

DIRECTIONAL SURVEY CALCULATION

MINIMUM CURVATURE METHOD

Well Name		Target Direction		Slot		N / S		E / W		Hole Size		Calculation by		Date	
Main 2924 1-13H		181.28		Coordinate										1/28/13	
Job Number		Type of Survey		Tie-in Point								Directional Co.			
0															
Measured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate		Dogleg Severity	Build Up °/100 ft	Walk/ °/100 ft					
						N + / S -	E + / W -								
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>							
250	1	335	250	249.98	-2.54	2.57	-1.20	0.52	0.52	133.95					
500	1	335	250	499.91	-7.62	7.70	-3.61	0.00	0.00	0.00					
750	1	335	250	749.88	-11.33	11.46	-5.37	0.28	-0.28	0.00					
1090	1	335	340	1,089.85	-15.05	15.22	-7.13	0.06	0.06	0.00					
1331	1	335	241	1,330.83	-17.88	18.07	-8.47	0.04	-0.04	0.00					
1805	0	103	474	1,804.82	-20.21	20.41	-8.45	0.20	-0.08	-48.91					
2270	0	227	465	2,269.82	-19.08	19.27	-8.15	0.12	0.00	26.74					
2741	1	249	471	2,740.80	-16.94	17.22	-12.11	0.11	0.10	4.50					
3213	1	276	472	3,212.73	-16.10	16.54	-19.65	0.12	0.07	5.91					
3678	1	304	465	3,677.63	-19.38	20.03	-28.53	0.13	0.05	5.89					
4142	2	266	464	4,141.46	-21.50	22.41	-40.76	0.26	0.13	-8.23					
4350	2	273	208	4,349.34	-21.25	22.32	-47.60	0.12	-0.04	3.51					
4381	2	272	31	4,380.33	-21.27	22.36	-48.60	0.14	0.00	-4.26					
4412	2	258	31	4,411.31	-21.16	22.28	-49.57	1.44	-0.29	-44.81					
4443	2	236	31	4,442.30	-20.80	21.94	-50.39	2.12	-0.58	-70.58					
4474	2	208	31	4,473.28	-20.07	21.21	-51.00	3.08	1.42	-88.45					
4505	3	193	31	4,504.26	-18.86	20.02	-51.43	3.05	2.29	-49.35					
4536	4	186	31	4,535.21	-17.16	18.33	-51.70	3.13	2.84	-24.10					
4567	5	180	31	4,566.12	-14.81	15.98	-51.79	5.01	4.81	-19.00					
4599	7	178	32	4,597.96	-11.58	12.74	-51.71	4.46	4.41	-6.84					
4632	8	177	33	4,630.69	-7.40	8.55	-51.49	4.80	4.79	-2.94					
4664	10	176	32	4,662.28	-2.36	3.50	-51.15	6.33	6.31	-2.75					
4695	12	175	31	4,692.68	3.68	-2.55	-50.64	7.70	7.68	-3.13					
4727	15	176	32	4,723.79	11.11	-10.00	-50.07	6.42	6.31	4.97					
4758	17	174	31	4,753.62	19.50	-18.40	-49.39	8.40	8.23	-6.26					
4790	20	174	32	4,783.99	29.51	-28.43	-48.35	8.27	8.25	-1.91					
4822	22	175	32	4,813.86	40.90	-39.85	-47.21	8.31	8.25	2.75					
4853	25	175	31	4,842.20	53.36	-52.34	-46.04	9.90	9.90	-0.29					
4883	28	175	30	4,868.95	66.85	-65.86	-44.81	9.98	9.97	1.17					
4914	31	176	31	4,895.81	82.24	-81.28	-43.58	10.06	9.94	3.13					
4946	35	176	32	4,922.57	99.70	-98.78	-42.38	11.01	11.00	0.81					
4977	38	177	31	4,947.55	117.99	-117.10	-41.25	8.45	8.39	1.71					
5008	40	177	31	4,971.78	137.27	-136.41	-40.17	6.46	6.45	0.55					
5039	41	177	31	4,995.38	157.31	-156.47	-39.14	5.21	5.16	1.13					
5071	43	177	32	5,019.05	178.78	-177.97	-37.99	6.99	6.87	-1.91					
5102	45	177	31	5,041.26	200.34	-199.57	-36.75	5.50	5.48	0.58					
5132	47	176	30	5,062.06	221.88	-221.15	-35.47	6.75	6.67	-1.47					
5162	49	177	30	5,082.05	244.17	-243.47	-34.10	7.36	7.33	0.87					
5193	51	177	31	5,101.98	267.84	-267.18	-32.74	4.54	4.52	0.58					
5222	51	177	29	5,120.30	290.25	-289.61	-31.48	0.76	0.72	-0.31					
5253	51	177	31	5,139.79	314.28	-313.68	-30.10	0.87	0.87	0.00					
5285	51	177	32	5,159.82	339.16	-338.60	-28.69	0.57	0.53	0.28					
5317	52	177	32	5,179.76	364.11	-363.59	-27.30	0.56	0.56	0.00					
5347	51	177	30	5,198.45	387.51	-387.02	-25.95	0.56	-0.30	-0.60					
5379	52	177	32	5,218.35	412.48	-412.04	-24.56	1.02	0.56	1.09					
5410	54	177	31	5,237.11	437.10	-436.68	-23.31	7.39	7.35	0.84					
5441	57	178	31	5,254.67	462.58	-462.20	-22.22	10.36	10.23	2.00					
5472	60	178	31	5,270.90	488.95	-488.59	-21.30	8.80	8.77	0.84					
5504	63	178	32	5,286.28	516.97	-516.64	-20.47	9.40	9.34	1.12					
5536	66	179	32	5,300.16	545.77	-545.46	-19.88	9.55	9.34	2.19					
5567	68	180	31	5,312.32	574.27	-573.98	-19.69	7.83	7.39	2.84					
5599	70	181	32	5,323.86	604.11	-603.82	-19.98	5.68	4.94	3.00					
5629	72	182	30	5,333.78	632.42	-632.12	-20.68	7.47	7.03	2.67					
5661	75	182	32	5,342.98	663.07	-662.75	-21.67	9.63	9.62	0.25					
5691	78	182	30	5,349.98	692.23	-691.90	-22.69	11.15	11.13	0.60					
5723	82	181	32	5,355.63	723.73	-723.38	-23.64	10.66	10.44	-2.19					
5753	85	181	30	5,359.28	753.50	-753.14	-24.31	9.98	9.97	-0.60					

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MINIMUM CURVATURE METHOD

Well Name		Target Direction	Slot	N / S	E / W	Hole Size	Calculation by	Date			
Main 2924 1-13H		181.28	Coordinate					1/28/13			
Job Number		Type of Survey	Tie-in Point				Directional Co.				
0											
Measured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate		Dogleg Severity	Build Up %/100 ft	Walk/ %/100 ft	
						N + / S -	E + / W -				
0	0	0	0	0.00	0.00						
<< TIE-IN POINT >>											
5765	86	181	12	5,360.28	765.46	-765.10	-24.55	11.77	11.75	-0.75	
5789	88	181	24	5,361.48	789.42	-789.06	-25.01	10.26	10.26	0.00	
5816	90	182	27	5,361.89	816.42	-816.05	-25.72	6.37	5.65	2.93	
5848	91	182	32	5,361.75	848.42	-848.03	-26.78	2.19	2.19	0.00	
5879	91	182	31	5,361.26	879.41	-879.01	-27.92	2.33	1.94	1.29	
5911	93	182	32	5,360.23	911.39	-910.97	-29.06	4.35	4.06	-1.56	
5942	93	181	31	5,358.82	942.36	-941.93	-29.87	2.04	0.65	-1.94	
5974	92	180	32	5,357.56	974.33	-973.90	-30.26	4.20	-2.81	-3.13	
6005	91	179	31	5,356.86	1,005.31	-1,004.89	-30.13	4.34	-3.23	-2.90	
6037	90	179	32	5,356.69	1,037.29	-1,036.88	-29.63	3.37	-3.13	-1.25	
6069	89	179	32	5,356.97	1,069.25	-1,068.87	-28.90	2.25	-1.87	-1.25	
6101	90	178	32	5,357.22	1,101.21	-1,100.86	-27.92	2.69	2.19	-1.56	
6132	90	178	31	5,357.20	1,132.15	-1,131.84	-26.73	1.61	0.97	-1.29	
6164	88	178	32	5,357.78	1,164.08	-1,163.80	-25.39	7.81	-7.81	0.00	
6196	87	178	32	5,359.21	1,195.98	-1,195.74	-24.08	1.59	-1.56	0.31	
6228	87	178	32	5,360.77	1,227.88	-1,227.68	-22.83	0.31	0.00	0.31	
6259	88	178	31	5,362.04	1,258.80	-1,258.63	-21.66	2.92	2.90	0.32	
6291	90	178	32	5,362.71	1,290.73	-1,290.60	-20.41	4.47	4.38	-0.94	
6323	90	177	32	5,362.77	1,322.66	-1,322.56	-18.99	2.67	2.50	-0.94	
6354	91	178	31	5,362.50	1,353.59	-1,353.54	-17.71	2.60	1.29	2.26	
6386	92	179	32	5,361.86	1,385.54	-1,385.52	-16.74	3.22	2.81	1.56	
6417	92	179	31	5,360.83	1,416.50	-1,416.49	-16.09	2.74	1.94	1.94	
6449	93	180	32	5,359.52	1,448.45	-1,448.46	-15.73	1.82	0.94	1.56	
6480	93	180	31	5,357.97	1,479.40	-1,479.42	-15.54	2.28	2.26	0.32	
6512	93	181	32	5,356.22	1,511.35	-1,511.37	-15.62	2.83	-0.31	2.81	
6544	93	181	32	5,354.62	1,543.30	-1,543.33	-16.12	2.44	-1.56	1.87	
6575	92	182	31	5,353.41	1,574.28	-1,574.30	-16.91	2.77	-2.26	1.61	
6607	91	182	32	5,352.65	1,606.27	-1,606.27	-17.88	3.45	-3.44	0.31	
6638	90	181	31	5,352.46	1,637.27	-1,637.26	-18.72	3.32	-2.90	-1.61	
6670	90	181	32	5,352.60	1,669.27	-1,669.25	-19.36	1.33	-0.94	-0.94	
6702	90	181	32	5,352.63	1,701.27	-1,701.25	-20.01	2.38	2.19	0.94	
6733	90	182	31	5,352.63	1,732.27	-1,732.23	-20.95	3.49	-1.94	2.90	
6765	89	183	32	5,353.02	1,764.26	-1,764.20	-22.40	3.54	-2.50	2.50	
6797	89	183	32	5,353.55	1,796.24	-1,796.15	-24.11	0.99	0.94	0.31	
6828	90	183	31	5,353.85	1,827.22	-1,827.10	-25.81	1.64	1.61	0.32	
6860	91	183	32	5,353.79	1,859.20	-1,859.05	-27.46	2.95	2.50	-1.56	
6892	91	183	32	5,353.29	1,891.19	-1,891.01	-28.99	2.52	2.50	0.31	
6923	92	182	31	5,352.32	1,922.16	-1,921.97	-30.40	3.47	3.23	-1.29	
6955	92	182	32	5,351.15	1,954.14	-1,953.92	-31.65	1.56	-1.25	-0.94	
6987	91	182	32	5,350.25	1,986.12	-1,985.89	-32.82	1.87	-1.88	0.00	
7018	90	182	31	5,349.90	2,017.12	-2,016.87	-33.85	4.39	-4.19	-1.29	
7050	90	181	32	5,350.04	2,049.12	-2,048.86	-34.63	2.44	-1.56	-1.87	
7081	89	183	31	5,350.47	2,080.11	-2,079.84	-35.61	4.91	-1.94	4.52	
7113	89	183	32	5,351.00	2,112.10	-2,111.80	-37.12	1.56	0.94	1.25	
7144	90	183	31	5,351.25	2,143.08	-2,142.75	-38.71	2.28	2.26	0.32	
7176	91	184	32	5,351.08	2,175.06	-2,174.70	-40.52	2.95	2.50	1.56	
7208	90	184	32	5,350.86	2,207.03	-2,206.63	-42.65	2.65	-1.88	1.87	
7239	91	184	31	5,350.69	2,238.00	-2,237.56	-44.73	2.07	1.29	-1.61	
7271	90	182	32	5,350.61	2,269.99	-2,269.52	-46.35	4.89	-2.19	-4.38	
7303	90	181	32	5,350.61	2,301.99	-2,301.51	-47.21	4.25	1.25	-4.06	
7334	89	181	31	5,350.75	2,332.98	-2,332.50	-47.62	3.06	-2.90	-0.97	
7366	89	180	32	5,351.16	2,364.98	-2,364.50	-47.90	0.70	-0.31	-0.62	
7398	90	180	32	5,351.47	2,396.97	-2,396.50	-47.92	2.69	1.56	-2.19	
7430	90	179	32	5,351.50	2,428.95	-2,428.50	-47.64	2.00	1.56	-1.25	
7461	91	178	31	5,351.23	2,459.92	-2,459.49	-47.00	3.76	1.94	-3.23	
7493	91	180	32	5,350.81	2,491.89	-2,491.48	-46.47	4.70	-0.31	4.69	
7525	91	180	32	5,350.25	2,523.88	-2,523.47	-46.49	2.44	1.87	1.56	

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Job Number		Type of Survey		Tie-in Point			Directional Co.			
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Measured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate		Dogleg Severity	Build Up %/100 ft	Walk/ %/100 ft
						N + / S -	E + / W -			
0	0	0	0	0.00	0.00					<< TIE-IN POINT >>
7556	92	181	31	5,349.30	2,554.86	-2,554.46	-46.76	3.18	2.90	1.29
7588	91	181	32	5,348.30	2,586.85	-2,586.44	-47.35	3.32	-2.50	2.19
7619	91	182	31	5,347.76	2,617.84	-2,617.42	-48.27	3.23	-2.58	1.94
7651	90	182	32	5,347.70	2,649.84	-2,649.39	-49.47	3.26	-3.13	0.94
7682	89	182	31	5,348.22	2,680.83	-2,680.37	-50.50	4.39	-3.55	-2.58
7714	89	182	32	5,349.00	2,712.82	-2,712.35	-51.47	1.68	0.63	1.56
7746	88	182	32	5,350.03	2,744.80	-2,744.31	-52.62	3.45	-3.44	0.31
7777	86	182	31	5,351.65	2,775.75	-2,775.25	-53.70	3.92	-3.87	-0.65
7809	87	182	32	5,353.64	2,807.69	-2,807.17	-54.70	0.70	0.31	-0.63
7841	87	182	32	5,355.56	2,839.63	-2,839.10	-55.68	0.44	0.31	0.31
7873	86	182	32	5,357.68	2,871.56	-2,871.01	-56.82	2.95	-2.50	1.56
7904	87	183	31	5,359.76	2,902.48	-2,901.91	-58.14	2.46	2.26	0.97
7936	87	182	32	5,361.61	2,934.42	-2,933.83	-59.51	1.56	1.25	-0.94
7968	87	182	32	5,363.22	2,966.38	-2,965.76	-60.65	2.00	1.25	-1.56
7999	88	181	31	5,364.50	2,997.35	-2,996.73	-61.38	3.68	2.26	-2.90
8032	88	181	33	5,365.59	3,030.33	-3,029.71	-61.84	0.86	0.61	-0.61
8063	89	181	31	5,366.48	3,061.32	-3,060.69	-62.22	0.97	0.97	0.00
8095	90	181	32	5,367.04	3,093.31	-3,092.68	-62.69	3.26	3.13	0.94
8126	90	181	31	5,367.07	3,124.31	-3,123.68	-63.18	2.97	2.90	-0.65
8158	90	181	32	5,367.10	3,156.31	-3,155.67	-63.74	3.08	-2.81	1.25
8190	90	181	32	5,367.29	3,188.31	-3,187.67	-64.35	1.13	0.94	-0.62
8221	91	181	31	5,367.21	3,219.31	-3,218.66	-64.84	2.35	2.26	-0.65
8253	90	182	32	5,366.99	3,251.31	-3,250.66	-65.48	2.27	-0.63	2.19
8285	90	182	32	5,366.82	3,283.31	-3,282.64	-66.46	1.56	0.00	1.56
8317	90	183	32	5,366.71	3,315.30	-3,314.61	-67.77	2.28	-0.63	2.19
8348	91	183	31	5,366.52	3,346.29	-3,345.58	-69.23	1.61	1.61	0.00
8380	89	183	32	5,366.57	3,378.28	-3,377.54	-70.77	4.39	-4.37	0.31
8411	89	183	31	5,366.98	3,409.26	-3,408.50	-72.34	0.72	0.32	0.65
8443	90	183	32	5,367.31	3,441.25	-3,440.46	-73.87	1.68	0.63	-1.56
8474	90	182	31	5,367.45	3,472.25	-3,471.43	-75.12	2.07	1.61	-1.29
8506	91	182	32	5,367.28	3,504.24	-3,503.41	-76.26	1.90	1.87	-0.31
8538	91	182	32	5,366.95	3,536.24	-3,535.39	-77.40	0.31	0.00	0.31
8570	89	182	32	5,367.03	3,568.23	-3,567.37	-78.58	4.69	-4.69	0.00
8602	90	184	32	5,367.28	3,600.22	-3,599.32	-80.20	5.74	2.81	5.00
8633	92	184	31	5,366.77	3,631.18	-3,630.25	-82.33	6.34	6.13	1.61
8665	93	183	32	5,365.54	3,663.12	-3,662.15	-84.42	3.38	1.87	-2.81
8696	91	183	31	5,364.51	3,694.09	-3,693.09	-86.07	4.19	-3.87	-1.61
8728	90	183	32	5,364.12	3,726.08	-3,725.05	-87.61	3.76	-3.75	-0.31
8759	90	183	31	5,364.23	3,757.07	-3,756.02	-89.09	1.96	-1.94	0.32
8791	88	183	32	5,364.87	3,789.05	-3,787.97	-90.63	4.07	-4.06	-0.31
8822	88	183	31	5,365.87	3,820.02	-3,818.92	-92.11	0.46	-0.32	0.32
8854	88	183	32	5,366.85	3,852.00	-3,850.87	-93.59	1.33	0.94	-0.94
8917	90	182	63	5,367.89	3,914.98	-3,913.81	-96.12	2.16	2.06	-0.63
8980	90	182	63	5,367.89	3,977.98	-3,976.78	-98.16	1.24	0.95	-0.79
9044	91	181	64	5,367.28	4,041.97	-4,040.75	-99.83	0.84	0.78	-0.31
9075	91	181	31	5,366.68	4,072.97	-4,071.74	-100.40	2.97	1.94	-2.26
9107	92	181	32	5,365.71	4,104.95	-4,103.72	-100.82	2.21	2.19	0.31
9170	94	180	63	5,362.63	4,167.87	-4,166.64	-101.48	2.31	2.22	-0.63
9202	94	180	32	5,360.56	4,199.80	-4,198.57	-101.53	2.25	1.25	-1.87
9234	95	179	32	5,358.22	4,231.70	-4,230.49	-101.31	2.25	1.87	-1.25
9266	96	179	32	5,355.38	4,263.55	-4,262.36	-100.95	3.76	3.75	-0.31
9297	95	180	31	5,352.41	4,294.39	-4,293.21	-100.68	1.82	-1.29	1.29
9329	94	180	32	5,349.87	4,326.28	-4,325.11	-100.68	5.05	-4.69	1.88
9360	93	180	31	5,348.08	4,357.22	-4,356.06	-100.68	3.76	-3.23	-1.94
9392	93	180	32	5,346.44	4,389.17	-4,388.02	-100.51	0.94	0.94	0.00
9423	93	180	31	5,344.92	4,420.12	-4,418.98	-100.38	1.96	-1.94	0.32
9455	92	180	32	5,343.67	4,452.08	-4,450.96	-100.29	1.59	-1.56	0.31

