



**COTERRA**

**COTERRA ENERGY INC.  
OPERATIONS MONITORING PLAN:  
RAYIAS, E. PAD 2**

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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 Rayias, E. Pad 2 (the “Rayias Pad”). The Rayias Pad is located at 1712 Van Auken Road, Kingsley, PA 18826 (41.72378300° -75.84603000°) in Susquehanna County. The new wells and API numbers are:

- RAYIAS 20 – API #3711523106
- RAYIAS 22 – API #3711523107
- RAYIAS 24 – API #3711523108
- RAYIAS 26 – API #3711523109

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 wellbore are listed below in Table 1.1 (the “Monitored Gas Wells”).

**Table 1.1 Monitored Gas Wells**

<b>Well Name</b>	<b>API Number</b>	<b>Offset from Planned New Wells</b>
Ratzel 2H	3711520152	Less than 1,000 ft.
Ratzel 3V	3711520117	More than 1,000 ft.; 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 Rayias 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 Rayias 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.

Accordingly, the two Monitored Gas Wells associated with the new Rayias Pad development will be monitored as follows:

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

This monitoring plan is appropriate for Monitored Gas Wells identified in our comprehensive assessment that have future plugging plans. 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.<sup>1</sup>

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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 feet of the new Rayias Pad gas wells.

## 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 surface locations of the new Rayias 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 Rayias 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 Rayias Well Pad**

Section 4.b of the COA imposes plugging obligations for existing gas wells listed in Exhibit G of the COA. One Exhibit G well, Ratzel 2H (API #3711520152), will be plugged in connection with development of the Rayias Pad as outlined in Section 4.c.iii of the COA.

Prior to plugging, during the development of the Rayias Pad, the Ratzel 2H will be monitored as outlined in Section 2.1, above, to satisfy Coterra's obligations in Sections 4.b.iv and 4.c.i of the COA.

The Ratzel 2H will be plugged after completion operations of the four new gas wells on the Rayias Pad, unless safety or operational considerations dictate the well be plugged sooner. At that time, Coterra will have the most up-to-date information on the status of the well to develop the most appropriate plugging plan. 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 Rayias Pad, Coterra will file a notice of intent to plug the Ratzel 2H well, which shall include the respective plugging and abandonment plan 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 Rayias 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.