COLORADO
Energy & Carbon Management Commission
Department of Natural Resources

INFORMATION SHEET:

HYDRAULIC FRACTURING TREATMENT (As required by ECMC Rule 303.e.(2).E)

Why am I receiving this information sheet?

The Colorado Energy & Carbon Management Commission ("ECMC") prepared this information sheet to provide the public with information related to hydraulic fracturing. Pursuant to Commission Rule 303.e.(2).E, Operators[1] are required to provide this information sheet to mineral owners within the area of proposed development and all landowners, homeowners, commercial property owners, tenants, and other entities within 2,000 feet of a proposed oil and gas location.

What is hydraulic fracturing treatment, and why is it necessary?

Hydraulic fracturing treatment is the process of creating small cracks, or "fractures," in the rocks of deep, underground geological formations that have oil and natural gas. The fractures enhance the flow of oil and gas from the formation to the oil and gas well where it flows or is pumped up the well to the production equipment located on the surface of the site.

The process of hydraulic fracturing has been used for decades in Colorado, dating back to the 1970s. Operators[2] continue to improve hydraulic fracturing, and it is now a standard practice used in almost all oil and gas wells in the state, and across much of the country. Hydraulic fracturing has made it possible to produce oil and gas from rock formations that did not often produce oil and gas in the early to middle part of the twentieth century.

What happens before hydraulic fracturing treatment?

The operator uses a drilling rig to drill a "surface hole" and set a steel pipe called "surface casing" in the hole. The surface casing may extend many hundreds of feet, sometimes more than 1,000 feet, underground. The operator places cement on the outside of the surface casing to seal and protect groundwater. The operator tests the

[1] "Operator" as defined in ECMC Rules.

[2] Hereinafter, and only for the purpose of describing the hydraulic fracture treatment process, the term "operator" includes the operator itself and all contractors and service providers that the operator hires to perform work.

surface casing with pressure, then a smaller "production hole" is drilled out the bottom of the surface casing. After completing a formation integrity test, the operator drills down to the geological formation containing oil and gas, usually many thousands of feet underground. The operator lowers a production casing into the production hole, and cement is used to make a seal above the deep oil and gas formation. The operator "completes" the well by placing holes, or "perforations" in the casing at the deep oil and gas formation, to allow oil and gas to flow into the well. The well is then ready for hydraulic fracturing treatment.

What happens during and after hydraulic fracturing treatment?

The operator performs the treatment by using high pressure water pumps to fracture the deep oil and gas rock formation. The pumps push fracturing fluids down the well and out through the perforations, into the oil and gas rock formation. The hydraulic fracturing fluids are mostly water and sand, with a small amount of chemical additives. The sand, also called "proppant," remains in the fractures to help keep the fractures open allowing oil and gas to flow through the fractures to the perforations.

After hydraulic fracture treatment, the well is allowed to "flowback," meaning hydraulic fracture fluids, oil, gas, and produced water from the formation flow through the perforations and up the well to the surface where the fluids are separated. The operator sells the oil and gas. Waste products, mostly water produced from the oil and gas formation and hydraulic fracture fluids, are captured and stored for proper treatment or disposal.

Common questions and answers about hydraulic fracturing treatment.

Q: How is an oil and gas well designed to be protective of public health, the environment, and wildlife resources?

A: ECMC engineering staff review all well permits to ensure that wells are lined with multiple layers of steel and cement sufficient to isolate groundwater from the deep oil and gas rock formations. The operator's wellbore design must meet ECMC wellbore isolation standards and rules in order to receive a permit to drill.

Surface casing extends from the ground surface to 50 feet or more below groundwater. Production casing is cemented to seal the oil and gas formation in the well and prevent flow between groundwater and the oil and gas formations. The operator

performs a well survey, called a "cement bond log," to verify the cement placement around the production casing. Additionally, the operator pressure tests surface equipment and ensures that nearby, "offset" wells that are close enough for pressure communication in the oil and gas formation have properly-rated surface equipment or downhole plugs.

Q: Will hydraulic fracturing treatment cause problems with water wells

A: Water well problems related to hydraulic fracturing in Colorado are rare, which is largely a result of ECMC's long-standing mission to protect Waters of the State of Colorado, including groundwater. Most recently, the ECMC adopted new rules for wellbore isolation, effective November 2, 2020 to further strengthen this mandate.

Geologic factors in Colorado also serve to help prevent groundwater impacts. Often, many thousands of feet of confining rock layers separate shallow groundwater formations that are used for drinking water, livestock, and irrigation from deep oil and gas formations. In cases where an operator intends to perform a hydraulic fracture treatment at a depth of less than 2,000 feet underground, a geological and engineering evaluation is required prior to approving a drilling permit. In cases where deep groundwater is present, ECMC rules require additional cement in oil and gas wells to seal the deep groundwater formations.

Q: What is hydraulic fracture fluid?

A: The ECMC and regulatory agencies of other oil and gas producing states partner with FracFocus, a Chemical Disclosure Registry, that operators use to report hydraulic fracture fluid chemical data (https://www.fracfocus.org/). According to FracFocus, approximately 98% to 99% of the fracturing fluid volume in most wells is water and sand. The remaining portion is made up of chemical additives used to reduce friction during pumping and prevent corrosion of the steel casing. Biocide is used to kill bacteria in the water. Surfactants promote water flowback from the formation, up the well and into the oil and gas production equipment at the well site or a nearby "tank battery." Fracturing chemicals are similar to other industrial chemicals which must be handled properly. ECMC rules require that operators properly store and handle chemicals in a manner that protects operator's employees, the public, the environment, and wildlife.

ECMC rules require operators to publicly disclose the components and concentrations of fracturing chemicals for each well within 60 days of the hydraulic fracture treatment on the FracFocus website, which is searchable by county, operator, and well. The website also provides information on chemicals used and their purpose.

Q: How are hydraulic fracturing fluids managed on the well site?

A: Operators manage large volumes of drilling fluid, hydraulic fracturing fluid, and flowback during drilling and hydraulic fracturing treatment. Operators protect the public, environmental resources, and wildlife by implementing best management practices specified by permit conditions and ECMC rules for spill prevention.

After hydraulic fracturing treatment, fluids return to production equipment at the well site as flowback. These flowback fluids are considered oil and gas Exploration and Production Waste ("E&P Waste") that are recycled for other oil and gas operations, or are disposed of in accordance with state regulations. Marketable production fluids, including oil and gas, are separated and contained in tanks or vessels, or sent by pipeline to sales.

Q: What can neighbors expect to experience during hydraulic fracturing treatment?

A: The operator provides the ECMC and the local government a 48-hour notice before performing hydraulic fracturing treatment. As the operator mobilizes the hydraulic fracturing crews, water tanks are placed at the site. The operator transports water to the site for hydraulic fracturing fluid by pipeline or water trucks. Heavy equipment, such as sand haulers, pump trucks, blending units and a control van arrives and the equipment is connected to the well with high pressure piping. The operator pressure tests the equipment, then the hydraulic fracture treatment begins. The work can take several days to several weeks, depending on the number of wells on the well site and the number of treatment stages needed for each well. The equipment noise from engines, pumps, and vehicles will be noticeable during the work. Induced seismicity from hydraulic fracturing is very low intensity, too small to be noticed by people at the ground surface, and therefore man-made earthquakes are not a common occurrence in Colorado during hydraulic fracturing treatment operations.

Where can I get additional information? FracFocus (www.fracfocus.org) contains detailed information on hydraulic fracturing, chemicals used, groundwater protection and how to find a well near you.

ECMC rules related to hydraulic fracturing:

- **Rule 308** Form 2, Application to Drill, Deepen, Re-Enter, or Recomplete, and Operate, Information Requirements
- **Rule 405.k** Notice of Intent to Conduct Hydraulic Fracturing Treatment
- **Rule 408** General Drilling Rules
- **Rule 411** Public Water System Protection
- **Rule 419** Bradenhead Monitoring, Testing, and Reporting
- **Rule 423 and 424** Noise and Lighting
- **Rule 437** Hydraulic Fracturing Chemical Additives
- **Rule 614** Coalbed Methane Wells
- **Rule 615** Groundwater Baseline Sampling and Monitoring
- **Rule 905** Management of E&P Waste
- **Rule 912** Spills and Releases (includes landowner notification requirements)

ECMC's rules are available as downloadable files at ECMC Regulation (state.co.us)