



Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	KP Kauffman Co, Inc.
Well Name & No.	Spade 1-12
API #	05-123-11567
County & State	Weld County, CO
SDI Job #	OP.013323
Rig	N/A
Survey Date	28-Sep-2018

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 0 feet to a measured depth of 7231.81 feet is true and correct as determined from all available records.

Seth M. Burstad

Signature

28-Sep-2018

Date

Seth M. Burstad

Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

KP Kauffman Co, Inc.

Weld County, CO

Spade

Spade 1-12

OH

Design: OH

Standard Survey Report

28 September, 2018



Company:	KP Kauffman Co, Inc.	Local Co-ordinate Reference:	Well Spade 1-12
Project:	Weld County, CO	TVD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Site:	Spade	MD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site	Spade, Site Center : Spade 1-12				
Site Position:		Northing:	1,389,521.53 usft	Latitude:	40° 24' 4.597 N
From:	Lat/Long	Easting:	3,156,509.91 usft	Longitude:	104° 56' 16.915 W
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence:	0.36 °

Well	Spade 1-12, 1980' FNL 1882' FWL Sec 18 T5N R67W					
Well Position	+N/-S	0.00 ft	Northing:	1,389,521.53 usft	Latitude:	40° 24' 4.597 N
	+E/-W	0.00 ft	Easting:	3,156,509.91 usft	Longitude:	104° 56' 16.915 W
Position Uncertainty		0.00 ft	Wellhead Elevation:	0.00 ft	Ground Level:	4,922.00 ft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/28/2018	8.45	66.73	52,231

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	256.770	

Survey Program	Date	9/28/2018			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
25.00	7,231.81	Survey #1 - Gyro Survey (OH)	SDI Standard Keeper 103	SDI Standard Wireline Keeper ver 1.0.3	

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.07	219.740	25.00	-0.01	-0.01	0.01	0.28	0.28	0.00
First SDI Gyro Survey									
50.00	0.14	219.740	50.00	-0.05	-0.04	0.05	0.28	0.28	0.00
75.00	0.22	219.740	75.00	-0.11	-0.09	0.11	0.32	0.32	0.00
100.00	0.29	211.600	100.00	-0.20	-0.15	0.19	0.31	0.28	-32.56
125.00	0.36	192.040	125.00	-0.33	-0.20	0.27	0.52	0.28	-78.24
150.00	0.30	201.740	150.00	-0.47	-0.24	0.34	0.33	-0.24	38.80
175.00	0.28	228.790	175.00	-0.57	-0.31	0.44	0.55	-0.08	108.20
200.00	0.29	223.410	200.00	-0.65	-0.40	0.54	0.11	0.04	-21.52
225.00	0.26	215.900	225.00	-0.75	-0.48	0.64	0.19	-0.12	-30.04

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Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
250.00	0.32	230.080	250.00	-0.84	-0.57	0.74	0.37	0.24	56.72
275.00	0.38	246.090	275.00	-0.91	-0.70	0.89	0.46	0.24	64.04
300.00	0.38	235.650	300.00	-1.00	-0.84	1.05	0.28	0.00	-41.76
325.00	0.41	228.930	325.00	-1.10	-0.98	1.20	0.22	0.12	-26.88
350.00	0.42	232.260	350.00	-1.22	-1.12	1.36	0.10	0.04	13.32
375.00	0.47	221.480	374.99	-1.35	-1.26	1.53	0.39	0.20	-43.12
400.00	0.50	218.900	399.99	-1.51	-1.39	1.70	0.15	0.12	-10.32
425.00	0.47	222.940	424.99	-1.67	-1.53	1.87	0.18	-0.12	16.16
450.00	0.48	219.950	449.99	-1.83	-1.67	2.04	0.11	0.04	-11.96
475.00	0.50	220.320	474.99	-1.99	-1.81	2.21	0.08	0.08	1.48
500.00	0.48	221.430	499.99	-2.15	-1.95	2.39	0.09	-0.08	4.44
525.00	0.50	225.410	524.99	-2.31	-2.09	2.56	0.16	0.08	15.92
550.00	0.49	226.160	549.99	-2.46	-2.25	2.75	0.05	-0.04	3.00
575.00	0.49	226.410	574.99	-2.60	-2.40	2.93	0.01	0.00	1.00
600.00	0.59	229.790	599.99	-2.76	-2.58	3.14	0.42	0.40	13.52
625.00	0.61	231.000	624.98	-2.93	-2.78	3.38	0.09	0.08	4.84
650.00	0.60	230.980	649.98	-3.09	-2.98	3.61	0.04	-0.04	-0.08
675.00	0.65	229.790	674.98	-3.27	-3.19	3.86	0.21	0.20	-4.76
700.00	0.68	232.140	699.98	-3.45	-3.42	4.12	0.16	0.12	9.40
725.00	0.67	231.720	724.98	-3.63	-3.65	4.39	0.04	-0.04	-1.68
750.00	0.71	234.380	749.98	-3.81	-3.89	4.66	0.20	0.16	10.64
775.00	0.71	238.560	774.97	-3.98	-4.15	4.95	0.21	0.00	16.72
800.00	0.67	235.910	799.97	-4.15	-4.40	5.24	0.20	-0.16	-10.60
825.00	0.68	228.420	824.97	-4.33	-4.64	5.50	0.35	0.04	-29.96
850.00	0.71	233.140	849.97	-4.52	-4.87	5.78	0.26	0.12	18.88
875.00	0.70	236.180	874.97	-4.70	-5.12	6.06	0.15	-0.04	12.16
900.00	0.72	233.730	899.97	-4.87	-5.37	6.35	0.15	0.08	-9.80
925.00	0.71	229.970	924.96	-5.07	-5.62	6.63	0.19	-0.04	-15.04
950.00	0.71	226.790	949.96	-5.27	-5.85	6.90	0.16	0.00	-12.72
975.00	0.73	231.400	974.96	-5.48	-6.09	7.18	0.25	0.08	18.44
1,000.00	0.72	240.160	999.96	-5.66	-6.35	7.48	0.44	-0.04	35.04
1,025.00	0.70	236.080	1,024.96	-5.82	-6.61	7.77	0.22	-0.08	-16.32
1,050.00	0.73	236.120	1,049.95	-5.99	-6.87	8.06	0.12	0.12	0.16
1,075.00	0.73	236.550	1,074.95	-6.17	-7.14	8.36	0.02	0.00	1.72
1,100.00	0.70	228.000	1,099.95	-6.36	-7.38	8.64	0.44	-0.12	-34.20
1,125.00	0.72	237.580	1,124.95	-6.55	-7.63	8.92	0.48	0.08	38.32
1,150.00	0.72	244.070	1,149.95	-6.70	-7.90	9.23	0.33	0.00	25.96
1,175.00	0.72	238.440	1,174.94	-6.85	-8.18	9.53	0.28	0.00	-22.52
1,200.00	0.75	230.140	1,199.94	-7.04	-8.44	9.82	0.44	0.12	-33.20
1,225.00	0.73	230.260	1,224.94	-7.24	-8.69	10.11	0.08	-0.08	0.48
1,250.00	0.74	236.140	1,249.94	-7.43	-8.94	10.41	0.30	0.04	23.52
1,275.00	0.73	235.500	1,274.94	-7.62	-9.21	10.71	0.05	-0.04	-2.56
1,300.00	0.72	234.420	1,299.93	-7.80	-9.47	11.00	0.07	-0.04	-4.32

Scientific Drilling, Intl
Survey Report



Company:	KP Kauffman Co, Inc.	Local Co-ordinate Reference:	Well Spade 1-12
Project:	Weld County, CO	TVD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Site:	Spade	MD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,325.00	0.71	232.030	1,324.93	-7.98	-9.72	11.29	0.13	-0.04	-9.56
1,350.00	0.74	237.280	1,349.93	-8.17	-9.97	11.58	0.29	0.12	21.00
1,375.00	0.76	245.880	1,374.93	-8.32	-10.26	11.89	0.46	0.08	34.40
1,400.00	0.77	243.370	1,399.93	-8.46	-10.56	12.22	0.14	0.04	-10.04
1,425.00	0.80	239.260	1,424.92	-8.63	-10.86	12.55	0.26	0.12	-16.44
1,450.00	0.76	232.730	1,449.92	-8.82	-11.15	12.87	0.39	-0.16	-26.12
1,475.00	0.75	227.220	1,474.92	-9.03	-11.40	13.16	0.29	-0.04	-22.04
1,500.00	0.76	233.350	1,499.92	-9.24	-11.65	13.46	0.33	0.04	24.52
1,525.00	0.74	238.560	1,524.91	-9.42	-11.92	13.76	0.28	-0.08	20.84
1,550.00	0.73	236.390	1,549.91	-9.60	-12.19	14.06	0.12	-0.04	-8.68
1,575.00	0.75	234.850	1,574.91	-9.78	-12.46	14.36	0.11	0.08	-6.16
1,600.00	0.75	243.350	1,599.91	-9.95	-12.74	14.68	0.44	0.00	34.00
1,625.00	0.79	251.320	1,624.91	-10.07	-13.05	15.01	0.46	0.16	31.88
1,650.00	0.82	251.050	1,649.90	-10.19	-13.38	15.36	0.12	0.12	-1.08
1,675.00	0.78	225.250	1,674.90	-10.36	-13.67	15.68	1.44	-0.16	-103.20
1,700.00	0.84	221.290	1,699.90	-10.62	-13.91	15.97	0.33	0.24	-15.84
1,725.00	0.88	220.180	1,724.90	-10.91	-14.16	16.28	0.17	0.16	-4.44
1,750.00	0.88	217.210	1,749.89	-11.21	-14.40	16.58	0.18	0.00	-11.88
1,775.00	0.88	219.470	1,774.89	-11.51	-14.63	16.88	0.14	0.00	9.04
1,800.00	0.87	224.710	1,799.89	-11.79	-14.89	17.19	0.32	-0.04	20.96
1,825.00	0.88	232.600	1,824.88	-12.04	-15.18	17.53	0.48	0.04	31.56
1,850.00	0.95	233.070	1,849.88	-12.28	-15.49	17.89	0.28	0.28	1.88
1,875.00	0.87	230.080	1,874.88	-12.53	-15.81	18.25	0.37	-0.32	-11.96
1,900.00	0.78	224.480	1,899.88	-12.77	-16.07	18.57	0.48	-0.36	-22.40
1,925.00	0.82	217.030	1,924.87	-13.04	-16.30	18.85	0.45	0.16	-29.80
1,950.00	0.83	214.320	1,949.87	-13.33	-16.51	19.12	0.16	0.04	-10.84
1,975.00	0.84	209.160	1,974.87	-13.64	-16.70	19.38	0.30	0.04	-20.64
2,000.00	0.83	209.570	1,999.86	-13.96	-16.88	19.62	0.05	-0.04	1.64
2,025.00	0.78	219.630	2,024.86	-14.24	-17.07	19.88	0.60	-0.20	40.24
2,050.00	0.77	219.090	2,049.86	-14.51	-17.29	20.15	0.05	-0.04	-2.16
2,075.00	0.73	217.790	2,074.86	-14.76	-17.49	20.41	0.17	-0.16	-5.20
2,100.00	0.72	217.060	2,099.86	-15.01	-17.69	20.65	0.05	-0.04	-2.92
2,125.00	0.63	210.000	2,124.85	-15.26	-17.85	20.87	0.49	-0.36	-28.24
2,150.00	0.64	205.910	2,149.85	-15.50	-17.98	21.05	0.19	0.04	-16.36
2,175.00	0.66	203.080	2,174.85	-15.76	-18.10	21.22	0.15	0.08	-11.32
2,200.00	0.67	202.690	2,199.85	-16.03	-18.21	21.39	0.04	0.04	-1.56
2,225.00	0.66	210.570	2,224.85	-16.29	-18.34	21.58	0.37	-0.04	31.52
2,250.00	0.64	214.260	2,249.85	-16.53	-18.49	21.78	0.19	-0.08	14.76
2,275.00	0.66	211.790	2,274.84	-16.76	-18.64	21.99	0.14	0.08	-9.88
2,300.00	0.69	211.780	2,299.84	-17.01	-18.80	22.19	0.12	0.12	-0.04
2,325.00	0.65	214.880	2,324.84	-17.26	-18.96	22.41	0.22	-0.16	12.40
2,350.00	0.66	220.350	2,349.84	-17.48	-19.13	22.63	0.25	0.04	21.88
2,375.00	0.66	223.470	2,374.84	-17.70	-19.33	22.86	0.14	0.00	12.48

Scientific Drilling, Intl
Survey Report



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Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
2,400.00	0.65	228.480	2,399.84	-17.90	-19.53	23.11	0.23	-0.04	20.04
2,425.00	0.67	232.820	2,424.83	-18.08	-19.75	23.37	0.22	0.08	17.36
2,450.00	0.68	236.260	2,449.83	-18.25	-19.99	23.64	0.17	0.04	13.76
2,475.00	0.68	233.580	2,474.83	-18.42	-20.24	23.92	0.13	0.00	-10.72
2,500.00	0.69	239.980	2,499.83	-18.58	-20.49	24.20	0.31	0.04	25.60
2,525.00	0.67	238.670	2,524.83	-18.74	-20.74	24.48	0.10	-0.08	-5.24
2,550.00	0.69	241.500	2,549.83	-18.88	-21.00	24.76	0.16	0.08	11.32
2,575.00	0.83	249.840	2,574.82	-19.02	-21.30	25.09	0.71	0.56	33.36
2,600.00	0.87	250.300	2,599.82	-19.14	-21.65	25.46	0.16	0.16	1.84
2,625.00	0.97	251.240	2,624.82	-19.28	-22.03	25.86	0.40	0.40	3.76
2,650.00	1.01	252.320	2,649.81	-19.41	-22.44	26.29	0.18	0.16	4.32
2,675.00	1.06	255.870	2,674.81	-19.53	-22.87	26.74	0.33	0.20	14.20
2,700.00	1.16	257.260	2,699.80	-19.65	-23.34	27.22	0.41	0.40	5.56
2,725.00	1.21	258.170	2,724.80	-19.76	-23.85	27.74	0.21	0.20	3.64
2,750.00	1.27	257.580	2,749.79	-19.87	-24.38	28.28	0.25	0.24	-2.36
2,775.00	1.37	260.430	2,774.79	-19.98	-24.94	28.85	0.48	0.40	11.40
2,800.00	1.37	261.930	2,799.78	-20.07	-25.53	29.45	0.14	0.00	6.00
2,825.00	1.42	264.410	2,824.77	-20.14	-26.14	30.06	0.31	0.20	9.92
2,850.00	1.45	266.430	2,849.76	-20.19	-26.76	30.67	0.24	0.12	8.08
2,875.00	1.43	266.360	2,874.76	-20.23	-27.39	31.29	0.08	-0.08	-0.28
2,900.00	1.53	275.640	2,899.75	-20.22	-28.03	31.92	1.04	0.40	37.12
2,925.00	1.57	278.280	2,924.74	-20.14	-28.70	32.55	0.33	0.16	10.56
2,950.00	1.57	278.610	2,949.73	-20.04	-29.38	33.19	0.04	0.00	1.32
2,975.00	1.57	277.930	2,974.72	-19.94	-30.06	33.82	0.07	0.00	-2.72
3,000.00	1.58	278.510	2,999.71	-19.84	-30.74	34.46	0.08	0.04	2.32
3,025.00	1.56	277.570	3,024.70	-19.74	-31.42	35.10	0.13	-0.08	-3.76
3,050.00	1.58	277.320	3,049.69	-19.66	-32.10	35.74	0.08	0.08	-1.00
3,075.00	1.63	274.360	3,074.68	-19.58	-32.79	36.41	0.39	0.20	-11.84
3,100.00	1.78	271.450	3,099.67	-19.55	-33.54	37.12	0.69	0.60	-11.64
3,125.00	1.87	269.520	3,124.66	-19.54	-34.33	37.89	0.44	0.36	-7.72
3,150.00	1.91	268.160	3,149.65	-19.56	-35.16	38.70	0.24	0.16	-5.44
3,175.00	2.01	269.520	3,174.63	-19.58	-36.01	39.54	0.44	0.40	5.44
3,200.00	2.13	272.450	3,199.61	-19.56	-36.91	40.41	0.64	0.48	11.72
3,225.00	2.19	277.560	3,224.60	-19.48	-37.85	41.30	0.81	0.24	20.44
3,250.00	2.24	284.990	3,249.58	-19.29	-38.80	42.18	1.17	0.20	29.72
3,275.00	2.27	290.940	3,274.56	-18.98	-39.73	43.02	0.94	0.12	23.80
3,300.00	2.37	297.090	3,299.54	-18.57	-40.65	43.83	1.07	0.40	24.60
3,325.00	1.80	296.330	3,324.52	-18.16	-41.47	44.52	2.28	-2.28	-3.04
3,350.00	1.52	306.700	3,349.51	-17.79	-42.08	45.04	1.64	-1.12	41.48
3,375.00	1.43	312.730	3,374.50	-17.38	-42.58	45.43	0.72	-0.36	24.12
3,400.00	1.40	318.910	3,399.50	-16.94	-43.01	45.74	0.62	-0.12	24.72
3,425.00	1.43	322.260	3,424.49	-16.46	-43.40	46.02	0.35	0.12	13.40
3,450.00	1.44	324.480	3,449.48	-15.96	-43.77	46.26	0.23	0.04	8.88
3,475.00	1.39	322.570	3,474.47	-15.46	-44.14	46.51	0.27	-0.20	-7.64

Company:	KP Kauffman Co, Inc.	Local Co-ordinate Reference:	Well Spade 1-12
Project:	Weld County, CO	TVD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Site:	Spade	MD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,500.00	1.42	322.240	3,499.46	-14.98	-44.51	46.76	0.12	0.12	-1.32
3,525.00	1.45	323.430	3,524.46	-14.48	-44.89	47.01	0.17	0.12	4.76
3,550.00	1.47	321.510	3,549.45	-13.97	-45.28	47.28	0.21	0.08	-7.68
3,575.00	1.47	320.370	3,574.44	-13.47	-45.68	47.56	0.12	0.00	-4.56
3,600.00	1.42	319.330	3,599.43	-12.99	-46.09	47.84	0.23	-0.20	-4.16
3,625.00	1.45	316.860	3,624.42	-12.53	-46.51	48.14	0.27	0.12	-9.88
3,650.00	1.48	319.010	3,649.42	-12.05	-46.94	48.45	0.25	0.12	8.60
3,675.00	1.49	320.410	3,674.41	-11.56	-47.36	48.74	0.15	0.04	5.60
3,700.00	1.54	320.190	3,699.40	-11.05	-47.78	49.04	0.20	0.20	-0.88
3,725.00	1.52	320.560	3,724.39	-10.54	-48.20	49.34	0.09	-0.08	1.48
3,750.00	1.49	320.250	3,749.38	-10.03	-48.62	49.63	0.12	-0.12	-1.24
3,775.00	1.40	317.280	3,774.37	-9.56	-49.04	49.92	0.47	-0.36	-11.88
3,800.00	1.26	313.660	3,799.37	-9.14	-49.44	50.22	0.65	-0.56	-14.48
3,825.00	1.17	313.120	3,824.36	-8.78	-49.83	50.52	0.36	-0.36	-2.16
3,850.00	0.98	307.780	3,849.36	-8.47	-50.18	50.79	0.86	-0.76	-21.36
3,875.00	0.77	297.150	3,874.35	-8.26	-50.50	51.05	1.06	-0.84	-42.52
3,900.00	0.62	278.810	3,899.35	-8.17	-50.79	51.31	1.07	-0.60	-73.36
3,925.00	0.68	257.490	3,924.35	-8.18	-51.06	51.58	0.99	0.24	-85.28
3,950.00	0.67	248.520	3,949.35	-8.26	-51.35	51.87	0.42	-0.04	-35.88
3,975.00	0.70	244.530	3,974.35	-8.38	-51.62	52.17	0.23	0.12	-15.96
4,000.00	0.69	244.320	3,999.35	-8.51	-51.89	52.46	0.04	-0.04	-0.84
4,025.00	0.67	241.850	4,024.34	-8.65	-52.16	52.75	0.14	-0.08	-9.88
4,050.00	0.66	243.160	4,049.34	-8.78	-52.41	53.03	0.07	-0.04	5.24
4,075.00	0.63	239.610	4,074.34	-8.92	-52.66	53.30	0.20	-0.12	-14.20
4,100.00	0.69	238.610	4,099.34	-9.06	-52.91	53.58	0.24	0.24	-4.00
4,125.00	0.61	236.370	4,124.34	-9.22	-53.15	53.85	0.34	-0.32	-8.96
4,150.00	0.56	227.810	4,149.34	-9.37	-53.35	54.08	0.40	-0.20	-34.24
4,175.00	0.57	225.610	4,174.33	-9.54	-53.53	54.29	0.10	0.04	-8.80
4,200.00	0.50	225.880	4,199.33	-9.70	-53.70	54.49	0.28	-0.28	1.08
4,225.00	0.50	221.980	4,224.33	-9.86	-53.85	54.67	0.14	0.00	-15.60
4,250.00	0.44	217.540	4,249.33	-10.02	-53.98	54.84	0.28	-0.24	-17.76
4,275.00	0.43	217.790	4,274.33	-10.17	-54.09	54.99	0.04	-0.04	1.00
4,300.00	0.38	223.340	4,299.33	-10.30	-54.21	55.13	0.25	-0.20	22.20
4,325.00	0.20	213.600	4,324.33	-10.40	-54.29	55.23	0.74	-0.72	-38.96
4,350.00	0.10	221.320	4,349.33	-10.45	-54.33	55.28	0.41	-0.40	30.88
4,375.00	0.05	220.250	4,374.33	-10.48	-54.35	55.31	0.20	-0.20	-4.28
4,400.00	0.04	267.590	4,399.33	-10.49	-54.37	55.32	0.15	-0.04	189.36
4,425.00	0.13	306.820	4,424.33	-10.47	-54.40	55.35	0.41	0.36	156.92
4,450.00	0.18	336.440	4,449.33	-10.42	-54.44	55.37	0.37	0.20	118.48
4,475.00	0.20	347.020	4,474.33	-10.34	-54.46	55.38	0.16	0.08	42.32
4,500.00	0.27	354.850	4,499.33	-10.24	-54.48	55.37	0.31	0.28	31.32
4,525.00	0.25	346.170	4,524.33	-10.13	-54.49	55.37	0.18	-0.08	-34.72
4,550.00	0.25	341.450	4,549.33	-10.02	-54.52	55.37	0.08	0.00	-18.88

Company:	KP Kauffman Co, Inc.	Local Co-ordinate Reference:	Well Spade 1-12
Project:	Weld County, CO	TVD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Site:	Spade	MD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,575.00	0.29	348.100	4,574.33	-9.91	-54.56	55.37	0.20	0.16	26.60
4,600.00	0.30	325.260	4,599.33	-9.79	-54.61	55.40	0.47	0.04	-91.36
4,625.00	0.30	325.710	4,624.33	-9.68	-54.68	55.44	0.01	0.00	1.80
4,650.00	0.35	327.790	4,649.33	-9.56	-54.76	55.49	0.21	0.20	8.32
4,675.00	0.39	331.510	4,674.33	-9.43	-54.84	55.54	0.19	0.16	14.88
4,700.00	0.39	327.170	4,699.33	-9.28	-54.93	55.59	0.12	0.00	-17.36
4,725.00	0.34	319.640	4,724.33	-9.15	-55.02	55.65	0.28	-0.20	-30.12
4,750.00	0.32	335.550	4,749.33	-9.03	-55.10	55.70	0.37	-0.08	63.64
4,775.00	0.36	329.110	4,774.33	-8.90	-55.17	55.74	0.22	0.16	-25.76
4,800.00	0.39	328.000	4,799.32	-8.76	-55.25	55.79	0.12	0.12	-4.44
4,825.00	0.36	327.590	4,824.32	-8.62	-55.34	55.84	0.12	-0.12	-1.64
4,850.00	0.37	330.140	4,849.32	-8.49	-55.42	55.89	0.08	0.04	10.20
4,875.00	0.34	332.370	4,874.32	-8.35	-55.50	55.93	0.13	-0.12	8.92
4,900.00	0.32	326.590	4,899.32	-8.23	-55.57	55.98	0.16	-0.08	-23.12
4,925.00	0.35	332.980	4,924.32	-8.10	-55.64	56.02	0.19	0.12	25.56
4,950.00	0.31	321.950	4,949.32	-7.98	-55.72	56.06	0.30	-0.16	-44.12
4,975.00	0.26	313.710	4,974.32	-7.89	-55.80	56.12	0.26	-0.20	-32.96
5,000.00	0.24	300.320	4,999.32	-7.82	-55.89	56.19	0.25	-0.08	-53.56
5,025.00	0.34	304.280	5,024.32	-7.75	-55.99	56.28	0.41	0.40	15.84
5,050.00	0.27	328.350	5,049.32	-7.66	-56.08	56.35	0.58	-0.28	96.28
5,075.00	0.17	308.300	5,074.32	-7.59	-56.14	56.39	0.50	-0.40	-80.20
5,100.00	0.14	329.800	5,099.32	-7.54	-56.19	56.42	0.26	-0.12	86.00
5,125.00	0.13	0.080	5,124.32	-7.48	-56.20	56.43	0.28	-0.04	121.12
5,150.00	0.19	338.760	5,149.32	-7.42	-56.22	56.42	0.33	0.24	-85.28
5,175.00	0.19	335.190	5,174.32	-7.34	-56.25	56.44	0.05	0.00	-14.28
5,200.00	0.29	306.270	5,199.32	-7.26	-56.32	56.49	0.62	0.40	-115.68
5,225.00	0.24	323.000	5,224.32	-7.19	-56.40	56.55	0.37	-0.20	66.92
5,250.00	0.20	328.000	5,249.32	-7.11	-56.46	56.59	0.18	-0.16	20.00
5,275.00	0.20	300.100	5,274.32	-7.05	-56.52	56.63	0.39	0.00	-111.60
5,300.00	0.16	305.560	5,299.32	-7.01	-56.58	56.69	0.17	-0.16	21.84
5,325.00	0.31	291.990	5,324.32	-6.96	-56.68	56.76	0.64	0.60	-54.28
5,350.00	0.48	285.490	5,349.32	-6.91	-56.84	56.91	0.70	0.68	-26.00
5,375.00	0.52	285.970	5,374.32	-6.85	-57.05	57.10	0.16	0.16	1.92
5,400.00	0.45	282.810	5,399.32	-6.79	-57.25	57.29	0.30	-0.28	-12.64
5,425.00	0.45	287.090	5,424.32	-6.74	-57.44	57.46	0.13	0.00	17.12
5,450.00	0.41	303.140	5,449.32	-6.67	-57.61	57.61	0.51	-0.16	64.20
5,475.00	0.09	311.270	5,474.31	-6.60	-57.70	57.68	1.28	-1.28	32.52
5,500.00	0.23	192.600	5,499.31	-6.64	-57.73	57.72	1.14	0.56	-474.68
5,525.00	0.20	242.720	5,524.31	-6.71	-57.78	57.78	0.74	-0.12	200.48
5,550.00	0.30	250.590	5,549.31	-6.75	-57.88	57.89	0.42	0.40	31.48
5,575.00	0.38	254.050	5,574.31	-6.80	-58.02	58.03	0.33	0.32	13.84
5,600.00	0.22	260.190	5,599.31	-6.83	-58.15	58.17	0.65	-0.64	24.56
5,625.00	0.34	247.700	5,624.31	-6.86	-58.26	58.29	0.54	0.48	-49.96

Company:	KP Kauffman Co, Inc.	Local Co-ordinate Reference:	Well Spade 1-12
Project:	Weld County, CO	TVD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Site:	Spade	MD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,650.00	0.33	253.270	5,649.31	-6.91	-58.40	58.43	0.14	-0.04	22.28
5,675.00	0.34	246.560	5,674.31	-6.96	-58.54	58.58	0.16	0.04	-26.84
5,700.00	0.35	250.230	5,699.31	-7.02	-58.68	58.73	0.10	0.04	14.68
5,725.00	0.26	232.240	5,724.31	-7.08	-58.79	58.85	0.52	-0.36	-71.96
5,750.00	0.36	227.840	5,749.31	-7.17	-58.90	58.97	0.41	0.40	-17.60
5,775.00	0.32	231.430	5,774.31	-7.26	-59.01	59.11	0.18	-0.16	14.36
5,800.00	0.29	235.520	5,799.31	-7.34	-59.12	59.23	0.15	-0.12	16.36
5,825.00	0.30	242.480	5,824.31	-7.41	-59.23	59.35	0.15	0.04	27.84
5,850.00	0.38	224.770	5,849.31	-7.50	-59.34	59.48	0.52	0.32	-70.84
5,875.00	0.38	225.920	5,874.31	-7.61	-59.46	59.62	0.03	0.00	4.60
5,900.00	0.39	227.800	5,899.31	-7.73	-59.58	59.77	0.06	0.04	7.52
5,925.00	0.46	231.100	5,924.31	-7.85	-59.72	59.94	0.30	0.28	13.20
5,950.00	0.48	232.030	5,949.31	-7.97	-59.89	60.12	0.09	0.08	3.72
5,975.00	0.55	223.060	5,974.31	-8.13	-60.05	60.32	0.43	0.28	-35.88
6,000.00	0.63	227.450	5,999.30	-8.31	-60.23	60.54	0.37	0.32	17.56
6,025.00	0.54	222.190	6,024.30	-8.49	-60.41	60.75	0.42	-0.36	-21.04
6,050.00	0.68	221.700	6,049.30	-8.69	-60.59	60.97	0.56	0.56	-1.96
6,075.00	0.74	221.450	6,074.30	-8.92	-60.80	61.22	0.24	0.24	-1.00
6,100.00	0.64	230.070	6,099.30	-9.13	-61.01	61.48	0.58	-0.40	34.48
6,125.00	0.62	228.320	6,124.30	-9.31	-61.22	61.72	0.11	-0.08	-7.00
6,150.00	0.56	224.950	6,149.30	-9.48	-61.41	61.95	0.28	-0.24	-13.48
6,175.00	0.64	228.840	6,174.29	-9.66	-61.60	62.17	0.36	0.32	15.56
6,200.00	0.76	230.390	6,199.29	-9.86	-61.83	62.45	0.49	0.48	6.20
6,225.00	0.76	229.790	6,224.29	-10.07	-62.08	62.74	0.03	0.00	-2.40
6,250.00	0.76	227.700	6,249.29	-10.29	-62.33	63.03	0.11	0.00	-8.36
6,275.00	0.83	227.250	6,274.29	-10.53	-62.59	63.34	0.28	0.28	-1.80
6,300.00	0.93	226.260	6,299.28	-10.79	-62.87	63.67	0.40	0.40	-3.96
6,325.00	0.93	228.260	6,324.28	-11.06	-63.17	64.02	0.13	0.00	8.00
6,350.00	0.92	231.300	6,349.28	-11.33	-63.47	64.38	0.20	-0.04	12.16
6,375.00	0.90	233.690	6,374.27	-11.57	-63.79	64.74	0.17	-0.08	9.56
6,400.00	1.04	232.990	6,399.27	-11.82	-64.13	65.13	0.56	0.56	-2.80
6,425.00	1.14	235.970	6,424.26	-12.10	-64.52	65.57	0.46	0.40	11.92
6,450.00	1.12	235.410	6,449.26	-12.37	-64.92	66.03	0.09	-0.08	-2.24
6,475.00	1.18	234.530	6,474.25	-12.66	-65.33	66.50	0.25	0.24	-3.52
6,500.00	1.22	236.390	6,499.25	-12.96	-65.77	66.99	0.22	0.16	7.44
6,525.00	1.32	235.800	6,524.24	-13.27	-66.23	67.50	0.40	0.40	-2.36
6,550.00	1.30	237.540	6,549.24	-13.58	-66.70	68.04	0.18	-0.08	6.96
6,575.00	1.29	238.570	6,574.23	-13.88	-67.18	68.58	0.10	-0.04	4.12
6,600.00	1.29	237.500	6,599.22	-14.18	-67.66	69.11	0.10	0.00	-4.28
6,625.00	1.28	237.980	6,624.22	-14.48	-68.13	69.64	0.06	-0.04	1.92
6,650.00	1.22	234.200	6,649.21	-14.78	-68.59	70.15	0.41	-0.24	-15.12
6,675.00	1.21	233.930	6,674.21	-15.09	-69.02	70.64	0.05	-0.04	-1.08
6,700.00	1.29	244.770	6,699.20	-15.37	-69.48	71.16	1.00	0.32	43.36
6,725.00	1.29	243.580	6,724.19	-15.61	-69.99	71.71	0.11	0.00	-4.76

Scientific Drilling, Intl
Survey Report



Company:	KP Kauffman Co, Inc.	Local Co-ordinate Reference:	Well Spade 1-12
Project:	Weld County, CO	TVD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Site:	Spade	MD Reference:	GL 4922' @ 4922.00ft (Ground Level)
Well:	Spade 1-12	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Casper District

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,750.00	1.26	246.470	6,749.19	-15.85	-70.49	72.25	0.28	-0.12	11.56
6,775.00	1.15	244.540	6,774.18	-16.07	-70.97	72.77	0.47	-0.44	-7.72
6,800.00	1.11	246.020	6,799.18	-16.27	-71.42	73.25	0.20	-0.16	5.92
6,825.00	1.08	246.110	6,824.17	-16.47	-71.86	73.72	0.12	-0.12	0.36
6,850.00	0.92	246.940	6,849.17	-16.64	-72.26	74.15	0.64	-0.64	3.32
6,875.00	0.68	247.700	6,874.17	-16.77	-72.58	74.49	0.96	-0.96	3.04
6,900.00	0.66	246.410	6,899.16	-16.89	-72.85	74.78	0.10	-0.08	-5.16
6,925.00	0.51	252.900	6,924.16	-16.98	-73.09	75.03	0.65	-0.60	25.96
6,950.00	0.47	252.950	6,949.16	-17.04	-73.29	75.25	0.16	-0.16	0.20
6,975.00	0.56	253.150	6,974.16	-17.11	-73.51	75.47	0.36	0.36	0.80
7,000.00	0.66	258.200	6,999.16	-17.17	-73.76	75.74	0.45	0.40	20.20
7,025.00	0.79	259.780	7,024.16	-17.23	-74.07	76.05	0.53	0.52	6.32
7,050.00	0.97	259.020	7,049.15	-17.30	-74.45	76.44	0.72	0.72	-3.04
7,075.00	0.95	262.810	7,074.15	-17.37	-74.87	76.85	0.27	-0.08	15.16
7,100.00	0.76	252.390	7,099.15	-17.45	-75.23	77.22	0.98	-0.76	-41.68
7,125.00	0.53	245.380	7,124.15	-17.54	-75.49	77.50	0.97	-0.92	-28.04
7,150.00	0.39	234.960	7,149.15	-17.64	-75.67	77.70	0.65	-0.56	-41.68
7,175.00	0.43	229.010	7,174.15	-17.75	-75.81	77.86	0.23	0.16	-23.80
7,200.00	0.10	205.810	7,199.15	-17.83	-75.89	77.95	1.36	-1.32	-92.80
7,225.00	0.20	70.280	7,224.15	-17.84	-75.86	77.92	1.12	0.40	-542.12
7,231.81	0.35	221.250	7,230.96	-17.85	-75.86	77.93	7.84	2.20	2,216.89
Last SDI Gyro Survey									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
25.00	25.00	-0.01	-0.01	First SDI Gyro Survey
7,231.81	7,230.96	-17.85	-75.86	Last SDI Gyro Survey

Checked By: _____ Approved By: _____ Date: _____