



Project: Lea County, NM (NAD83 NME)
Site: Angus State 24-35 16
Well: 602H
Wellbore: OH
Design: Plan 1 01-17-18
Rig: Cactus 123



Azimuths to Grid North
True North: -0.51°
Magnetic North: 6.29°
Magnetic Field
Strength: 48021.4nT
Dip Angle: 59.93°
Date: 1/17/2018
Model: HDGM

GL+KB @ 3419.00usft (Cactus 123)
Ground Level: 3389.00

WELL DETAILS

+N/-S	+E/-W	Northing	Ground Level	Easting	Latitude	Longitude
+N/-S	+E/-W	446533.90	3389.00	837819.00	32° 13' 26.26241 N	103° 22' 28.51026 W

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
BHL - Angus State 24-35 16 602H	12200.00	-4647.90	374.10	441886.00	838193.10	32° 12' 40.23866 N	103° 22' 24.63894 W
FTP - Angus State 24-35 16 602H	12200.00	-496.93	334.73	446036.97	838153.73	32° 13' 21.31588 N	103° 22' 24.66564 W

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Deg	TFace	VSec	Target	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	11627.04	0.00	0.00	11627.04	0.00	0.00	0.00	0.00	0.00	0.00	KOP, Begin 10.00°/100' Build
3	12527.04	90.00	160.95	12200.00	-541.58	187.01	10.00	160.95	543.32		LP, Hold 90.00° Inc, Begin 2.00°/100' Turn
4	13452.38	90.00	179.46	12200.00	-1449.46	343.77	2.00	90.00	1452.64		Hold 179.46° Azm
5	16650.96	90.00	179.46	12200.00	-4647.90	374.10	0.00	0.00	4651.22		BHL - Angus State 24-35 16 602H TD at 16650.96

CASING DETAILS

No casing data is available

LEGEND

+ 452H, OH, Plan 1 01-17-18 V0
+ 451H, OH, Plan 1 01-17-18 V0
+ 601H, OH, Plan 1 01-17-18 V0
+ Plan 1 01-17-18

Map System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone Name: New Mexico Eastern Zone

Local Origin: Well 602H, Grid North

Latitude: 32° 13' 26.26241 N
Longitude: 103° 22' 28.51026 W

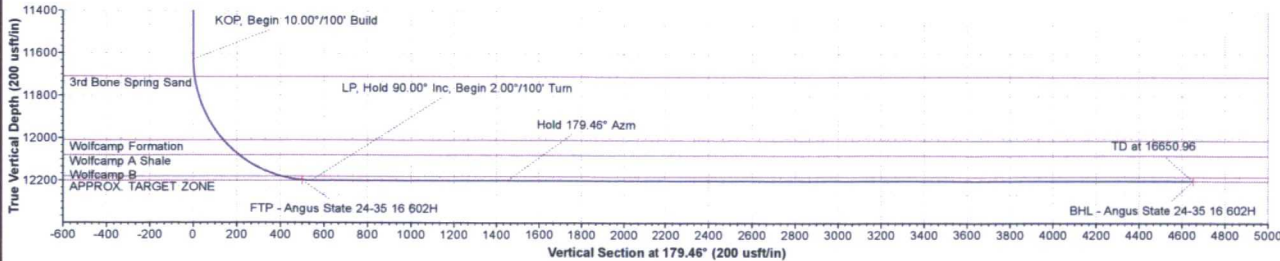
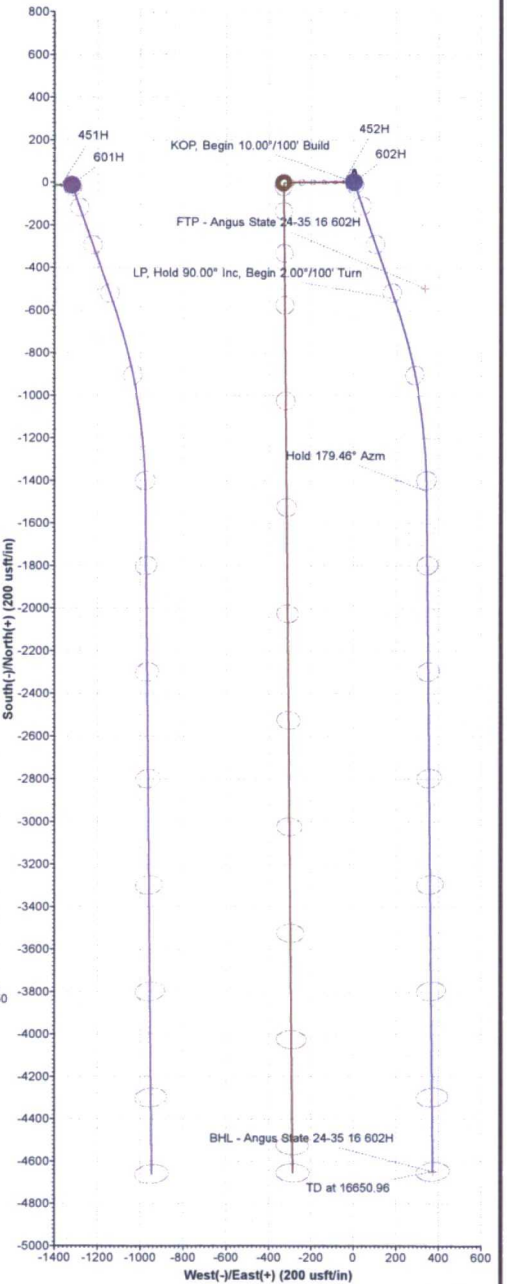
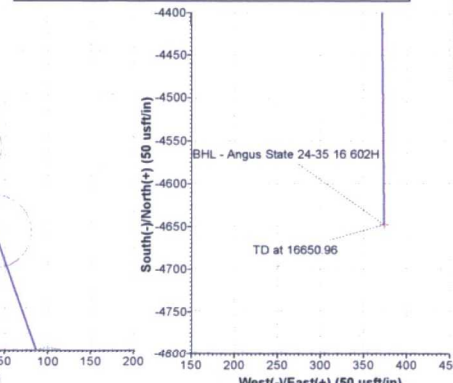
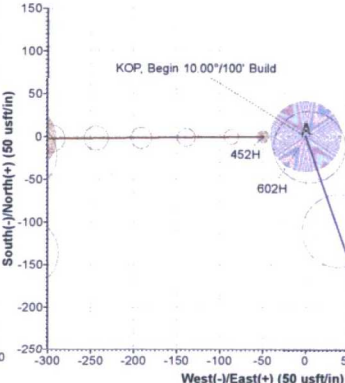
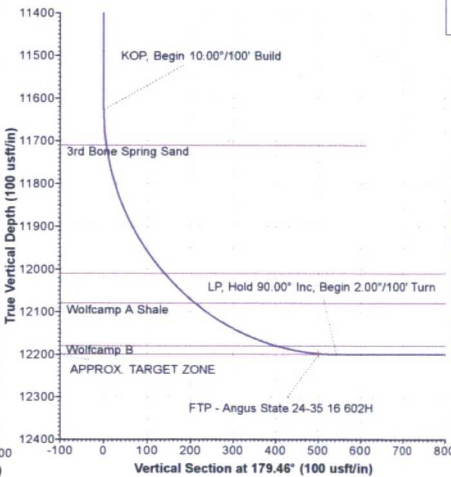
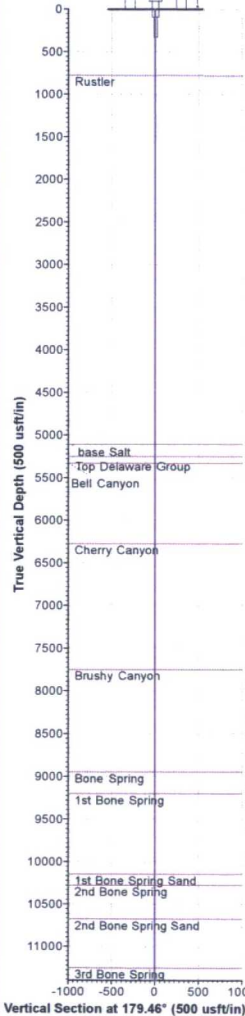
Grid East: 837819.00
Grid North: 446533.90
Scale Factor: 1.000

Geomagnetic Model: HDGM
Sample Date: 17-Jan-18
Magnetic Declination: 6.80°
Dip Angle from Horizontal: 59.93°
Magnetic Field Strength: 48021

To convert a Magnetic Direction to a Grid Direction, Add 6.29°
To convert a Magnetic Direction to a True Direction, Add 6.80° East
To convert a True Direction to a Grid Direction, Subtract 0.51°

FORMATION TOP DETAILS

TVDPath	MDPath	Formation	DipAngle	DpDr
780.00	780.00	Rustler		
5110.00	5110.00	base Salt		
5250.00	5250.00	Top Delaware Group		
5330.00	5330.00	Bell Canyon		
6275.00	6275.00	Cherry Canyon		
7750.00	7750.00	Brushy Canyon		
8950.00	8950.00	Bone Spring		
9205.00	9205.00	1st Bone Spring		
10150.00	10150.00	1st Bone Spring Sand		
10280.00	10280.00	2nd Bone Spring		
10680.00	10680.00	2nd Bone Spring Sand		
11255.00	11255.00	3rd Bone Spring		
11710.00	11710.29	3rd Bone Spring Sand		
12010.00	12046.47	Wolfcamp Formation		
12080.00	12149.42	Wolfcamp A Shale		
12180.00	12375.22	Wolfcamp B		
12200.00	12527.04	APPROX. TARGET ZONE		



Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 602H
Company:	Energen Resources	TVD Reference:	GL+KB @ 3419.00usft (Cactus 123)
Project:	Lea County, NM (NAD83 NME)	MD Reference:	GL+KB @ 3419.00usft (Cactus 123)
Site:	Angus State 24-35 16	North Reference:	Grid
Well:	602H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

Project	Lea County, NM (NAD83 NME)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site		Angus State 24-35 16			
Site Position:		Northing:	446,521.50 usft	Latitude:	32° 13' 26.26039 N
From:	Map	Easting:	836,449.10 usft	Longitude:	103° 22' 44.45733 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.51 °

Well	602H					
Well Position	+N/-S	12.40 usft	Northing:	446,533.90 usft	Latitude:	32° 13' 26.26241 N
	+E/-W	1,369.90 usft	Easting:	837,819.00 usft	Longitude:	103° 22' 28.51026 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,389.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	1/17/2018	6.80	59.93	48,021

Design	Plan 1 01-17-18			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	179.46

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11,627.04	0.00	0.00	11,627.04	0.00	0.00	0.00	0.00	0.00	0.00	
12,527.04	90.00	160.95	12,200.00	-541.58	187.01	10.00	10.00	0.00	160.95	
13,452.38	90.00	179.46	12,200.00	-1,449.47	343.77	2.00	0.00	2.00	90.00	
16,650.96	90.00	179.46	12,200.00	-4,647.90	374.10	0.00	0.00	0.00	0.00	BHL - Angus State

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Site:	Angus State 24-35 16	North Reference:	Grid
Well:	602H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
780.00	0.00	0.00	780.00	0.00	0.00	0.00	0.00	0.00	0.00
Rustler									
5,110.00	0.00	0.00	5,110.00	0.00	0.00	0.00	0.00	0.00	0.00
base Salt									
5,250.00	0.00	0.00	5,250.00	0.00	0.00	0.00	0.00	0.00	0.00
Top Delaware Group									
5,330.00	0.00	0.00	5,330.00	0.00	0.00	0.00	0.00	0.00	0.00
Bell Canyon									
6,275.00	0.00	0.00	6,275.00	0.00	0.00	0.00	0.00	0.00	0.00
Cherry Canyon									
7,750.00	0.00	0.00	7,750.00	0.00	0.00	0.00	0.00	0.00	0.00
Brushy Canyon									
8,950.00	0.00	0.00	8,950.00	0.00	0.00	0.00	0.00	0.00	0.00
Bone Spring									
9,205.00	0.00	0.00	9,205.00	0.00	0.00	0.00	0.00	0.00	0.00
1st Bone Spring									
10,150.00	0.00	0.00	10,150.00	0.00	0.00	0.00	0.00	0.00	0.00
1st Bone Spring Sand									
10,280.00	0.00	0.00	10,280.00	0.00	0.00	0.00	0.00	0.00	0.00
2nd Bone Spring									
10,680.00	0.00	0.00	10,680.00	0.00	0.00	0.00	0.00	0.00	0.00
2nd Bone Spring Sand									
11,255.00	0.00	0.00	11,255.00	0.00	0.00	0.00	0.00	0.00	0.00
3rd Bone Spring									
11,627.04	0.00	0.00	11,627.04	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 10.00°/100' Build									
11,700.00	7.30	160.95	11,699.80	-4.38	1.51	4.40	10.00	10.00	0.00
11,710.29	8.33	160.95	11,710.00	-5.71	1.97	5.73	10.00	10.00	0.00
3rd Bone Spring Sand									
11,800.00	17.30	160.95	11,797.39	-24.49	8.46	24.57	10.00	10.00	0.00
11,900.00	27.30	160.95	11,889.79	-60.31	20.82	60.50	10.00	10.00	0.00
12,000.00	37.30	160.95	11,974.21	-110.74	38.24	111.10	10.00	10.00	0.00
12,046.47	41.94	160.95	12,010.00	-138.75	47.91	139.19	10.00	10.00	0.00
Wolfcamp Formation									
12,100.00	47.30	160.95	12,048.09	-174.27	60.18	174.83	10.00	10.00	0.00
12,149.42	52.24	160.95	12,080.00	-209.93	72.49	210.60	10.00	10.00	0.00
Wolfcamp A Shale									
12,200.00	57.30	160.95	12,109.17	-248.96	85.97	249.76	10.00	10.00	0.00
12,300.00	67.30	160.95	12,155.60	-332.55	114.83	333.61	10.00	10.00	0.00
12,375.22	74.82	160.95	12,180.00	-399.74	138.03	401.03	10.00	10.00	0.00
Wolfcamp B									
12,400.00	77.30	160.95	12,185.97	-422.48	145.88	423.83	10.00	10.00	0.00
12,500.00	87.30	160.95	12,199.36	-516.03	178.19	517.69	10.00	10.00	0.00
12,527.04	90.00	160.95	12,200.00	-541.58	187.01	543.32	10.00	10.00	0.00
LP, Hold 90.00° Inc, Begin 2.00°/100' Turn - APPROX. TARGET ZONE									
12,600.00	90.00	162.41	12,200.00	-610.84	209.94	612.79	2.00	0.00	2.00
12,700.00	90.00	164.41	12,200.00	-706.67	238.49	708.89	2.00	0.00	2.00
12,800.00	90.00	166.41	12,200.00	-803.44	263.68	805.89	2.00	0.00	2.00
12,900.00	90.00	168.41	12,200.00	-901.03	285.48	903.68	2.00	0.00	2.00
13,000.00	90.00	170.41	12,200.00	-999.32	303.86	1,002.14	2.00	0.00	2.00
13,100.00	90.00	172.41	12,200.00	-1,098.20	318.80	1,101.15	2.00	0.00	2.00

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Site:	Angus State 24-35 16	North Reference:	Grid
Well:	602H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,200.00	90.00	174.41	12,200.00	-1,197.53	330.27	1,200.59	2.00	0.00	2.00
13,300.00	90.00	176.41	12,200.00	-1,297.20	338.28	1,300.33	2.00	0.00	2.00
13,400.00	90.00	178.41	12,200.00	-1,397.10	342.80	1,400.27	2.00	0.00	2.00
13,452.38	90.00	179.46	12,200.00	-1,449.46	343.77	1,452.64	2.00	0.00	2.00
Hold 179.46° Azm									
13,500.00	90.00	179.46	12,200.00	-1,497.09	344.22	1,500.26	0.00	0.00	0.00
13,600.00	90.00	179.46	12,200.00	-1,597.08	345.17	1,600.26	0.00	0.00	0.00
13,700.00	90.00	179.46	12,200.00	-1,697.08	346.12	1,700.26	0.00	0.00	0.00
13,800.00	90.00	179.46	12,200.00	-1,797.07	347.07	1,800.26	0.00	0.00	0.00
13,900.00	90.00	179.46	12,200.00	-1,897.07	348.02	1,900.26	0.00	0.00	0.00
14,000.00	90.00	179.46	12,200.00	-1,997.06	348.97	2,000.26	0.00	0.00	0.00
14,100.00	90.00	179.46	12,200.00	-2,097.06	349.91	2,100.26	0.00	0.00	0.00
14,200.00	90.00	179.46	12,200.00	-2,197.05	350.86	2,200.26	0.00	0.00	0.00
14,300.00	90.00	179.46	12,200.00	-2,297.05	351.81	2,300.26	0.00	0.00	0.00
14,400.00	90.00	179.46	12,200.00	-2,397.04	352.76	2,400.26	0.00	0.00	0.00
14,500.00	90.00	179.46	12,200.00	-2,497.04	353.71	2,500.26	0.00	0.00	0.00
14,600.00	90.00	179.46	12,200.00	-2,597.04	354.65	2,600.26	0.00	0.00	0.00
14,700.00	90.00	179.46	12,200.00	-2,697.03	355.60	2,700.26	0.00	0.00	0.00
14,800.00	90.00	179.46	12,200.00	-2,797.03	356.55	2,800.26	0.00	0.00	0.00
14,900.00	90.00	179.46	12,200.00	-2,897.02	357.50	2,900.26	0.00	0.00	0.00
15,000.00	90.00	179.46	12,200.00	-2,997.02	358.45	3,000.26	0.00	0.00	0.00
15,100.00	90.00	179.46	12,200.00	-3,097.01	359.40	3,100.26	0.00	0.00	0.00
15,200.00	90.00	179.46	12,200.00	-3,197.01	360.34	3,200.26	0.00	0.00	0.00
15,300.00	90.00	179.46	12,200.00	-3,297.00	361.29	3,300.26	0.00	0.00	0.00
15,400.00	90.00	179.46	12,200.00	-3,397.00	362.24	3,400.26	0.00	0.00	0.00
15,500.00	90.00	179.46	12,200.00	-3,497.00	363.19	3,500.26	0.00	0.00	0.00
15,600.00	90.00	179.46	12,200.00	-3,596.99	364.14	3,600.26	0.00	0.00	0.00
15,700.00	90.00	179.46	12,200.00	-3,696.99	365.08	3,700.26	0.00	0.00	0.00
15,800.00	90.00	179.46	12,200.00	-3,796.98	366.03	3,800.26	0.00	0.00	0.00
15,900.00	90.00	179.46	12,200.00	-3,896.98	366.98	3,900.26	0.00	0.00	0.00
16,000.00	90.00	179.46	12,200.00	-3,996.97	367.93	4,000.26	0.00	0.00	0.00
16,100.00	90.00	179.46	12,200.00	-4,096.97	368.88	4,100.26	0.00	0.00	0.00
16,200.00	90.00	179.46	12,200.00	-4,196.96	369.82	4,200.26	0.00	0.00	0.00
16,300.00	90.00	179.46	12,200.00	-4,296.96	370.77	4,300.26	0.00	0.00	0.00
16,400.00	90.00	179.46	12,200.00	-4,396.95	371.72	4,400.26	0.00	0.00	0.00
16,500.00	90.00	179.46	12,200.00	-4,496.95	372.67	4,500.26	0.00	0.00	0.00
16,600.00	90.00	179.46	12,200.00	-4,596.95	373.62	4,600.26	0.00	0.00	0.00
16,650.96	90.00	179.46	12,200.00	-4,647.90	374.10	4,651.22	0.00	0.00	0.00
TD at 16650.96									

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL - Angus State 24 - hit/miss target - Shape - Point	0.00	0.00	12,200.00	-4,647.90	374.10	441,886.00	838,193.10	32° 12' 40.23987 N	03° 22' 24.63894 W
FTP - Angus State 24 - plan misses target center by 154.22usft at 12531.09usft MD (12200.00 TVD, -545.41 N, 188.33 E) - Point	0.00	0.00	12,200.00	-496.93	334.73	446,036.97	838,153.73	32° 13' 21.31588 N	03° 22' 24.66564 W

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Site:	Angus State 24-35 16	North Reference:	Grid
Well:	602H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
780.00	780.00	Rustler				
5,110.00	5,110.00	base Salt				
5,250.00	5,250.00	Top Delaware Group				
5,330.00	5,330.00	Bell Canyon				
6,275.00	6,275.00	Cherry Canyon				
7,750.00	7,750.00	Brushy Canyon				
8,950.00	8,950.00	Bone Spring				
9,205.00	9,205.00	1st Bone Spring				
10,150.00	10,150.00	1st Bone Spring Sand				
10,280.00	10,280.00	2nd Bone Spring				
10,680.00	10,680.00	2nd Bone Spring Sand				
11,255.00	11,255.00	3rd Bone Spring				
11,710.29	11,710.00	3rd Bone Spring Sand				
12,046.47	12,010.00	Wolfcamp Formation				
12,149.42	12,080.00	Wolfcamp A Shale				
12,375.22	12,180.00	Wolfcamp B				
12,527.04	12,200.00	APPROX. TARGET ZONE				

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
11,627.04	11,627.04	0.00	0.00	KOP, Begin 10.00°/100' Build	
12,527.04	12,200.00	-541.58	187.01	LP, Hold 90.00° Inc, Begin 2.00°/100' Turn	
13,452.38	12,200.00	-1,449.46	343.77	Hold 179.46° Azm	
16,650.96	12,200.00	-4,647.90	374.10	TD at 16650.96	