

# DIRECTIONAL SURVEY CALCULATION

## MINIMUM CURVATURE METHOD

Well Name		Target Direction	Slot	N / S	E / W	Hole Size	Calculation by		Date		
Esplund Farms 301		179.34	Coordinate						2/27/13		
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 >>			
275	1	154	275	274.99	1.73	-1.72	0.85	0.29	0.29	55.93	
500	1	154	225	499.97	4.21	-4.19	2.06	0.09	-0.09	0.00	
750	1	154	250	749.96	6.77	-6.73	3.31	0.04	0.04	0.00	
1006	1	154	256	1,005.94	9.79	-9.74	4.79	0.04	0.04	0.00	
1168	0	154	162	1,167.93	11.33	-11.26	5.54	0.25	-0.25	0.00	
1625	0	334	457	1,624.92	12.04	-11.98	5.89	0.13	-0.04	39.39	
2081	0	157	456	2,080.92	12.06	-11.99	5.86	0.09	0.00	-38.86	
2538	1	298	457	2,537.92	11.85	-11.80	4.41	0.15	0.07	30.85	
2994	0	295	456	2,993.91	10.57	-10.55	1.92	0.07	-0.07	-0.68	
3450	0	250	456	3,449.91	10.64	-10.64	0.08	0.05	0.02	-9.87	
3907	0	255	457	3,906.90	11.44	-11.47	-2.58	0.02	0.02	1.18	
4363	0	350	456	4,362.89	10.66	-10.71	-4.33	0.11	-0.02	20.81	
4424	2	168	61	4,423.88	11.55	-11.60	-4.14	3.77	2.79	-297.54	
4454	4	172	30	4,453.84	12.97	-13.02	-3.91	5.04	5.00	13.33	
4485	5	173	31	4,484.75	15.31	-15.35	-3.63	5.49	5.48	3.55	
4515	7	177	30	4,514.59	18.46	-18.50	-3.37	5.80	5.67	11.67	
4546	9	179	31	4,545.30	22.64	-22.68	-3.24	5.58	5.48	7.74	
4576	10	181	30	4,574.90	27.54	-27.58	-3.26	5.40	5.33	5.33	
4606	12	180	30	4,604.34	33.29	-33.33	-3.32	5.68	5.67	-1.67	
4637	14	180	31	4,634.56	40.21	-40.25	-3.32	6.47	6.45	-2.26	
4667	16	178	30	4,663.53	47.97	-48.01	-3.17	7.45	7.33	-5.00	
4698	19	179	31	4,693.10	57.29	-57.33	-2.99	9.11	9.03	3.87	
4728	21	181	30	4,721.27	67.60	-67.64	-3.00	8.14	8.00	4.33	
4759	23	181	31	4,750.00	79.23	-79.27	-3.18	4.85	4.84	0.97	
4789	24	180	30	4,777.53	91.14	-91.19	-3.28	4.21	4.00	-3.33	
4820	26	179	31	4,805.68	104.12	-104.16	-3.20	4.93	4.84	-2.26	
4850	27	178	30	4,832.55	117.46	-117.50	-2.91	6.18	6.00	-3.33	
4881	30	179	31	4,859.79	132.25	-132.29	-2.57	7.82	7.74	2.26	
4911	32	179	30	4,885.56	147.61	-147.64	-2.31	7.34	7.33	0.33	
4941	34	179	30	4,910.78	163.86	-163.89	-2.09	6.01	6.00	0.67	
4972	35	180	31	4,936.32	181.42	-181.45	-1.94	5.21	5.16	1.29	
5002	38	180	30	4,960.47	199.22	-199.25	-1.87	7.34	7.33	0.67	
5033	39	180	31	4,984.78	218.45	-218.49	-1.91	5.54	5.48	1.29	
5063	41	180	30	5,007.76	237.73	-237.77	-1.98	5.35	5.33	-0.67	
5094	43	180	31	5,030.85	258.41	-258.45	-1.97	6.79	6.77	-0.65	
5124	45	179	30	5,052.39	279.29	-279.32	-1.81	8.16	8.00	-2.33	
5155	48	179	31	5,073.73	301.77	-301.81	-1.37	7.87	7.74	-1.94	
5185	50	178	30	5,093.55	324.29	-324.32	-0.72	6.46	6.33	-1.67	
5216	51	178	31	5,113.37	348.11	-348.14	0.07	4.19	4.19	0.00	
5246	51	178	30	5,132.25	371.42	-371.44	0.84	0.67	0.67	0.00	
5276	51	178	30	5,151.13	394.73	-394.74	1.61	0.67	-0.67	0.00	
5307	50	178	31	5,170.81	418.68	-418.68	2.49	2.18	-1.94	-1.29	
5337	50	178	30	5,190.07	441.67	-441.66	3.45	1.74	-1.67	-0.67	
5367	49	177	30	5,209.57	464.44	-464.42	4.57	2.78	-2.33	-2.00	
5398	49	177	31	5,229.89	487.84	-487.80	5.83	0.32	-0.32	0.00	
5428	51	178	30	5,249.09	510.87	-510.83	6.79	8.77	8.00	4.67	
5459	55	180	31	5,267.64	535.71	-535.66	7.17	12.63	11.94	5.16	
5489	59	180	30	5,284.04	560.82	-560.77	7.11	11.75	11.67	1.67	
5520	62	181	31	5,299.38	587.75	-587.71	6.87	11.30	11.29	0.65	
5550	65	181	30	5,312.76	614.59	-614.55	6.61	9.34	9.33	-0.33	
5581	67	181	31	5,325.39	642.89	-642.86	6.34	6.78	6.77	0.32	
5611	70	181	30	5,336.44	670.77	-670.75	6.02	9.34	9.33	0.33	
5642	74	180	31	5,346.19	700.18	-700.16	5.85	12.13	11.94	-2.26	
5672	76	180	30	5,353.98	729.15	-729.13	5.87	9.67	9.67	-0.33	
5702	79	180	30	5,360.30	758.47	-758.46	5.92	9.67	9.67	0.00	
5733	82	179	31	5,365.36	789.06	-789.04	6.14	8.60	8.39	-1.94	
5763	85	179	30	5,368.70	818.86	-818.84	6.55	11.35	11.33	-0.67	

# DIRECTIONAL SURVEY CALCULATION

## MINIMUM CURVATURE METHOD

Well Name		Target Direction		Slot Coordinate		N / S		E / W		Hole Size		Calculation by		Date	
Esplund Farms 30		179.34												2/27/13	
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 >>							
5782	87	179	19	5,369.96	837.82	-837.80	6.83	9.49	9.47	0.53					
5871	90	179	89	5,372.60	926.78	-926.74	8.15	2.70	2.70	-0.11					
5903	90	180	32	5,372.85	958.77	-958.74	8.54	1.29	0.31	1.25					
5934	90	180	31	5,373.07	989.77	-989.74	8.82	0.00	0.00	0.00					
5966	90	179	32	5,373.32	1,021.77	-1,021.73	9.18	0.99	-0.31	-0.94					
5997	90	179	31	5,373.59	1,052.77	-1,052.73	9.58	0.32	0.00	0.32					
6029	90	179	32	5,373.87	1,084.77	-1,084.73	9.97	0.00	0.00	0.00					
6060	90	179	31	5,374.09	1,115.77	-1,115.72	10.43	1.16	0.65	-0.97					
6092	90	179	32	5,374.23	1,147.77	-1,147.72	10.94	0.70	0.31	0.62					
6123	90	179	31	5,374.25	1,178.77	-1,178.71	11.42	1.16	0.97	-0.65					
6155	90	180	32	5,374.23	1,210.77	-1,210.71	11.82	1.90	-0.31	1.87					
6186	90	179	31	5,374.12	1,241.77	-1,241.71	12.14	1.82	1.29	-1.29					
6218	90	179	32	5,373.95	1,273.77	-1,273.71	12.53	0.88	-0.63	0.63					
6250	90	179	32	5,373.81	1,305.77	-1,305.70	12.87	0.31	0.31	0.00					
6281	90	180	31	5,373.65	1,336.77	-1,336.70	13.00	2.26	0.00	2.26					
6313	91	181	32	5,373.40	1,368.76	-1,368.70	12.83	1.56	0.94	1.25					
6344	91	181	31	5,373.05	1,399.75	-1,399.70	12.51	0.72	0.32	0.65					
6376	91	181	32	5,372.63	1,431.74	-1,431.69	12.06	0.70	0.31	0.63					
6407	91	181	31	5,372.17	1,462.72	-1,462.68	11.47	1.33	0.32	1.29					
6439	90	181	32	5,371.83	1,494.70	-1,494.68	10.88	2.44	-1.88	-1.56					
6470	89	181	31	5,371.94	1,525.69	-1,525.67	10.37	3.37	-3.23	0.97					
6502	89	181	32	5,372.36	1,557.67	-1,557.66	9.70	0.70	-0.31	0.63					
6533	89	181	31	5,372.76	1,588.65	-1,588.65	9.16	1.96	0.32	-1.94					
6565	89	180	32	5,373.18	1,620.65	-1,620.65	8.90	1.59	-0.31	-1.56					
6596	89	181	31	5,373.62	1,651.64	-1,651.65	8.72	0.97	0.00	0.97					
6628	90	179	32	5,373.98	1,683.63	-1,683.64	8.80	4.17	0.94	-4.06					
6659	90	179	31	5,374.22	1,714.63	-1,714.64	9.39	1.96	0.32	-1.94					
6691	90	178	32	5,374.39	1,746.63	-1,746.62	10.26	1.13	0.63	-0.94					
6722	90	178	31	5,374.58	1,777.62	-1,777.61	11.21	1.02	-0.97	-0.32					
6754	90	178	32	5,374.83	1,809.61	-1,809.59	12.38	1.90	0.31	-1.87					
6785	90	178	31	5,375.05	1,840.59	-1,840.56	13.68	0.00	0.00	0.00					
6816	89	178	31	5,375.32	1,871.58	-1,871.53	14.87	1.44	-0.65	1.29					
6848	89	178	32	5,375.65	1,903.57	-1,903.51	16.07	0.94	0.00	-0.94					
6879	90	178	31	5,375.90	1,934.56	-1,934.48	17.31	0.97	0.97	0.00					
6911	90	178	32	5,376.09	1,966.54	-1,966.46	18.60	0.31	-0.31	0.00					
6942	90	177	31	5,376.25	1,997.52	-1,997.43	19.97	1.74	0.65	-1.61					
6974	90	177	32	5,376.31	2,029.50	-2,029.39	21.59	0.88	0.63	-0.62					
7005	90	177	31	5,376.20	2,060.47	-2,060.34	23.24	1.33	1.29	-0.32					
7037	91	177	32	5,375.89	2,092.44	-2,092.29	24.97	0.94	0.94	0.00					
7068	91	177	31	5,375.41	2,123.41	-2,123.25	26.62	1.33	1.29	0.32					
7100	92	177	32	5,374.60	2,155.38	-2,155.20	28.21	2.38	2.19	0.94					
7131	92	178	31	5,373.49	2,186.34	-2,186.15	29.56	2.07	1.61	1.29					
7163	93	178	32	5,372.04	2,218.30	-2,218.09	30.68	2.65	1.88	1.88					
7194	92	179	31	5,370.71	2,249.27	-2,249.06	31.33	4.34	-2.90	3.23					
7226	91	180	32	5,370.01	2,281.26	-2,281.05	31.44	5.63	-4.69	3.13					
7257	90	180	31	5,369.77	2,312.26	-2,312.05	31.39	1.33	-0.32	-1.29					
7289	90	180	32	5,369.60	2,344.25	-2,344.05	31.36	1.13	-0.63	0.94					
7320	90	180	31	5,369.68	2,375.25	-2,375.05	31.33	2.46	-2.26	-0.97					
7352	89	180	32	5,369.99	2,407.25	-2,407.04	31.47	0.99	-0.31	-0.94					
7383	90	179	31	5,370.21	2,438.25	-2,438.04	31.77	1.61	1.29	-0.97					
7415	90	179	32	5,370.35	2,470.25	-2,470.04	32.22	0.70	-0.31	-0.63					
7446	90	179	31	5,370.43	2,501.25	-2,501.03	32.73	1.02	0.97	-0.32					
7478	90	179	32	5,370.40	2,533.25	-2,533.03	33.23	0.70	0.31	0.62					
7509	89	179	31	5,370.70	2,564.24	-2,564.03	33.64	4.21	-4.19	0.32					
7541	88	179	32	5,371.48	2,596.23	-2,596.01	34.03	1.25	-1.25	0.00					
7572	89	179	31	5,372.32	2,627.22	-2,627.00	34.41	0.32	0.32	0.00					
7604	89	179	32	5,373.04	2,659.21	-2,658.99	34.85	1.40	1.25	-0.63					



