



**COTERRA**

**COTERRA ENERGY INC.  
OPERATIONS MONITORING PLAN:  
PALKO, J. PAD 1**

December 14, 2023

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## 1.0 BACKGROUND AND PLANNED DEVELOPMENT

Coterra Energy Inc. (“Coterra”) and the Pennsylvania Department of Environmental Protection (the “Department”) entered into a Consent Order and Agreement on November 29<sup>th</sup>, 2022 (the “COA”). Section 4 of the COA imposes certain plugging and monitoring obligations for any new wells that will traverse under the Dimock/Carter Road Area, as defined in the COA, from surface hole locations outside the Dimock/Carter Road Area.

Coterra has submitted, and received, unconventional new well permits for four (4) wells on the Palko, J. Pad 1 (the “Palko Pad”). The Palko Pad is located at 14187 Dimock to Nicholson Rd, Hop Bottom, PA 18824 (41.69965000° -75.84586700°) in Susquehanna County. The new wells and API numbers are:

- PALKO 2 – API #3711523102
- PALKO 4 – API #3711523103
- PALKO 6 – API #3711523104
- PALKO 8 – API #3711523105

The existing unconventional wells identified on Exhibit G of the COA, located within 2,000 feet measured horizontally from any of the new Coterra vertical wellbores or 2,000 feet measured from the surface above the entire length of the new Coterra horizontal wellbores are listed below in Table 1.1 (the “Monitored Gas Wells”).

**Table 1.1 Monitored Gas Wells**

Well Name	API Number	Offset from Planned New Wells
Costello, J. 1v	3711520036	Less than 1,000 ft
Ely, K. 2v	3711520015	Less than 1,000 ft
Ely, K. 4h-nw (4V)	3711520034	Less than 1,000 ft
Ely, K. 5h-nw	3711520054	Less than 1,000 ft
Ely, K. 6h-se	3711520041	Less than 1,000 ft
Lewis, H. 2v	3711520030	Less than 1,000 ft
Ratzel, D. 2h-nw	3711520152	Less than 1,000 ft
Ratzel, D. 3v	3711520117	Less than 1,000 ft
Gesford, K. 2v	3711520033	More than 1,000ft; Less than 2,000 ft
Gesford, K. 7h-nw	3711520163	More than 1,000ft; Less than 2,000 ft
Teel, C. 5	3711520024	More than 1,000ft; Less than 2,000 ft

## **2.0 OPERATIONS MONITORING PLAN**

Pursuant to Section 4.c of the COA, Coterra shall:

- utilize isolation mechanisms and continuous monitoring in real-time by Coterra's 24-hour Operations Control Center ("Gas Control") for gas wells identified on Exhibit G of the COA in the Dimock/Carter Road Area within 2,000 feet measured horizontally from the vertical well bore and 2,000 feet measured from the surface above the entire length of the new Coterra horizontal wellbore;
- monitor all drinking water wells within 3,000 feet of Coterra's surface location for the new wellbore, subject to landowner consent, by conducting pre-drill and post-completion water sampling for dissolved methane;
- plug and abandon the wells identified on Exhibit G of the COA drilled by Cabot within 1,000 feet measured horizontally from the vertical well bore and 1,000 feet measured from the surface above the entire length of the new Coterra horizontal wellbore in accordance with Paragraph 4.b of the COA; and
- report monitoring results to the Department.

### **2.1 Monitored Gas Wells**

While not required by the COA, in order to understand the current status of Monitored Gas Wells, Coterra is implementing an evaluation plan. Coterra will notify the Department of the intended schedule of that plan. The evaluation plan will involve conducting a thorough assessment of the wellbore integrity for all Monitored Gas Wells. This assessment may include various tests and evaluations, such as pressure build-up testing, annular flow rate testing, or modern cement bond logs, results of which will be shared with the Department. Based on the results of these evaluations, Coterra may conduct remedial operations on Monitored Gas Wells in advance of drilling and/or completions work on associated gas wells as may be deemed appropriate by Coterra engineers.

In order to address scenarios specific to each gas well pad to be drilled, Coterra has developed a number of monitoring plans that allow Coterra to comply with its monitoring obligations under Sections 4.b.iv and 4.c.i of the COA. All monitoring plans incorporate monitoring thresholds applicable to each well. In the event that a threshold is triggered, the process outlined in each monitoring plan will be activated to promptly alert the Control Center. Subsequently, the Control Center will immediately contact responsible personnel who will deploy appropriate measures to investigate and respond to the threshold notification.

In addition to the findings of the evaluation plan, existing wellbore construction, the existing layout (including proximity of each Monitored Gas Well to the Palko Pad development), and history of each Monitored Gas Well were considered in developing the monitoring plan assigned during the offset drilling and completion of each new Palko Pad well. Below are various monitoring components which could be utilized to assist in monitoring efforts depending on Coterra's evaluation:

- Setting and configuring pressure alarms on the tubing and casing;
- Installing flow meters to measure the annular flow rates on accessible annuli;
- Installing inline orifice plates with upstream transducers on annular piping;
- Replacing 5,000 psi production wellheads with two 10,000 psi 5 1/8” valves;
- Installing two retrievable bridge plugs in the production tubing;
- Installing a temporary 500-hundred-barrel gas buster tank with a diffuser;
- Installing a cast iron bridge plug inside the casing of a Monitored Gas Well;
- Having 24-hour manned coverage on location to actively monitor the Monitored Gas Wells.
- Performing any additional monitoring or remedial measure as may be dictated by circumstances realized in the field.

Based on currently available information, two different monitoring plans will be utilized to monitor the eleven Monitored Gas Wells associated with the new Palko Pad development.

A comprehensive assessment of the layouts of each Monitored Gas Well in relation to the Palko Pad drilling and completion activity will be conducted. Specifically, the Palko Pad completions plan will be reviewed, and an assessment will be conducted to identify the stages that may impact the Monitored Gas Wells.

**2.1a Monitoring Plan 1**

**Table 2.1a Monitored Gas Wells in Exhibit G**

<b>Well Name</b>	<b>API Number</b>	<b>Offset from Planned New Wells</b>
Gesford, K. 2v	3711520033	More than 1,000ft; Less than 2,000 ft
Gesford, K. 7h-nw	3711520163	More than 1,000ft; Less than 2,000 ft
Teel, C. 5	3711520024	More than 1,000ft; Less than 2,000 ft

Monitoring Plan 1 is appropriate for Monitored Gas Wells identified in our comprehensive assessment that will have minimal communication with the Palko Pad development shown in Table 2.1a. This encompasses existing gas wells that are more than 1,000 feet away from the planned Palko wells or wells that have minimal risk of communication with the Palko Pad development. The implementation of Monitoring Plan 1 involves configuring remote pressure alarms on both the tubing and casing of the Monitored Gas Wells to facilitate real-time notification to the Control Center in the event that pressure exceeds 90% of the maximum allowable working pressure. If this threshold is exceeded, the Control Center will notify appropriate personnel to suspend the nearby offset drilling or completion activity on the current

stage and notify the Department in accordance with the AOR Guidelines<sup>1</sup> and as outlined in section 2.4.

## 2.1b Monitoring Plan 2

**Table 2.1b Monitored Gas Wells in Exhibit G**

Well Name	API Number	Offset from Planned New Wells
Costello, J. 1v	3711520036	Less than 1,000 ft
Ely, K. 2v	3711520015	Less than 1,000 ft
Ely, K. 4h-nw (4V)	3711520034	Less than 1,000 ft
Ely, K. 5h-nw	3711520054	Less than 1,000 ft
Ely, K. 6h-se	3711520041	Less than 1,000 ft
Lewis, H. 2v	3711520030	Less than 1,000 ft
Ratzel, D. 2h-nw	3711520152	Less than 1,000 ft
Ratzel, D. 3v	3711520117	Less than 1,000 ft

Monitoring Plan 2 is appropriate for Monitored Gas Wells identified in our comprehensive assessment that have future plugging plans shown in Table 2.1b. A bridge plug will be set inside such Monitored Gas Wells. A flow meter or an inline orifice plate with an upstream transducer will be installed on the backside vent header, precisely between the wellhead and the vent storage tank. A flow meter or a differential pressure alarm will be configured to promptly notify the Control Center should the flow rate or differential pressure have significant increases or otherwise anomalous changes beyond that which would be typically expected between proximal gas wells during drilling and completions activities. If the flow rate or differential pressure has a significant increase or change, the Control Center will notify appropriate personnel to suspend the nearby offset drilling or completion activity on the current stage and notify the Department in accordance with the AOR Guidelines<sup>1</sup> and as outlined in section 2.4.

Coterra’s monitoring plan assignments are based on currently available data, as described above. The results of the evaluation plan and other circumstances, such as real-time monitoring, may provide information indicating that a different monitoring plan would be more appropriate for a given Monitored Gas Well. Should this occur, Coterra will communicate any changes to the Department as part of its reporting obligations in Section 4.c of the COA.

## 2.2 Monitoring Drinking Water Wells

COA Section 4.c.ii outlines Coterra’s obligations regarding monitoring of drinking water wells within 3,000 feet of the surface locations of each new wellbore. Beyond the requirements specified in the COA, Coterra has elected to conduct multiple rounds of pre-drill sampling, subject to landowner consent, at all drinking water supplies within a 3,000-foot radius of the

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<sup>1</sup> In addition, in accordance with best management practices, Coterra will follow the Department’s “Guidelines for Implementing Area of Review (“AOR”) Regulatory Requirements for Unconventional Wells 800-0810-001” (“AOR Guidelines”) for monitoring of any additional existing gas wells within 2000’ of the new Palko Pad.

surface locations of the new Palko Pad wellbores and analyze each sample for Coterra’s full, standard pre-drill suite of parameters (see minimum parameter list in Table 2.2 for reference). In addition, pursuant to COA Section 4.c.ii., Coterra will collect dissolved methane samples from each drinking water supply within the 3,000-foot radius of the surface locations of the new Palko Pad wellbores post-completion. All results will be shared with the Department pursuant to Paragraph 4.c.iv of the COA.

<b>Table 2.2 - Pre-Drill Sampling Analyte List</b>		
<b>Dissolved Gases</b>	<b>VOCs</b>	<b>Wet Chemistry/Miscellaneous</b>
Ethane	Benzene	Oil & Grease
Isobutane	n-Butylbenzene	Alkalinity (as CaCO <sub>3</sub> )
Methane	sec Butylbenzene	Bromide
n_butane	Ethylbenzene	Chloride
Propane	Isopropyl Benzene	Ethylene Glycol
<b>Metals</b>	p-Isopropyltoluene	Hardness
Aluminum	Naphthalene	MBAS
Arsenic	n-Propylbenzene	Total Nitrite/Nitrate Nitrogen
Barium	Toluene	Sulfate
Cadmium	Xylenes (Total)	Sulfide
Calcium	1, 2, 4 Trimethylbenzene	TDS
Chromium	1, 3, 5 Trimethylbenzene	TSS
Iron	<b>Field Parameters</b>	Turbidity
Lead	Conductivity	
Lithium	Dissolved Oxygen	
Magnesium	ORP	
Manganese	pH	
Potassium		
Selenium		
Sodium		
Strontium		
Vanadium		
Zinc		

### **2.3 Plugging of COSA Exhibit G Wells Associated With Palko Well Pad**

Section 4.b of the COA imposes plugging obligations for existing gas wells listed in Exhibit G of the COA. Table 2.3 lists the Monitored Gas Wells identified in Exhibit G that will be plugged in connection with development of the Palko Pad as outlined in Section 4.c.iii of the COA.

**Table 2.3 Monitored Gas Wells in Exhibit G To Be Plugged**

<b>Well Name</b>	<b>API Number</b>
Costello, J. 1v	3711520036
Ely, K. 2v	3711520015
Ely, K. 4h-nw (4V)	3711520034
Ely, K. 5h-nw	3711520054
Ely, K. 6h-se	3711520041
Lewis, H. 2v	3711520030
Ratzel, D. 2h-nw	3711520152
Ratzel, D. 3v	3711520117

Prior to plugging, during the development of the Palko Pad, the Monitored Gas Wells in Table 2.3 will be monitored as outlined in Section 2.1b, above, to satisfy Coterra's obligations in Sections 4.b.iv and 4.c.i of the COA.

The Monitored Gas Wells in Table 2.3 will be plugged after completion operations of the four new gas wells on the Palko Pad, unless safety or operational considerations dictate a well be plugged sooner. At that time, Coterra will have the most up-to-date information on the status of the wells to develop the most appropriate plugging plans. Plugging shall be in accordance with the requirements of 58 Pa.C.S. § 3220 and 25 Pa. Code §§ 78a.91-78a.98, or an appropriate Department-approved alternative under 25 Pa. Code § 78a.75. No later than 60 days after the completion of all wells presently permitted on the Palko Pad, Coterra will file notices of intent to plug the Monitored Gas Wells in Table 2.3, which shall include the respective plugging and abandonment plans and will follow the applicable plugging and abandonment procedures provided under Pennsylvania law. Any adjustments to the plugging and abandonment schedule shall be coordinated with the Department based on operational considerations. Should safety or operational considerations dictate a well be plugged sooner, Coterra will file the required notice of intent to plug the well as per the regulations stated above.

## **2.4 Reporting Monitoring Results to the Department**

Coterra will report gas well and drinking water well monitoring results to the Department in accordance with its obligations in Section 4.c.iv of the COA.

Specifically, for monitoring results associated with the Monitored Gas Wells, annular pressure and/or flow data and associated time series graphs will be submitted when available following the drilling and/or completion of all new Palko Pad gas wells or as otherwise requested by the Department. If any AOR thresholds are exceeded, Coterra will follow the recommendations specified in the AOR Guidelines. Additionally, any other diagnostic logs, tests, or evaluations conducted pursuant to Section 2.1 above will be made available to the Department as requested.



Regarding drinking water supply monitoring results, copies of all analytical data packages will be provided to the Department following receipt of the final reports from the respective laboratories.