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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Harold D. Ward, Cabinet Secretary  
[www.dep.wv.gov](http://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 / 12644  
47-039-06402-00-00

**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 / 12644  
Farm Name: JAMES A. & FRED A MARIE MORTON  
U.S. WELL NUMBER: 47-039-06402-00-00  
Horizontal New Drill  
Date Modification Issued: 4/1/2024

Promoting a healthy environment.

04/05/2024

4703906402M



**2024**

**Coco B New Drills**

*Sundry Request*

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**04/05/2024**

# 1 Contents

- 2 Concise Prognosis ..... 1
  - 2.1 Coco B 12643 (API 47-039-06401T) ..... 1
  - 2.2 Coco B 12644 (API 47-039-06402T) ..... 1
- 3 Wellbore Diagram with Casing Design Calculations ..... 2
  - 3.1 Coco B 12643 (API 47-039-06401T) ..... 2
  - 3.2 Coco B 12644 (API 47-039-06402T) ..... 4
- 4 Directional Profile ..... 6
  - 4.1 Coco B 12643 (API 47-039-06401T) ..... 6
  - 4.2 Coco B 12644 (API 47-039-06402T) ..... 7

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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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*August White*  
3-29-24

# Coco B well 12644

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

Deepest Fresh Water  
 @ 693 ft GL

Salt Sand 1040 - 1436 ft KB

Weir SS 1868 - 2041 ft KB  
 \*potentially may encounter oil

Berea SS 2199 - 2201 ft KB

KOP @ 2300 ft MD KB

Marcellus Shale  
 5056 - 5080 ft TVD KB (5732 - 5793 ft MD KB)  
 Onondaga LS  
 5080 - 5197 ft TVD KB  
 (5793 - 6246 ft MD KB)

24" Conductor @ 40 ft GL

**18-5/8" Surface csg @ 750 ft KB**  
 87.5 ppf J-55 ERW R3 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

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

**9-5/8" Intermed2 csg @ 5099 ft TVD KB (~5846 ft MD KB)**  
 47 ppf L-80 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 = 3.9 relative to dry pipe weight)  
 Joint Strength: 1084 Klbs (SF = 4.0 relative to dry pipe weight)  
 Uniaxial Bend Ratio: 3.5 - 3.9 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

TD ~5215 ft TVD KB  
 (~10,090 ft MD KB)

VSEC ~1225 ft

Lateral ~3845 ft

8-1/2" hole

6-1/8" hole

Oriskany SS 5197 - 5234 ft TVD KB

**7" Flowstring @ 5197 ft TVD KB (~6246 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: 3.9 - 5.3 deg/100 ft  
 Cement to 500' overlap into 13-3/8" casing  
 Estimated Design Day Gas Velocity = 20 ft/sec

VSEC ~4931 ft

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*Handwritten signature and date: 3-29-24*

3.2 **Coco B 12644 (API 47-039-06402T)**

Geologic Prognosis				
Formation	Lithology	Tops TVD KB	Base TVD KB	Comments
Red Rock	Shale			Unstable shale, major hole issues likely
Salt Sand	Sandstone	1040	1436	Potential Water <b>(add soap / stiff foam)</b>
Red Rock	Shale			Unstable shale, major hole issues likely
Maxton	Sandstone	1527	1567	
Little Lime	Limestone	1572	1607	
Big Lime	Limestone	1626	1665	
Big Injun	Sandstone	1675	1788	Potential Gas
Weir	Sandstone	1868	2041	Potential Gas, Water, Oil
Coffee	Shale	2188	2199	Potential intervals <0.43 psi/ft F.G.
Berea	Sandstone	2199	2201	Potential intervals <0.43 psi/ft F.G.
Lower Huron	Shale	3383	4189	Potential intervals <0.43 psi/ft F.G.
Marcellus	Shale	5056	5080	<b>&lt;0.43 psi/ft F.G.</b>
Onondaga	Limestone	5080	5099	Caprock
Corniferous (Onon)	Limestone	5099	5197	Caprock
Oriskany	Sandstone	5197	5234	Potential Gas, Storage Interval
Landing Point	Sandstone	5215		

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	5846	Cover Marcellus	1730'
Flowstring	7	26	L-80 ERW R3	6246	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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 [Signature]  
 3-29-24

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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 Point	MO	INCL	AZIM	Critical Points				DLS
				TVD	VSEC	N(+)/S(-)	E(+)/W(-)	
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	2718.80	4982.44	0.00

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4.2 **Coco B 12644 (API 47-039-06402T)**

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

**Projected Wellbore (all coordinates are in NAD 27)**

Profile: Horizontal  
 Surface Location: Lat: 38.41273 Long: -81.47217  
 Kick-off Point: 2300 ft KB  
 Target at Landing Point: Lat: 38.407855 Long: -81.47374  
 Landing point inclination: 90 degrees  
 Landing pt entry azimuth: 241.22 degrees  
 Lateral inclination: 90 degrees  
 Lateral azimuth: 241.22 degrees  
 Vertical Section: +/- 4931 ft  
 Openhole Lateral: +/- 3845 ft

**MAXIMUM MEASURED DEPTH (EXTENDED): 10090 ft**

Critical Point	MD	INCL	AZIM	Critical Points				DLS
				TVD	VSEC	N(+)/S(-)	E(+)/W(-)	
Surface	0.00	0.00	112.27	0.00	0.00	0.00	0.00	
18.625 In Casing	750.00	0.00	111.18	750.00	0.00	0.00	0.00	0.00
Salt Sands	1040.00	0.00	111.18	1040.00	0.00	0.00	0.00	0.00
Maxton	1527.00	0.00	111.18	1527.00	0.00	0.00	0.00	0.00
Little Lime	1572.00	0.00	111.18	1572.00	0.00	0.00	0.00	0.00
Big Injun	1626.00	0.00	111.18	1626.00	0.00	0.00	0.00	0.00
Weir	1888.00	0.00	111.18	1888.00	0.00	0.00	0.00	0.00
Coffee	2188.00	0.00	111.18	2188.00	0.00	0.00	0.00	0.00
Berea	2199.00	0.00	111.18	2199.00	0.00	0.00	0.00	0.00
13.375 in Casing	2200.00	0.00	111.18	2200.00	0.00	0.00	0.00	0.00
KOP - Build @ 3.5° DLS	2300.00	0.00	111.18	2300.00	0.00	0.00	0.00	0.00
Hold	3403.17	39.61	111.18	3321.55	-149.58	-129.28	333.69	3.50
Lower Huron	3481.81	38.61	111.18	3383.00	-170.09	-147.01	379.44	0.00
Build & Turn @ 3.9° DLS	3493.87	38.61	111.18	3392.42	-173.24	-149.72	386.46	0.00
Marcellus	5732.15	66.06	229.41	5056.00	739.58	-1298.88	229.22	3.90
onondaga	5793.75	68.07	230.84	5080.00	796.15	-1335.24	185.68	3.90
Comiferous	5846.63	69.81	232.03	5099.00	845.26	-1366.00	147.10	3.90
Hold 75ft	5846.63	69.81	232.03	5099.00	845.26	-1366.00	147.10	3.90
9.625 in Casing	5846.63	69.81	232.03	5099.00	845.26	-1366.00	147.10	3.90
Build @ 5.3° DLS	5921.63	69.81	232.03	5124.89	915.25	-1409.31	91.61	0.00
Oriskany	6246.24	84.50	241.22	5197.00	1224.83	-1582.11	-172.06	5.30
Hold 75ft	6246.24	84.50	241.22	5197.00	1224.83	-1582.11	-172.06	5.30
7 in Casing	6246.24	84.50	241.22	5197.00	1224.83	-1582.11	-172.06	5.30
Build @ 2.5° DLS	6321.24	84.50	241.22	5204.19	1298.83	-1618.05	-237.49	0.00
Landing Point	8541.07	90.00	241.22	5214.74	1508.51	-1723.73	-429.87	2.50
Coco B 12644 BHL_extended	10090.08	90.00	241.22	5215.00	4831.24	-3432.82	-3540.37	0.00

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