



**DRILLING PROGRAM**

BHR Fed O23-14-397-4RH  
SE/4, SE/4 S23 T3N R97W  
Rio Blanco Co., Colorado

Surface: Lat. 40.208617° Long: -108.240532°  
BHL: Lat. 40.234524° Long: -108.24434°  
Graded GL: 6,077  
KB: 25'  
Date: May 25-2018

**1 ESTIMATED FORMATION TOPS**

FORMATION	TVD(KB)	MD(KB)
Wasatch	25'	
Mesaverde	1,847'	
Loss Zone 1 (in H1 Sidetrack)	3,137'	
Rollins	5,346'	5,370'
Loss Zone 2 (in Wiley Vertical Plot)	5,737'	
Sego-Lower	6,626'	6,669'
Castlegate	7,047'	7,097'
Mancos - Marker 6 - Condensed Section	8,404'	8,473'
Niobrara - Buck Peak	*	9,733'
Niobrara - Tow Creek	*	10,193'
Niobrara - Wolf Mountain	*	10,570'
Niobrara - Hot Wolf Mtn - Rangely Bench	*	10,903'
Top Target	*	10,936'
Target		10,961'
Base Target		10,986'

**2 ESTIMATED DEPTHS AT WHICH WATER, OIL, GAS, OR OTHER MINERAL BEARING FORMATIONS ARE EXPECTED TO BE ENCOUNTERED**

A. Formations marked with an asterisk (\*) in "1.0" above indicate anticipated oil or gas bearing formations.  
Several water zones were identified within the Mesaverde and Upper Mancos stratigraphic units between 3,300' (base of surface casing) and 6,416' MD using open hole logs/mud logs from 23-3-97 #1 vertical pilot hole (API # 05-103-11954-00) that was drilled on same pad as proposed BHR Fed O23-15-397-4RH well. These porous rock units have been noted, and casing design for proposed O23-15-397-4RH well has taken these into account so that surface and intermediate casing will cover all identified zones. A thixotropic mixture of cement has been proposed on intermediate lead to cover loss zone around 5,120'.

**3 CASING AND CEMENTING WILL BE DONE TO PROTECT POTENTIALLY PRODUCTIVE HYDROCARBONS, FRESH WATER ZONES, ABNORMAL PRESSURE ZONES, AND PROSPECTIVELY VALUABLE MINERAL DEPOSITS.**

A. Casing Head: 13-5/8" 5M x 13 3/8", With Flange at Ground Level  
Tubing Head: 13 3/8" 5M x 7-1/6" 10M  
Operators minimum specifications for pressure control equipment are shown on the attached BOP schematic. After running surface and intermediate casing, and prior to drilling out, all BOPE (blind rams, pipe rams, manifold, etc.) and related equipment will be pressure tested to 100% of the BOP's rated working pressure. The Annular Preventer will be tested to 70% of its rated working pressure. Thereafter, the BOPE will be checked daily for mechanical operations. Such check will be noted in the IADC drilling reports. BOPE will be tested to a low pressure of 250 psi prior to testing to the high pressures indicated above.

**4.0a PROPOSED CASING PROGRAM**

Section	Top (MD)	Bottom (MD)	Hole	Csg OD	Wt (lb/ft)	Grade	Thread	Length
Conductor:	Surface	80'	26"	20"	104	XHY	PE	80'
Surface:	Surface	3,300'	17 1/2"	13-3/8"	68	J55	BTC	3,300'
Intermediate:	Surface	10,130'	12 1/4"	9 5/8"	43.5	HCP110	BTC	10,130
Production Liner:	9930'	20,707'	8 1/2"	5 1/2"	20	P110	BTC	10,777'

NOTE: All casing installed shall be NEW CONDITION

**4.0b CASING PROPERTIES DESIGN FACTORS**

Section	Interval (MD)	Casing	ID	COLLAPSE (psi)	BURST (psi)	TENSION (k-lbs)*
Conductor:	Surface - 80'	20", 104#, XHY, PE	19.0"	n/a	n/a	n/a
Surface:	Surface - 3,300'	13-3/8", 68#, J55, BTC	12.415"	1,950	3,450	675
Intermediate:	Surface - 10,130'	9-5/8", 43.5#, HCP110, BTC	8.755"	5,940	9,850	1388
Production Liner:	9,930' - 20,707'	5 1/2", 20#, P110 HTQ, BTC	4.788"	11,100	12,530	641

\* Less of Body or Jt Strength



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**CASING RATING / DESIGN SAFETY FACTORS**

Section	Interval (MD)	Casing	COLLAPSE (psi)			BURST (psi)			TENSION (k-ibs)		
Conductor:	Surface - 80'	20", 104#, XHY, PE	n/a	/	n/a	n/a	/	n/a	n/a	/	n/a
Surface:	Surface - 3,300'	13-3/8", 68#, J55, BTC	1.0	/	1.14	1.2	/	2.01	1.8	/	3.3
Intermediate:	Surface - 10,130'	9-5/8", 43.5#, HCP110, BTC	1.0	/	1.14	1.2	/	1.89	1.8	/	2.6
Production Liner:	9,930' - 20,707'	5 1/2", 20#, P110 HTQ, BTC	1.0	/	1.39	1.2	/	1.56	1.8	/	2.1

**5 CEMENTING PROGRAM**

5.1 Surface Casing Cementing Program

Surface Casing Set At: **3,300' MD(KB)**

	Density (lb/gal)	Fill Up (ft)	Volume (ft³)	Excess (%)	Total Vol + % Excess		Yield (ft³/sx)	Sacks	
					( bbl)	(ft³)			
Lead:	12	0'-2,800'	2,800'	1945.0 ft³	50%	519 bbl	2917.5 ft³	2.53 ft³/sx	1,155
Tail:	12.5	2,800'-3,300'	500'	347.3 ft³	0%	62 bbl	347.3ft³	2.22 ft³/sx	156
Shoe:	12.5	43'	36.1 ft³	0%	6.4 bbl	36.1 ft³	2.22 ft³/sx	16	
Slurry Recipes									
Lead:	Type III + Additives								
Tail:	Type III + Additives								
Shoe Track:	Same Slurry As Tail.								

5.2 Intermediate Casing Cementing Program

Intermediate Casing Set At: **10,130' MD(KB)**

	Density (lb/gal)	Fill Up (ft)	Volume (ft³)	Excess (%)	Total Vol + % Excess		Yield (ft³/sx)	Sacks	
					( bbl)	(ft³)			
Lead:	12.5	3100'-3300'	200'	67.1 ft³	20%	14.3 bbl	80.5 ft³	2.07ft³/sx	39
Lead:	12.5	3300'-8273'	4,973'	1557.5 ft³	20%	332.9 bbl	1869 ft³	2.07ft³/sx	903
Tail:	13.5	8273'-10130'	1,857'	581.6 ft³	20%	124 bbl	697.9 ft³	1.9 ft³/sx	367
Shoe:	13.5	43'	18 ft³	0%	3.2 bbl	18 ft³	1.9 ft³/sx	10	
Slurry Recipes									
Lead:	Type III + Additives								
Tail:	50/50 Class G / POZ + Additives								
Shoe Track:	Same Slurry As Tail.								

5.3 Production Casing Cementing Program

Production Casing Set: **20,707' MD(KB)**

	Density (lb/gal)	Fill Up (ft)	Volume (ft³)	Excess (%)	Total Vol + % Excess		Yield (ft³/sx)	Sacks	
					( bbl)	(ft³)			
Lead:	13.5	9,930'-10,130'	200'	50.6 ft³	0%	9 bbl	50.6 ft³	1.85 ft³/sx	27
Tail:	13.5	10,130'-20,707'	10,577'	2423 ft³	10%	475 bbl	2665.3 ft³	1.85 ft³/sx	1441
Shoe:	13.5	43'	5.4 ft³	0%	0.95 bbl	5.4 ft³	1.85 ft³/sx	3	
Slurry Recipes									
Lead:	50/50 Class G / POZ + Additives								
Tail:	50/50 Class G / POZ + Additives								
Shoe Track:	Same Slurry As Tail								

**6 DRILLING MUD PROGRAM**

Hole Section	From	To	Mud Type	MW (lb/gal)	Vis (sec/qt)	PV (cP)	YP (lb/100 ft³)	LGS (%)	pH	API WL	HPHT (ml)	O/W (αw)	ES	WPS (mg/l)
Surface	80'	3,300'	LSND	8.5-9.0	30-45	8-20	6-12	<6%	8.5-9.5	12-20	-	-	-	-
Intermediate	3,300'	10,130'	LSND	8.5-9.5	30-45	8-20	6-12	<6%	8.5-9.5	6-8	-	-	-	-
Production	10,130'	20,707'	OBM	12.5-13.0	40-60	12-20	6-14	<5%	-	-	10.0-20.0	8020-1525	500-900	250-350



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**7 BOTTOM HOLE PRESSURE AND TEMPERATURE**

BHP (psi)	BHT Circ	BHT Static
7,047	240°F	260°F

**8 AUXILIARY EQUIPMENT**

See attached schematic for BOP components  
Centrifuge to be used in Intermediate and Production Holes

**9 BLM AND COLORADO OIL & GAS COMMISSION NOTICES**

- a) 24 Hours prior to spud/48 Hrs COGCC
- b) 24 hours prior to running and cementing casing
- c) 24 hours prior to testing BOPs/FIT
- d) 24 hours prior to P&A of well/48 hrs COGCC

**10 DEVIATION & MWD SURVEYS AND OPEN HOLE LOGGING PROGRAM**

**10.1 Deviation Surveys & MWD**

Surface Hole: 3° maximum deviation, 1"/100' Dog Leg Severity. Survey every 500'  
Surface - TD: Please see attached directional plan

**10.2 Open Hole Logging Program**

The first well on the O23 Pad has been logged with an open-hole resistivity log with gamma-ray from TD into the surface casing. All subsequent wells including O23-14-397-4RH on the pad will have a cement bond log with gamma-ray run on the intermediate casing and top of production liner. The horizontal portion of wellbore will be logged with measured-while-drilling log with gamma-ray.



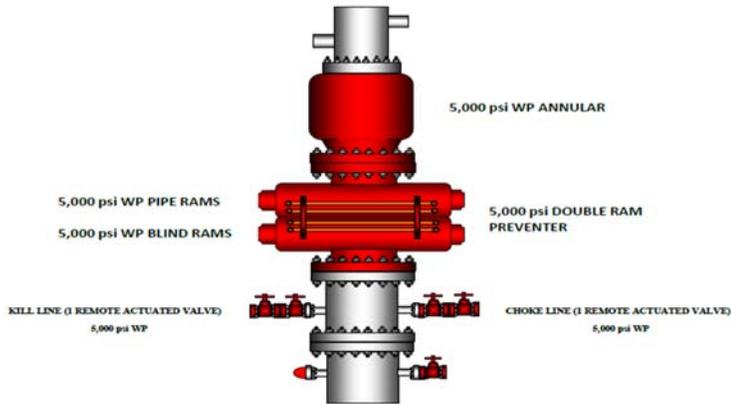
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**BOP AND PRESSURE CONTAINMENT DATA**

1. BOP EQUIPMENT SHALL CONSIST OF A DOUBLE GATE, HYDRAULICALLY OPERATED ANNULAR PREVENTER WITH PIPE & BLIND RAMS OR TOW SINGLE RAM TYPE PREVENTERS. ONE EQUIPPED WITH PIPE RAMS, THE OTHER EQUIPPED WITH BLIND RAMS.
2. BOP'S ARE TO BE WELL BRACED WITH HAND CONTROLS EXTENDED CLEAR OF THE SUBSTRUCTURE.
3. ACCUMULATOR TO PROVIDE CLOSING PRESSURE IN EXCESS OF THAT REQUIRED WITH SUFFICIENT VOLUME TO OPERATE ALL COMPONENTS.
4. AUXILIARY EQUIPMENT: LOWER KELLY COCK, FULL OPENING STARBBING VALVE, 2½" CHOKE MANIFOLD.
5. ALL BOP EQUIPMENT, AUXILIARY EQUIPMENT, STAND PIPE, VALVES, AND ROTARY HOSE TO BE TESTED TO THE RATED WORKING PRESSURE OF THE BOP'S AT THE TIME OF INSTALLATION AND EVERY 30 DAYS THEREAFTER. BOT'S TO BE MECHANICALLY CHECKED DAILY.
6. MODIFICATION OF HOOK-UP OR TESTING PROCEDURE MUST BE APPROVED IN WRITING ON TOWER REPORTS BY WELLSITE SUPERVISOR.





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**ATTACHMENT B**  
PRESSURE CONTAINMENT MAINFOLD EQUIPMENT

