461.30 W	1,230,495.64	3,133,065.75	0.77	7,290.44	90.00	
17,300.00	90.00	178.70	7,994.82	6,763.19 S	3,456.60 W	1,230,304.73	3,133,071.50	0.12	7,471.95	90.00	
17,394.00	89.63	179.60	7,995.13	6,857.18 S	3,455.20 W	1,230,210.75	3,133,073.41	1.04	7,561.55	112.35	
17,490.00	90.00	180.14	7,995.44	6,953.18 S	3,454.99 W	1,230,114.76	3,133,074.15	0.68	7,653.43	55.58	
17,585.00	90.31	179.83	7,995.18	7,048.18 S	3,454.96 W	1,230,019.77	3,133,074.70	0.46	7,744.40	-45.00	
17,680.00	90.56	180.32	7,994.46	7,143.17 S	3,455.09 W	1,229,924.77	3,133,075.10	0.58	7,835.41	62.97	

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured		True	Vertical	Local Coordinates		Map Coordinates		Dogleg	Vertical	Toolface	Comments
Depth	Inclination	Azimuth	Depth	Northing	Easting	Northing	Easting	Rate	Section	Angle	
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	(usft)	(°)	
17,775.00	90.62	180.73	7,993.48	7,238.16 S	3,455.96 W	1,229,829.78	3,133,074.75	0.44	7,926.63	81.67	
17,870.00	90.49	180.72	7,992.56	7,333.15 S	3,457.16 W	1,229,734.79	3,133,074.07	0.14	8,017.94	-175.60	
17,965.00	90.56	181.92	7,991.69	7,428.12 S	3,459.35 W	1,229,639.82	3,133,072.40	1.27	8,109.52	86.66	
18,060.00	90.56	180.53	7,990.76	7,523.09 S	3,461.38 W	1,229,544.84	3,133,070.89	1.46	8,201.06	-89.99	
18,154.00	90.56	178.56	7,989.84	7,617.08 S	3,460.63 W	1,229,450.86	3,133,072.16	2.10	8,290.85	-89.99	
18,249.00	90.19	179.41	7,989.22	7,712.06 S	3,458.95 W	1,229,355.89	3,133,074.36	0.98	8,381.33	113.52	
18,343.00	90.25	178.79	7,988.86	7,806.05 S	3,457.47 W	1,229,261.91	3,133,076.35	0.66	8,470.91	-84.47	
18,438.00	90.43	178.30	7,988.30	7,901.02 S	3,455.06 W	1,229,166.97	3,133,079.29	0.55	8,561.17	-69.83	
18,531.00	90.56	177.14	7,987.49	7,993.94 S	3,451.36 W	1,229,074.07	3,133,083.50	1.26	8,649.09	-83.60	
18,627.00	90.49	177.51	7,986.61	8,089.83 S	3,446.88 W	1,228,978.21	3,133,088.50	0.39	8,739.63	100.71	
18,722.00	90.68	178.77	7,985.64	8,184.77 S	3,443.80 W	1,228,883.28	3,133,092.11	1.34	8,829.67	81.42	
18,911.00	90.49	180.72	7,983.71	8,373.75 S	3,442.96 W	1,228,694.32	3,133,093.99	1.04	9,010.41	95.55	
19,006.00	90.06	181.68	7,983.26	8,468.73 S	3,444.94 W	1,228,599.34	3,133,092.52	1.11	9,101.93	114.13	
19,101.00	90.19	182.16	7,983.05	8,563.67 S	3,448.13 W	1,228,504.38	3,133,089.86	0.52	9,193.78	74.85	
19,196.00	90.19	182.40	7,982.73	8,658.60 S	3,451.91 W	1,228,409.44	3,133,086.60	0.25	9,285.77	90.00	
19,292.00	90.49	183.06	7,982.17	8,754.49 S	3,456.48 W	1,228,313.53	3,133,082.56	0.76	9,378.92	65.55	
19,387.00	90.49	181.57	7,981.35	8,849.40 S	3,460.32 W	1,228,218.59	3,133,079.24	1.57	9,470.92	-89.99	
19,482.00	90.49	181.43	7,980.54	8,944.37 S	3,462.80 W	1,228,123.62	3,133,077.27	0.15	9,562.58	-90.00	
19,577.00	90.43	180.16	7,979.78	9,039.35 S	3,464.12 W	1,228,028.63	3,133,076.48	1.34	9,653.93	-92.70	
19,673.00	90.25	178.44	7,979.21	9,135.34 S	3,462.95 W	1,227,932.66	3,133,078.18	1.80	9,745.51	-95.97	
19,768.00	89.88	177.81	7,979.10	9,230.29 S	3,459.84 W	1,227,837.73	3,133,081.81	0.77	9,835.55	-120.43	
19,958.00	90.06	178.39	7,979.20	9,420.18 S	3,453.54 W	1,227,647.88	3,133,089.15	0.32	10,015.59	72.76	
20,052.00	90.06	177.23	7,979.10	9,514.11 S	3,449.95 W	1,227,553.97	3,133,093.26	1.23	10,104.51	-90.00	
20,147.00	90.00	177.82	7,979.05	9,609.02 S	3,445.85 W	1,227,459.09	3,133,097.88	0.62	10,194.22	95.81	
20,243.00	89.94	178.71	7,979.10	9,704.98 S	3,442.94 W	1,227,363.15	3,133,101.32	0.93	10,285.28	93.86	
20,338.00	89.81	179.02	7,979.31	9,799.96 S	3,441.06 W	1,227,268.19	3,133,103.72	0.35	10,375.70	112.75	
20,433.00	89.69	178.32	7,979.72	9,894.93 S	3,438.85 W	1,227,173.23	3,133,106.45	0.75	10,466.02	-99.73	
20,529.00	89.88	178.83	7,980.08	9,990.90 S	3,436.47 W	1,227,077.28	3,133,109.36	0.57	10,557.24	69.57	
20,624.00	89.63	178.54	7,980.49	10,085.88 S	3,434.29 W	1,226,982.32	3,133,112.06	0.40	10,647.56	-130.76	
20,719.00	89.44	180.05	7,981.26	10,180.86 S	3,433.12 W	1,226,887.35	3,133,113.75	1.60	10,738.19	97.18	
20,815.00	89.44	179.40	7,982.20	10,276.86 S	3,432.66 W	1,226,791.36	3,133,114.74	0.68	10,829.99	-90.00	
20,910.00	89.44	179.61	7,983.13	10,371.85 S	3,431.83 W	1,226,696.38	3,133,116.08	0.22	10,920.72	90.00	
21,004.00	89.69	179.81	7,983.84	10,465.84 S	3,431.36 W	1,226,602.39	3,133,117.07	0.34	11,010.60	38.66	
21,099.00	89.63	179.79	7,984.41	10,560.84 S	3,431.03 W	1,226,507.40	3,133,117.93	0.07	11,101.49	-161.57	
21,195.00	89.88	182.10	7,984.82	10,656.82 S	3,432.61 W	1,226,411.41	3,133,116.87	2.42	11,193.86	83.83	
21,290.00	89.63	181.80	7,985.22	10,751.77 S	3,435.84 W	1,226,316.46	3,133,114.16	0.41	11,285.71	-129.81	
21,385.00	89.75	182.45	7,985.74	10,846.70 S	3,439.37 W	1,226,221.51	3,133,111.16	0.70	11,377.64	79.54	

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
				Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)				
21,481.00	90.00	182.30	7,985.95	10,942.62 S	3,443.34 W	1,226,125.57	3,133,107.71	0.30	11,470.64	-30.96	
21,576.00	90.12	182.39	7,985.85	11,037.54 S	3,447.23 W	1,226,030.64	3,133,104.34	0.16	11,562.67	36.87	
21,672.00	90.31	182.25	7,985.49	11,133.46 S	3,451.12 W	1,225,934.70	3,133,100.98	0.25	11,655.64	-36.38	
21,767.00	90.62	181.34	7,984.71	11,228.41 S	3,454.09 W	1,225,839.74	3,133,098.53	1.01	11,747.43	-71.18	
21,862.00	90.31	179.73	7,983.94	11,323.40 S	3,454.98 W	1,225,744.75	3,133,098.16	1.73	11,838.65	-100.89	Final Sperry MWD Survey at 21862.00' MD
21,955.00	90.31	179.73	7,983.44	11,416.39 S	3,454.54 W	1,225,651.76	3,133,099.11	0.00	11,927.59	0.00	Straight Line Projection to TD at 21955.00' MD

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
131.00	130.99	-1.31	0.11	First Atlas MWD Survey at 131.00' MD
1,558.00	1,554.69	16.79	-58.86	Final Atlas MWD Survey at 1558.00' MD
1,642.00	1,637.61	18.19	-72.22	First Sperry MWD Survey at 1642.00' MD
21,862.00	7,983.94	-11,323.40	-3,454.98	Final Sperry MWD Survey at 21862.00' MD
21,955.00	7,983.44	-11,416.39	-3,454.54	Straight Line Projection to TD at 21955.00' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	NORTHWEST A S20-25-10N_Plat BHL	196.73	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
131.00	1,558.00	Atlas MWD Surveys	3_MWD
1,642.00	21,862.00	Sperry MWD Surveys	3_MWD
21,955.00	21,955.00	PTB - No Survey	3_Blind

Design Report for NORTHWEST A S20-25-10N - Final Surveys

Design Targets

Target Name	Dip	Dip							
- hit/miss target	Angle	Dir.	TVD	+N/-S	+E/-W	Northing	Easting		
- Shape	()	()	()	()	()	()	()	Latitude	Longitude
()									

Directional Difficulty Index

Average Dogleg over Survey:	1.80 °/100usft	Maximum Dogleg over Survey:	15.20 °/100usft at 9,360.00 usft
Net Tortousity applicable to Plans:	0.94 °/100usft	Directional Difficulty Index:	7.256

Audit Info

North Reference Sheet for Sec. 09-T01S-R68W (NORTHWEST A S20-25 Pad) - NORTHWEST A S20-25-10N - OWB_20790

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

Vertical Depths are relative to KB = 29' @ 5343.00usft (Patterson 901). Northing and Easting are relative to NORTHWEST A S20-25-10N

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 -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996769

Grid Coordinates of Well: 1,237,086.58 usft N, 3,136,490.78 usft E

Geographical Coordinates of Well: 39.983158, -105.012918

Grid Convergence at Surface is: 0.31°

Based upon Minimum Curvature type calculations, at a Measured Depth of 21,955.00usft
the Bottom Hole Displacement is 11,927.61usft in the Direction of 196.84° (True).

Magnetic Convergence at surface is: -7.94° (1 November 2019, , BGGM2018)

