

University of Colorado Law School

## Colorado Law Scholarly Commons

---

Workshop on Directional Drilling in the Rocky  
Mountain Region (November 13)

2003

---

11-13-2003

### Notes from the Directional Drilling Workshop

University of Colorado Boulder. Natural Resources Law Center

Follow this and additional works at: <https://scholar.law.colorado.edu/workshop-on-directional-drilling-rocky-mountain-region>



Part of the [Energy and Utilities Law Commons](#), [Energy Policy Commons](#), [Environmental Health and Protection Commons](#), [Environmental Law Commons](#), [Environmental Policy Commons](#), [Hydraulic Engineering Commons](#), [Natural Resource Economics Commons](#), [Natural Resources Law Commons](#), [Natural Resources Management and Policy Commons](#), [Oil, Gas, and Mineral Law Commons](#), [Property Law and Real Estate Commons](#), [Science and Technology Law Commons](#), and the [State and Local Government Law Commons](#)

---

#### Citation Information

University of Colorado Boulder. Natural Resources Law Center, "Notes from the Directional Drilling Workshop" (2003). *Workshop on Directional Drilling in the Rocky Mountain Region (November 13)*. <https://scholar.law.colorado.edu/workshop-on-directional-drilling-rocky-mountain-region/7>

Reproduced with permission of the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment (formerly the Natural Resources Law Center) at the University of Colorado Law School.

## **Notes from the Directional Drilling Workshop**

*These notes were taken by one of our law students attending the workshop. They are not a verbatim transcript and they were not supplied by, and may not have been reviewed by, the speakers. There may be errors or gaps in the notes and for these we apologize in advance. Where the speaker provided an abstract of their talk, these are included and noted as such. Power point presentation or other reference materials provided by the speakers are included elsewhere on this site.*

### **Ann J. Morgan, University of Colorado School of Law Natural Resources Law Center**

Introduction of the workshop and topic. The Rocky Mountain region is seeing a large increase in the amount of exploration and production of oil and gas resources. Many people are interested in the use of directional and horizontal drilling technology but not much is understood about these technologies outside of the oil and gas industry. Many hold out the promise that directional drilling can minimize environmental impacts and the footprint of development. The technological, environmental, legal and policy implications of directional drilling for oil and gas in the Rocky Mountain region are the focus of this workshop.

**I. DIRECTIONAL DRILLING THE PROMISE AND THE PERIL:** *What is it, where can it be done and how does it fit into full field development for oil and gas? This segment will set the foundation and bring everyone up to a basic level of understanding of the technology of directional drilling.*

### **Dr. Bill Eustes, Colorado School of Mines**

Directional Drilling: The Promise and the Peril

(Please see the power point presentation provided by Dr. Eustes)

**II. DECIDING WHEN TO UTILIZE DIRECTIONAL DRILLING:** *For companies doing directional drilling, what are the direct and indirect costs and benefits? When is it economical and what factors does industry take into account in making the decisions to utilize directional drilling?*

### **John Moran, Reservoir Engineer EnCana Oil & Gas (USA) Inc.**

**Abstract:** Will discuss reservoir/economic aspects of directional drilling, and go over the criteria used in the decision making process. I will speak about these economic aspects directly as they apply to the directional drilling that I use every day to develop our Mamm Creek Field in Western Colorado. Our Mamm Creek Field is located just south of Rifle, CO where we currently have 16 drilling rigs running in the field. In 2003, we will drill ~ 270 wells, and ~ 94% of them will have been directionally drilled.

### **Notes:**

(Please see the power point presentation provided by Mr. Moran)

Reservoir engineering

Directional drilling possibilities

-horizontal

-S-shaped

## Extended reach well

- drilled because of economics

## Reservoirs

- generally need many wells to access all the natural gas
- generally many unconnected reservoirs
- very discontinuous
  - o visualize as a large bowl of potato chips
  - o wells separated by 20 acres – sometimes wells drilled at 10 acre intervals will miss reservoirs.

## Economic drivers of directional drilling

- reservoir conditions must support the cost of directional drilling
- in some conditions, horizontal or extended reach drilling becomes most *economic alternative* for reaching and developing a given reservoir
- Horizontal drilling has proven to be a viable, economic technology for developing specific reservoir types (fractured, and/or low permeability)

## Economic Drivers continued (re: Mesa Verde Stacked Sands)

- related to cost: as well density increases, the economic recovery also increases, because you're connected to more sands (reduces waste).
- resource recovery on a Per-well basis decreases as you increase well density. As costs go up, reserves go down. There's a diminishing return on investments.
- directional drilling exacerbates the situation.

## Where does directional drilling make sense?

- obviously, offshore where infrastructure costs are very high
- mountainous areas make sense in many ways. Offsets the cost of access associated w/ mountains.
- unique reservoir types
- urban areas, urban sprawl (DJ basin outside of Denver), and Mamm Creek.
- In Garfield County Colorado, it's not economic to build many wells. A 4-well directional pad is more economic than trying to build a well on the side of the mountain.

## Where does directional drilling NOT work?

- reservoirs that don't support it- poor economic return
- difficult drilling areas- when even vertical drilling is difficult, you have to spend more money to fight the problems.

## **Dr. Rusty Riese: Consulting Geologist for BP American Production Co.**

**Abstract:** The applicability of horizontal for high-angle directional drilling in the Fruitland Formation coals of the San Juan Basin is quite problematic. The coals of interest are often present in several beds which are widely separated vertically. The individual beds are also vertically partitioned by the presence of clay-rich clastic interbeds. These two situations - widely separated beds and internal barriers to vertical flow - result in requiring more horizontal wells than would otherwise be drilled vertically for the development of this resource.

Additional impediments to the application of this technology in Fruitland Formation coals stem from the inherent weakness of the reservoir coals themselves. The coals are cleated, or fractured, at a very fine scale - millimeters to centimeters. If these cleats are "open" when the well is drilled their presence will generally be expected to preclude keeping the well open long enough to case it. If they are not "open" during drilling they will open during production because the coal matrix shrinks as it releases gas. This shrinkage will occur in the near-well bore coals first, will lead to formation collapse, and will result in a loss of formation permeability. This has been demonstrated in physical laboratory experiments.

Finally it must be recognized that methane is kept in the coal reservoirs by hydrodynamic pressure: by the pressure of the waters present in and above the coal formations. This water must be removed in order to allow gas to flow, and removal requires pumps. Rod pumps cannot be run in highly deviated wells. Furthermore, any "low spots" in the well bore will tend to accumulate water, which will ultimately attenuate flow; these "low spots" cannot be cleared of water without pumping.

**Notes:**

- Coal beds are the emphasis of this talk
- Coalbeds are very irregular. If the reservoir jogs around, it's almost impossible to develop with directional drilling technology.
- Coalbeds are also vertically discontinuous. One well may only drain 1-2 feet of a 50-ft thick deposit
- Coalbeds are laterally discontinuous- faults and erosion preclude extensive lateral drainage.
- Coal is lousy excuse for a rock.
- Irregularities of coal-mining in the San Juan basin.
  - The high wall (shown on slide) is about 6,000 ft long, and coals are 5 ft thick. Trying to steer a drill bit to stay within the coal seam is almost impossible.
  - Lateral discontinuities- Ash faults have de-glassed and turned into a clay with NO permeability. It's so impermeable its used by geologists for pit liners to prevent groundwater contamination. This prevents drainage of the resource.
- Regarding faulting: Rocky Mountain basin faults- 2 major types of faults
  - when the sediment is just being deposited, its very soft, and has the consistency of oatmeal. Thick coal deposit, offset by 'listric normal faults'. They can't be mapped, there's no tool. You can't steer something through it, we'd never drain above or below.
- Lens of sand (shown on slide) is deposited by a channel. Channel has eroded the bottom surface and has taken 4 ft of coal.
- Excessive overburden pressures will cause horizontal holes to collapse.
- These are not reservoirs that can be developed using horizontal drilling.
- On next slide, gas isn't present in pore spaces.
- Fluids will drain into pore spaces, and in ordinary reservoirs, but in coal, the gas is held in the coal matrix, like CO<sub>2</sub> in a soft drink. Once the pressure is lessened, the gas is de-sorbed. Think of a brick shrinking. It loses continuity with the bricks around it and collapses. Very soon after nearby well bore holes are drilled, it loses structural continuity and collapses.

-Also, you need to get the fluid out and that requires pumps. Rod parts can't be used. If we "porpoise" to get all the deposits, we're left with low spots where the water collects and we can't get it out. Directional drilling is wholly inappropriate for coalbeds.

**Erik Molvar, Biodiversity Conservation Alliance.**

Eric is a biologist not a petroleum geologist. He is the author of *Drilling Smarter: Using Directional Drilling to Reduce Oil and Gas Impacts in the Intermountain West* which is based on an extensive literature review. The report can be accessed at <http://www.biodiversityassociates.org/blm/pubs/DirectionalDrilling1.pdf>

**Abstract:** The petroleum engineering literature shows that directional drilling, in its several forms (diagonal, S-Turn, horizontal, multilateral), has amassed a solid track record of success in a variety of geologic settings, from oil to natural gas to coalbed methane, from extremely shallow to extremely deep wells, and for small targets and difficult geology. These technologies hold great promise in reducing the environmental impacts of drilling on the land, through clustering of numerous wells on a few drilling pads and through using long-reach technologies to produce petroleum resources beneath sensitive landscapes and wildlife habitats without disturbing the surface. But these environmental benefits have yet to be realized. The time has come to make the use of directional drilling to minimize the footprint of oil and gas development and help to achieve multiple-use mandates on public lands.

**Notes:**

-(Slide showing types of horizontal and directionally drilled wells) Vertical well 4 miles away from well pad...you can get farther using horizontal wells.

-Significant increase in productivity using horizontal drilling vs. using vertical wells in the same field. Directional drilling can increase reserves as a whole. It has offset drilling costs. The costs are more, but so is the production.

-Directional Drilling can tackle the most challenging drilling situations. The Schrader Bluff multilateral well is in a really messy fault situation. MWD techs and LWD techs were able to stay within narrow tolerance limits and each well was economically viable and produced more than 1000 Bbl per day.

-It has been used in geologically difficult areas, with multiple fractures, tight tolerances, etc., but directional drilling has still been successful in these conditions. Slotted liners help with sand production problems.

-(Slide: List of directional drilling successes in North America.) Directional drilling is widely used, successfully used in every setting. Coals, shales, carbonates/limestone; every type of formation has proved successful. Can be even more economical than vertical wells. Horizontal wells cost almost twice as much but produce at 3 times the rate.

-Directional drilling allows for petroleum production to be operated more efficiently. There are also fewer costs on the surface: roads, infrastructure, pipeline, etc.

-Costs and techniques may differ.

-Directional drilling is now a standard drilling technology.

(Slide comparing well fields in Wyoming and Alaska)

-Wyoming drilling, maze of roads and wells and also pipelines, similar sized area in Alaska, drained by 2 well pads w/14 wells on each pad.

-Minimal footprint will reduce cost. Drilling in this way (multiple wells per pad) had the “side benefit” of minimizing impacts on the surface, but the Alaskan field was drilled directionally with lower costs in mind, not the surface impact.

What should be happening on the ground to minimize environmental impacts?

-National energy policy: 21<sup>st</sup> Century policy- new technology. Smaller, lighter rigs and advances in directional drilling, slim hole drilling, production of oil and gas keeping protection of wetlands, etc. in mind.

- BLM under current administration has repeatedly refused to provide for directional drilling
  - o Directional drilling allows wildlife habitats of various types to be protected
  - o directional drilling can be used to move away from sensitive habitats- this is the ultimate expression of multiple use.
  - o directional drilling should be allowed for full-field development. BLM has a legal mandate to prevent unnecessary or undue degradation to lands and wildlife under FLPMA. (Federal Land Policy Management Act).
  - o Adding wells- directional drilling should be required to prevent further clogging of already crowded well fields.
- Minimizing environmental impacts should be the standard method of doing business
- However, O&G development is:
  - o Driven by industry
  - o Increasing profitability
  - o Just to maximize economic benefits
- If it costs more to drill directionally, it should be viewed as the cost of doing business on the public lands!

### **Questions from the audience and discussion with panelists:**

Q: Given reservoirs in the Rocky Mountains, you can drill almost anything, which ones readily lend themselves to horizontal drilling?

A: Block-and-shales in North Dakota, single layer type reservoirs, Austin chalk in Texas. Also, reservoirs which are single-layer, laterally extensive, and without large numbers of internal flow barriers. Most of the reservoirs in the Rockies are from Cretaceous, and are old beach settings, and they are very laterally discontinuous, so many of the reservoirs should not be developed in this manner.

A: (Molvar)- Using S-turn drilling might be appropriate. There probably is a directional drilling method for every reservoir

Q: You say Horizontal drilling is not useful in the San Juan basin, but what about the S-turn drilling?

A: (Riese) Specifically for coals. 2 points:

-S-wells have been used, for the reasons of difficult access, and trying to minimize cost and access issues.

-Also, horizontal drilling HAS been performed in the San Juans, and has been successfully performed in the proven coals, and production has been better, BUT most of those holes have collapsed, early in their lives, too soon to pay out investment. Investors aren't going to stand for not paying out the full amount of their investments.

Q: Is there enough overburden over the Fruitland, are you just reaching a series of vertical wells?

A: (Riese) Shallowest drilling is 1,200-1,500 feet, not enough room to do a lot of maneuvering, more room at deeper depth, and this is where it can be more successfully applied. If the economics don't work, the well won't get drilled, and resource is left behind

Q: What types of drilling have been used?

A: (Rises) Liner completion, any type of completion, doesn't matter, there's fines migration, and they've all collapsed.

Q Give us the cost comparison of 6 wells per pad vs. a single vertical well.

A: (Moran) cost is controlling factor- in Mamm Creek, an incremental well cost of \$100K per well is the general rule of thumb. That cost has to be offset by what I would've had to do to drill the well-as a single vertical well. So if it's on a mountain and the road would cost \$200K, that's an offset.

Q: How much does a regular vertical well cost in that basin?

A: (Moran) To DRILL the well is \$400K. To COMPLETE the well is another \$400K-\$500K. To do a horizontal well, its another \$100K. Gas reservoirs in the Rockies are stingy in how they yield -doesn't seem like a big percentage, \$100K on a \$1M well. BUT, I'm also getting less production. Investors get about 10-12% return on investment- so if I add another \$100K on a \$1 million investment, that well is not economical anymore.

(Molvar) A lot depends on the fluctuations of the oil and gas market, too. BUT, if its uneconomical to drill it NOW, it'll probably be economical to drill it sometime in the future. So, why use the heavy-handed technology now? Wait until it's economical to use the directional drilling methods.

(Riese) Gas prices need to be strong for awhile before it's economical to use directional drilling. What most companies do is forward-sell their product for a price that's lower than the margin prices. Most of the gas from the Rockies is already spoken for. The forward- selling pays for the drilling. You have to make sure you keep the resource flowing... if you delay drilling, you take the resource to a point in time where it can't be developed.

Comments from audience participant:

-If horizontal wells were as cost-effective and production-efficient as it would seem, the industry would've started using them consistently awhile ago- how many wells fail? The risk of collapse or failure is increased with directional drilling.

-the costs of equipment and demand and supply are also quite volatile- the margins don't suddenly expand

(Molvar) Yes many wells were failing- but my data shows that 5% failure is a fair amount, we don't have data on vertical wells. At a recently-undertaken EIS in Wyoming- the projected success rate is 15% for vertical wells. So its not that much worse.

(Riese) The failure rate for vertical wells in the Fruitland Basin is less than 1/2 of 1 %. 95 % for DRILLING is good for horizontal holes, but this is "grossly" misleading because the eventual collapse/failure rate is 100% for directional drilling in that area.

Q: Is the picture of the 2 drill fields (Box Arch, Wyoming and Alpine Field Alaska) comparing similar basins?

A: (Molvar) They are broadly dissimilar; however, S-turn drilling might have been appropriate in Wyoming

Q: Are you hoping to develop box Arch w/ directional wells?

A: (Molvar): Yes, something more could've been done.

-(Riese) I think that's wrong, you're comparing apples and oranges. You can't do horizontal/directional drilling in a "potato chip" bowl.

-Alpine field and Box Arch are NOTHING alike- you can't compare the 2 of them.

-Directional drilling has been done on the offshore very frequently and for decades.

-Box Arch does not have the kind of room you need for directional drilling.

**III. LEGAL CONSIDERATION OF DIRECTION DRILLING: *When does the state require directional drilling? Can land owners require it in Surface Use Agreements? What does Colorado's version of the accommodation doctrine mean for directional drilling?***

**Carol Harmon, Attorney with Colorado Attorney General's Office**

**Notes:**

(Please see the power point presentation provided by Ms. Harmon)

When does the State require directional drilling? Rarely. The question people frequently ask: why *not* require directional drilling, especially when it comes to environmental impacts? The Colorado Oil and Gas Conservation Commission (COGCC) has statutory authority through Colorado Revised Statutes 34-60-101 *et seq.* The COGCC has jurisdiction and power granted to it by the General Assembly. The Commission can't act outside of its authority.

## Powers of the Colorado Oil and Gas Conservation Commission

COGCC issues O&G drilling permits throughout the State. The Commission is mandated to strike a balance between fostering and encouraging O&G development, in a manner protecting the public's health, safety, and welfare; to protect correlative rights; to prevent and mitigate significant environmental impacts...to the extent necessary to protect public health, safety, and welfare, but taking into consideration cost effectiveness, considering economics and technological feasibility. There hasn't been a showing that directional drilling is *necessary* to protect public health, safety, and welfare, though it may be technically feasible or cost effective.

Surface owners have the ability to make that contention, that directional drilling is necessary to protect their health, safety, and welfare. However, few surface owners make this contention. It's rarely done. The Commission did choose to impose directional drilling on some 20-acre-density proposed wells in Garfield Co., and some wells located near recreational facilities near Longmont.

### What is the Commission NOT authorized to consider?

- Property values

- Quality of life

The Commission isn't specifically authorized to take in these factors when issuing drilling permits. COGCC has an *indirect* ability to require by default directional drilling. The Commission has sought to promote specific safety rules in high-density areas (dense population and designated outside activity areas, such as playgrounds, ball fields, etc.)

Setbacks for wells in high population areas are higher than those usually required. Because they have to be set back farther, drilling may be precluded or directional drilling would be necessary if the operator wants to have a bottom hole location that isn't accessible due to high-density regulations.

The rules of the Commission encourage operators to drill wells from existing well pads. They don't require operators to drill directionally, but you can also have several wells to several formations at different depths. These aren't requirements.

It's up to the operator to decide whether drilling a directional well is what it wants to do. The only rule is R. 321, contemplating that the operator HAS made the decision to use directional drilling. R. 321 describes information the directional drilling operator needs to provide in addition to the information provided by a normal well operator. Because the surface location is different from the bottom location, there's more data and surveys that need to be provided. The operator thus needs to provide a picture, an open view and a cross-section.

### Slide: Map of Colorado, and directional drilling wells within.

Historically in CO, the Commission looked at regulating horizontal wells. Horizontal wells are intentionally highly deviated, to take advantage of naturally-occurring fractures, in order to increase production. A directional well is less deviated than a horizontal well, but it moves away from the well site on the surface because of topography or surface

agreement. Sometimes the operator wants to accommodate the surface owners' requests, in order to seem like a good neighbor.

Even in Garfield Co., where 10-acre density has been approved, directional drilling wells are used for economic reasons. It bears repeating that simply because there's technology available that works for one particular well in one producing basin, it does not mean that it can be used everywhere. Directional drilling isn't a cookie-cutter answer to everything, and every well is unique and needs to be dealt w/ individually.

Of all the wells in Colorado, 1,583 are directional drilling wells, 23,000 + producing wells and 40,000 plugged or abandoned. So, around 2% have been directionally drilled. This includes horizontal wells and slightly deviated wells.

Example of directional drilling (including Horizontal Wells):

Garfield Co. has 596 directionally drilled wells. The order of the Commission was to have a 20-acre density. Operators proposed a 10-acre density. Operators proposed using existing wells from a surface ownership and good neighbor perspective.

Weld Co (460): surface development

Technological development, growth of cities, terrain are major factors here.

Four counties in Colorado account for 80 % of all wells in the state: Weld, Garfield, Rio Blanco, and \_\_\_\_

When directional drilling was tested, the Commission formed a committee to study whether regulations should be developed for directional drilling. The committee found that existing rules were sufficient for horizontal drilling at that time. It recommended that a policy be established for submitting extra info for these wells. Not much has changed in that time. Only a handful of directional wells are applied for per year. The current rules and regulations of the Commission have been sufficient for directional drilling wells and regular wells. This policy is at [www.oil-gas.state.co.us](http://www.oil-gas.state.co.us) (Rules page), which also contains maps, information, etc.

**Erika Enger: Attorney with Temkin, Wielga, & Hardt**

**Abstract:**

- Whether Colorado law requires directional drilling if the surface owner requests it, under the accommodation doctrine and the *Gerrity v. Magness* case.
- Has represented industry clients in various scenarios where the surface owner did not like the operator's choice of surface location.
- Legal and practical considerations that have gone into resolving surface estate-mineral estate owner disputes.
- Will discuss situations where a surface owner asks the Oil and Gas Commission to order directional drilling, and talk about how those issues can be resolved.

**Notes:**

A response to Ms. Harmon's statement about Longmont: two principles: 1.) Commission staff can't impose directional drilling administratively, it has to go thru hearing and rulemaking

process, and 2.) City of Longmont was seeking to build a to create high density rule, (therefore requiring setbacks,) but the City hadn't implemented the building, and an area can't be high-density until the buildings are there.

Her practice is often viewed in the severed estate context: It comes up in surface use agreements and wellhead locations, which are often done at the same time. The split-estate is an important negotiating tool; it's important to understand the rights and the extent of the right. Litigation is expensive, but going before the Commission is expensive too.

What are the basic legal rights in a severed estate situation?

- Rights of operator or mineral owner, are to use as much of the surface as reasonably necessary for its operations.
- The surface owner is to use as much of the surface as reasonably you see fit- as long as it doesn't interfere with the rights of the mineral owner/operator.

What do rights NOT include:

- Neither the surface owner or the mineral owner has the right to exclude the other from the surface. For example, a surface owner can't block the road with his pickup truck. The court agreed with the mineral operator, that you can't take the matter in your own hands. Judge issued an injunction.
- The mineral owner/operator doesn't have the right to act unreasonably, by using more of the surface than is reasonably necessary, causing excessive damage, failing to reclaim surface area appropriately, etc. Commission rules can be determinative on the issue of reasonable use of surface.
- The surface owner doesn't have the right to avoid all possible inconvenience. The mineral owner's use has to *materially interfere* with his surface occupation.

Where does directional drilling fit into this context of split-estate ownership?

- The accommodation doctrine, and having due regard for the rights of others. In Colorado, these are expressed in *Gerrity Oil & Gas Co. v. Magness*, 946 P.2d 913 (S.Ct. Colo., 1992). Anyone who has to deal with split estates should reread the case now and then.
- Accommodation doctrine balances the rights of surface and mineral owners. Neither the mineral estate nor the surface estate can be dominant, and both must have due regard for the rights of the other. *Gerrity* sets out recovery: the surface owner in *Gerrity* tries to claim relief using a trespass theory. The elements of his claim is where directional drilling comes into the case. The surface owner makes a claim that the mineral owner has trespassed by using more of the surface than reasonably necessary. Remember mere inconvenience is not enough. To rebut the claim, the owner of the mineral estate must show that his use of the surface was reasonable and necessary. If he successfully rebuts the surface owner's claim, the surface owner must try to show that reasonable alternatives to the mineral estate owner's actions were available, and these reasonable alternatives should have been used to accommodate the surface owner. The Court then has to determine whether the reasonable alternative was available, and whether the surface use was in fact reasonable and necessary.

-The relief sought can be damages for a past injury, and injunction against future injury. If directional drilling is held to be a reasonable alternative, it'll boil down to the specific facts of the case. You don't know whether its going to be "reasonable" until you get in front of a judge. You can know your rights but things might come out quite differently than how you think they're going to. As far as the speaker (Erika Enger) knows, a court has never found that directional drilling was a reasonable alternative.

There are two things to look at to decide whether directional drilling is a reasonable alternative:

-Technical Feasibility

-Directional drilling can be hard to do, and it's not going to work everywhere, see *Amoco v. Thunderhead Investments*, 235 F.Supp. 1163 (D.Colo. 2002). This case has a good discussion as to why directional drilling wouldn't work for various reasons, and constraints that made it impractical in this situation.

-Cost

-More likely, this is where its going to turn. More expensive than it needs to be, could be done more cheaply. The uncertainty of drilling results is a big factor. If you start from the beginning, you don't know what the outcome is going to be. The judge is going to figure out the answer.

-Directional drilling is getting cheaper and technology is getting better, but it's still expensive.

-Judge West held that the accommodation doctrine doesn't require directional drilling. As directional drilling gets cheaper and more feasible, you'll probably find more cases where directional drilling may be held out as a reasonable alternative. The Colorado version of the accommodation doctrine doesn't hold out a blanket requirement to use directional drilling. The surface owner may help the mineral estate holder to know about his surface usage, and directional drilling can be used as negotiating tool. Surface owners might chip in for the incremental cost.

-Directional drilling is not a legal panacea. Get a lawyer who is experienced in the O&G arena.

**Lance Astrella, Attorney with Astrella & Rice**

**Abstract:** Directional drilling of wells, where technically feasible, can reduce surface impact, benefiting not only the surface owner, but also the public. While it may be legally unclear as to whether the surface owner or the oil and gas lessee has the obligation to pay the incremental cost of directional drilling, the burden is often borne by the surface owner who wishes to preserve valuable land for present and future use. How that cost should be equitably borne and how it should be paid depends on a number of factors including (i) the effect of down-spacing orders which postdate the lease (ii) whether directional wells will provide acceptable rates of return absent payment by the surface owner (iii) the relative values of the surface and oil and gas leasehold and (iv) the benefits to the public. In Colorado, there is a statutory and administrative void which is unlikely to be filled and which places the burden on establishing policies with the courts.

**Notes:**

In old days, the surface owner was the dominant estate.

The actions of the mineral estate holder must be reasonable AND necessary. There's a big difference between "reasonably necessary" and "reasonable AND necessary".

-*Gerrity* doesn't tell us whether the surface owner can force the driller to use directional drilling, and it doesn't say who pays the cost of directional drilling.

In rural areas, it's a question of the environment. In urban areas, the surface owner can force the mineral estate holder to move his well location by providing/allowing a drilling location outside of the drilling window.

A case of his that hasn't made it to trial claims that in the Greater Wattenburg area, in the early 70s, you could drill 2 "J" wells to get to the reservoirs. Now, you can drill up to 10. What was the contemplation of the parties when they entered into the lease? The "meeting of the minds" at the point of leasing, WAS 2, so how is it now 10? Can we say as a matter of contract, that the O&G lessee has the right to drill those additional 8 wells? What about down-spacing?

Another case of his that is up on appeal, if the surface owner provides another location within the drilling window, can the surface owner make that location? (Not the lessee?)

Handout: 4 spots in each governmental quarter section. People that want to minimize urban sprawl. COGCC won't decide. Developers don't have the time to take every case to the Supreme Court, but it's important to get the cases on the books so everyone has guidelines.

If the surface owner wants a directional well drilled, the surface owner agrees to pay the incremental cost of directional drilling. It's a question of property rights, and does the surface owner have the funding to pay the incremental costs? The surface owner usually pays, whether or not the well is actually drilled. Real estate developers often go out of business; they have a legitimate concern

The commission should be involved, so that there's a long-term escrow account. If this were the case, if the mineral estate owner uses directional drilling, its paid for by the surface owner, but if the well is never drilled, or a traditional vertical well is drilled, the money goes back to the surface owner, or for a different purpose, but not to the operator. The legal issues that need to be established are: dealing with the payment in advance of the incremental cost of drilling, and making sure it's honest dealing. Technology plays a big role...the more directional drilling can enhance production, the less onerous and contentious it will be.

### **Questions from the audience and discussion with panelists:**

Q: Since the State and the surface owner can't require directional drilling, can the local government or the Feds?

A: (Harmon): A Surface agreement isn't something used as a condition on an O&G permit. That's something negotiated between private parties, and is not enforceable by the Commission. Parties would have to seek the appropriate remedy in court under contract law.

Q: Does the State commission's inability to require directional drilling, does that preclude the feds from requiring it?

A: (Harmon) Can the BLM impose it? Yes. Their rules preempt the state rules. The state and the BLM cooperate when a well is being drilled on federal land. The operator has to file permits with both state and federal agencies, but usually the operator gets its permit first from BLM. In the technical aspects, there's cooperation, but BLM takes the lead.

Q: The state can't require directional drilling unless there's a public health, safety, and welfare danger. But don't wells threaten economic welfare of public that live near a well?

A: (Harmon) The Commission distinguishes between a 20-acre density and a surface owner who wants a directional well in one particular location. How many wells becomes an issue when there's a lot of wells.

Q: How many wells affect the public welfare when there are a lot of wells?

A: (Harmon) There isn't anything specific in the oil and gas regulations that addresses property values or quality of life. These considerations haven't been delegated to COGCC to consider when issuing permits. It can CONSIDER public health, safety, and welfare issues. It's a fine line- property value and quality of life are out there indirectly when density reaches a certain level. The commission has looked at safety issues in population density or well density.

Q: Does the Commission's jurisdiction depend on the scale of the proposed impact?

A: (Harmon) It has to be a SIGNIFICANT public health, safety, and welfare issue.

Q: What are the rights of the public?

A: (Harmon) Notice to assert rights at a hearing. The title for the mineral estate isn't available from your local title company. Get a land man to do it. Banks who finance the projects, or title companies rely on the attorney.

A: (Enger) Not aware of specific statute, but the more people you can get to the table, the more you know- the surprise factor of the split estate is very disturbing to a lot of people.

A: (Harmon) If they were to write a new statute, cities would annex parcels and approve developments without regard for mineral estate, and people need to know about the mineral estate.

Q: The Accommodation doctrine requires accommodation of the existing uses; when does that use become an "existing" use? If a subdivision is planned, when does it become an "existing" use?

A: (Estrella) ASAP! There's little or no case law on the matter.

A: (Enger) It will depend on facts of every situation. Example: There was a planned use of creating a gravel pit on the surface where the mineral estate holder wanted to drill. The surface owner had gone ahead with some progress, had gotten some permits, etc., but hadn't turned the dirt yet. This dispute went to a negotiated agreement. It's not clear that it has to be an existing use for it to be accommodated- depends on state/case law. In

Colorado, the law is still unclear, but there've been cases where planned uses have been accommodated. It's very fact-specific.

Q: Incremental cost- when the court looks at directional drilling, in calculating extra cost for the directional drilling, is that just the drilling itself, or does it count the savings involved in road building, infrastructure, etc.?

A: (Estrella) It needs to be offset by the savings. Not sure where you go with it. In the free market way to look at it, look at what the market value of the surface is. If an oil and gas operator had to pay the social cost of the impact on the environment, what would he be paying? This calculation is different in urban areas, where the land cost is high, more casing is required in the hole, etc.

A: (Enger) In a court case, both sides would present their version of what the incremental cost would be and the court would decide.

Q: If the state were to give more direction to Carol, what should it say to resolve the issue through statutory language?

A: (Estrella) Decide what the property law is between the parties. Establish the escrow fund so that the development companies can't rip people off. The Commission can and should study if someone is trying to develop a property for a public purpose, what happens if its not drilled and they go away? Mineral owner brings a case saying your lease is gone, you didn't drill within sufficient time. A better policy would be to put in a permanent location- put the wells in a place that's least disruptive, benefits the public as a whole in keeping those things in one place on the ground. There was a proposal by senator, which was attractive because it provides some certainty that there will be some room set aside for Commission and local governments. Where does the state authority begin/end, and what about the county oil and gas authority? Clarify what the legislation means, consistent with considering Public health, safety, and welfare. Right now it's a struggle to figure out what that means. What the Commission should do, but doesn't, is to undertake studies to find out how technology can improve the surface-mineral value maximization- they're looking at it through their statutory lens, but they should look at how they can bring parties together. Encourage experimental programs and technology development.

Q: Why do we need the government to set up the escrow account? Couldn't the parties do it by contract?

A: (Estrella) So far we've been unsuccessful in doing this.

**IV ENVIRONMENTAL ANALYSIS OF DIRECTIONAL DRILLING: *What are the environmental considerations involved with directional drilling? How should the NEPA analysis take this technology into account? When should it be analyzed as an alternative to conventional vertical drilling?***

**Kent Hoffman, Deputy State Director, Utah Bureau of Land Management**

BLM is a resource management agency, with a myriad of laws to comply with- Endangered Species Act (ESA), Federal Land Policy and Management Act (FLPMA), etc. The National

Environmental Policy Act (NEPA), requires planning, in the form of Environmental Analyses, (EAs), and Environmental Impact Statements (EISs).

Levels of planning and analysis:

- Resource Management Plans: (RMPs, formerly Management Framework Plans) are the primary planning document, the foundation for all other plans.
- Majority of plans that BLM work under were written during the mid 80s to mid 90s.
- Many of the assumptions/analyses of decisions BLM makes today are based on old plans.
- There is a large plan revision process going on now - many plans under revision.

What do you do with an RMP, when it's under revision?

- The simple answer is, you manage the area using the existing plan.
- The more complicated answer is, you stay with existing plan so long as it doesn't preclude the new management objectives.
  - What's the status of on-going plans?
  - Will it include proposed alternatives?
  - When is a right vested/when does it become "existing"?
  - Stay with the existing plan until the new plan is in place. Don't preclude alternatives when writing new plans.

Usually the RMPs are pretty generic and further, more detailed level of planning is needed.

Activity plan level:

- Develop Oil and gas in a specific given area. Now you look more deeply, and write it into the programmatic plan through an EA process.

Project level plan:

- This is when you're doing something on the ground.

BLM is criticized by critics who say BLM should be looking at things like directional drilling in RMPs. However, it's inappropriate for us to be doing that based on the type of plan the RMP is. An RMP allocates different uses to different areas. There may be an emphasis on specific activities in certain areas, and a de-emphasis for other activities in a given area, but all areas are multiple use; even wilderness areas.

- For example, if there's a high potential for oil and gas, then we want to facilitate leasing.
- Where directional drilling should be analyzed and addressed is certainly at the project level. For the activity-level plans, it depends on what the plan entails. How big is the plan? We write activity plans of our own volition, we aren't handed a plan from an operator. Assuming spacing of well pads for analysis purposes is inappropriate at the activity-level plan, because they haven't been proposed yet.

The *projects themselves* trigger the project level plans. Specific well locations will be analyzed in the project-level plans. For the activity-level NEPA analysis, it's a matter of what we reasonably perceive may occur in those areas.

Getting to the point: why doesn't BLM include analysis of an alternative action using directional drilling in *all* our plans?

-It's BLM's belief and policy that directional drilling should be analyzed on a site-specific, case-by-case basis. It's difficult to say that any one approach is the catch-all. We need to take scientific and technical information together to plan the NEPA analysis. NEPA analysis is litigated in almost everything BLM does these days! There's no *prohibition* anywhere against directional drilling of any kind, but there's no *requirement* that it be done either. Clearly, some people think that BLM should *always* recommend directional drilling as an alternative under the standard of preventing unnecessary or undue degradation (UUD), as mandated by FLPMA. If the proponents of always recommending can show and prove that UUD would be occurring without directional drilling, then directional drilling alternative analysis should happen. But it's very rare.

When BLM, operators, and other interests get together, they might start out at polar opposites, but usually they can come to a compromise. The maxim used to be, if everyone's equally unhappy, we must be doing something right. NOW, it's more like, "everyone should be equally happy". This doesn't change the way we do business but at least allows win-win scenarios.

Besides simply not allowing the lease to occur, or forcing operators to adopt a plan alternative that requires directional drilling, BLM has many other tools in the box to protect the environment.

- Regulations in the lease terms that allow the operators to move the lease 200 meters. 200 meter rule helps a lot of times- and operators are willing to go even farther when they see the conditions on the ground.
- BLM can regulate and control the size of roads, require pipelines to be beneath the road, the size of the location, and intermediate reclamation procedures.
- Radio telemetry has helped a lot: Companies have gone to this on their own volition. The decreased human presence associated when companies monitor the wells using telemetry has a much lighter impact on the ground than the companies coming out every day in trucks to monitor their wells.
- Directional drilling is also a tool in the box. It hasn't yet been used frequently but will be in the future. We're still learning, we're still gaining data, we don't claim to have all the answers.

Specific observations:

- One thing about directional drilling is the cost.
- It's been his experience that there is no generally-accepted standard of what's economical or not.
- This type of analysis gets very complicated very quickly.
- BLM stays out of the corporate boardroom; BLM doesn't want to make the decisions for the companies. There are numerous decisions out there about the "proven operator" rule, and BLM can't require operator to do something that's clearly uneconomic. It's a tough call.
- BLM also tries to avoid getting into the actual design of wells. BLM reviews proposals, to review them within the sideboards of the scope of regulations. BLM doesn't design, but we review. It needs to be within the minimum accepted standards. There are a bevy of professionals in BLM, and we bring in an interdisciplinary team from BLM. Soils,

geologists, hydrologists, lawyers. BLM also depends on the industry to do research. BLM encourages R&D by the companies, operators. Come up with proposals!

-We will make suggestions based on info we have from cadre of professionals that there are some areas that should be avoided, because they are especially sensitive habitat, etc. In these types of areas, we will say, use directional drilling, or don't drill. We don't lease large continuous blocks of land that aren't accessible.

-Another aspect: many times when protecting other resource values this can entail very large areas. Not just big game habitat, but 30-40,000 acres of land. We identify certain areas where no surface occupancy (NSO) will be permitted. This is hard to predict, but these patches of development will probably, if not dictate, at least push towards cluster-type development or directional drilling.

-Utilizing No Surface Occupancy areas is moving towards a higher level of land management

The EPCA study took a hard look at access to public lands...when you rack up timing restrictions, and overlay considerations in time and space, there are very short windows when an operator can have access to his lease. Can this be avoided using directional drilling? Maybe, if it expands the window of opportunity to drill. But if directional drilling makes the drilling process take longer, and you already have a short drilling "window," this too may lessen profitability, and make the available window to obtain the resource even smaller.

*In sum, nothing in policy or regulations that precludes horizontal or directional drilling, but there's nothing that requires it either.*

The goal and objective is to use all of the "tools in the box"; directional drilling is just one of them. Directional drilling is analyzed on a case-by-case basis. You can't be overly broad in generalizing where it's appropriate and where it's not appropriate. This analysis usually ends up in a NEPA document. Don't get locked into analysis paralysis. Be very careful with the process- we should only take those opportunities for directional drilling which seem possible, viable, into account as alternatives.

### **Mike Chiropolis, Attorney with Western Resource Advocates**

#### **Notes:**

(Please see the power point presentation provided by Mr. Chiropolis)

Directional drilling offers the ability to protect habitat, roadless lands, proposed wilderness and cultural resources from direct impacts and reduce the likelihood of indirect impacts that follow roads and other development. Directional drilling should always be considered in NEPA analysis for mineral development. The level and type of analysis depends on the circumstances. Sometimes the main concern will be reducing overall well density and road mileage in a fully developed field - so the emphasis might be on drilling multiple bores from a single well-pad.

Other times, the concern will be avoiding surface disturbances entirely within a certain area - so one or more directional well bores might allow development to proceed from pads adjacent to existing roads without compromising natural values of neighboring lands.

In the last year or two, public pressure has resulted in federal land management agencies (the

BLM and Forest Service) starting to analyze directional drilling in certain high-profile EAs and EISs. Whereas before they dismissed such methods in a sentence or two (to paraphrase: "According to the project proponents, directional drilling would render the project un-economic and is technically infeasible"), now they give it a page or two and reach the same conclusion.

Sometimes directional drilling is analyzed as an alternative. On one or two occasions, agencies have retained a third-party consultant to analyze economic and technical issues. However, to the best of my knowledge, paying more attention to analysis of directional drilling doesn't appear to have achieved much in the way of actual environmental protection on the ground - for whatever reason. My hope is that this conference leads to some real results.

We're not seeing directional drilling technologies required to protect sensitive resources, except in rare occasions when industry proposes to apply it. Nor are agencies or industry taking seriously the admonition that perhaps certain special places should not be opened to drilling until technology has a chance to develop to the point where surface damage might be substantially less than using today's conventional drilling methods - and could even allow large landscapes to be entirely spared while still recovering minerals. Places like the HD Mountains and Roan Plateau in western Colorado would require extensive road construction and infrastructure to develop in 2004, lasting impacts that might not be necessary if we wait 10 or 20 years - only the blink of an eye in geologic time.

For existing fields suited to mineral development, my perspective is that economies of scale will significantly reduce the cost of directional drilling once the technology is established for a given field or region, and the lease operators get used to doing business with the directional drilling contractors. There's a role for economists and other experts to investigate how to get us to the point where costs equalize or new technologies out-compete accepted methods.

Government needs to play an active role to foster change, instead of saying it's out of their hands how operators develop federal minerals leases. Industry also needs to show leadership. On our part, we have to be willing to talk about common ground and solutions, rather than emphasizing a defensive posture.

There has to be a way to get creative with pooling agreements and other regulatory tools to avoid the environmental impacts of high-density development that characterizes some mature gas fields. For instance, BLM has allowed up to 15 wells per square mile in Farmington, New Mexico. The result is a regulatory oversight program that has failed three straight performance reviews, and an ecosystem on the verge of collapse because management has focused almost exclusively on "conservation" of minerals (maximizing recovery), rather than surface resources.

Concerned environmental groups are doing our best to identify and retain qualified experts, such as petroleum engineers and geologists, to comment in favor of directional drilling. One constraint is that any experts we work with might lack access to geophysical and other data which is proprietary property of the lessee and seismic company. Another is that, urban legends about our fund-raising prowess to the contrary, we are not in a position to compete with industry or government for the services of experts in these disciplines.

Government agencies need to step up to the plate to actively promote directional drilling and other minimum footprint technologies. Industry needs to initiate some collaboratively designed pilot projects and show a real commitment to using directional drilling technologies. We're willing - even eager -- to discuss to talk about project design and field development with other stakeholders. Most of the decisions are made before the first NEPA draft goes to the printer. I'd much rather sit down at the negotiating table than across the courtroom. Litigation is a last-ditch strategy when all else has failed, and better communication about how technology might help us realize shared goals should significantly reduce the number of challenges.

Otherwise, the implementation of the National Energy Plan in the Rockies is going to make our region what the FERC Director recently termed the nation's "ground zero" for accelerated natural gas development. Nobody who lives in the Rocky Mountain states wants to be ground zero for anything. It's not in anybody's best interests in the long-run, not to mention the health of the land or its ability to sustain other uses in the future.

When all is said and done, history won't judge this natural gas boom on how many million cubic feet of gas was produced in how short a time span. Rather, we will be judged on our ability to spare special places like potential BLM wilderness and Forest Service roadless areas, on whether stakeholders and politicians worked together to minimize the footprint of development and associated environmental impacts, and on how well we respected the other uses and values for which Americans treasure our public lands.

#### **Questions from the audience and discussion with panelists:**

Q: Twice you talked about the economic feasibility, and you said the BLM doesn't attempt to get in the boardroom. If directional drilling makes sense from a land use planning standpoint, does that mean if the Company says "no, its not feasible," you won't bring it as an alternative?

A: (Hoffman) No. It comes down to, if BLM can show that the other resources warrant the directional drilling and its economics based on the regional model, will it meet some reasonable rate of a return; meet the t-bill rates. It's very complicated as to what is considered "economic." BLM stays away from telling a company what is economic for them. If the project can't meet the prudent operator test, then it won't happen. But BLM may modify the plan.

Q: Does BLM have its own models that they develop or does it rely on industry models?

A: (Hoffman) The models BLM uses are off the shelf, very simplistic, basic models. Not industry models. The more complicated the models, the bigger the bones of contention on the field.

Q: If the analysis found that the other resources needed/would benefit from directional drilling, but the company said it's not economic, what do you do?

A: (Hoffman) You have valid existing rights once its leased, so they would have to allow it...so they pull out the other tools in the box.

Q: So O&G leasing is the dominant use of the public lands?

A: (Hoffman) No, we try to mitigate them to death, and they may throw up their hands and leave.

Q: Isn't the RMP stage the appropriate place to do the alternatives analysis? If you don't do it there, then you've done the leases, and created the valid existing right problem for yourselves.

A: (Hoffman) The RMP stage isn't delving into what's happening on the ground in a specific area. The RMP is for deciding to lease or not to lease a specific area, period. The RMP determines the "category" applied to that area. The RMP isn't where we get into specifics. Land managers lack specific information at that point. It's very difficult to get into project-level decision making at the RMP level; its much too broad.

Q: But at the RMP stage, shouldn't you be talking about the density of well spacing, etc.? Those questions do affect your analysis. You would make some of those decisions.

A: (Hoffman) In well-established areas, we might have the information to make the call...but in new reserves, we don't have the information. The key at the RMP level is to make and define objectives, not to define precise procedures.

Q. You make the decision about what areas will be subject to No Surface Occupancy during the RMP stage, don't you?

A: (Hoffman) Yes, No Surface Occupancies are determined in the RMP.

Q: Take the Otero Mesa example: An area is leased, and might initially be thought to have well spacing of 160 acres, but through development its turns into 40 or 20, etc. What seems to be missing in the equation, is during the lease phase, the lease gives to the operator the ability to develop it in any economic way with the geology they then discover. During the RMP level stage, why can't BLM say, it can't be developed using well spacing any denser than 40 acres? Then the company says whether to make the call or not. It's outcome based. It's the company's business decision to lease or not!

A: (Hoffman) The Standard Lease would have to fundamentally change. The lease now has the due diligence standard in there, the companies are expected to develop it and develop it to its fullest.

Q: What about putting the provisions for well spacing into the lease?

A: (Hoffman) That would be much easier. There's a lot of litigation involved, and delaying a project is a win. To drill in certain areas, operators are realizing, is just not worth the trouble. In the future there will probably be more stipulations in the leases. Best available technology will always be available before the best management practices.