west virginia department of environmental protection

Office of Oil and Gas
601 57th Street, S.E.
Charleston, WV 25304
(304) 926-0450
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Harold D. Ward, Cabinet Secretary
www.dep.wv.gov

Monday, April 1, 2024
PERMIT MODIFICATION APPROVAL
Horizontal / New Drill

COLUMBIA GAS TRANSMISSION, LLC
1700 MACCORKLE AVENUE SE

CHARLESTON, WV 25314

Re: Permit Modification Approval for COCO B / 12643
47-039-06401-00-00

SUBSURFACE CHANGES TO INCLUDE UPDATED CASING POINTS, GEOLOGIC PROGNOSIS AND DIRECTIONAL DRILL PROFILES.

COLUMBIA GAS TRANSMISSION, LLC

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin
Chief

Operator's Well Number: COCO B / 12643
Farm Name: JAMES A. & FREDA MARIE MORTON
U.S. WELL NUMBER: 47-039-06401-00-00
Horizontal New Drill
Date Modification Issued: 4/1/2024

04/05/2024

4703906401M

Columbia Gas Transmission, LLC
1700 MacCorkle Ave., SE, Charleston, WV, USA 25314

TC Energy

March 18, 2024

WV DEP – Office of Oil & Gas
601 57th Street, SE
Charleston, WV 25304-2345

Enclosed please find a summary of subsurface changes to the new drill well plans for previously approved permit applications for the following Columbia Gas Transmission storage wells:

Coco B 12643 (API 47-039-06401T)
Coco B 12644 (API 47-039-06402T)

Concise well plan prognosis has been expanded to include description of planned batch drilling operations and updated casing points. Geologic prognosis has been updated per new stratigraphic interpretations which has resulted in a change to the casing program and directional well profiles.

If you have questions, feel free to call.

Regards,

Maria Medvedeva
Senior Wells Engineer
Well Engineering & Technology
Columbia Gas Transmission, LLC
Mob: 304-410-4313
maria_medvedeva@tcenergy.com

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TC Energy

2024

Coco B New Drills

Sundry Request

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1 Contents

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2 Concise Prognosis

2.1 Coco B 12643 (API 47-039-06401T)

Construct access road and well pad. Install +/- 40 ft of 24" conductor pipe. Air drill 22" hole, install +/- 750 ft of 18-5/8" casing (minimum 40' below deepest known fresh water) and cement to surface. Air drill 17-1/2" hole, install +/- 2230 ft of 13-3/8" casing and cement to surface (to cover the Berea sandstone interval). Directionally air dill 12-1/4" hole, install 9-5/8" casing at +/- 5095 ft TVD / 5717 ft MD KB, 2 stage cement via cement stage tool for 500' overlap inside of the 13-3/8" casing. Stage tool to be set at 800' TVD above the Marcellus shale. Secure well.

Skid to well 12644 to drill air sections and the 8-1/2" section on fluid (see Drilling Program for Coco B 12644). Skid back to Coco B 12643 well.

Directionally drill 8-1/2" hole to casing point at the top of Oriskany sandstone, install +/- 6164 ft of 7" casing, and cement to 500' overlap into 13-3/8" casing. LD 5" and PU 4" workstring. Drill 6-1/8" borehole to +/- 10,880 ft MTD as per Geologist, leave as openhole completion. Secure well.

Skid to Coco B 12644 well to drill its 6-1/8" reservoir interval. RDMO drilling rig. Cleanout and acid stimulate reservoir section using 10,000 gallons 15 % HCl acid with Coil Tubing Unit on both wells. Reclaim.

2.2 Coco B 12644 (API 47-039-06402T)

Skid from Coco B 12643 and RU. Air drill 22" hole, install +/- 750 ft of 18-5/8" casing (minimum 40' below deepest known fresh water) and cement to surface. Air drill 17-1/2" hole, install +/- 2230 ft of 13-3/8" casing and cement to surface (to cover the Berea sandstone interval). Directionally air dill 12-1/4" hole, install 9-5/8" casing at +/- 5099 ft TVD / 5850 ft MD KB, 2 stage cement via cement stage tool for 500' overlap inside of the 13-3/8" casing. Stage tool to be set at 800' TVD above the Marcellus shale. Swap over to a KCL polymer fluid system. Directionally drill 8-1/2" hole to casing point at the top of Oriskany sandstone, install +/- 6250 ft of 7" casing and cement to 500' overlap into the 13-3/8" casing. Secure well.

Skid back to well 12643 to drill the 8-1/2" and 6-1/8" sections on fluid (see Drilling Program for Coco B 12643). Secure well. Skid back to Coco B 12644 well.

Drill 6-1/8" borehole to +/- 10,090 ft MTD as per Geologist, leave as openhole completion. Secure well.

RDMO drilling rig. Cleanout and acid stimulate reservoir section using 10,000 gallons 15 % HCl acid with Coil Tubing Unit on both wells. Reclaim.

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3 Wellbore Diagram with Casing Design Calculations

Due to an updated geologic interpretation of area stratigraphy, new target casing depths have been designed for both of the new drill wells.

3.1 Coco B 12643 (API 47-039-06401T)

Geologic Prognosis

Formation	Lithology	Tops TVD KB	Base TVD KB	Comments
Red Rock	Shale			Unstable shale, major hole issues likely
Salt Sand	Sandstone	1019	1432	Potential Water **(add soap / stiff foam)**
Red Rock	Shale			Unstable shale, major hole issues likely
Maxton	Sandstone	1509	1541	
Little Lime	Limestone	1572	1606	
Big Lime	Limestone	1627	1667	
Big Injun	Sandstone	1674	1785	Potential Gas
Weir	Sandstone	1871	2041	Potential Gas, Water, Oil
Coffee	Shale	2188	2198	Potential intervals <0.43 psi/ft F.G.
Berea	Sandstone	2198	2201	Potential intervals <0.43 psi/ft F.G.
Lower Huron	Shale	3381	4192	Potential intervals <0.43 psi/ft F.G.
Marcellus	Shale	5065	5084	**<0.43 psi/ft F.G.**
Onondaga	Limestone	5084	5094	Caprock
Corniferous (Onon)	Limestone	5094	5207	Caprock
Oriskany	Sandstone	5207	5244	Potential Gas, Storage Interval
Landing Point	Sandstone	5217		

Casing Program

Type	Size (in)	Weight (ppf)	Grade	Set Depth (MD KB)	Depth Relation	Cement Top
Surface	18-5/8	87.5	J-55 ERW R3	750	Cover FW	Surface
Intermediate 1	13-3/8	68	J-55 ERW R3	2230	Cover Berea	Surface
Intermediate 2	9-5/8	47	L-80 ERW R3	5717	Cover Marcellus	1730'
Flowstring	7	26	L-80 ERW R3	6164	Oriskany Top	1730'

Logging Program

Sections	Type	Bottom	Top	Comments
18-5/8" Surface Csg	Cement Bond Log	Wiper plug	Surface	If no returns to surf
13-3/8" Intermediate 1	Cement Bond Log	Wiper plug	Surface	If no returns to surf
9-5/8" Intermediate 2	Cement Bond Log	Shoe	Surface	Tractor conveyed
7" Flowstring Csg	Cement Bond & HRVRT Logs	Shoe	Surface	Tractor conveyed

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Coco B well 12643

Proposed as of 02/15/24

~ not to scale ~

Well Pad Elevations
Pre Construction GL: 856 ft
Post Construction GL: 846 ft
KB to GL: 19 ft

30" hole

24" Conductor @ 40 ft GL

Deepest Fresh Water @ 693 ft GL

22" hole

Salt Sand 1019 – 1541' KB

18-5/8" Surface csg @ 750 ft KB
87.5 ppf J-55 ERW R4 w/ BTC
Internal Yield: 2250 psi
Collapse: 630 psi
Body Yield Strength: 1367 Klbs
Joint Strength:1329 Klbs
Cement to surface

Max surface operating pressure 1800 psig
Max reservoir pressure 2075 psig

Minimum Casing Design Safety Factors

Internal Yield:	**1.2**
Collapse:	**1.2**
Tensile:	**1.6**

TOC 1730' TVD / MD KB

Weir SS 1871 – 2041 ft KB
*potentially may encounter oil

17-1/2" hole

Berea SS 2198 - 2201 ft KB

Deepest fresh water zone is based on an evaluation of 18 existing offset storage wells. The deepest recorded fresh water interval out of all 18 was at a depth of 153 ft above sea level, or relative to subject storage well, at a depth of 693 ft GL.

13-3/8" Intermed1 csg @ 2230 ft TVD / MD KB
68 ppf J-55 ERW R3 w/ BTC
Internal Yield: 3450 psi (SF = 1.9 relative to max reservoir press)
Collapse: 1950 psi (SF = 1.9 relative to 0.46 psi/ft overburden gradient)
Body Yield Strength: 1069 Klbs (SF = 7.2 relative to dry pipe weight)
Joint Strength: 1140 Klbs (SF = 7.6 relative to dry pipe weight)
Cement to surface

KOP @ 2300 ft MD KB

12-1/4" hole

9-5/8" Interm2 csg @ 5094 ft TVD KB (~5717' ft MD KB)
47 ppf L-80 HC ERW R3 w/ GB CD Butt connection
Internal Yield: 6870 psi (SF = 3.8 relative to max reservoir press)
Collapse: 4750 psi (SF = 1.8 relative to 0.50 psi/ft overburden gradient)
Body Yield Strength: 1086 Klbs (SF = 4.0 relative to dry pipe weight)
Joint Strength: 1084 Klbs (SF = 4.0 relative to dry pipe weight)
Uniaxial Bend Ratio: 3.0 – 4.3 deg/100 ft
2 stage cement via stage tool for a 500' overlap into 13-3/8" casing – stage tool to be placed 800' TVD above Marcellus formation

VSEC ~1066 ft

TD ~5217 ft TVD KB
(~10,883 ft MD KB)

Lateral ~4719 ft

Marcellus Shale
5065 - 5084 ft TVD KB (5645 - 5691 MD KB)

Onondaga LS
5084 - 5207 ft TVD KB
(5691 - 6164 ft MD KB)

8-1/2" hole

6-1/8" hole

Oriskany SS 5207 - 5244 ft TVD KB

7" Flowstring @ 5207 ft TVD KB (~6164 ft MD KB)
26 ppf L-80 HC ERW R3 w/ VAM21
Internal Yield: 7240 psi (SF = 4.0 relative to max reservoir press)
Collapse: 5410 psi (SF = 2.0 relative to 0.50 psi/ft overburden gradient)
Body Yield Strength: 604 Klbs (SF = 3.7 relative to dry pipe weight)
Joint Strength: 604 Klbs (SF = 3.7 relative to dry pipe weight)
Uniaxial Bend Ratio: 4.3 - 5.75 deg/100 ft
Cement to 500' overlap into 13-3/8" casing
Estimated Design Day Gas Velocity = 43 ft/sec

VSEC ~5675 ft

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4 Directional Profile

4.1 Coco B 12643 (API 47-039-06401T)

Directional profile has been optimized to drill-by around offset storage wells in the area and for a new landing point into the Oriskany reservoir for the lateral section.

Projected Wellbore (all coordinates are in NAD 27)

Profile:	Horizontal	
Surface Location:	Lat: 38.41273	Long: -81.47216
Kick-off Point:	2300 ft KB	
Target at Landing Point:	Lat: 38.41676	Long: -81.46985
Landing point inclination:	90 degrees	
Landing pt entry azimuth:	73.77 degrees	
Lateral inclination:	90 degrees	
Lateral azimuth:	73.77 degrees	
Vertical Section:	+/- 5675 ft	
Openhole Lateral:	+/- 4720 ft	

MAXIMUM PERMITTED MEASURED DEPTH: 10962 ft

Critical Points

Critical Point	MD	INCL	AZIM	TVD	VSEC	N(+)/S(-)	E(+)/W(-)	DLS
Surface	0.00	0.00	308.56	0.00	0.00	0.00	0.00	
18.625 in Casing	750.00	0.00	307.27	750.00	0.00	0.00	0.00	0.00
Salt Sands	1019.00	0.00	307.27	1019.00	0.00	0.00	0.00	0.00
Maxton	1509.00	0.00	307.27	1509.00	0.00	0.00	0.00	0.00
Little Lime	1572.00	0.00	307.27	1572.00	0.00	0.00	0.00	0.00
Big Lime	1627.00	0.00	307.27	1627.00	0.00	0.00	0.00	0.00
Big Injun	1674.00	0.00	307.27	1674.00	0.00	0.00	0.00	0.00
Weir	1871.00	0.00	307.27	1871.00	0.00	0.00	0.00	0.00
Coffee	2188.00	0.00	307.27	2188.00	0.00	0.00	0.00	0.00
Berea	2198.00	0.00	307.27	2198.00	0.00	0.00	0.00	0.00
13.375 in Casing	2200.00	0.00	307.27	2200.00	0.00	0.00	0.00	0.00
KOP - Build @ 3° DLS	2300.00	0.00	307.27	2300.00	0.00	0.00	0.00	0.00
Hold	3446.52	34.40	307.27	3378.88	-136.52	202.20	-265.75	3.00
Lower Huron	3449.08	34.40	307.27	3381.00	-137.11	203.07	-266.90	0.00
Build & Turn @ 4.3° DLS	3743.60	34.40	307.27	3624.02	-205.13	303.82	-399.30	0.00
Marcellus	5645.29	64.92	61.09	5065.00	573.31	1203.54	-3.26	4.30
onondaga	5691.59	66.62	62.22	5084.00	615.53	1223.58	33.90	4.30
Hold 75ft	5717.29	67.57	62.84	5094.00	639.19	1234.50	54.90	4.30
9.625 in Casing	5717.29	67.57	62.84	5094.00	639.19	1234.50	54.90	4.30
Corniferous	5717.29	67.57	62.84	5094.00	639.19	1234.50	54.90	4.30
Build & Turn @ 5.75° DLS	5792.29	67.57	62.84	5122.62	708.50	1266.15	116.58	0.00
Oriskany	6164.74	86.20	73.77	5207.00	1066.26	1398.20	452.07	5.75
Hold 75ft	6164.74	86.20	73.77	5207.00	1066.26	1398.20	452.07	5.75
7 in Casing	6164.74	86.20	73.77	5207.00	1066.26	1398.20	452.07	5.75
Build @ 2.5° DLS	6239.74	86.20	73.77	5211.97	1139.36	1419.12	523.92	0.00
Landing Point	6391.74	90.00	73.77	5217.01	1287.72	1461.57	669.76	2.50
CoCo B 12643 BHL	10883.38	90.00	73.77	5217.00	5675.01	2716.80	4982.44	0.00