

BISON EXPLORATION

**ARAPAHOE COUNTY, COLORADO (NAD 83)
SE NE SEC. 22 T4S R64W 6th P.M.
HOULIHAN 4-64 22A 21-1**

ORIGINAL WELLBORE

30 March, 2017

Plan: PROPOSAL #1



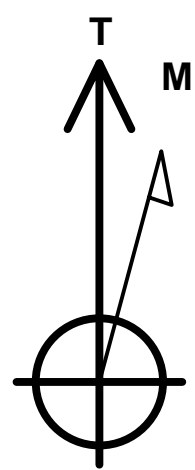
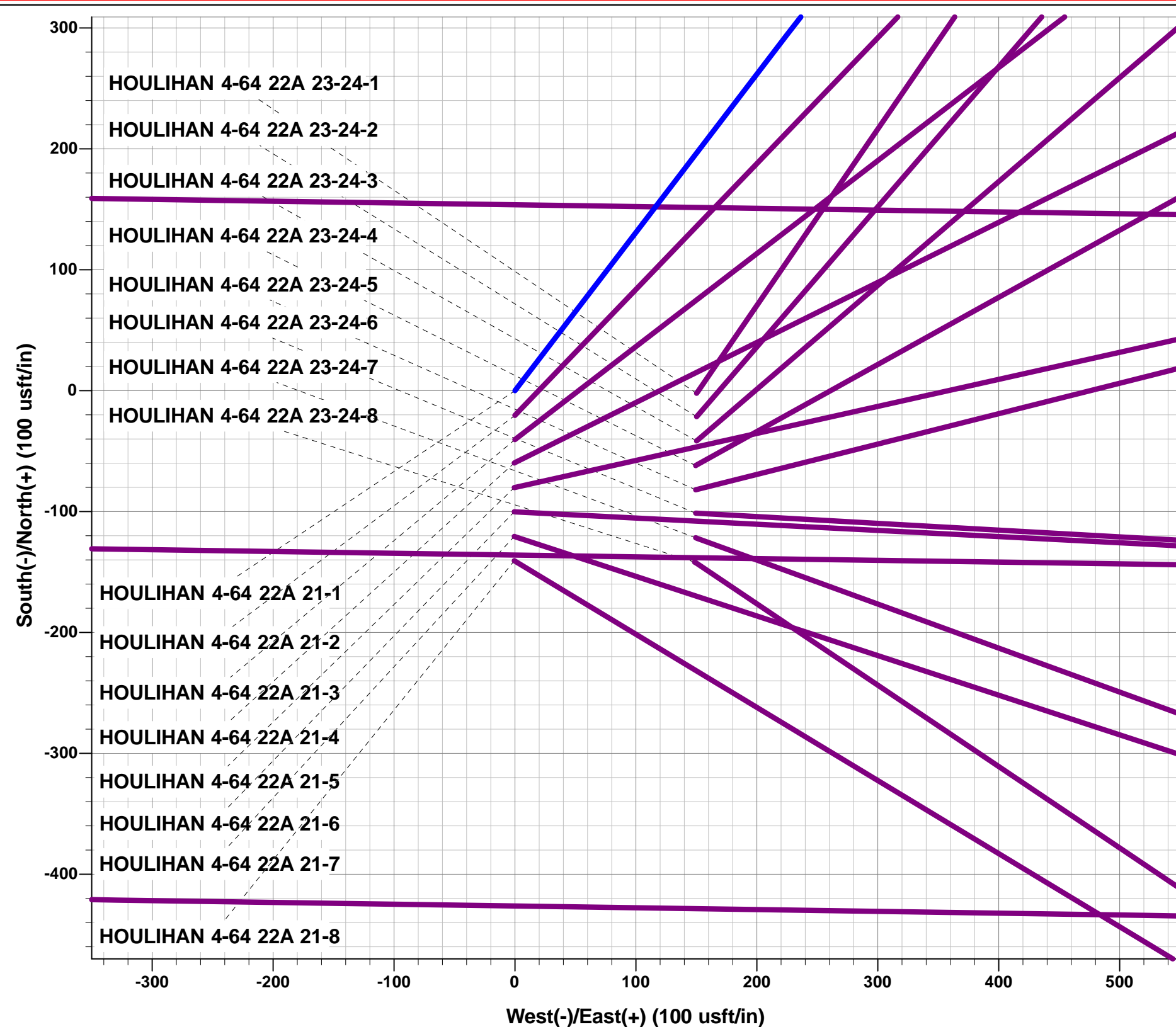
Project: ARAPAHOE COUNTY, COLORADO (NAD 83)
Site: SE NE SEC. 22 T4S R64W 6th P.M.
Well: HOULIHAN 4-64 22A 21-1
Wellbore: ORIGINAL WELLBORE
Design: PROPOSAL #1

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Dep	Annotation
0.0	0.0	0.00	0.00	0.0	0.0	0.0	0.0	SHL: 1774ft FNL & 1005ft FEL of Sec 22
100.0	100.0	0.00	0.00	0.0	0.0	0.0	0.0	START NUDGE (2°/100ft BUR)
843.7	852.3	15.05	37.39	78.0	59.6	-46.6	98.2	EOB TO 15.05° INC
6193.6	6392.2	15.05	37.39	1220.7	932.9	-728.4	1536.3	END OF TANGENT
6937.3	7144.4	0.00	0.00	1298.7	992.5	-775.0	1634.5	EOD TO VERTICAL
6967.3	7174.4	0.00	0.00	1298.7	992.5	-775.0	1634.5	KOP (10°/100ft BUR)
7523.4	7935.2	76.08	270.85	1305.2	557.5	-344.4	2069.7	BEGIN PROD INTERVAL
7540.3	8074.4	90.00	270.85	1307.2	419.6	-207.9	2207.5	HZ LP *NEW*: 460ft FNL & 597.9ft FEL of Sec 22
7540.3	17546.9	90.00	270.85	1447.4	-9051.8	9166.8	11679.9	BHL: 460ft FNL & 460ft FWL of Sec 21

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
KOP - HOULIHAN 4-64 22A 21-1	6967.3	1298.7	992.5	39.693982	-104.527679
BHL - HOULIHAN 4-64 22A-21-1	7540.3	1447.4	-9051.8	39.694386	-104.563372
HZ LP *NEW* - HOULIHAN 4-64 22A 21-1	7540.3	1307.2	419.6	39.694006	-104.529715



Azimuths to True North
Magnetic North: 8.05°

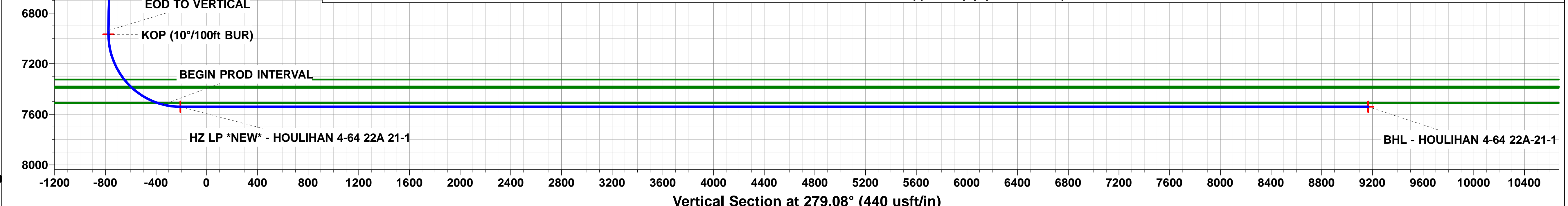
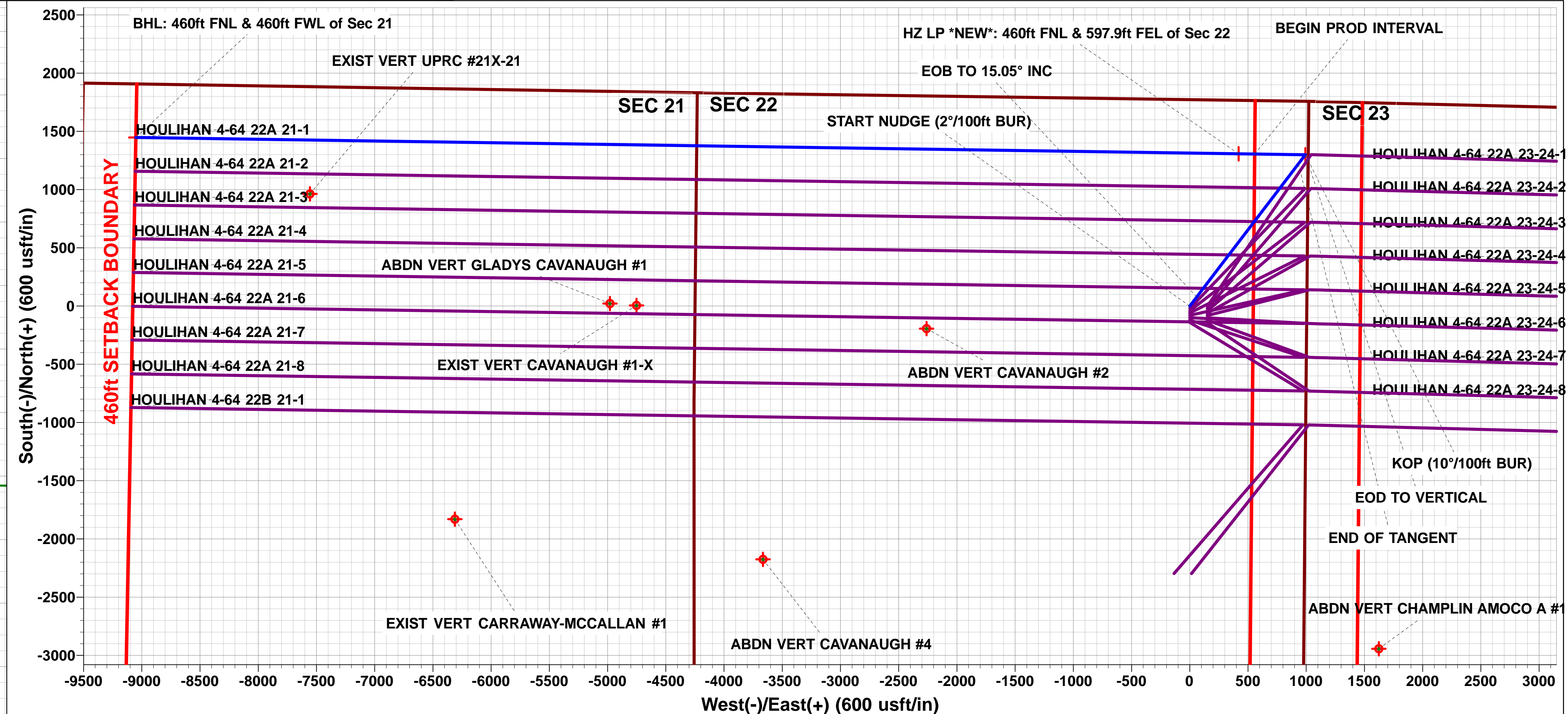
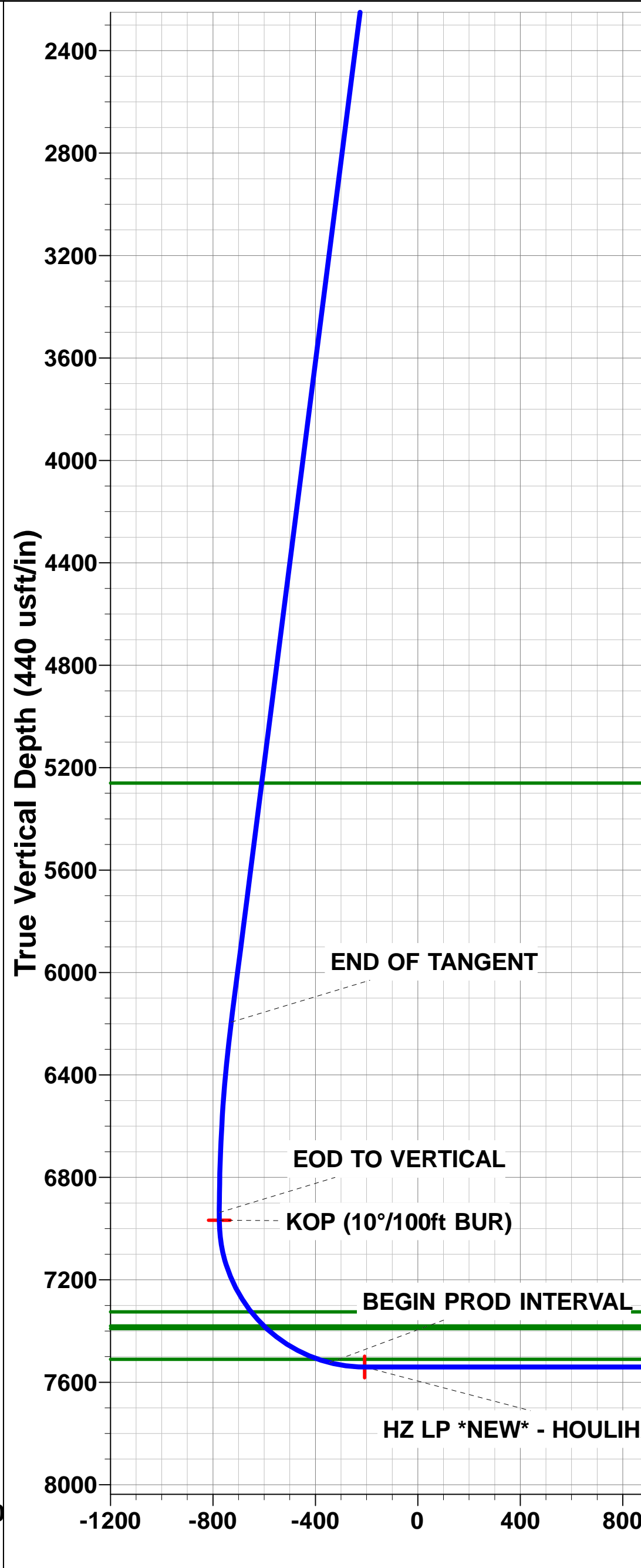
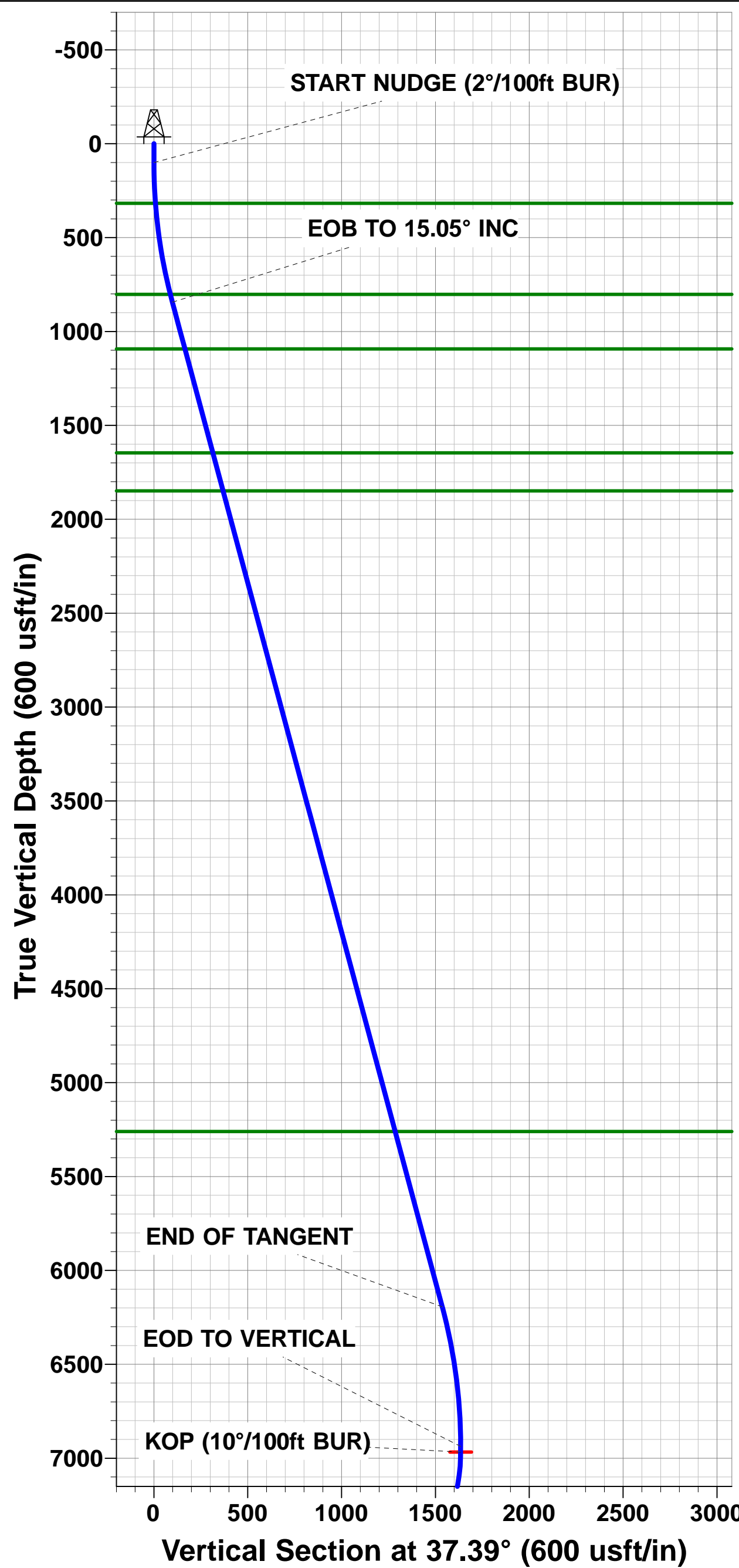
Magnetic Field
Strength: 52062.9snT
Dip Angle: 66.33°
Date: 30/03/2017
Model: IGRF2015

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
317.3	317.5	DENVER
802.3	809.5	UPPER ARAPAHOE
1092.3	1109.7	LOWER ARAPAHOE
1646.3	1683.4	LARAMIE - FOX HILLS
1848.3	1892.6	PIERRE SHALE
5260.3	5425.7	SHANNON SANDSTONE MBR
7325.3	7561.1	SHARON SPRINGS SHALE
7380.3	7635.7	NIOBRARA FORMATION
7390.3	7650.3	NIOBRARA A CHALK
7510.3	7888.4	NIOBRARA B CHALK

PROPOSED LOCAL COORDINATES:

SHL: 1774ft FNL & 1005ft FEL of Sec 22
BEGIN PROD INT: 460ft FNL & 460ft FEL of Sec 22
HZ LP: 460ft FNL & 597.9ft FEL of Sec 22
BHL: 460ft FNL & 460ft FWL of Sec 21



Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Project	ARAPAHOE COUNTY, COLORADO (NAD 83)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		Using geodetic scale factor

Site	SE NE SEC. 22 T4S R64W 6th P.M.				
Site Position:		Northing:	1,677,817.09 usft	Latitude:	39.690417
From:	Lat/Long	Easting:	3,272,633.76 usft	Longitude:	-104.531206
Position Uncertainty:	0.0 usft	Slot Radius:	1.10000ft	Grid Convergence:	0.61 °

Well	HOULIHAN 4-64 22A 21-1					
Well Position	+N/-S	0.0 usft	Northing:	1,677,817.09 usft	Latitude:	39.690417
	+E/-W	0.0 usft	Easting:	3,272,633.76 usft	Longitude:	-104.531206
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	5,705.3 usft

Wellbore	ORIGINAL WELLBORE				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	30/03/2017	8.05	66.33	52,063

Design	PROPOSAL #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	7,540.3	0.0	0.0	279.08

Plan Sections											
MD (usft)	Inc (°)	Azi (°)	Vertical Depth	SS (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	-5,730.3	0.0	0.0	0.00	0.00	0.00	0.00	
100.0	0.00	0.00	100.0	-5,630.3	0.0	0.0	0.00	0.00	0.00	0.00	
852.3	15.05	37.39	843.7	-4,886.6	78.0	59.6	2.00	2.00	0.00	37.39	
6,392.2	15.05	37.39	6,193.6	463.3	1,220.7	932.9	0.00	0.00	0.00	0.00	
7,144.4	0.00	0.00	6,937.3	1,207.0	1,298.7	992.5	2.00	-2.00	0.00	180.00	
7,174.4	0.00	0.00	6,967.3	1,237.0	1,298.7	992.5	0.00	0.00	0.00	0.00	KOP - HOULIHAN 4
8,074.4	90.00	270.85	7,540.3	1,810.0	1,307.2	419.6	10.00	10.00	0.00	270.85	
17,546.9	90.00	270.85	7,540.3	1,810.0	1,447.4	-9,051.8	0.00	0.00	0.00	-97.01	BHL - HOULIHAN 4

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Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey

MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
SHL: 1774ft FNL & 1005ft FEL of Sec 22										
0.0	0.00	0.00	0.0	5,730.30	0.0	0.0	0.0	0.00	0.00	0.00
START NUDGE (2°/100ft BUR)										
100.0	0.00	0.00	100.0	5,630.30	0.0	0.0	0.0	0.00	0.00	0.00
200.0	2.00	37.39	200.0	5,530.32	1.4	1.1	-0.8	2.00	2.00	0.00
300.0	4.00	37.39	299.8	5,430.46	5.5	4.2	-3.3	2.00	2.00	0.00
DENVER										
317.5	4.35	37.39	317.3	5,413.00	6.6	5.0	-3.9	2.00	2.00	0.00
400.0	6.00	37.39	399.5	5,330.85	12.5	9.5	-7.4	2.00	2.00	0.00
500.0	8.00	37.39	498.7	5,231.60	22.2	16.9	-13.2	2.00	2.00	0.00
600.0	10.00	37.39	597.5	5,132.83	34.6	26.4	-20.6	2.00	2.00	0.00
700.0	12.00	37.39	695.6	5,034.68	49.7	38.0	-29.7	2.00	2.00	0.00
800.0	14.00	37.39	793.1	4,937.24	67.6	51.7	-40.3	2.00	2.00	0.00
UPPER ARAPAHOE										
809.5	14.19	37.39	802.3	4,928.00	69.5	53.1	-41.4	2.00	2.00	0.00
EOB TO 15.05° INC										
852.3	15.05	37.39	843.7	4,886.62	78.0	59.6	-46.6	2.00	2.00	0.00
900.0	15.05	37.39	889.7	4,840.55	87.9	67.2	-52.4	0.00	0.00	0.00
1,000.0	15.05	37.39	986.3	4,743.98	108.5	82.9	-64.7	0.00	0.00	0.00
1,100.0	15.05	37.39	1,082.9	4,647.41	129.1	98.7	-77.1	0.00	0.00	0.00
LOWER ARAPAHOE										
1,109.7	15.05	37.39	1,092.3	4,638.00	131.1	100.2	-78.3	0.00	0.00	0.00
1,200.0	15.05	37.39	1,179.5	4,550.84	149.7	114.4	-89.4	0.00	0.00	0.00
1,300.0	15.05	37.39	1,276.0	4,454.26	170.4	130.2	-101.7	0.00	0.00	0.00
1,400.0	15.05	37.39	1,372.6	4,357.69	191.0	146.0	-114.0	0.00	0.00	0.00
1,500.0	15.05	37.39	1,469.2	4,261.12	211.6	161.7	-126.3	0.00	0.00	0.00
1,600.0	15.05	37.39	1,565.8	4,164.55	232.3	177.5	-138.6	0.00	0.00	0.00
LARAMIE - FOX HILLS										
1,683.4	15.05	37.39	1,646.3	4,084.00	249.5	190.6	-148.9	0.00	0.00	0.00
1,700.0	15.05	37.39	1,662.3	4,067.98	252.9	193.3	-150.9	0.00	0.00	0.00
1,800.0	15.05	37.39	1,758.9	3,971.41	273.5	209.0	-163.2	0.00	0.00	0.00
PIERRE SHALE (BASE FOX HILLS)										
1,892.6	15.05	37.39	1,848.3	3,882.00	292.6	223.6	-174.6	0.00	0.00	0.00
1,900.0	15.05	37.39	1,855.5	3,874.83	294.1	224.8	-175.5	0.00	0.00	0.00
2,000.0	15.05	37.39	1,952.0	3,778.26	314.8	240.5	-187.8	0.00	0.00	0.00
2,100.0	15.05	37.39	2,048.6	3,681.69	335.4	256.3	-200.1	0.00	0.00	0.00
2,200.0	15.05	37.39	2,145.2	3,585.12	356.0	272.1	-212.4	0.00	0.00	0.00
2,300.0	15.05	37.39	2,241.8	3,488.55	376.6	287.8	-224.8	0.00	0.00	0.00
2,400.0	15.05	37.39	2,338.3	3,391.97	397.3	303.6	-237.1	0.00	0.00	0.00
2,500.0	15.05	37.39	2,434.9	3,295.40	417.9	319.4	-249.4	0.00	0.00	0.00
2,600.0	15.05	37.39	2,531.5	3,198.83	438.5	335.1	-261.7	0.00	0.00	0.00
2,700.0	15.05	37.39	2,628.0	3,102.26	459.1	350.9	-274.0	0.00	0.00	0.00
2,800.0	15.05	37.39	2,724.6	3,005.69	479.8	366.6	-286.3	0.00	0.00	0.00
2,900.0	15.05	37.39	2,821.2	2,909.12	500.4	382.4	-298.6	0.00	0.00	0.00
3,000.0	15.05	37.39	2,917.8	2,812.54	521.0	398.2	-310.9	0.00	0.00	0.00
3,100.0	15.05	37.39	3,014.3	2,715.97	541.6	413.9	-323.2	0.00	0.00	0.00
3,200.0	15.05	37.39	3,110.9	2,619.40	562.3	429.7	-335.5	0.00	0.00	0.00
3,300.0	15.05	37.39	3,207.5	2,522.83	582.9	445.5	-347.8	0.00	0.00	0.00
3,400.0	15.05	37.39	3,304.0	2,426.26	603.5	461.2	-360.1	0.00	0.00	0.00
3,500.0	15.05	37.39	3,400.6	2,329.68	624.1	477.0	-372.5	0.00	0.00	0.00
3,600.0	15.05	37.39	3,497.2	2,233.11	644.8	492.7	-384.8	0.00	0.00	0.00
3,700.0	15.05	37.39	3,593.8	2,136.54	665.4	508.5	-397.1	0.00	0.00	0.00
3,800.0	15.05	37.39	3,690.3	2,039.97	686.0	524.3	-409.4	0.00	0.00	0.00

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Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey

MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
3,900.0	15.05	37.39	3,786.9	1,943.40	706.6	540.0	-421.7	0.00	0.00	0.00
4,000.0	15.05	37.39	3,883.5	1,846.83	727.3	555.8	-434.0	0.00	0.00	0.00
4,100.0	15.05	37.39	3,980.0	1,750.25	747.9	571.6	-446.3	0.00	0.00	0.00
4,200.0	15.05	37.39	4,076.6	1,653.68	768.5	587.3	-458.6	0.00	0.00	0.00
4,300.0	15.05	37.39	4,173.2	1,557.11	789.1	603.1	-470.9	0.00	0.00	0.00
4,400.0	15.05	37.39	4,269.8	1,460.54	809.8	618.8	-483.2	0.00	0.00	0.00
4,500.0	15.05	37.39	4,366.3	1,363.97	830.4	634.6	-495.5	0.00	0.00	0.00
4,600.0	15.05	37.39	4,462.9	1,267.39	851.0	650.4	-507.8	0.00	0.00	0.00
4,700.0	15.05	37.39	4,559.5	1,170.82	871.6	666.1	-520.2	0.00	0.00	0.00
4,800.0	15.05	37.39	4,656.0	1,074.25	892.3	681.9	-532.5	0.00	0.00	0.00
4,900.0	15.05	37.39	4,752.6	977.68	912.9	697.7	-544.8	0.00	0.00	0.00
5,000.0	15.05	37.39	4,849.2	881.11	933.5	713.4	-557.1	0.00	0.00	0.00
5,100.0	15.05	37.39	4,945.8	784.54	954.2	729.2	-569.4	0.00	0.00	0.00
5,200.0	15.05	37.39	5,042.3	687.96	974.8	745.0	-581.7	0.00	0.00	0.00
5,300.0	15.05	37.39	5,138.9	591.39	995.4	760.7	-594.0	0.00	0.00	0.00
5,400.0	15.05	37.39	5,235.5	494.82	1,016.0	776.5	-606.3	0.00	0.00	0.00
SHANNON SANDSTONE MBR										
5,425.7	15.05	37.39	5,260.3	470.00	1,021.3	780.5	-609.5	0.00	0.00	0.00
5,500.0	15.05	37.39	5,332.1	398.25	1,036.7	792.2	-618.6	0.00	0.00	0.00
5,600.0	15.05	37.39	5,428.6	301.68	1,057.3	808.0	-630.9	0.00	0.00	0.00
5,700.0	15.05	37.39	5,525.2	205.10	1,077.9	823.8	-643.2	0.00	0.00	0.00
5,800.0	15.05	37.39	5,621.8	108.53	1,098.5	839.5	-655.5	0.00	0.00	0.00
5,900.0	15.05	37.39	5,718.3	11.96	1,119.2	855.3	-667.9	0.00	0.00	0.00
6,000.0	15.05	37.39	5,814.9	-84.61	1,139.8	871.1	-680.2	0.00	0.00	0.00
6,100.0	15.05	37.39	5,911.5	-181.18	1,160.4	886.8	-692.5	0.00	0.00	0.00
6,200.0	15.05	37.39	6,008.1	-277.75	1,181.0	902.6	-704.8	0.00	0.00	0.00
6,300.0	15.05	37.39	6,104.6	-374.33	1,201.7	918.3	-717.1	0.00	0.00	0.00
END OF TANGENT										
6,392.2	15.05	37.39	6,193.6	-463.32	1,220.7	932.9	-728.4	0.00	0.00	0.00
6,400.0	14.89	37.39	6,201.2	-470.90	1,222.3	934.1	-729.4	2.00	-2.00	0.00
6,500.0	12.89	37.39	6,298.3	-567.97	1,241.3	948.7	-740.8	2.00	-2.00	0.00
6,600.0	10.89	37.39	6,396.1	-665.82	1,257.7	961.2	-750.5	2.00	-2.00	0.00
6,700.0	8.89	37.39	6,494.6	-764.33	1,271.4	971.6	-758.7	2.00	-2.00	0.00
6,800.0	6.89	37.39	6,593.7	-863.38	1,282.3	979.9	-765.2	2.00	-2.00	0.00
6,900.0	4.89	37.39	6,693.1	-962.85	1,290.4	986.2	-770.1	2.00	-2.00	0.00
7,000.0	2.89	37.39	6,792.9	-1,062.61	1,295.8	990.3	-773.3	2.00	-2.00	0.00
7,100.0	0.89	37.39	6,892.9	-1,162.55	1,298.4	992.3	-774.8	2.00	-2.00	0.00
EOD TO VERTICAL										
7,144.4	0.00	0.00	6,937.3	-1,207.00	1,298.7	992.5	-775.0	2.00	-2.00	0.00
KOP (10°/100ft BUR)										
7,174.4	0.00	0.00	6,967.3	-1,237.00	1,298.7	992.5	-775.0	0.00	0.00	0.00
7,200.0	2.56	270.85	6,992.8	-1,262.54	1,298.7	991.9	-774.4	10.00	10.00	0.00
7,300.0	12.56	270.85	7,091.8	-1,361.55	1,298.9	978.8	-761.4	10.00	10.00	0.00
7,400.0	22.56	270.85	7,187.1	-1,456.77	1,299.4	948.7	-731.6	10.00	10.00	0.00
7,500.0	32.56	270.85	7,275.6	-1,545.31	1,300.0	902.5	-685.9	10.00	10.00	0.00
SHARON SPRINGS SHALE										
7,561.1	38.67	270.85	7,325.3	-1,595.00	1,300.6	866.9	-650.7	10.00	10.00	0.00
7,600.0	42.56	270.85	7,354.8	-1,624.49	1,300.9	841.6	-625.6	10.00	10.00	0.00
NIORARA FORMATION										
7,635.7	46.12	270.85	7,380.3	-1,650.00	1,301.3	816.7	-601.0	10.00	10.00	0.00
NIORARA A CHALK										
7,650.3	47.58	270.85	7,390.3	-1,660.00	1,301.5	806.0	-590.4	10.00	10.00	0.00
7,700.0	52.56	270.85	7,422.2	-1,691.89	1,302.0	767.9	-552.7	10.00	10.00	0.00

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey										
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
7,800.0	62.56	270.85	7,475.8	-1,745.47	1,303.3	683.6	-469.3	10.00	10.00	0.00
NIORARA B CHALK										
7,888.4	71.39	270.85	7,510.3	-1,780.00	1,304.5	602.4	-388.9	10.00	10.00	0.00
7,900.0	72.56	270.85	7,513.9	-1,783.60	1,304.7	591.4	-377.9	10.00	10.00	0.00
BEGIN PROD INTERVAL										
7,935.2	76.08	270.85	7,523.4	-1,793.12	1,305.2	557.5	-344.4	10.00	10.00	0.00
8,000.0	82.56	270.85	7,535.4	-1,805.13	1,306.1	493.8	-281.4	10.00	10.00	0.00
HZ LP *NEW*: 460ft FNL & 597.9ft FEL of Sec 22										
8,074.4	90.00	270.85	7,540.3	-1,809.96	1,307.2	419.6	-207.9	10.00	10.00	0.00
8,100.0	90.00	270.85	7,540.3	-1,809.96	1,307.6	394.1	-182.7	0.00	0.00	0.00
8,200.0	90.00	270.85	7,540.3	-1,809.96	1,309.1	294.1	-83.7	0.00	0.00	0.00
8,300.0	90.00	270.85	7,540.3	-1,809.96	1,310.5	194.1	15.3	0.00	0.00	0.00
8,400.0	90.00	270.85	7,540.3	-1,809.96	1,312.0	94.1	114.3	0.00	0.00	0.00
8,500.0	90.00	270.85	7,540.3	-1,809.96	1,313.5	-5.9	213.2	0.00	0.00	0.00
8,600.0	90.00	270.85	7,540.3	-1,809.96	1,315.0	-105.9	312.2	0.00	0.00	0.00
8,700.0	90.00	270.85	7,540.3	-1,809.96	1,316.5	-205.9	411.2	0.00	0.00	0.00
8,800.0	90.00	270.85	7,540.3	-1,809.96	1,318.0	-305.9	510.1	0.00	0.00	0.00
8,900.0	90.00	270.85	7,540.3	-1,809.96	1,319.4	-405.9	609.1	0.00	0.00	0.00
9,000.0	90.00	270.85	7,540.3	-1,809.96	1,320.9	-505.8	708.1	0.00	0.00	0.00
9,100.0	90.00	270.85	7,540.3	-1,809.96	1,322.4	-605.8	807.0	0.00	0.00	0.00
9,200.0	90.00	270.85	7,540.3	-1,809.96	1,323.9	-705.8	906.0	0.00	0.00	0.00
9,300.0	90.00	270.85	7,540.3	-1,809.96	1,325.4	-805.8	1,005.0	0.00	0.00	0.00
9,400.0	90.00	270.85	7,540.3	-1,809.96	1,326.9	-905.8	1,103.9	0.00	0.00	0.00
9,500.0	90.00	270.85	7,540.3	-1,809.96	1,328.3	-1,005.8	1,202.9	0.00	0.00	0.00
9,600.0	90.00	270.85	7,540.3	-1,809.96	1,329.8	-1,105.8	1,301.9	0.00	0.00	0.00
9,700.0	90.00	270.85	7,540.3	-1,809.96	1,331.3	-1,205.8	1,400.8	0.00	0.00	0.00
9,800.0	90.00	270.85	7,540.3	-1,809.96	1,332.8	-1,305.8	1,499.8	0.00	0.00	0.00
9,900.0	90.00	270.85	7,540.3	-1,809.96	1,334.3	-1,405.7	1,598.8	0.00	0.00	0.00
10,000.0	90.00	270.85	7,540.3	-1,809.96	1,335.8	-1,505.7	1,697.8	0.00	0.00	0.00
10,100.0	90.00	270.85	7,540.3	-1,809.96	1,337.2	-1,605.7	1,796.7	0.00	0.00	0.00
10,200.0	90.00	270.85	7,540.3	-1,809.96	1,338.7	-1,705.7	1,895.7	0.00	0.00	0.00
10,300.0	90.00	270.85	7,540.3	-1,809.96	1,340.2	-1,805.7	1,994.7	0.00	0.00	0.00
10,400.0	90.00	270.85	7,540.3	-1,809.96	1,341.7	-1,905.7	2,093.6	0.00	0.00	0.00
10,500.0	90.00	270.85	7,540.3	-1,809.96	1,343.2	-2,005.7	2,192.6	0.00	0.00	0.00
10,600.0	90.00	270.85	7,540.3	-1,809.96	1,344.6	-2,105.7	2,291.6	0.00	0.00	0.00
10,700.0	90.00	270.85	7,540.3	-1,809.96	1,346.1	-2,205.7	2,390.5	0.00	0.00	0.00
10,800.0	90.00	270.85	7,540.3	-1,809.96	1,347.6	-2,305.6	2,489.5	0.00	0.00	0.00
10,900.0	90.00	270.85	7,540.3	-1,809.96	1,349.1	-2,405.6	2,588.5	0.00	0.00	0.00
11,000.0	90.00	270.85	7,540.3	-1,809.96	1,350.6	-2,505.6	2,687.4	0.00	0.00	0.00
11,100.0	90.00	270.85	7,540.3	-1,809.96	1,352.0	-2,605.6	2,786.4	0.00	0.00	0.00
11,200.0	90.00	270.85	7,540.3	-1,809.96	1,353.5	-2,705.6	2,885.4	0.00	0.00	0.00
11,300.0	90.00	270.85	7,540.3	-1,809.96	1,355.0	-2,805.6	2,984.3	0.00	0.00	0.00
11,400.0	90.00	270.85	7,540.3	-1,809.96	1,356.5	-2,905.6	3,083.3	0.00	0.00	0.00
11,500.0	90.00	270.85	7,540.3	-1,809.96	1,358.0	-3,005.6	3,182.3	0.00	0.00	0.00
11,600.0	90.00	270.85	7,540.3	-1,809.96	1,359.5	-3,105.6	3,281.3	0.00	0.00	0.00
11,700.0	90.00	270.85	7,540.3	-1,809.96	1,360.9	-3,205.5	3,380.2	0.00	0.00	0.00
11,800.0	90.00	270.85	7,540.3	-1,809.96	1,362.4	-3,305.5	3,479.2	0.00	0.00	0.00
11,900.0	90.00	270.85	7,540.3	-1,809.96	1,363.9	-3,405.5	3,578.2	0.00	0.00	0.00
12,000.0	90.00	270.85	7,540.3	-1,809.97	1,365.4	-3,505.5	3,677.1	0.00	0.00	0.00
12,100.0	90.00	270.85	7,540.3	-1,809.97	1,366.9	-3,605.5	3,776.1	0.00	0.00	0.00
12,200.0	90.00	270.85	7,540.3	-1,809.97	1,368.3	-3,705.5	3,875.1	0.00	0.00	0.00
12,300.0	90.00	270.85	7,540.3	-1,809.97	1,369.8	-3,805.5	3,974.0	0.00	0.00	0.00
12,400.0	90.00	270.85	7,540.3	-1,809.97	1,371.3	-3,905.5	4,073.0	0.00	0.00	0.00

Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Planned Survey										
MD (usft)	Inc (°)	Azi (°)	TVD (usft)	SS (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
12,500.0	90.00	270.85	7,540.3	-1,809.97	1,372.8	-4,005.5	4,172.0	0.00	0.00	0.00
12,600.0	90.00	270.85	7,540.3	-1,809.97	1,374.3	-4,105.4	4,270.9	0.00	0.00	0.00
12,700.0	90.00	270.85	7,540.3	-1,809.97	1,375.7	-4,205.4	4,369.9	0.00	0.00	0.00
12,800.0	90.00	270.85	7,540.3	-1,809.97	1,377.2	-4,305.4	4,468.9	0.00	0.00	0.00
12,900.0	90.00	270.85	7,540.3	-1,809.97	1,378.7	-4,405.4	4,567.8	0.00	0.00	0.00
13,000.0	90.00	270.85	7,540.3	-1,809.97	1,380.2	-4,505.4	4,666.8	0.00	0.00	0.00
13,100.0	90.00	270.85	7,540.3	-1,809.97	1,381.7	-4,605.4	4,765.8	0.00	0.00	0.00
13,200.0	90.00	270.85	7,540.3	-1,809.97	1,383.1	-4,705.4	4,864.7	0.00	0.00	0.00
13,300.0	90.00	270.85	7,540.3	-1,809.97	1,384.6	-4,805.4	4,963.7	0.00	0.00	0.00
13,400.0	90.00	270.85	7,540.3	-1,809.97	1,386.1	-4,905.4	5,062.7	0.00	0.00	0.00
13,500.0	90.00	270.85	7,540.3	-1,809.97	1,387.6	-5,005.4	5,161.7	0.00	0.00	0.00
13,600.0	90.00	270.85	7,540.3	-1,809.97	1,389.1	-5,105.3	5,260.6	0.00	0.00	0.00
13,700.0	90.00	270.85	7,540.3	-1,809.97	1,390.5	-5,205.3	5,359.6	0.00	0.00	0.00
13,800.0	90.00	270.85	7,540.3	-1,809.97	1,392.0	-5,305.3	5,458.6	0.00	0.00	0.00
13,900.0	90.00	270.85	7,540.3	-1,809.97	1,393.5	-5,405.3	5,557.5	0.00	0.00	0.00
14,000.0	90.00	270.85	7,540.3	-1,809.97	1,395.0	-5,505.3	5,656.5	0.00	0.00	0.00
14,100.0	90.00	270.85	7,540.3	-1,809.97	1,396.4	-5,605.3	5,755.5	0.00	0.00	0.00
14,200.0	90.00	270.85	7,540.3	-1,809.98	1,397.9	-5,705.3	5,854.4	0.00	0.00	0.00
14,300.0	90.00	270.85	7,540.3	-1,809.98	1,399.4	-5,805.3	5,953.4	0.00	0.00	0.00
14,400.0	90.00	270.85	7,540.3	-1,809.98	1,400.9	-5,905.3	6,052.4	0.00	0.00	0.00
14,500.0	90.00	270.85	7,540.3	-1,809.98	1,402.4	-6,005.2	6,151.3	0.00	0.00	0.00
14,600.0	90.00	270.85	7,540.3	-1,809.98	1,403.8	-6,105.2	6,250.3	0.00	0.00	0.00
14,700.0	90.00	270.85	7,540.3	-1,809.98	1,405.3	-6,205.2	6,349.3	0.00	0.00	0.00
14,800.0	90.00	270.85	7,540.3	-1,809.98	1,406.8	-6,305.2	6,448.2	0.00	0.00	0.00
14,900.0	90.00	270.85	7,540.3	-1,809.98	1,408.3	-6,405.2	6,547.2	0.00	0.00	0.00
15,000.0	90.00	270.85	7,540.3	-1,809.98	1,409.8	-6,505.2	6,646.2	0.00	0.00	0.00
15,100.0	90.00	270.85	7,540.3	-1,809.98	1,411.2	-6,605.2	6,745.1	0.00	0.00	0.00
15,200.0	90.00	270.85	7,540.3	-1,809.98	1,412.7	-6,705.2	6,844.1	0.00	0.00	0.00
15,300.0	90.00	270.85	7,540.3	-1,809.98	1,414.2	-6,805.2	6,943.1	0.00	0.00	0.00
15,400.0	90.00	270.85	7,540.3	-1,809.98	1,415.7	-6,905.1	7,042.1	0.00	0.00	0.00
15,500.0	90.00	270.85	7,540.3	-1,809.98	1,417.1	-7,005.1	7,141.0	0.00	0.00	0.00
15,600.0	90.00	270.85	7,540.3	-1,809.98	1,418.6	-7,105.1	7,240.0	0.00	0.00	0.00
15,700.0	90.00	270.85	7,540.3	-1,809.99	1,420.1	-7,205.1	7,339.0	0.00	0.00	0.00
15,800.0	90.00	270.85	7,540.3	-1,809.99	1,421.6	-7,305.1	7,437.9	0.00	0.00	0.00
15,900.0	90.00	270.85	7,540.3	-1,809.99	1,423.1	-7,405.1	7,536.9	0.00	0.00	0.00
16,000.0	90.00	270.85	7,540.3	-1,809.99	1,424.5	-7,505.1	7,635.9	0.00	0.00	0.00
16,100.0	90.00	270.85	7,540.3	-1,809.99	1,426.0	-7,605.1	7,734.8	0.00	0.00	0.00
16,200.0	90.00	270.85	7,540.3	-1,809.99	1,427.5	-7,705.1	7,833.8	0.00	0.00	0.00
16,300.0	90.00	270.85	7,540.3	-1,809.99	1,429.0	-7,805.0	7,932.8	0.00	0.00	0.00
16,400.0	90.00	270.85	7,540.3	-1,809.99	1,430.4	-7,905.0	8,031.7	0.00	0.00	0.00
16,500.0	90.00	270.85	7,540.3	-1,809.99	1,431.9	-8,005.0	8,130.7	0.00	0.00	0.00
16,600.0	90.00	270.85	7,540.3	-1,809.99	1,433.4	-8,105.0	8,229.7	0.00	0.00	0.00
16,700.0	90.00	270.85	7,540.3	-1,809.99	1,434.9	-8,205.0	8,328.6	0.00	0.00	0.00
16,800.0	90.00	270.85	7,540.3	-1,809.99	1,436.4	-8,305.0	8,427.6	0.00	0.00	0.00
16,900.0	90.00	270.85	7,540.3	-1,809.99	1,437.8	-8,405.0	8,526.6	0.00	0.00	0.00
17,000.0	90.00	270.85	7,540.3	-1,810.00	1,439.3	-8,505.0	8,625.5	0.00	0.00	0.00
17,100.0	90.00	270.85	7,540.3	-1,810.00	1,440.8	-8,605.0	8,724.5	0.00	0.00	0.00
17,200.0	90.00	270.85	7,540.3	-1,810.00	1,442.3	-8,704.9	8,823.5	0.00	0.00	0.00
17,300.0	90.00	270.85	7,540.3	-1,810.00	1,443.7	-8,804.9	8,922.4	0.00	0.00	0.00
17,400.0	90.00	270.85	7,540.3	-1,810.00	1,445.2	-8,904.9	9,021.4	0.00	0.00	0.00
17,500.0	90.00	270.85	7,540.3	-1,810.00	1,446.7	-9,004.9	9,120.4	0.00	0.00	0.00
BHL: 460ft FNL & 460ft FWL of Sec 21										
17,546.9	90.00	270.85	7,540.3	-1,810.00	1,447.4	-9,051.8	9,166.8	0.00	0.00	0.00

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well HOULIHAN 4-64 22A 21-1
Company:	BISON EXPLORATION	TVD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Project:	ARAPAHOE COUNTY, COLORADO (NAD 83)	MD Reference:	KB-EST @ 5730.3usft (Original Well Elev)
Site:	SE NE SEC. 22 T4S R64W 6th P.M.	North Reference:	True
Well:	HOULIHAN 4-64 22A 21-1	Survey Calculation Method:	Minimum Curvature
Wellbore:	ORIGINAL WELLBORE		
Design:	PROPOSAL #1		

Formations						
MD (usft)	TVD (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
317.5	317.3	DENVER				
809.5	802.3	UPPER ARAPAHOE				
1,109.7	1,092.3	LOWER ARAPAHOE				
1,683.4	1,646.3	LARAMIE - FOX HILLS				
1,892.6	1,848.3	PIERRE SHALE (BASE FOX HILLS				
5,425.7	5,260.3	SHANNON SANDSTONE MBR				
7,561.1	7,325.3	SHARON SPRINGS SHALE				
7,635.7	7,380.3	NIOBRARA FORMATION				
7,650.3	7,390.3	NIOBRARA A CHALK				
7,888.4	7,510.3	NIOBRARA B CHALK				

Plan Annotations				
MD (usft)	TVD (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
0.0	0.0	0.0	0.0	SHL: 1774ft FNL & 1005ft FEL of Sec 22
100.0	100.0	0.0	0.0	START NUDGE (2°/100ft BUR)
852.3	843.7	78.0	59.6	EOB TO 15.05° INC
6,392.2	6,193.6	1,220.7	932.9	END OF TANGENT
7,144.4	6,937.3	1,298.7	992.5	EOD TO VERTICAL
7,174.4	6,967.3	1,298.7	992.5	KOP (10°/100ft BUR)
7,935.2	7,523.4	1,305.2	557.5	BEGIN PROD INTERVAL
8,074.4	7,540.3	1,307.2	419.6	HZ LP *NEW*: 460ft FNL & 597.9ft FEL of Sec 22
17,546.9	7,540.3	1,447.4	-9,051.8	BHL: 460ft FNL & 460ft FWL of Sec 21