

Chama Oil and Minerals, LLC - SECO



Project: Cheyenne Co., CO
Site: Sec 36-T16S-R46W
Well: Kern State 36-16-46 1H
Wellbore: Sidetrack 1
Final Surveys
Rig: Xtreme 11

Surface Location:
SHL 600' FNL & 660' FEL Sec 36-T16S-R46W

US State Plane 1983
Colorado Southern Zone
Elevation: 4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Northing 1727313.49 Easting 3853396.11 Latitude 38° 37' 35.508 N Longitude 102° 30' 45.180 W

SECTION DETAILS Plan 7.1

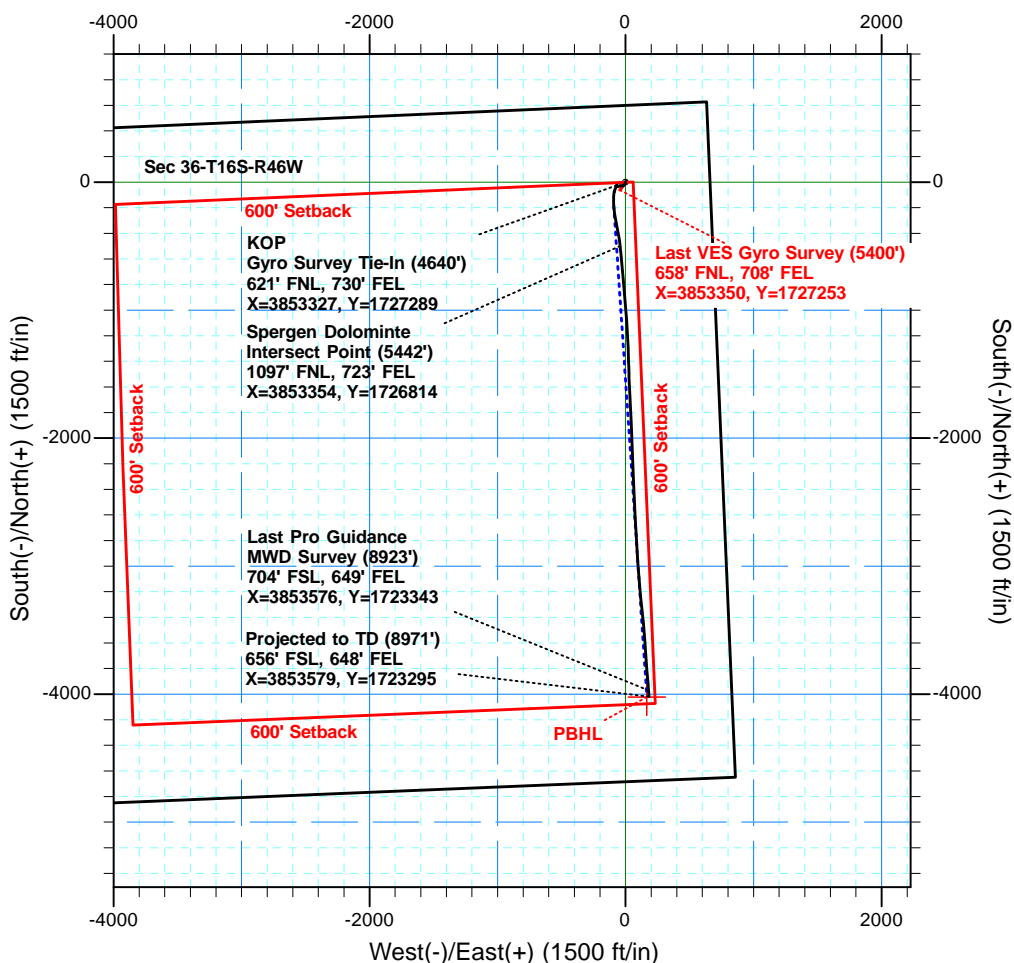
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
5085.00	46.50	175.70	5036.99	-187.16	-92.75	0.00	0.00	183.12	Survey Tie-In / Begin Build/Turn at 5085' MD, 5036' TVD
5535.64	90.00	176.15	5200.00	-594.72	-63.95	9.65	0.65	591.53	EOC at 5536' MD, 5200' TVD
8971.00	90.00	176.15	5200.00	-4022.31	166.95	0.00	0.00	4025.77	PBHL

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
PBHL	5200.00	-4022.31	166.95	38° 36' 55.718 N	102° 30' 44.698 W

To convert a Magnetic Direction to a Grid Direction, Add 5.46°

Magnetic Model: IGRF2010 Date: 11-Dec-12
Azimuths & Coordinates to NAD83 Grid



Azimuths to Grid North
True North: -1.83°
Magnetic North: 5.46°

Magnetic Field
Strength: 52261.6snT
Dip Angle: 65.91°
Date: 12/11/2012
Model: IGRF2010

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Surface Location:
 SHL 600' FNL & 660' FEL Sec 36-T16S-R46W

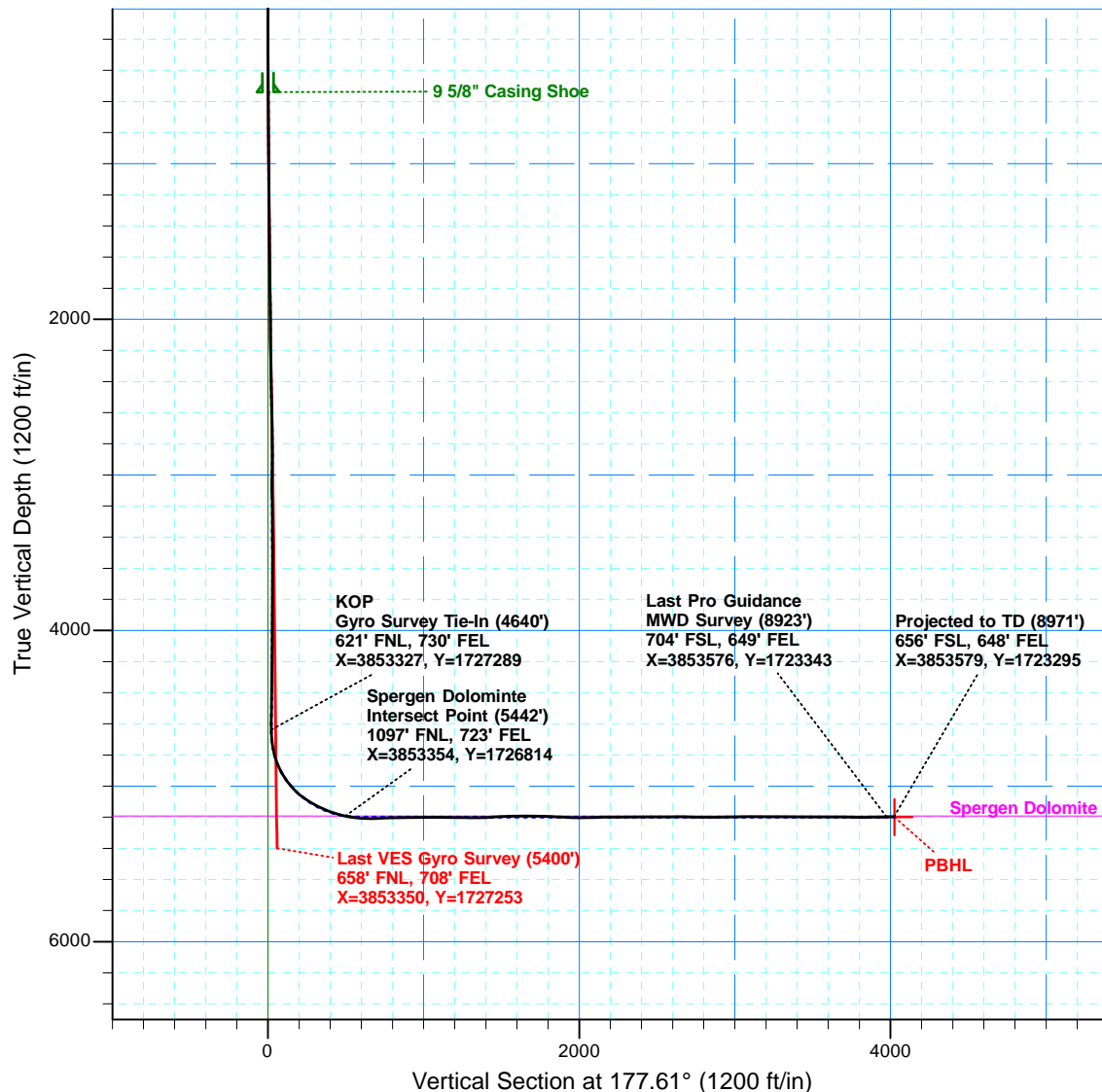
US State Plane 1983
 Colorado Southern Zone
 Elevation: 4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
 Northing 1727313.49 Easting 3853396.11 Latitude 38° 37' 35.508 N Longitude 102° 30' 45.180 W

SECTION DETAILS Plan 7.1

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
5085.00	46.50	175.70	5036.99	-187.16	-92.75	0.00	0.00	183.12	Survey Tie-In / Begin Build/Turn at 5085' MD, 5036' TVD
5535.64	90.00	176.15	5200.00	-594.72	-63.95	9.65	0.65	591.53	EOC at 5536' MD, 5200' TVD
8971.00	90.00	176.15	5200.00	-4022.31	166.95	0.00	0.00	4025.77	PBHL

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
PBHL	5200.00	-4022.31	166.95	38° 36' 55.718 N	102° 30' 44.698 W



Chama Oil and Minerals, LLC - SECO

Cheyenne Co., CO

Sec 36-T16S-R46W

Kern State 36-16-46 1H

Sidetrack 1

Design: Final Surveys

Standard Survey Report

17 April, 2013



Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Project		Cheyenne Co., CO	
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Southern Zone		

Site		Sec 36-T16S-R46W			
Site Position:		Northing:		1,727,313.49 ft	
From:	Lat/Long	Easting:		3,853,396.11 ft	
Position Uncertainty:		Slot Radius:		1.10000 ft	
				Latitude: 38° 37' 35.508 N	
				Longitude: 102° 30' 45.180 W	
				Grid Convergence: 1.83 °	

Well		Kern State 36-16-46 1H				
Well Position	+N/-S	0.00 ft	Northing:	1,727,313.49 ft	Latitude:	38° 37' 35.508 N
	+E/-W	0.00 ft	Easting:	3,853,396.11 ft	Longitude:	102° 30' 45.180 W
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	4,139.00 ft

Wellbore	Sidetrack 1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2012/12/11	7.29	65.91	52,262

Survey Program		Date	2013/04/17		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,800.00	VES Gyro Surveys (Original Hole)	CB-GYRO-MS	Gyro Multishot	
2,845.00	8,923.00	Pro Guidance MWD Surveys (Sidetrack 1)	MWD	MWD - Standard	
8,971.00	8,971.00	Projected to TD (Sidetrack 1)	Projection	Projection	

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,853,396.11	1,727,313.49	0.00
100.00	0.07	152.72	100.00	0.06	-0.05	0.03	3,853,396.13	1,727,313.44	0.07

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Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
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Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)	
200.00	0.15	161.43	200.00	0.24	-0.23	0.10	3,853,396.20	1,727,313.26	0.08	
300.00	0.19	170.35	300.00	0.53	-0.52	0.17	3,853,396.27	1,727,312.97	0.05	
400.00	0.23	179.26	400.00	0.89	-0.88	0.20	3,853,396.30	1,727,312.61	0.05	
500.00	0.34	191.17	500.00	1.38	-1.38	0.14	3,853,396.25	1,727,312.12	0.12	
600.00	0.44	203.09	600.00	2.02	-2.02	-0.07	3,853,396.04	1,727,311.47	0.13	
700.00	0.44	199.83	699.99	2.72	-2.73	-0.35	3,853,395.76	1,727,310.76	0.03	
800.00	0.44	196.56	799.99	3.44	-3.46	-0.59	3,853,395.52	1,727,310.03	0.03	
900.00	0.43	195.54	899.99	4.16	-4.19	-0.80	3,853,395.31	1,727,309.30	0.01	
1,000.00	0.42	194.52	999.98	4.86	-4.91	-0.99	3,853,395.12	1,727,308.58	0.01	
1,100.00	0.45	192.65	1,099.98	5.59	-5.65	-1.17	3,853,394.94	1,727,307.85	0.03	
1,200.00	0.48	190.77	1,199.98	6.38	-6.44	-1.33	3,853,394.78	1,727,307.05	0.03	
1,300.00	0.58	191.72	1,299.97	7.28	-7.35	-1.51	3,853,394.59	1,727,306.15	0.10	
1,400.00	0.68	192.66	1,399.97	8.34	-8.42	-1.74	3,853,394.36	1,727,305.07	0.10	
1,500.00	0.74	198.52	1,499.96	9.52	-9.62	-2.08	3,853,394.03	1,727,303.88	0.09	
1,600.00	0.80	204.38	1,599.95	10.75	-10.86	-2.57	3,853,393.53	1,727,302.63	0.10	
1,700.00	0.88	205.89	1,699.94	12.05	-12.19	-3.20	3,853,392.91	1,727,301.30	0.08	
1,800.00	0.96	207.40	1,799.93	13.45	-13.62	-3.92	3,853,392.19	1,727,299.87	0.08	
1,900.00	0.88	211.63	1,899.91	14.81	-15.02	-4.71	3,853,391.40	1,727,298.47	0.10	
2,000.00	0.79	215.86	1,999.90	15.99	-16.24	-5.51	3,853,390.59	1,727,297.26	0.11	
2,100.00	0.83	218.32	2,099.89	17.08	-17.36	-6.36	3,853,389.74	1,727,296.13	0.05	
2,200.00	0.87	220.78	2,199.88	18.18	-18.51	-7.31	3,853,388.80	1,727,294.99	0.05	
2,300.00	1.08	223.73	2,299.87	19.39	-19.76	-8.46	3,853,387.65	1,727,293.73	0.22	
2,400.00	1.29	226.69	2,399.85	20.78	-21.21	-9.93	3,853,386.18	1,727,292.28	0.22	
2,500.00	1.56	228.63	2,499.82	22.37	-22.89	-11.77	3,853,384.34	1,727,290.61	0.27	
2,600.00	1.83	230.57	2,599.77	24.19	-24.80	-14.02	3,853,382.08	1,727,288.69	0.28	
2,700.00	1.67	229.43	2,699.72	26.05	-26.76	-16.36	3,853,379.74	1,727,286.73	0.16	
2,800.00	1.51	228.29	2,799.69	27.79	-28.59	-18.45	3,853,377.65	1,727,284.91	0.16	

Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)	
2,845.00	1.60	237.40	2,844.67	28.48	-29.32	-19.43	3,853,376.68	1,727,284.18	0.58	
2,898.00	3.30	276.20	2,897.62	28.63	-29.55	-21.57	3,853,374.54	1,727,283.94	4.31	
2,931.00	4.70	282.80	2,930.54	28.13	-29.15	-23.83	3,853,372.28	1,727,284.34	4.46	
2,974.00	6.10	285.20	2,973.35	26.98	-28.16	-27.75	3,853,368.35	1,727,285.33	3.30	
3,016.00	6.40	281.60	3,015.10	25.74	-27.11	-32.20	3,853,363.91	1,727,286.39	1.17	
3,059.00	5.60	265.30	3,057.87	25.24	-26.80	-36.64	3,853,359.47	1,727,286.70	4.36	
3,102.00	4.90	251.10	3,100.69	25.85	-27.56	-40.47	3,853,355.64	1,727,285.93	3.42	
3,145.00	4.40	238.40	3,143.55	27.17	-29.02	-43.61	3,853,352.50	1,727,284.47	2.65	
3,187.00	4.10	252.50	3,185.43	28.35	-30.32	-46.41	3,853,349.69	1,727,283.18	2.58	
3,230.00	4.50	267.30	3,228.31	28.76	-30.86	-49.56	3,853,346.54	1,727,282.64	2.73	
3,273.00	4.60	270.70	3,271.18	28.68	-30.92	-52.97	3,853,343.13	1,727,282.58	0.67	
3,316.00	4.50	272.00	3,314.04	28.45	-30.84	-56.38	3,853,339.72	1,727,282.66	0.33	
3,358.00	4.50	266.30	3,355.91	28.37	-30.89	-59.67	3,853,336.43	1,727,282.61	1.06	
3,401.00	4.50	271.90	3,398.78	28.28	-30.94	-63.04	3,853,333.06	1,727,282.56	1.02	
3,444.00	3.00	264.70	3,441.69	28.21	-30.99	-65.85	3,853,330.26	1,727,282.51	3.65	
3,487.00	1.50	217.90	3,484.66	28.69	-31.54	-67.32	3,853,328.79	1,727,281.96	5.25	
3,529.00	1.40	180.30	3,526.64	29.63	-32.48	-67.66	3,853,328.45	1,727,281.01	2.24	
3,572.00	0.80	113.20	3,569.64	30.28	-33.13	-67.38	3,853,328.72	1,727,280.37	3.06	
3,615.00	1.00	95.70	3,612.63	30.46	-33.28	-66.73	3,853,329.37	1,727,280.21	0.79	
3,658.00	1.00	84.30	3,655.63	30.49	-33.28	-65.99	3,853,330.12	1,727,280.21	0.46	
3,700.00	1.10	74.40	3,697.62	30.38	-33.14	-65.23	3,853,330.87	1,727,280.36	0.49	
3,743.00	1.10	80.40	3,740.61	30.24	-32.96	-64.43	3,853,331.68	1,727,280.54	0.27	
3,786.00	0.60	36.00	3,783.61	30.01	-32.71	-63.89	3,853,332.22	1,727,280.79	1.84	
3,829.00	0.60	321.40	3,826.60	29.65	-32.35	-63.90	3,853,332.21	1,727,281.15	1.69	
3,871.00	0.50	316.30	3,868.60	29.33	-32.04	-64.16	3,853,331.94	1,727,281.45	0.26	
3,914.00	0.60	334.20	3,911.60	28.99	-31.70	-64.39	3,853,331.72	1,727,281.79	0.46	
3,957.00	0.70	332.80	3,954.60	28.54	-31.27	-64.61	3,853,331.50	1,727,282.23	0.24	

Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)	
4,000.00	0.90	342.70	3,997.59	27.98	-30.71	-64.83	3,853,331.28	1,727,282.78	0.56	
4,042.00	0.80	325.00	4,039.59	27.41	-30.16	-65.09	3,853,331.01	1,727,283.34	0.67	
4,085.00	0.70	336.20	4,082.59	26.91	-29.67	-65.37	3,853,330.73	1,727,283.82	0.41	
4,128.00	0.60	339.40	4,125.58	26.46	-29.22	-65.56	3,853,330.55	1,727,284.27	0.25	
4,171.00	0.80	342.70	4,168.58	25.95	-28.72	-65.73	3,853,330.38	1,727,284.77	0.47	
4,213.00	0.60	336.60	4,210.58	25.46	-28.24	-65.90	3,853,330.21	1,727,285.25	0.51	
4,256.00	0.60	314.70	4,253.57	25.09	-27.88	-66.15	3,853,329.96	1,727,285.62	0.53	
4,299.00	0.70	321.00	4,296.57	24.71	-27.51	-66.48	3,853,329.63	1,727,285.98	0.29	
4,342.00	0.60	316.60	4,339.57	24.33	-27.15	-66.80	3,853,329.31	1,727,286.35	0.26	
4,384.00	0.60	319.20	4,381.57	23.99	-26.82	-67.09	3,853,329.02	1,727,286.68	0.06	
4,427.00	0.60	314.40	4,424.56	23.65	-26.49	-67.40	3,853,328.71	1,727,287.00	0.12	
4,470.00	0.80	320.80	4,467.56	23.25	-26.10	-67.75	3,853,328.36	1,727,287.39	0.50	
4,513.00	0.80	306.80	4,510.56	22.82	-25.69	-68.18	3,853,327.93	1,727,287.81	0.45	
4,555.00	0.90	315.60	4,552.55	22.39	-25.28	-68.64	3,853,327.46	1,727,288.22	0.39	
4,598.00	0.80	314.70	4,595.55	21.92	-24.83	-69.09	3,853,327.01	1,727,288.67	0.23	
4,610.00	0.80	312.30	4,607.55	21.80	-24.71	-69.22	3,853,326.89	1,727,288.78	0.28	
4,640.00	0.50	246.10	4,637.54	21.70	-24.62	-69.49	3,853,326.62	1,727,288.87	2.51	
KOP / Gyro Survey Tie-In (4640') / 621' FNL, 730' FEL / X=3853327, Y=1727289										
4,670.00	3.10	194.50	4,667.53	22.52	-25.46	-69.81	3,853,326.29	1,727,288.03	9.39	
4,700.00	5.20	200.80	4,697.45	24.55	-27.52	-70.50	3,853,325.61	1,727,285.98	7.15	
4,730.00	8.30	200.60	4,727.24	27.79	-30.82	-71.74	3,853,324.36	1,727,282.68	10.33	
4,760.00	11.50	199.20	4,756.79	32.57	-35.67	-73.49	3,853,322.62	1,727,277.83	10.70	
4,790.00	14.50	202.40	4,786.01	38.76	-41.97	-75.91	3,853,320.20	1,727,271.53	10.28	
4,815.00	17.30	204.30	4,810.06	44.92	-48.25	-78.63	3,853,317.48	1,727,265.25	11.39	
4,845.00	20.40	203.90	4,838.44	53.60	-57.10	-82.58	3,853,313.52	1,727,256.40	10.34	
4,875.00	24.10	196.00	4,866.21	64.10	-67.77	-86.39	3,853,309.71	1,727,245.72	15.83	
4,905.00	27.70	189.80	4,893.20	76.74	-80.54	-89.27	3,853,306.84	1,727,232.96	15.00	

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4,935.00	30.40	186.40	4,919.42	91.06	-94.95	-91.30	3,853,304.80	1,727,218.54	10.55
4,965.00	33.20	184.30	4,944.92	106.72	-110.69	-92.76	3,853,303.34	1,727,202.80	10.03
4,995.00	36.40	181.60	4,969.55	123.76	-127.78	-93.63	3,853,302.48	1,727,185.71	11.84
5,025.00	39.60	181.10	4,993.19	142.19	-146.25	-94.06	3,853,302.05	1,727,167.25	10.72
5,055.00	43.10	178.10	5,015.71	161.99	-166.06	-93.90	3,853,302.20	1,727,147.44	13.40
5,085.00	46.50	175.70	5,036.99	183.12	-187.16	-92.75	3,853,303.36	1,727,126.34	12.66
5,115.00	50.00	173.50	5,056.97	205.46	-209.43	-90.63	3,853,305.48	1,727,104.06	12.88
5,145.00	54.50	171.60	5,075.33	229.08	-232.95	-87.54	3,853,308.56	1,727,080.55	15.81
5,175.00	57.80	170.60	5,092.04	253.83	-257.56	-83.69	3,853,312.42	1,727,055.94	11.34
5,205.00	60.30	169.50	5,107.47	279.34	-282.89	-79.24	3,853,316.87	1,727,030.60	8.91
5,235.00	61.80	168.80	5,121.99	305.30	-308.67	-74.30	3,853,321.81	1,727,004.82	5.40
5,265.00	63.80	169.70	5,135.70	331.70	-334.89	-69.32	3,853,326.79	1,726,978.61	7.18
5,295.00	66.90	169.20	5,148.21	358.69	-361.69	-64.33	3,853,331.78	1,726,951.81	10.44
5,325.00	68.60	170.10	5,159.57	386.18	-389.00	-59.34	3,853,336.77	1,726,924.49	6.31
5,355.00	70.90	170.90	5,169.95	414.11	-416.76	-54.70	3,853,341.41	1,726,896.73	8.06
5,385.00	73.50	171.00	5,179.12	442.48	-444.97	-50.20	3,853,345.90	1,726,868.53	8.67
5,415.00	76.10	171.70	5,186.99	471.26	-473.58	-45.85	3,853,350.25	1,726,839.91	8.95
5,442.00	78.44	172.96	5,192.94	497.48	-499.68	-42.34	3,853,353.77	1,726,813.81	9.79
Spergen Dolomite Intersect Point (5442') / 1097' FNL, 723' FEL / X=3853354, Y=1726814 - Spergen Dolomite									
5,445.00	78.70	173.10	5,193.53	500.41	-502.60	-41.98	3,853,354.12	1,726,810.89	9.79
5,475.00	80.90	174.20	5,198.85	529.86	-531.94	-38.72	3,853,357.39	1,726,781.55	8.17
5,495.00	82.60	174.50	5,201.71	549.62	-551.64	-36.77	3,853,359.34	1,726,761.85	8.63
5,537.00	85.00	173.30	5,206.25	591.29	-593.15	-32.33	3,853,363.77	1,726,720.34	6.38
5,568.00	87.80	174.40	5,208.20	622.15	-623.91	-29.02	3,853,367.09	1,726,689.58	9.70
5,598.00	91.10	175.40	5,208.48	652.12	-653.79	-26.35	3,853,369.75	1,726,659.71	11.49
5,629.00	91.70	176.00	5,207.73	683.09	-684.69	-24.03	3,853,372.08	1,726,628.80	2.74
5,660.00	91.30	175.70	5,206.92	714.06	-715.60	-21.79	3,853,374.32	1,726,597.90	1.61

Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)
5,690.00	91.70	175.60	5,206.13	744.04	-745.50	-19.51	3,853,376.60	1,726,567.99	1.37
5,721.00	92.10	175.60	5,205.10	775.00	-776.39	-17.13	3,853,378.97	1,726,537.10	1.29
5,752.00	91.30	174.90	5,204.18	805.96	-807.27	-14.57	3,853,381.54	1,726,506.22	3.43
5,782.00	91.50	174.80	5,203.45	835.92	-837.14	-11.88	3,853,384.23	1,726,476.35	0.75
5,813.00	92.00	174.80	5,202.50	866.86	-868.00	-9.07	3,853,387.04	1,726,445.49	1.61
5,843.00	90.90	174.70	5,201.74	896.82	-897.87	-6.32	3,853,389.78	1,726,415.63	3.68
5,874.00	90.40	174.80	5,201.39	927.78	-928.73	-3.49	3,853,392.62	1,726,384.76	1.64
5,905.00	90.70	174.70	5,201.10	958.74	-959.60	-0.65	3,853,395.46	1,726,353.89	1.02
5,936.00	90.20	175.40	5,200.85	989.70	-990.48	2.02	3,853,398.13	1,726,323.01	2.77
5,966.00	90.90	175.60	5,200.56	1,019.68	-1,020.39	4.38	3,853,400.48	1,726,293.10	2.43
5,997.00	90.00	176.50	5,200.32	1,050.67	-1,051.32	6.51	3,853,402.62	1,726,262.18	4.11
6,028.00	89.20	176.50	5,200.54	1,081.66	-1,082.26	8.41	3,853,404.51	1,726,231.24	2.58
6,058.00	89.40	176.50	5,200.90	1,111.65	-1,112.20	10.24	3,853,406.34	1,726,201.30	0.67
6,089.00	89.60	176.30	5,201.17	1,142.65	-1,143.14	12.18	3,853,408.29	1,726,170.36	0.91
6,119.00	89.10	176.50	5,201.51	1,172.64	-1,173.07	14.07	3,853,410.17	1,726,140.42	1.80
6,150.00	88.90	176.50	5,202.06	1,203.63	-1,204.01	15.96	3,853,412.07	1,726,109.48	0.65
6,181.00	89.60	177.10	5,202.46	1,234.62	-1,234.96	17.69	3,853,413.80	1,726,078.53	2.97
6,211.00	89.90	177.70	5,202.59	1,264.62	-1,264.93	19.05	3,853,415.16	1,726,048.57	2.24
6,242.00	89.20	177.30	5,202.84	1,295.62	-1,295.90	20.40	3,853,416.51	1,726,017.60	2.60
6,273.00	89.30	177.70	5,203.24	1,326.62	-1,326.87	21.75	3,853,417.86	1,725,986.63	1.33
6,303.00	91.00	178.00	5,203.16	1,356.62	-1,356.84	22.88	3,853,418.99	1,725,956.65	5.75
6,348.00	92.90	178.50	5,201.63	1,401.58	-1,401.79	24.25	3,853,420.36	1,725,911.70	4.37
6,390.00	93.50	179.00	5,199.29	1,443.51	-1,443.72	25.17	3,853,421.27	1,725,869.78	1.86
6,435.00	93.50	178.80	5,196.54	1,488.41	-1,488.63	26.03	3,853,422.14	1,725,824.87	0.44
6,480.00	92.50	178.00	5,194.18	1,533.35	-1,533.55	27.29	3,853,423.39	1,725,779.95	2.84
6,524.00	89.70	177.40	5,193.34	1,577.33	-1,577.50	29.05	3,853,425.16	1,725,736.00	6.51
6,569.00	89.60	177.00	5,193.61	1,622.33	-1,622.44	31.25	3,853,427.35	1,725,691.05	0.92

Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)
6,612.00	90.20	177.60	5,193.69	1,665.33	-1,665.40	33.27	3,853,429.38	1,725,648.10	1.97
6,670.00	90.40	177.30	5,193.39	1,723.33	-1,723.34	35.85	3,853,431.96	1,725,590.16	0.62
6,715.00	89.30	177.30	5,193.50	1,768.33	-1,768.29	37.97	3,853,434.08	1,725,545.21	2.44
6,759.00	86.00	177.00	5,195.31	1,812.28	-1,812.19	40.16	3,853,436.27	1,725,501.31	7.53
6,804.00	86.80	176.90	5,198.13	1,857.19	-1,857.04	42.55	3,853,438.66	1,725,456.46	1.79
6,847.00	87.50	177.10	5,200.27	1,900.14	-1,899.92	44.80	3,853,440.90	1,725,413.57	1.69
6,890.00	88.20	176.80	5,201.88	1,943.10	-1,942.83	47.08	3,853,443.19	1,725,370.66	1.77
6,933.00	89.00	177.30	5,202.94	1,986.09	-1,985.76	49.30	3,853,445.40	1,725,327.73	2.19
6,977.00	90.50	177.80	5,203.13	2,030.09	-2,029.72	51.18	3,853,447.28	1,725,283.77	3.59
7,020.00	91.90	178.10	5,202.23	2,073.07	-2,072.68	52.71	3,853,448.82	1,725,240.81	3.33
7,063.00	92.50	177.80	5,200.58	2,116.04	-2,115.62	54.25	3,853,450.36	1,725,197.87	1.56
7,095.00	91.10	178.40	5,199.57	2,148.02	-2,147.59	55.31	3,853,451.42	1,725,165.91	4.76
7,140.00	89.30	177.80	5,199.41	2,193.02	-2,192.56	56.80	3,853,452.91	1,725,120.93	4.22
7,184.00	89.30	178.00	5,199.95	2,237.02	-2,236.53	58.42	3,853,454.52	1,725,076.97	0.45
7,227.00	90.50	177.80	5,200.03	2,280.01	-2,279.50	59.99	3,853,456.10	1,725,034.00	2.83
7,270.00	91.00	177.80	5,199.46	2,323.01	-2,322.46	61.64	3,853,457.75	1,724,991.03	1.16
7,313.00	90.40	177.70	5,198.94	2,366.01	-2,365.43	63.33	3,853,459.44	1,724,948.07	1.41
7,358.00	89.90	177.70	5,198.82	2,411.01	-2,410.39	65.14	3,853,461.24	1,724,903.10	1.11
7,400.00	90.10	177.60	5,198.82	2,453.01	-2,452.35	66.86	3,853,462.96	1,724,861.14	0.53
7,443.00	89.80	177.10	5,198.86	2,496.01	-2,495.31	68.85	3,853,464.95	1,724,818.19	1.36
7,488.00	89.40	177.10	5,199.17	2,541.00	-2,540.25	71.12	3,853,467.23	1,724,773.25	0.89
7,532.00	91.10	177.10	5,198.98	2,585.00	-2,584.19	73.35	3,853,469.46	1,724,729.30	3.86
7,575.00	91.70	176.80	5,197.93	2,627.98	-2,627.12	75.64	3,853,471.74	1,724,686.38	1.56
7,618.00	89.40	176.50	5,197.52	2,670.97	-2,670.04	78.15	3,853,474.25	1,724,643.46	5.39
7,661.00	87.80	176.30	5,198.57	2,713.95	-2,712.94	80.85	3,853,476.95	1,724,600.55	3.75
7,703.00	88.70	176.70	5,199.85	2,755.92	-2,754.84	83.41	3,853,479.52	1,724,558.65	2.34
7,746.00	89.50	176.60	5,200.53	2,798.91	-2,797.76	85.92	3,853,482.03	1,724,515.73	1.87

Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)
7,791.00	90.40	176.80	5,200.56	2,843.90	-2,842.69	88.51	3,853,484.62	1,724,470.81	2.05
7,834.00	91.20	176.60	5,199.96	2,886.89	-2,885.61	90.99	3,853,487.09	1,724,427.88	1.92
7,877.00	91.20	176.40	5,199.06	2,929.88	-2,928.52	93.61	3,853,489.72	1,724,384.97	0.47
7,919.00	90.70	176.10	5,198.37	2,971.86	-2,970.43	96.36	3,853,492.47	1,724,343.07	1.39
7,962.00	90.40	176.10	5,197.95	3,014.84	-3,013.32	99.28	3,853,495.39	1,724,300.17	0.70
8,007.00	89.90	175.80	5,197.84	3,059.82	-3,058.21	102.46	3,853,498.57	1,724,255.28	1.30
8,049.00	90.10	175.50	5,197.84	3,101.80	-3,100.09	105.65	3,853,501.75	1,724,213.40	0.86
8,093.00	89.60	175.10	5,197.95	3,145.76	-3,143.94	109.25	3,853,505.36	1,724,169.55	1.46
8,135.00	90.30	174.70	5,197.99	3,187.71	-3,185.78	112.99	3,853,509.09	1,724,127.72	1.92
8,178.00	90.40	174.30	5,197.73	3,230.65	-3,228.58	117.11	3,853,513.21	1,724,084.92	0.96
8,221.00	89.90	174.20	5,197.61	3,273.58	-3,271.36	121.42	3,853,517.52	1,724,042.13	1.19
8,265.00	90.00	173.40	5,197.65	3,317.48	-3,315.10	126.17	3,853,522.27	1,723,998.39	1.83
8,308.00	89.60	174.20	5,197.80	3,360.38	-3,357.85	130.81	3,853,526.92	1,723,955.64	2.08
8,350.00	89.90	174.10	5,197.99	3,402.31	-3,399.63	135.09	3,853,531.20	1,723,913.86	0.75
8,393.00	89.70	174.80	5,198.14	3,445.24	-3,442.43	139.25	3,853,535.36	1,723,871.07	1.69
8,436.00	90.20	175.20	5,198.17	3,488.20	-3,485.26	143.00	3,853,539.10	1,723,828.23	1.49
8,479.00	90.00	175.40	5,198.10	3,531.16	-3,528.12	146.52	3,853,542.63	1,723,785.37	0.66
8,521.00	89.20	176.40	5,198.39	3,573.14	-3,570.01	149.52	3,853,545.63	1,723,743.48	3.05
8,564.00	89.50	176.40	5,198.88	3,616.13	-3,612.92	152.22	3,853,548.33	1,723,700.57	0.70
8,607.00	89.50	176.10	5,199.25	3,659.11	-3,655.83	155.04	3,853,551.14	1,723,657.67	0.70
8,650.00	90.30	176.00	5,199.33	3,702.10	-3,698.73	158.00	3,853,554.10	1,723,614.77	1.87
8,692.00	89.80	175.40	5,199.29	3,744.07	-3,740.61	161.15	3,853,557.25	1,723,572.89	1.86
8,735.00	88.50	175.60	5,199.93	3,787.04	-3,783.47	164.52	3,853,560.63	1,723,530.02	3.06
8,778.00	90.00	175.30	5,200.49	3,830.00	-3,826.33	167.93	3,853,564.04	1,723,487.17	3.56
8,821.00	90.80	175.30	5,200.19	3,872.97	-3,869.18	171.46	3,853,567.56	1,723,444.31	1.86
8,863.00	90.70	174.90	5,199.64	3,914.92	-3,911.03	175.04	3,853,571.15	1,723,402.47	0.98
8,906.00	92.40	176.10	5,198.48	3,957.88	-3,953.88	178.42	3,853,574.52	1,723,359.62	4.84

Professional Directional LTD
Standard Survey Report



Company:	Chama Oil and Minerals, LLC - SECO	Local Co-ordinate Reference:	Well Kern State 36-16-46 1H
Project:	Cheyenne Co., CO	TVD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Site:	Sec 36-T16S-R46W	MD Reference:	4139' GL + 20' KB @ 4159.00ft (Xtreme 11)
Well:	Kern State 36-16-46 1H	North Reference:	Grid
Wellbore:	Sidetrack 1	Survey Calculation Method:	Minimum Curvature
Design:	Final Surveys	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	TVD (ft)	Vertical Section (ft)	N/S (ft)	E/W (ft)	Easting (ft)	Northing (ft)	Dog Leg Severity (°/100ft)
8,923.00	91.90	176.10	5,197.84	3,974.86	-3,970.82	179.57	3,853,575.68	1,723,342.67	2.94
Last Pro Guidance MWD Survey (8923') / 704' FSL, 649' FEL / X=3853576, Y=1723343									
8,971.00	91.90	176.10	5,196.25	4,022.82	-4,018.69	182.83	3,853,578.94	1,723,294.81	0.00
Projected to TD (8971') / 656' FSL, 648' FEL / X=3853579, Y=1723295									

Formations						
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)	
5,442.00	5,192.94	Spergen Dolomite		0.00		

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
4,640.00	4,637.54	-24.62	-69.49	KOP / Gyro Survey Tie-In (4640') / 621' FNL, 730' FEL / X=3853327, Y=172728	
5,442.00	5,192.94	-499.68	-42.34	Spergen Dolomite Intersect Point (5442') / 1097' FNL, 723' FEL / X=3853354, Y=1723343	
8,923.00	5,197.84	-3,970.82	179.57	Last Pro Guidance MWD Survey (8923') / 704' FSL, 649' FEL / X=3853576, Y=1723343	
8,971.00	5,196.25	-4,018.69	182.83	Projected to TD (8971') / 656' FSL, 648' FEL / X=3853579, Y=1723295	