STATE OVERSIGHT OF HYDRAULIC FRACTURING

TOWN MEETING
April 20, 2013
Cyancio’s at Hyland Hills Golf Course

Bob Randall
Colorado Department of Natural Resources
Colorado as Oil and Gas Producer

- 150-year history of production
  - #5 in Natural Gas production
  - #10 in Oil production
- 50,254 active wells as of February 2013
- 33,000 “plugged and abandoned” wells
- Wells permitted in 37 of the state’s 64 counties in 2012
- ~5% of producing wells are within city or town boundary
- ~80% of wells are drilled with surface use agreements in place with landowners
Colorado as Outdoor Destination

- 55 mountains over 14,000 feet
- 4 National Parks and 41 Wilderness areas
  - 42 State Parks
  - 12,000,000 skier visits
- World-class wildlife populations
- Over 1 million fishing licenses sold annually
- Over 650,000 hunting licenses sold annually
COGCC MISSION

PROMOTE RESPONSIBLE AND BALANCED DEVELOPMENT OF COLORADO’S OIL & GAS RESOURCES

• Ensure that:
  – Exploration and production of oil and gas resources are conducted efficiently.
  – Mineral owners’ rights are protected.
  – Oil and gas production is conducted in a manner consistent with protection of public health, safety, and welfare, including the environment & wildlife resources.
COLORADO OIL AND GAS DRILLING PERMITS BY COUNTY - 2012

- **Weld County (1826)**: 48%
- **Garfield County (1046)**: 28%
- **Rio Blanco County (117)**: 3%
- **Mesa County (150)**: 4%
- **La Plata County (71)**: 2%
- **All Others (565)**: 15%
Well Construction & Hydraulic Fracturing
# LIFESPAN OF A WELL

## #1 SITE LEASING
Leases for oil and gas drilling usually run 3-10 years. It can be several years after land is leased before any drilling starts.

## #2 WELL IS DRILLED
Depending on depth and type of well, drilling can take from 2 to 30 days.

## #3 HYDRAULIC FRACTURING/COMPLETION
Usually immediately follows drilling and casing of a well. Fracturing takes most of a day for each stage, so time will depend on stages. A 20-stage frac could take a few days to three weeks.

## #4 INTERIM RECLAMATION
This reduces the size of the well pad. It is to occur within six months after well completion, or within three months if the land is used for crops.

## #5 FINAL RECLAMATION
When a well is plugged, which may occur immediately after drilling or decades later, final reclamation must be completed within one year; three months if the land is used for crops.

## #6 RELEASE FROM BOND
The COGCC will release the financial assurance liability from a well when the vegetation has recovered to eighty percent (80%) of the predisturbance coverage. This revegetation may take several years depending on the areas soil type, and the annual precipitation.
Wellbore isolates oil/gas formation from water
COGCC Rule 317 – protecting aquifers
- Concrete and steel casing are cemented in place & to the surface

Natural gas bearing formation – separated by more than a mile of solid rock, with concrete isolation across zones.

Drill with clear water to set Surface Casing
- Add bentonite clay and pH control agent to help thicken bentonite (improve yield)

More time & $$$ to drill, equip, and stimulate

Hydraulic fracturing is similar to vertical well... just larger volumes because more formation is exposed to wellbore.
HYDRAULIC FRACTURING: BASICS

- Hydraulic fracturing dates to the 1940s. Used in Weld County since 1980s.
- It is not only used for oil and gas, it can also be used to enhance groundwater production.
- Fracturing enhances resource recovery, and unlocks oil and gas from formations once considered off-limits for significant development.
- Today, > 90% of oil and gas wells are hydraulically fractured.
HYDRAULIC FRACTURING: OVERSIGHT

- COGCC requires cement bond logs and pressure monitoring to ensure integrity of well and cement work during hydraulic fracturing.

- As of April 1, 2012 operators must disclose all fracturing ingredients and concentrations to FracFocus.org and file paperwork to certify proprietary claims.

- COGCC in January approved mandatory groundwater sampling to take effect May 1, 2013.
Composition of Frac Fluid

From: Gas Research Institute
## Composition of Frac Fluid

<table>
<thead>
<tr>
<th>Additive</th>
<th>Main Compound</th>
<th>Common Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biocide</td>
<td>Glutaraldehyde</td>
<td>Dental Disinfectant</td>
</tr>
<tr>
<td>Iron Control</td>
<td>Citric Acid</td>
<td>Food Additive</td>
</tr>
<tr>
<td>Surfactant</td>
<td>Isopropanol</td>
<td>Glass Cleaner</td>
</tr>
<tr>
<td>Friction Reducer</td>
<td>Polyacrylamide</td>
<td>Water and Soil Treatment</td>
</tr>
<tr>
<td>Diluted Acid</td>
<td>Hydrochloric or Muriatic Acid</td>
<td>Swimming Pools</td>
</tr>
<tr>
<td>Gelling Agent</td>
<td>Guar Gum</td>
<td>Biscuits</td>
</tr>
<tr>
<td>Crosslinker</td>
<td>Borate Salts</td>
<td>Laundry Detergents</td>
</tr>
<tr>
<td>Breaker</td>
<td>Ammonium Persulfate</td>
<td>Bleaching Hair</td>
</tr>
<tr>
<td>Scale Inhibitor</td>
<td>Ethylene Glycol</td>
<td>Antifreeze</td>
</tr>
</tbody>
</table>

Note: A typical “Slickwater” contains the bold items
Groundwater Protection During Drilling and Hydraulic Fracturing
PROTECTING WATER

• Ensure surface casing is set at least 50 feet below the deepest water well or aquifers.

• Ensure production casing and cementing isolate all production zones and create a seal to protect aquifers.

• Rules require setbacks and additional steps when drilling near streams and public drinking water sources.
GROUNDWATER SAMPLING

• Beginning May 1, 2013 operators must take one pre-drilling and two post-drilling samples at up to four water well or spring locations within ½ mile of pad.

• Only state in the country to require post-drilling water sampling. Only three other states require any sampling.

• Samples will be collected and analyzed by a third-party and results will be provided to the COGCC.

• Data will be public through COGCC website.
HYDRAULIC FRACTURING ACCOUNTS FOR LESS THAN 1/10 OF 1% OF COLORADO’S ANNUAL WATER USE.

The amount of water used for hydraulic fracturing in Colorado is comparable to that used in snowmaking.

Operators can get water from various sources but must adhere to state water law when obtaining and using it.

60% of water for frack jobs recycled.
OVERSIGHT:
Inspections and Complaint Response
SITE INSPECTIONS

Conducted 12,239 field inspections in 2011, including:

- Pre-drilling site review
- Cementing of well casing
- Mechanical integrity testing
- Hydraulic fracturing
- Producing well
- Reclamation of well pad
- Inspection of waste injection wells
- Inspection of public complaint
COMPLAINT RESPONSE

- Complaints are a priority. COGCC responds to complaints within 48 hours; usually within 24 hours.
- Complaints are often regarding dust, lighting, noise, odor and water well issues
- Complaint issue that is a violation of COGCC rules results in a Notice of Alleged Violation and requires action to correct.
COMPLAINT RESPONSE - WATER

- Collect water/gas samples from water well or soil.
- Compare water analyses to regional water quality.
- Evaluate gas analysis to determine thermogenic/biogenic.
- Collect gas samples from nearby oil and gas wells.
- Compare stable isotopic signatures to determine source.
- If complaint verified:
  - Operator must remediate soil and water to meet standards.
  - Operator must mitigate impacts.
Drilling within 1,000’ of an occupied structure must implement new protective requirements:

- Closed Loop Drilling to eliminate waste pits
- Liner standards to protect against spills
- Capture of gasses to reduce odors
- Noise, dust, and lighting requirements

Existing setbacks are extended to uniform 500’ statewide.

No drilling within 1,000’ of schools, hospitals, etc. without a hearing before the Commission.

Operators must provide expanded notice and conduct outreach with nearby residents.
Questions?

Bob Randall, Deputy Director
Colorado Department of Natural Resources
(303) 866-3311 x8668
robert.randall@state.co.us

Matt Lepore, Director
Colorado Oil and Gas Conservation Commission
303-894-2100 x5122
matt.lepore@state.co.us

http://cogcc.state.co.us/