



Directional Survey

Well Name HAYHURST 17 FEDERAL 001H		Lease Hayhurst 17 Federal		Field Name Cottonwood Draw		Business Unit Mid-Continent	
Ground Elevation (ft) 3,244.90	Original RKB (ft) 3,276.00	Current RKB Elevation 3,276.00, 2/19/2014				Mud Line Elevation (ft) 0.00	Water Depth (ft) 0.00

Wellbore Name Original Hole		Parent Wellbore Original Hole		Kick Off Depth (ftKB) 6,880		Vertical Section Direction (°) 173.67	
UTM Northing (Y) (ft)			UTM Easting (X) (ft)			UTM Grid Zone	
Date 2/19/2014		Definitive? Y		Description MWD		Planned? N	
MD Tie In (ftKB)		TVDTie In (ftKB)		Inclination Tie In (°)		Azimuth Tie In (°)	
				NSTie In (ft)		EWTie In (ft)	

Survey Data

MD (ftKB)	Incl (°)	Azm (°)	TVD (ftKB)	NS (ft)	EW (ft)	VS (ft)	DLS (°/100ft)	Method	Survey Company	Build (°/100ft)	Depart (ft)	Turn (°/100ft)	Unuse d data
			0.00	0.00	0.00	0.00	0.00	Gyro MWD	Halliburton	0.00	0.00	0.00	N
495	1.75	207.97	494.92					Gyro MWD	Halliburton	0.35			N
682	1.69	210.87	681.84				0.06	Gyro MWD	Halliburton	-0.03		1.55	N
869	1.09	200.47	868.78				0.35	Gyro MWD	Halliburton	-0.32		-5.56	N
1,054	1.21	222.69	1,053.75				0.25	Gyro MWD	Halliburton	0.06		12.01	N
1,245	1.07	240.71	1,244.71				0.20	Gyro MWD	Halliburton	-0.07		9.43	N
1,435	0.47	118.25	1,434.70				0.73	Gyro MWD	Halliburton	-0.32		-64.45	N
1,624	0.88	103.00	1,623.69				0.23	Gyro MWD	Halliburton	0.22		-8.07	N
1,814	2.26	94.93	1,813.61				0.73	Gyro MWD	Halliburton	0.73		-4.25	N
1,976	1.56	87.90	1,975.52				0.45	Gyro MWD	Halliburton	-0.43		-4.34	N
2,109	0.65	75.39	2,108.49				0.70	Gyro MWD	Halliburton	-0.68		-9.41	N
2,299	0.69	72.00	2,298.48				0.03	Gyro MWD	Halliburton	0.02		-1.78	N
2,490	0.60	97.11	2,489.47				0.15	Gyro MWD	Halliburton	-0.05		13.15	N
2,680	0.40	112.98	2,679.46				0.13	Gyro MWD	Halliburton	-0.11		8.35	N
2,870	0.36	139.40	2,869.46				0.09	Gyro MWD	Halliburton	-0.02		13.91	N
3,060	0.41	101.93	3,059.45				0.13	Gyro MWD	Halliburton	0.03		-19.72	N
3,251	0.28	164.15	3,250.45				0.20	Gyro MWD	Halliburton	-0.07		32.58	N
3,631	0.40	229.58	3,630.44				0.10	Gyro MWD	Halliburton	0.03		17.22	N
3,822	0.25	231.38	3,821.44				0.08	Gyro MWD	Halliburton	-0.08		0.94	N
4,012	0.37	199.85	4,011.44				0.11	Gyro MWD	Halliburton	0.06		-16.59	N
4,202	0.64	238.80	4,201.43				0.22	Gyro MWD	Halliburton	0.14		20.50	N
4,392	0.66	252.57	4,391.42				0.08	Gyro MWD	Halliburton	0.01		7.25	N
4,582	0.54	247.30	4,581.41				0.07	Gyro MWD	Halliburton	-0.06		-2.77	N
4,773	0.52	215.36	4,772.40				0.15	Gyro MWD	Halliburton	-0.01		-16.72	N
4,963	0.53	214.22	4,962.39				0.01	Gyro MWD	Halliburton	0.01		-0.60	N
5,154	0.59	175.46	5,153.39				0.20	Gyro MWD	Halliburton	0.03		-20.29	N

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Ground Elevation (ft) 3 244.90	Original RKB (ft) 3 276.00	Current RKB Elevation 3 276.00, 2/19/2014				Mud Line Elevation (ft) 0.00	Water Depth (ft) 0.00

Survey Data

MD (ftKB)	Incl (°)	Azm (°)	TVD (ftKB)	NS (ft)	EW (ft)	VS (ft)	DLS (°/100ft)	Method	Survey Company	Build (°/100ft)	Depart (ft)	Turn (°/100ft)	Unuse d data
5,291	0.72	172.56	5,290.38				0.10	Gyro MWD	Halliburton	0.09		-2.12	N
5,418	0.91	186.35	5,417.36				0.21	Gyro MWD	Halliburton	0.15		10.86	N
5,608	1.04	187.14	5,607.34				0.07	Gyro MWD	Halliburton	0.07		0.42	N
5,792	1.47	237.66	5,791.30				0.62	Gyro MWD	Halliburton	0.23		27.46	N
5,987	0.94	204.13	5,986.25				0.44	Gyro MWD	Halliburton	-0.27		-17.19	N
6,177	1.55	161.18	6,176.21				0.57	Gyro MWD	Halliburton	0.32		-22.61	N
6,367	1.76	155.60	6,366.13				0.14	Gyro MWD	Halliburton	0.11		-2.94	N
6,558	1.70	138.42	6,557.05				0.27	Gyro MWD	Halliburton	-0.03		-8.99	N
6,749	1.10	178.43	6,747.99				0.58	Gyro MWD	Halliburton	-0.31		20.95	N
6,843	1.55	173.48	6,841.97				0.49	Gyro MWD	Halliburton	0.48		-5.27	N
6,907	5.11	169.38	6,905.85				5.57	Gyro MWD	Halliburton	5.56		-6.41	N
6,938	8.33	166.95	6,936.63				10.43	Gyro MWD	Halliburton	10.39		-7.84	N
6,970	11.55	165.99	6,968.15				10.08	Gyro MWD	Halliburton	10.06		-3.00	N
7,001	14.92	164.54	6,998.32				10.92	Gyro MWD	Halliburton	10.87		-4.68	N
7,033	17.94	164.46	7,029.01				9.44	Gyro MWD	Halliburton	9.44		-0.25	N
7,065	21.06	166.34	7,059.17				9.94	Gyro MWD	Halliburton	9.75		5.87	N
7,096	23.85	165.61	7,087.82				9.04	Gyro MWD	Halliburton	9.00		-2.35	N
7,128	26.16	165.12	7,116.82				7.25	Gyro MWD	Halliburton	7.22		-1.53	N
7,160	29.23	166.26	7,145.15				9.74	Gyro MWD	Halliburton	9.59		3.56	N
7,191	32.25	167.86	7,171.79				10.09	Gyro MWD	Halliburton	9.74		5.16	N
7,223	34.79	167.24	7,198.47				8.01	Gyro MWD	Halliburton	7.94		-1.94	N
7,253	36.71	166.77	7,222.81				6.47	Gyro MWD	Halliburton	6.40		-1.57	N
7,285	40.43	166.41	7,247.83				11.65	Gyro MWD	Halliburton	11.63		-1.13	N
7,316	45.86	166.59	7,270.44				17.52	Gyro MWD	Halliburton	17.52		0.58	N
7,348	51.58	167.25	7,291.54				17.94	Gyro MWD	Halliburton	17.88		2.06	N
7,380	57.35	167.56	7,310.13				18.05	Gyro MWD	Halliburton	18.03		0.97	N
7,412	62.08	167.28	7,326.26				14.80	Gyro MWD	Halliburton	14.78		-0.88	N
7,443	66.59	166.06	7,339.69				14.97	Gyro MWD	Halliburton	14.55		-3.94	N
7,466	69.31	165.95	7,348.32				11.83	Gyro MWD	Halliburton	11.83		-0.48	N



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Survey Data													
MD (ftKB)	Incl (°)	Azm (°)	TVD (ftKB)	NS (ft)	EW (ft)	VS (ft)	DLS (°/100ft)	Method	Survey Company	Build (°/100ft)	Depart (ft)	Turn (°/100ft)	Unuse d data
7,498	73.27	166.35	7,358.58				12.43	Gyro MWD	Halliburton	12.38		1.25	N
7,530	75.86	167.20	7,367.10				8.49	Gyro MWD	Halliburton	8.09		2.66	N
7,561	77.48	167.98	7,374.25				5.77	Gyro MWD	Halliburton	5.23		2.52	N
7,593	79.01	169.74	7,380.77				7.20	Gyro MWD	Halliburton	4.78		5.50	N
7,624	80.76	172.56	7,386.21				10.59	Gyro MWD	Halliburton	5.65		9.10	N
7,656	81.19	172.71	7,391.23				1.42	Gyro MWD	Halliburton	1.34		0.47	N
7,688	82.43	173.21	7,395.79				4.17	Gyro MWD	Halliburton	3.88		1.56	N
7,720	85.81	174.05	7,399.07				10.88	Gyro MWD	Halliburton	10.56		2.63	N
7,814	90.74	174.88	7,401.90				5.32	Gyro MWD	Halliburton	5.24		0.88	N
7,909	91.85	174.77	7,399.75				1.17	Gyro MWD	Halliburton	1.17		-0.12	N
8,005	90.28	173.44	7,397.97				2.14	Gyro MWD	Halliburton	-1.64		-1.39	N
8,100	90.59	172.13	7,397.24				1.42	Gyro MWD	Halliburton	0.33		-1.38	N
8,195	88.92	171.94	7,397.65				1.77	Gyro MWD	Halliburton	-1.76		-0.20	N
8,290	88.86	171.22	7,399.49				0.76	Gyro MWD	Halliburton	-0.06		-0.76	N
8,386	89.91	171.46	7,400.52				1.12	Gyro MWD	Halliburton	1.09		0.25	N
8,480	91.08	170.73	7,399.71				1.47	Gyro MWD	Halliburton	1.24		-0.78	N
8,576	87.26	171.72	7,401.10				4.11	Gyro MWD	Halliburton	-3.98		1.03	N
8,671	86.66	171.56	7,406.14				0.65	Gyro MWD	Halliburton	-0.63		-0.17	N
8,766	87.63	171.06	7,410.87				1.15	Gyro MWD	Halliburton	1.02		-0.53	N
8,862	87.90	171.10	7,414.61				0.28	Gyro MWD	Halliburton	0.28		0.04	N
8,956	88.67	170.79	7,417.43				0.88	Gyro MWD	Halliburton	0.82		-0.33	N
9,051	89.11	171.04	7,419.27				0.53	Gyro MWD	Halliburton	0.46		0.26	N
9,147	89.72	170.92	7,420.25				0.65	Gyro MWD	Halliburton	0.64		-0.13	N
9,242	89.60	174.02	7,420.81				3.27	Gyro MWD	Halliburton	-0.13		3.26	N
9,336	89.91	174.91	7,421.21				1.00	Gyro MWD	Halliburton	0.33		0.95	N
9,527	91.45	174.85	7,418.95				0.81	Gyro MWD	Halliburton	0.81		-0.03	N
9,622	92.62	174.59	7,415.57				1.26	Gyro MWD	Halliburton	1.23		-0.27	N
9,718	90.37	174.22	7,413.07				2.38	Gyro MWD	Halliburton	-2.34		-0.39	N
9,812	90.80	173.98	7,412.11				0.52	Gyro MWD	Halliburton	0.46		-0.26	N



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10,003	88.40	173.25	7,413.44				1.31	Gyro MWD	Halliburton	-1.26		-0.38	N
10,098	88.28	174.10	7,416.19				0.90	Gyro MWD	Halliburton	-0.13		0.89	N
10,193	89.08	173.73	7,418.38				0.93	Gyro MWD	Halliburton	0.84		-0.39	N
10,288	90.03	173.31	7,419.12				1.09	Gyro MWD	Halliburton	1.00		-0.44	N
10,384	90.77	173.52	7,418.45				0.80	Gyro MWD	Halliburton	0.77		0.22	N
10,479	91.54	172.96	7,416.54				1.00	Gyro MWD	Halliburton	0.81		-0.59	N
10,574	89.48	173.46	7,415.69				2.23	Gyro MWD	Halliburton	-2.17		0.53	N
10,670	89.75	173.32	7,416.33				0.32	Gyro MWD	Halliburton	0.28		-0.15	N
10,765	90.80	173.23	7,415.88				1.11	Gyro MWD	Halliburton	1.11		-0.09	N
10,859	91.67	173.03	7,413.85				0.95	Gyro MWD	Halliburton	0.93		-0.21	N
10,954	89.44	173.53	7,412.93				2.41	Gyro MWD	Halliburton	-2.35		0.53	N
11,049	89.72	173.56	7,413.63				0.30	Gyro MWD	Halliburton	0.29		0.03	N
11,144	90.86	173.49	7,413.15				1.20	Gyro MWD	Halliburton	1.20		-0.07	N
11,239	88.68	175.24	7,413.53				2.94	Gyro MWD	Halliburton	-2.29		1.84	N
11,336	89.23	175.61	7,415.30				0.68	Gyro MWD	Halliburton	0.57		0.38	N
11,431	89.69	175.50	7,416.19				0.50	Gyro MWD	Halliburton	0.48		-0.12	N
11,526	90.31	175.43	7,416.19				0.66	Gyro MWD	Halliburton	0.65		-0.07	N
11,621	91.36	175.69	7,414.81				1.14	Gyro MWD	Halliburton	1.11		0.27	N
11,717	92.61	175.36	7,411.48				1.35	Gyro MWD	Halliburton	1.30		-0.34	N
11,812	91.54	175.35	7,408.04				1.13	Gyro MWD	Halliburton	-1.13		-0.01	N
11,907	91.69	175.32	7,405.37				0.16	Gyro MWD	Halliburton	0.16		-0.03	N
12,003	92.93	175.41	7,401.50				1.30	Gyro MWD	Halliburton	1.29		0.09	N
12,083	93.80	175.11	7,396.80				1.15	Gyro MWD	Halliburton	1.09		-0.37	N
12,151	93.80	175.11	7,392.30				0.00	Gyro MWD	Halliburton	0.00		0.00	N