Energy Development What's the Big Fracking Deal?

Tisha Schuller Mike Chiropolos Barbara Kirkmeyer Ken Carlson Colorado Oil and Gas Association Western Resource Advocates Weld County Commissioner Colorado State University

Sara Cassidy Director

Colorado Competitive Council

Tisha Schuller CEO and President

Colorado Oil & Gas Association



Oil and Gas 101



Do I Use Petroleum Products?









Less Obvious







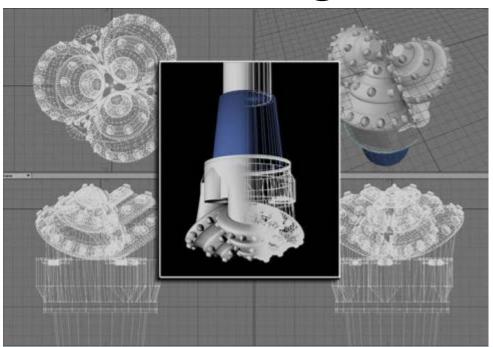




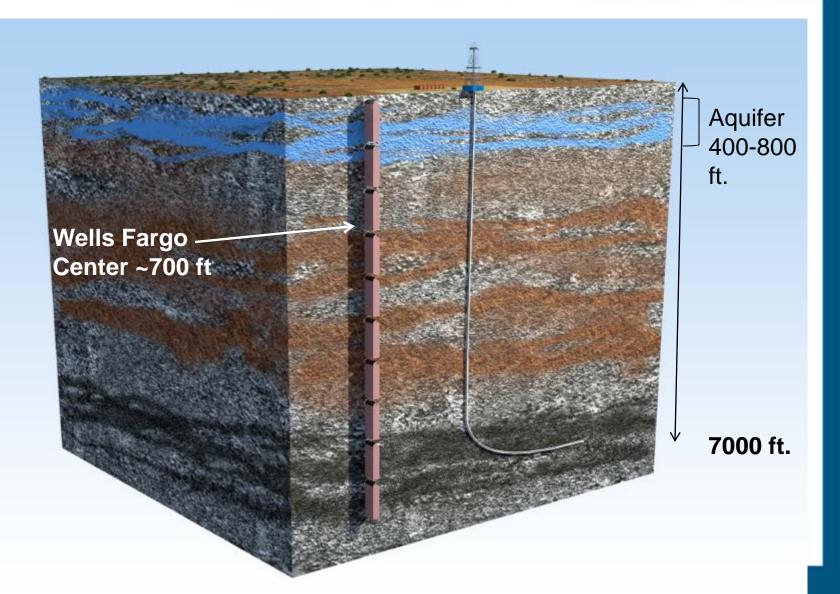




Drilling

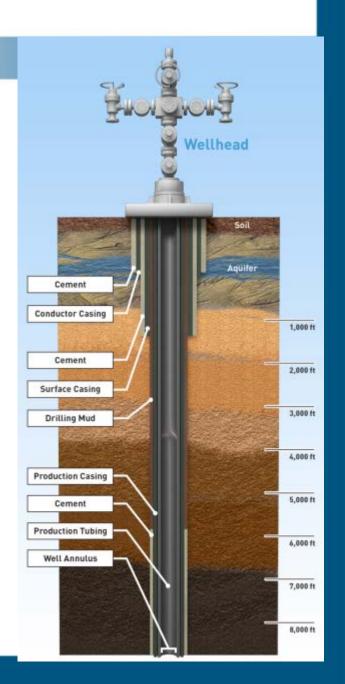


Drilling Distance



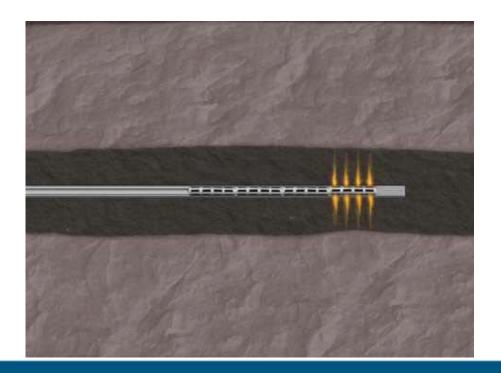
Casing

- Multiple layers surrounding the aquifer
 - Cement
 - Conductor Casing
 - Cement
 - Surface Casing
 - Drilling Mud/Cement
 - Production Casing
 - Production Tubing

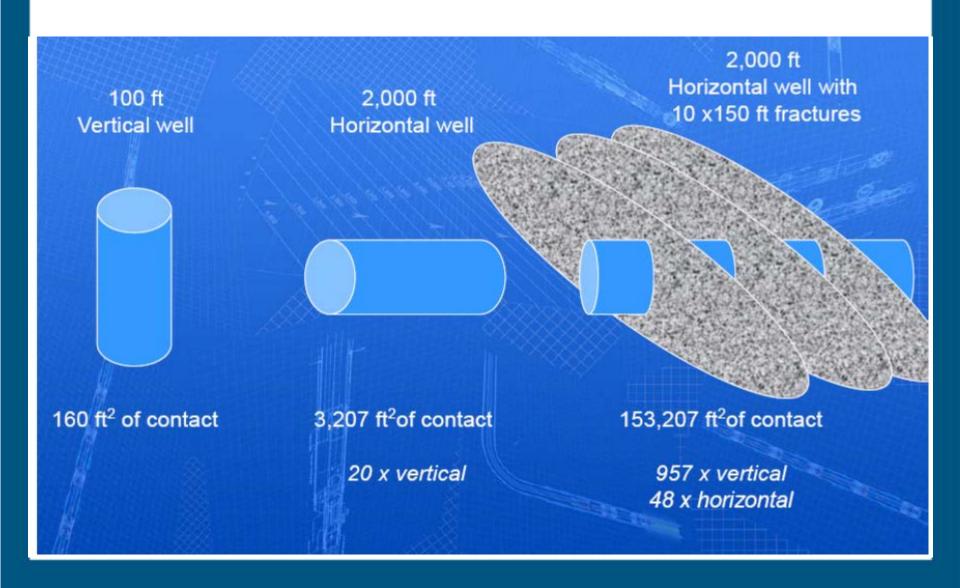




Hydraulic Fracturing



Fractured Contact



►►► Footprint



Perforation Gun

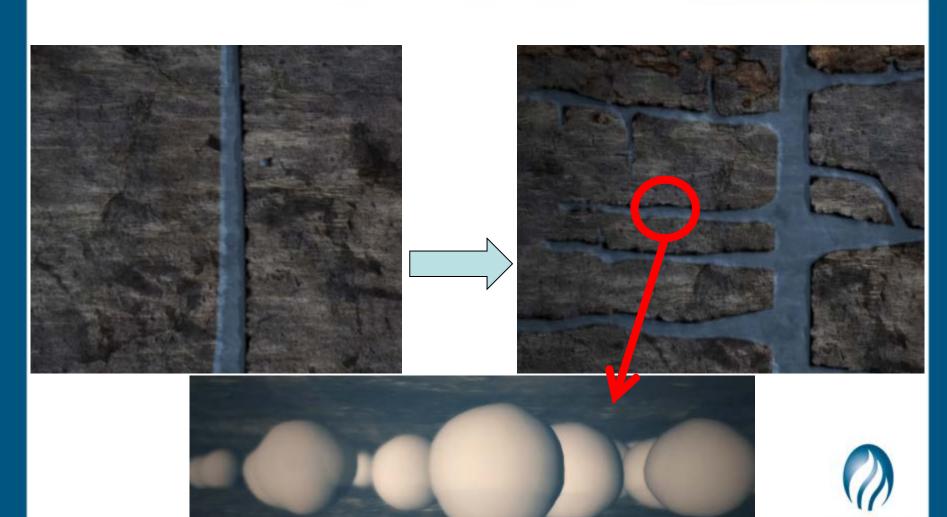




Water is Pumped



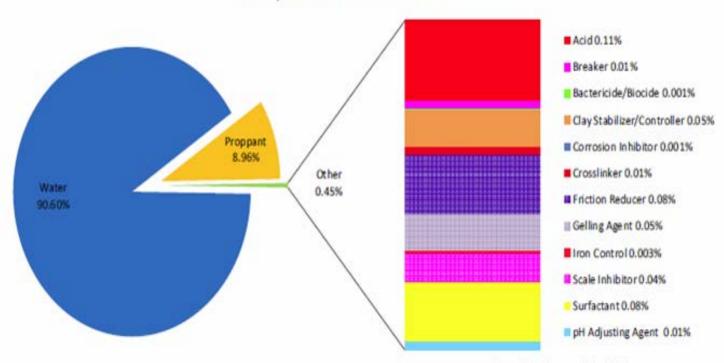
Fractures and Proppant



COLORADO OIL & GAS

HF Fluids

Composition of Frac Fluid



From: Gas Research Institute



HF Fluids

Additive	Main Compound	Common Use
Diluted Acid	Hydrochloricor, Muriatic Acid	Swimming Pools
Biocide	Glutaraldehyde	Dental Disinfectant
Breaker	Ammonium Persulfate	Bleaching Hair
Crosslinker	Borate Salts	Laundry Detergents
Iron Control	Citric Acid	Food Additive
Gelling Agent	Guar Gum	Biscuits
Scale Inhibitor	Ethylene Glycol	Antifreeze
Surfactant	Isopropanol	Glass Cleaner
Friction Reducer	Polyacrylamide	Water and Soil Treatment

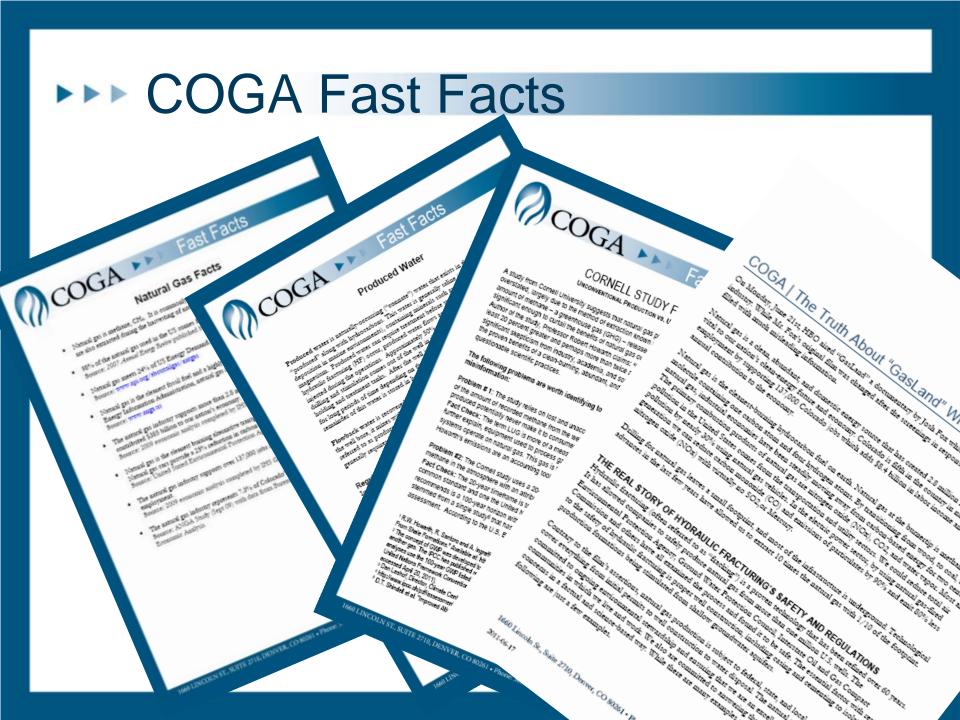


Property Rights

- Surface
- Subsurface
- Split estate

Colorado law provides for access to the mineral estate by allowing subsurface owners "reasonable use" of the surface estate





Mike Chiropolos Chief Counsel, Lands Program

Western Resource Advocates



Mike Chiropolos
Chief Counsel, Lands Program
NCLA Energy Development Panel
Communities, Environment & Quality of Life

August 23,2012

• Questions:

What should be the scope and substance of the upcoming oil and gas rulemaking in Colorado?

How can local and state regulation combine to best balance competing interests while protecting our environment, quality of life and residents?



• Potential Issues for Rulemaking

- Residential setbacks
- Well integrity
- Fugitive emissions
- Water quality
- Process: notice, appeals, etc.



Identifying Common Ground: Principles with Broad Agreement

- We all use energy
- Protecting public health and the environment are paramount concerns
- Striking the right balance involves listening to valid concerns raised by all stakeholders
- We support a clean energy future
- We value Colorado's unsurpassed quality of life





2012: What Is New or Different than 2008?

- More and more residents and communities are now potentially exposed to drilling and hydraulic fracturing
- Technology, geologic knowledge, engineering and operations have evolved since 2008
 - New drilling shifting from the Piceance Basin in NW CO to the Niobrara on the Front Range
 - Leading operators in Niobrara have the capacity to drill up to 9,000 foot horizontally – unheard of in 2008
 - Piceance operators have drilled 50 or more bores on a single pad (currently 20 in Niobrara?)





The Niobrara: Concerns and Opportunities

The "game changer" has been the combination of two well-known technologies — horizontal drilling and hydraulic fracturing — said Peter Dea, chief executive of Cirque Energy, a Denver-based independent driller in the Niobrara.

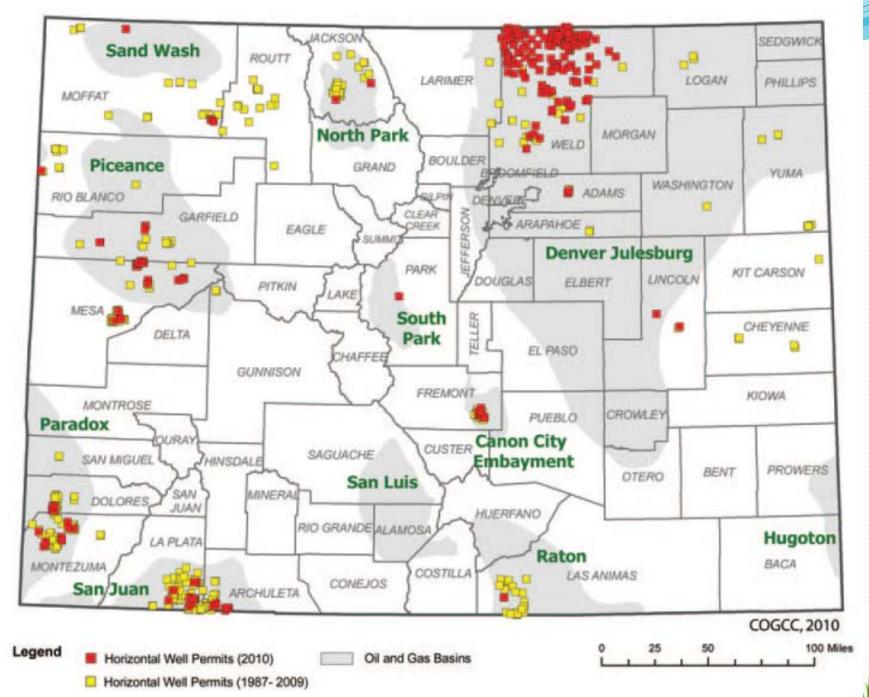
http://www.denverpost.com/business/ci 17807084#ixzz24JV0o 92L

CGS, ROCKTALK:

http://geosurvey.state.co.us/pubs/Documents/rtv13n1%204-15-11%20B.pdf







Two Central Principles: Primary Prevention to Safeguard Public Health

- Minimize quantities of materials of concern to reduce the risk of exposure
 - The less toxic or harmful chemicals or other products used, stored or transported in conjunction with operations, the better
- 2. Maximize distances to reduce the risks of exposure
 - The longer the distance between toxic materials and people, the less likely nearby residents will be exposed to unhealthy quantities that could have adverse health impacts
 - Applies both to normal operations <u>and</u> accidents or spills



"Social License to Operate"

- Like any other industry, oil and gas must strive to be a good neighbor and address community concerns
- This concept or phrase is borrowed from the "Golden Rules" World Energy Outlook Report published this year, http://www.worldenergyoutlook.org/media/weowebsite/ 2012/goldenrules/WEO2012_GoldenRulesReport.pdf.
- Tekton Energy negotiated an agreement with Windsor and local residents: the right way to do business in 2012



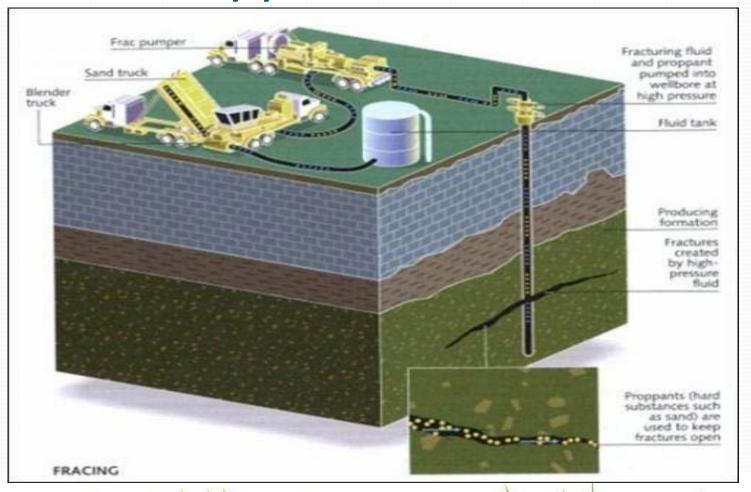


Legitimate concerns with drilling & fracking?

• What could go wrong?



How its supposed to work



Tough workers, challenging work



What happens when the job doesn't go as planned?

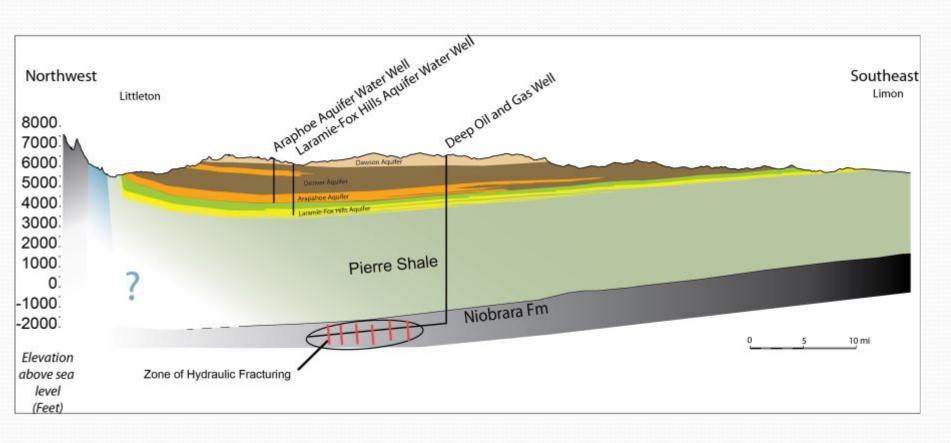
- Unexpected conditions
- Human error or malfeasance
- Technology malfunction
- Haste makes waste

Longer Setbacks Are Workable

- La Plata County: 450 feet
- Longmont: 750 foot setback
- Maryland: 1,000 feet
- West Virginia: 625 feet
- Horizontal wellbore capacity: 5,000-plus feet on the Front Range







Niobrara Report, Colorado Energy News

Proposed Changes

- WRA, SJCA & WCC letter dated July 25, 2012:
 - Increased residential setback of 1,000 feet
 - 1,500 feet for schools, hospitals, etc.
 - Enforce best practices to reduce toxic substances
 - Look at the big picture by addressing other concerns regarding today's oil and gas footprint, technologies and risks
 - Water quality, planning and drilling technologies





Residents' Concerns re: Drilling Near Neighborhoods

- Local elected officials have been increasingly hearing from residents
- What can we do at state level to address those concerns?
- Can state rules address local concerns, statewide?
- Can we avoid more litigation between the State and political subdivisions of the State?
- What about a Geographic Area Plan for the Niobrara formation (COGCC Rule 503)?





What's at stake?

- Healthy environment and communities
- A livable climate
- Jobs and prosperity
- Energy
- Colorado's quality of life



Barbara Kirkmeyer County Commissioner

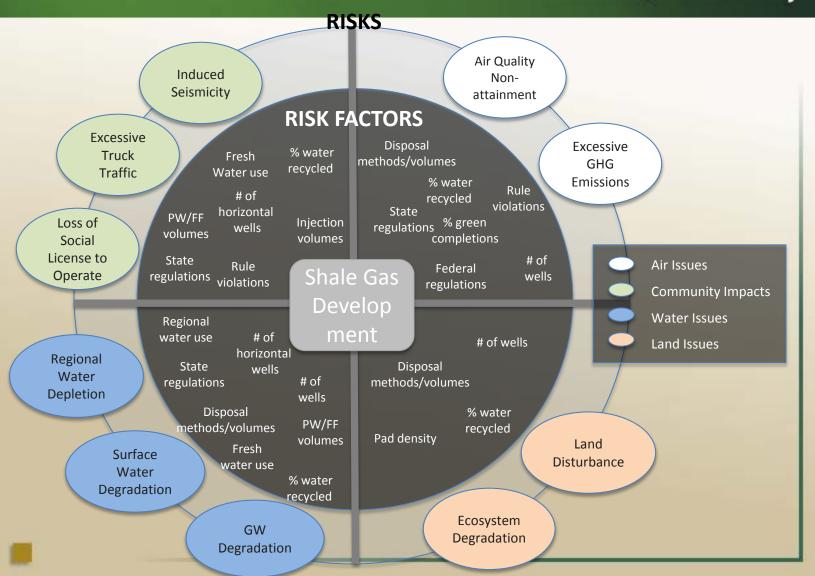
Weld County

Ken Carlson Associate Professor Civil and Environmental Engineering

Colorado State University

Community and Environmental Risks Urban Oil and Gas Development

Ken Carlson Associate Professor Civil and Environmental Engineering



Geosciences

- Exploration/geology of shale deposits
- Multiple industry partners





Land Reclamation

- Restoration Ecology Lab
- Reclamation of energy development lands
- Shell endowed chair Mark
 Paschke

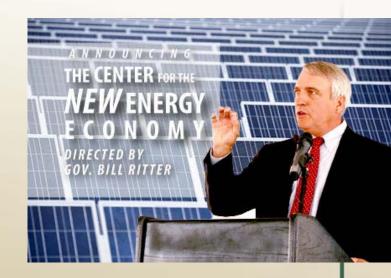
Air Quality

- Recognized program in Atmospheric Chemistry
- Strong presence in Mechanical Engineering
- Air quality studies
 - NOX, SOX, VOCs
- West slope (Garfield County) study beginning in 2012
 - o \$1.8 MM
 - o CDPHE, industry, county
 - Primary focus air toxics secondary, ozone precursors



Center for the New Energy Economy

- Established Jan 2011
- Directed by former
 Colorado governor Bill Ritter
- Source of science-based information



- Will convene statewide, national, and international discussions among policymakers, scientists, business, environmental organizations, and others
- Significant focus on energy policy

Colorado Energy Water Consortium

- Industry/university research center focused on natural gas/oil water issues.
- Collaborative industry/CSU research.
- Communicate natural gas related water issues and solutions to public, industry and others.
- Enhance curricula and programs within CSU to respond to an evolving job market in the energywater resources field.

http://cewc.colostate.edu



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