GEOLOGIC & DRILLING PROGNOSIS Prepared: 18-Feb-21 DC

WELL NAME: **RG 44-7-297**
Directional from the pad RG 41-18-297

API: 05-103-12471-00
STATE: CO
COUNTY: RIO BLANCO Unspaced
BOTTOM HOLE LOCATION: Sec. 7 T 2S R 97W
TYPE OF UNIT: FED
FEDERAL EA: Yes
HARDLINE: No

ELEVATION (ft):
PAD (ft): 6621
GROUND (ft): 6620
KELLY BUSHING (ft): 6651

RIG INFORMATION:
RIG NAME: HP 329
KB HEIGHT (ft): 30

ESTIMATE TOPS:

Formation	TVD	MD	Formation Resource Notes
Green River	966	**978**	Potentially Useable Water
A Groove	1126	**1146**	Potentially Useable Water
B Groove	1311	**1343**	Potentially Useable Water
Dissolution Surface	1626	**1679**	Possible Lost Circ Zone
Orange Marker	2546	**2659**	Potentially Useable Water
Wasatch	2751	**2877**	Potentially Useable Water
Top of "G" Sand	5201	**5486**	Possible Lost Circ Zone
Fort Union	5531	**5837**	Gas and Limited Use and Quality Water
Ohio Creek	6931	**7325**	Possible Lost Circ Zone
Mesaverde	6931	**7325**	Gas and Limited Use and Quality Water
Approx. Top Gas	8021	**8431**	Gas and Limited Use and Quality Water
Cameo Coals	10371	**10781**	Gas, Coal, and Limited Use and Quality Water
Rollins SS	10951	**11361**	Gas and Limited Use and Quality Water
Cozzette	11101	**11511**	Gas and Limited Use and Quality Water
Corcoran	11321	**11731**	Gas and Limited Use and Quality Water
Upper Sego	11681	**12091**	Gas and Limited Use and Quality Water
Lower Sego	11981	**12391**	Gas and Limited Use and Quality Water
TD	12101	**12511**	

MUD LOGGING:
Type: **(Optional) Remote Gas Unit**
Interval: **Base of surface casing to TD with total gas only**

OPEN HOLE LOGS:
Specifics: **(Optional) Triple-Combo (DIL-GR-SP-Neutron Density)**
Interval: **GR from TD to surface, DIL-SP and Neutron Density from TD to 100' inside surface casing**

CASED HOLE LOGS:
Specifics: **Pulsed Neutron Log (e.g. RMTE, RPM, or RST)**
Processing: **Emulation Triple Combo Using OH logs and training well**
Cement Evaluation: **CBL**

CSG & CEMENT PROGRAM: SHOE TEST REQUIRED

	Csg Size (in)	Depth Set (tvd)	Depth Set (md)	Hole Size (in)	Approx. Cmt Tail (ft3)	Tail Yield (ft3/sx)	Approx. Sx Tail	Approx. Cmt Lead (ft3)	Lead Yield (ft3/sx)	Approx. Sx Lead	WOC (hrs)
Conductor:	20	84	84	30	228	199					
Surface	13.375	1426	1479	17.5	N/A	N/A	N/A	1130	2.34	483	
Intermediate	9.625	3251	3377	12.25	172	2.10	82	172	2.40	72	
Liner or Production:	4.5	12101	12511	8.75/7.875	1446	1.85	784	374	2.00	187	
					Surface (sacks): 483		**Intermediate (sacks):**	154	**Prod. (sacks):** 971		

ANTICIPATED PRESSURES (psi)

MASP	Prod Csg Test Pressure	Anticipated BHP	Prod. Csg. Grade
2,965	8,500	5,627	P-110

MUD PROGRAM: (Do not deviate from mud engineer's recommendation without prior consent from Parachute office)

FROM (md)	TO (md)	TYPE MUD	#/GAL	VIS	WL	CHEMICALS
0	3377	WBM	8.33-9.0	45-50	7-15	Bentonite/PHPA
3377	12511	LSND	8.7-10.0	40-80	6-10	PHPA/Barite

(Write mud added to system on tour sheets and report all mud mixed and daily cost in morning report)

LOST CIRCULATION: Report depth and bbls of mud lost on morning report and tour sheet. Any severe lost circulation problems should be reported immediately to well supervisor.

SURVEYS: Run every 100' on surface hole and trips unless otherwise instructed.

TEP GEOLOGIST: **Office** **Cell**
Stephen Sunnenberg **281-936-0361** **303-918-4327** ssunnenberg@terraep.com
(note: if there are questions concerning TD or logging, please call Geologist)

CASING & CEMENTING PLAN

Operator: Terra Energy Partners
Well Name & Number: RG 44-7-297
Location: Ryan Gulch

Casing Design Calculations											
Type of Casing	Size of Hole (inches)	Size of Casing (inches)	Weight per Foot (lbs/ft)	Grade	Thread	Interval (ft - ft)	Length (feet)	Setting Depth (TVD feet)	Collapse (psi)	Burst (psi)	Tension (lbs)
Surface	17.5	13.375	54.5	J-55	BTC	0-1479	1,479	1,426	1130	2735	853,000
Intermediate	12.250	9.625	36.0	J-55	LTC	0-3377	3,377	3,251	2,020	3,520	453,000
Production	8.750	4.500	11.6	P-110	DWC/C	0-12511	12,511	12,101	8,860	12,150	417,000

Surface Casing Shoe		Intermdiate Casing Shoe		Production Casing Shoe	
Max MW =	9.2 ppg	Max MW =	9.2 ppg	Max MW =	10.0 ppg
HP =	682 psi	HP =	1,555 psi	HP =	6,293 psi

True Vertical Depth =	12,101
Bottom Hole Pressure =	5,627
Pore Pressure Gradient =	0.465
Max. Sur. Pressure =	2,965
BOP Required =	3M

5M system will be used as per N

Bottom Hole Temperature = 230 degrees Farenheit

Casing Safety Factors			
Surface Casing	Pb = 3.43	Min = 1.100	Pass
	Pc = 1.66	Min = 1.125	Pass
	Sj = 10.58	Min = 1.500	Pass
Intermediate Casing	Pb = 1.19	Min = 1.100	Pass
	Pc = 1.30	Min = 1.125	Pass
	Sj = 3.73	Min = 1.500	Pass
Production Casing	Pb = 4.10	Min = 1.100	Pass
	Pc = 1.41	Min = 1.125	Pass
	Sj = 2.87	Min = 1.500	Pass

Cement Design Calculations
Estimating Cement for Ryan Gulch Wells (Permitting purpose only)

Critical Depths - Permitting Purposes Only	
Casing/Formation	Measured Depth
Surface Casing	1,479 ft
Intermediate Casing	3,377 ft
Top of Mesaverde	7,325 ft
Top of Gas	8,431 ft
Total Depth	12,511 ft

Production Cement Tops (Permitting Purposes Only)	
Cement Slurry	TOC - Measured Depth
Scavenger	3,177 ft
Lead	7,125 ft
Tail	8,231 ft

Surface Cement	Lead
Cement Tops	**Surface**
Volume, bbls	183
Annular vol w/ excess, ft^3	1130
Volume, sacks	483
Slurry Weight, ppg	12.3
Slurry Yield, ft^3/sk	2.340
Mixwater, gal/sk	13.40
Annular Capacity (BBl)	0.1237
Annular Capacity (CF)	0.6947
Excess	0.1
Total Sacks	483
Total Cubic Ft.	1,130

Intermediate Cement	Lead	Tail
Cement Tops	**2,377**	**2,877**
Volume, bbls	28	28
Annular vol w/ excess, ft^3	172	172
Volume, sacks	72	82
Slurry Weight, ppg	12.3	12.8
Slurry Yield, ft^3/sk	2.400	2.100
Mixwater, gal/sk	13.30	11.30
Annular Capacity (BBl)	0.0558	0.0558
Annular Capacity (CF)	0.3132	0.3132
Excess	0.1	0.1
	Total Sacks =	154
	Total Cubic Ft. =	345

Production Cement	Scavenger	Lead
Cement Tops	**3,177**	**7125**
Volume, bbls	216	61
Annular vol w/excess, ft^3	1,334	374
Volume, sacks	434	187
Slurry Weight, ppg	11.0	12.7
Slurry Yield, ft^3/sk	3.074	1.999
Mixwater, gal/sk	18.830	11.000
Annular Capacity (BBl)	0.0547	0.0547
Annular Capacity (CF)	0.3072	0.3072
Excess	0.1	0.1
		Total Sacks =
		Total Cubic Ft. =

NOTES:
Surface Casing 17-1/2" hole to TD - Cement to surface.
54.5# 13-3/8" J-55, BTC surface casing will be ran.
10% excess is included in calculations.
Normal Surface excess is 40% over gauge hole
Normal Intermediate excess is 50% over gauge hole
Normal Production excess is 45% over gauge hole.

Casing Design Calculations

Surface Casing - 54.5#

Burst

Bottom Hole Pressure = TVD * Pore Pressure Gradient
= 3251 * 0.465
= 1511.715 psi

Pburst = Bottom Hole Presure - (0.22 * TVD)
= 1511.715 - (0.22 * 3251)
= 796.495 psi

Pb = Casing Burst Rating / Pburst
= 2735 / 796.495
= 3.43

Pb		1.1
3.43	≥	1.1

Collapse

If: Max MW * Setting TVD * 0.052 ≥ Pore Pressure Gradient * Setting TVD
9.2 * 1426 * 0.052 ≥ 0.465 * 1426
682.1984 ≥ 663.09

Pcollapse = Max MW * Setting TVD *0.052
= 682.1984 psi

Else:
Pcollapse = Pore Pressure Gradient * Setting TVD
= 663.09 psi
Pcollapse= 682.1984 psi

Pc = Casing Collapse Rating / Pcollapse
= 1130 / 682.1984
= 1.66

Pc		1.125
1.66	≥	1.125

Tensile

Tension = (Weight1 * Length1)
= (54.5 * 1479)
= 80605.5 lbs

Sj = Casing Tension Rating / Tension
= 853000 / 80605.5
= 10.58

Sj		1.5
10.58	≥	1.5

Intermediate Casing - 36#

Burst

Bottom Hole Pressure = TVD * Pore Pressure Gradient
= 12101 * 0.465
= 5627 psi

Pburst = Bottom Hole Presure - (0.22 * TVD)
= 5626.965 - (0.22 * 12101)
= 2964.7 psi

Pb = Casing Burst Rating / Pburst
= 3520 / 2964.745
= 1.19

Pb		1.1
1.19	≥	1.1

Collapse

If: Max MW * Setting TVD * 0.052 ≥ Pore Pressure Gradient * Setting TVD
9.2 * 3251 * 0.052 ≥ 0.465 * 3251
1555.3 ≥ 1511.715

Pcollapse = Max MW * Setting TVD *0.052
= 1555.3 psi

Else:
Pcollapse = Pore Pressure Gradient * Setting TVD
= 1511.7 psi
Pcollapse= 1555.3 psi

Pc = Casing Collapse Rating / Pcollapse
= 2020 / 1555.2784
= 1.30

Pc		1.125
1.30	≥	1.125

Tensile

Tension = (Weight1 * Length1)
= (36 * 3377)
= 121572 lbs

Sj = Casing Tension Rating / Tension
= 453000 / 121572
= 3.73

Sj		1.5
3.73	≥	1.5

Production Casing

Burst

Bottom Hole Pressure = TVD * Pore Pressure Gradient
= 12101 * 0.465
= 5627 psi

Pburst = Bottom Hole Presure - (0.22 * TVD)
= 5626.965 - (0.22 * 12101)
= 2964.7 psi

Pb = Casing Burst Rating / Pburst
= 12150 / 2964.745
= 4.10

Pb		1.1
4.10	≥	1.1

Collapse

If: Max MW * Setting TVD * 0.052 ≥ Pore Pressure Gradient * Setting TVD
10 * 12101 * 0.052 ≥ 0.465 * 12101
6292.5 ≥ 5626.965

Pcollapse = Max MW * Setting TVD *0.052
= 6292.5 psi

Else:
Pcollapse = Pore Pressure Gradient * Setting TVD
= 5627 psi

Pcollapse= 6292.5 psi
Pc = Casing Collapse Rating / Pcollapse
= 8860 / 6292.52
= 1.41

Pc		1.125
1.41	≥	1.125

Tensile

Tension = Weight * Length
= 11.6 * 12511
= 145128 lbs

Sj = Casing Tension Rating / Tension
= 417000 / 145127.6
= 2.87

Sj		1.5
2.87	≥	1.5