




## Directional Survey Certification

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

<b>Operator</b>	Quicksilver Resources
<b>Well Name &amp; No.</b>	Pirtlaw Partners 24-33
<b>County &amp; State</b>	Routt County, CO
<b>SDI Job No.</b>	42DEF1208129
<b>Rig</b>	DHS 6

I, Janie Collins, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 1250 feet to a measured depth of 7,880 feet is true and correct as determined from all available records.

  
Signature

21-Aug-12  
Date

**Janie Collins**  
Grand Junction Well Planner  
Scientific Drilling - Rocky Mountain District

# **Quicksilver Resources, Inc.**

**Routt County, CO NAD83**

**Pirtlaw Partners, Ltd.**

**Pirtlaw Partners, Ltd 24-33**

**OH**

**Design: OH**

## **Standard Survey Report**

**21 August, 2012**



# Scientific Drilling International

## Survey Report



<b>Company:</b>	Quicksilver Resources, Inc.	<b>Local Co-ordinate Reference:</b>	Well Pirtlaw Partners, Ltd 24-33
<b>Project:</b>	Routt County, CO NAD83	<b>TVD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
<b>Site:</b>	Pirtlaw Partners, Ltd.	<b>MD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
<b>Well:</b>	Pirtlaw Partners, Ltd 24-33	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	Rockies Compass Server

<b>Project</b>	Routt County, CO NAD83, Sec. 9 T6N R87W		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		

<b>Site</b>	Pirtlaw Partners, Ltd.		
<b>Site Position:</b>		<b>Northing:</b>	1,435,166.56 usft
<b>From:</b>	Map	<b>Easting:</b>	2,539,722.49 usft
<b>Position Uncertainty:</b>	0.00 ft	<b>Slot Radius:</b>	0.000 in
		<b>Latitude:</b>	40° 30' 58.097 N
		<b>Longitude:</b>	107° 9' 20.062 W
		<b>Grid Convergence:</b>	-1.07 °

<b>Well</b>	Pirtlaw Partners, Ltd 24-33		
<b>Well Position</b>	<b>+N/-S</b>	0.00 ft	<b>Northing:</b> 1,435,166.56 usft
	<b>+E/-W</b>	0.00 ft	<b>Easting:</b> 2,539,722.49 usft
<b>Position Uncertainty</b>	0.00 ft	<b>Wellhead Elevation:</b>	ft
		<b>Latitude:</b>	40° 30' 58.097 N
		<b>Longitude:</b>	107° 9' 20.062 W
		<b>Ground Level:</b>	6,944.46 ft

<b>Wellbore</b>	OH		
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>
	IGRF2010	8/10/2012	9.94
			<b>Dip Angle (°)</b> 66.69
			<b>Field Strength (nT)</b> 52,779

<b>Design</b>	OH		
<b>Audit Notes:</b>			
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL
		<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>
	0.00	0.00	0.00
			<b>Direction (°)</b> 81.46

<b>Survey Program</b>	<b>Date</b>	8/21/2012		
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
157.00	1,250.00	Survey #1 - Surface MWD (OH)	MWD SDI	MWD - Standard ver 1.0.1
1,320.00	7,880.00	Survey #2 - Production MWD (OH)	MWD SDI	MWD - Standard ver 1.0.1

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Turn Rate (°/100ft)</b>
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
157.00	0.53	64.39	157.00	0.31	0.65	0.69	0.34	0.34	0.00
<b>First SDI Surface MWD</b>									
248.00	0.53	64.12	247.99	0.68	1.41	1.50	0.00	0.00	-0.30
343.00	0.26	70.45	342.99	0.94	2.01	2.13	0.29	-0.28	6.66
438.00	0.70	79.15	437.99	1.12	2.78	2.92	0.47	0.46	9.16
533.00	1.58	80.82	532.97	1.44	4.65	4.81	0.93	0.93	1.76
628.00	2.37	85.48	627.91	1.81	7.90	8.08	0.85	0.83	4.91
722.00	3.34	84.34	721.79	2.23	12.56	12.75	1.03	1.03	-1.21
817.00	4.13	85.13	816.59	2.79	18.72	18.93	0.83	0.83	0.83

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## Survey Report



<b>Company:</b>	Quicksilver Resources, Inc.	<b>Local Co-ordinate Reference:</b>	Well Pirtlaw Partners, Ltd 24-33
<b>Project:</b>	Routt County, CO NAD83	<b>TVD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
<b>Site:</b>	Pirtlaw Partners, Ltd.	<b>MD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
<b>Well:</b>	Pirtlaw Partners, Ltd 24-33	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	Rockies Compass Server

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)
910.00	3.78	82.40	909.37	3.48	25.10	25.34	0.43	-0.38	-2.94
1,005.00	2.99	80.65	1,004.20	4.30	30.65	30.95	0.84	-0.83	-1.84
1,100.00	3.25	80.56	1,099.06	5.14	35.75	36.12	0.27	0.27	-0.09
1,193.00	4.04	80.03	1,191.87	6.14	41.58	42.03	0.85	0.85	-0.57
Last SDI Surface MWD									
1,250.00	4.04	80.03	1,248.73	6.84	45.53	46.04	0.00	0.00	0.00
Projection to TD									
1,320.00	4.13	80.50	1,318.55	7.68	50.45	51.03	0.14	0.13	0.67
First SDI Production MWD									
1,415.00	2.02	19.78	1,413.43	9.82	54.39	55.24	3.79	-2.22	-63.92
1,509.00	1.67	244.08	1,507.41	10.78	53.72	54.72	3.64	-0.37	-144.36
1,603.00	0.97	328.81	1,601.39	10.87	52.07	53.11	1.97	-0.74	90.14
1,698.00	1.06	291.36	1,696.38	11.87	50.84	52.04	0.69	0.09	-39.42
1,792.00	1.06	283.81	1,790.36	12.40	49.18	50.48	0.15	0.00	-8.03
1,886.00	0.79	275.19	1,884.35	12.66	47.69	49.05	0.32	-0.29	-9.17
1,980.00	0.53	314.74	1,978.34	13.03	46.74	48.16	0.54	-0.28	42.07
2,074.00	1.23	283.01	2,072.33	13.56	45.45	46.96	0.88	0.74	-33.76
2,168.00	1.41	269.30	2,166.31	13.77	43.31	44.87	0.39	0.19	-14.59
2,263.00	0.62	277.83	2,261.29	13.83	41.63	43.22	0.84	-0.83	8.98
2,358.00	0.62	272.82	2,356.29	13.93	40.61	42.23	0.06	0.00	-5.27
2,448.00	1.06	308.41	2,446.28	14.47	39.47	41.18	0.74	0.49	39.54
2,546.00	1.85	291.01	2,544.25	15.60	37.28	39.19	0.91	0.81	-17.76
2,641.00	1.41	306.22	2,639.21	16.84	34.91	37.02	0.65	-0.46	16.01
2,735.00	1.14	349.90	2,733.19	18.44	33.81	36.17	1.04	-0.29	46.47
2,829.00	1.23	280.03	2,827.17	19.54	32.65	35.19	1.45	0.10	-74.33
2,923.00	1.06	289.78	2,921.15	20.01	30.84	33.47	0.27	-0.18	10.37
3,002.57	1.78	268.39	3,000.70	20.22	28.91	31.59	1.11	0.91	-26.88
Pirtlaw Partners Ltd 24-33 INT Target									
3,017.00	1.93	266.31	3,015.12	20.20	28.44	31.13	1.11	1.01	-14.43
3,111.00	1.58	278.27	3,109.08	20.28	25.58	28.31	0.54	-0.37	12.72
3,205.00	0.79	324.59	3,203.06	21.00	23.92	26.78	1.26	-0.84	49.28
3,300.00	0.62	331.62	3,298.05	21.98	23.30	26.31	0.20	-0.18	7.40
3,394.00	1.76	250.14	3,392.03	21.94	21.70	24.72	1.89	1.21	-86.68
3,488.00	0.26	276.86	3,486.02	21.48	20.13	23.10	1.63	-1.60	28.43
3,582.00	0.79	52.39	3,580.01	21.90	20.43	23.46	1.06	0.56	144.18
3,677.00	1.49	70.93	3,674.99	22.70	22.12	25.25	0.82	0.74	19.52
3,771.00	1.49	136.68	3,768.97	22.21	24.11	27.14	1.72	0.00	69.95
3,865.00	1.14	235.64	3,862.95	20.79	24.18	27.00	2.14	-0.37	105.28
3,960.00	1.76	233.80	3,957.92	19.40	22.22	24.86	0.65	0.65	-1.94
4,054.00	0.79	144.85	4,051.90	18.02	21.43	23.87	2.04	-1.03	-94.63
4,148.00	1.58	219.29	4,145.89	16.48	20.98	23.20	1.67	0.84	79.19
4,242.00	1.93	208.92	4,239.84	14.10	19.40	21.27	0.50	0.37	-11.03
4,336.00	1.32	213.32	4,333.80	11.81	18.04	19.59	0.66	-0.65	4.68
4,430.00	1.67	244.87	4,427.77	10.32	16.20	17.55	0.94	0.37	33.56

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<b>Project:</b>	Routt County, CO NAD83	<b>TVD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
<b>Site:</b>	Pirtlaw Partners, Ltd.	<b>MD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
<b>Well:</b>	Pirtlaw Partners, Ltd 24-33	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	Rockies Compass Server

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)
4,525.00	1.76	228.43	4,522.73	8.76	13.86	15.00	0.52	0.09	-17.31
4,619.00	1.14	239.16	4,616.70	7.33	11.97	12.93	0.72	-0.66	11.41
4,713.00	0.26	102.66	4,710.70	6.80	11.38	12.26	1.43	-0.94	-145.21
4,807.00	0.18	15.48	4,804.70	6.90	11.63	12.52	0.33	-0.09	-92.74
4,902.00	0.35	69.00	4,899.70	7.14	11.94	12.87	0.30	0.18	56.34
4,996.00	0.44	25.14	4,993.69	7.57	12.36	13.35	0.33	0.10	-46.66
5,089.00	1.06	311.75	5,086.69	8.47	11.87	12.99	1.10	0.67	-78.91
5,184.00	2.64	92.82	5,181.66	8.95	13.40	14.58	3.71	1.66	148.49
5,278.00	2.73	109.17	5,275.56	8.10	17.67	18.68	0.82	0.10	17.39
5,373.00	0.53	287.58	5,370.53	7.49	19.39	20.29	3.43	-2.32	187.80
5,467.00	2.55	308.41	5,464.49	8.92	17.34	18.47	2.19	2.15	22.16
5,561.00	3.78	315.97	5,558.34	12.45	13.55	15.25	1.38	1.31	8.04
5,656.00	0.18	287.32	5,653.27	14.75	11.23	13.29	3.81	-3.79	-30.16
5,750.00	0.79	45.62	5,747.27	15.25	11.55	13.69	0.95	0.65	125.85
5,813.00	1.41	11.78	5,810.26	16.31	12.02	14.31	1.39	0.98	-53.71
5,941.00	3.43	16.44	5,938.14	21.52	13.42	16.47	1.58	1.58	3.64
6,035.00	2.02	75.15	6,032.04	24.65	15.82	19.31	3.13	-1.50	62.46
6,130.00	0.79	176.40	6,127.02	24.42	17.48	20.92	2.43	-1.29	106.58
6,224.00	1.58	207.69	6,221.00	22.63	16.92	20.09	1.06	0.84	33.29
6,318.00	1.58	189.50	6,314.97	20.20	16.10	18.93	0.53	0.00	-19.35
6,411.00	1.85	238.37	6,407.93	18.15	14.61	17.15	1.55	0.29	52.55
6,506.00	2.11	203.12	6,502.88	15.74	12.62	14.82	1.29	0.27	-37.11
6,599.00	0.62	184.14	6,595.85	13.66	11.91	13.81	1.65	-1.60	-20.41
6,693.00	1.06	212.53	6,689.84	12.42	11.41	13.13	0.63	0.47	30.20
6,787.00	1.67	312.63	6,783.82	12.61	9.93	11.70	2.26	0.65	106.49
6,881.00	0.79	222.72	6,877.80	13.07	8.49	10.33	1.96	-0.94	-95.65
6,975.00	1.41	201.10	6,971.79	11.51	7.63	9.26	0.78	0.66	-23.00
7,070.00	2.20	217.18	7,066.74	8.97	6.11	7.37	0.98	0.83	16.93
7,165.00	1.67	238.01	7,161.69	6.78	3.83	4.80	0.92	-0.56	21.93
7,259.00	2.46	218.77	7,255.63	4.48	1.41	2.06	1.11	0.84	-20.47
7,353.00	3.78	192.49	7,349.49	-0.12	-0.53	-0.54	2.04	1.40	-27.96
7,447.00	1.58	158.82	7,443.38	-4.35	-0.73	-1.37	2.78	-2.34	-35.82
7,541.00	2.02	246.63	7,537.35	-6.22	-1.78	-2.69	2.68	0.47	93.41
7,636.00	3.08	275.98	7,632.26	-6.61	-5.86	-6.77	1.74	1.12	30.89
7,730.00	1.58	324.59	7,726.19	-5.29	-9.12	-9.81	2.51	-1.60	51.71
7,803.86	0.76	18.50	7,800.04	-4.00	-9.56	-10.04	1.74	-1.11	72.99
Pirtlaw Partners Ltd 24-33 PHBL									
7,824.00	0.79	44.65	7,820.17	-3.78	-9.42	-9.87	1.74	0.17	129.83
7,835.00	0.97	29.36	7,831.17	-3.64	-9.32	-9.75	2.68	1.64	-139.00
Last SDI Production MWD									
7,880.00	0.97	29.36	7,876.16	-2.98	-8.94	-9.29	0.00	0.00	0.00
Projection to TD									

# Scientific Drilling International

## Survey Report



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<b>Project:</b>	Routt County, CO NAD83	<b>TVD Reference:</b>	GL 6944.46' & RKB 16' @ 6960.46ft
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<b>Well:</b>	Pirtlaw Partners, Ltd 24-33	<b>North Reference:</b>	True
<b>Wellbore:</b>	OH	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	OH	<b>Database:</b>	Rockies Compass Server

### Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
157.00	157.00	0.31	0.65	First SDI Surface MWD
1,193.00	1,191.87	6.14	41.58	Last SDI Surface MWD
1,250.00	1,248.73	6.84	45.53	Projection to TD
1,320.00	1,318.55	7.68	50.45	First SDI Production MWD
7,835.00	7,831.17	-3.64	-9.32	Last SDI Production MWD
7,880.00	7,876.16	-2.98	-8.94	Projection to TD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_