

## **BMSA Oil and Gas Committee**

### **Meeting with Antero on 9/16/09**

**Members in Attendance:** Chairman Bill Nelson, Chuck Hall, Don Mumma, Frances Rose, Lynn Shore

**Antero Representatives:** Vice president-geology Robert Mueller, John Black, Kelly Bruchez, Mark Kachmar, David Strickland, Brian Wade

**Also in Attendance:** Approximately thirty members of the Battlement Mesa Community whose questions and the answers that were engendered are incorporated in each section of the presentation.

**Topic of Meeting:** Drilling, Completion and Water Management Plan

Mr. Black commenced with a background on Antero Resources. In the Piceance Basin between 2004 and 2009, the company has 175+ wells. Its primary operations in Garfield County are focused along the Rifle-Silt corridor.

An overview of the drilling process was then presented. Drilling permits are submitted to COGCC. If the permit is approved COGCC (Form 2A) gives the operator permission to build access road and pad and drill conductor hole (between 50 to 100 feet deep). The operator is then given permission to drill the well after COGCC Form 2 is submitted and approved. These are State Regulations that must be submitted and approved before well pads are started.

After approval, an access road and pad site construction is started. A smaller mobile rig is brought in to drill the conductor hole(s); it is assembled. The operator drills wells, runs casing and cements the casing in place. Then, the drilling rig is disassembled and is removed from the location. Well Logging (start up information is taken) which can occur before casing has been put in or after it has been. Location is then cleared and prepared for completion operations.

The access road and pad construction must be approved by the County. The area is surveyed and then County Operational Permits are acquired. The application for the permit must include the driveway entrances and any other surface areas that may be disturbed. Equipment is cleaned prior to being mobilized to a location to deal with cross-contamination of noxious weeds, etc. Pad surface soil horizons are segregated for erosion control. Pad topsoil is stock-piled and stabilized; tarps are put over the soil to protect it. Pad is sloped and bermed to control water runoff and the watershed.

Roads and pads sites have a dust problem that the company tries to control by road washing and/or brushing. Road is cleaned of any mud as machinery is moved. The pad is graveled, silt fencing to control storm water is installed and best management plans are implemented. After drilling conductor holes cellars are installed in the area of dirt around the conductor hole to catch run off from the drill. Then a larger rig is brought in for drilling the production hole.

The drilling sequence is as follows: 1. Conductor hole and steel conductor pipe is cemented; 2. Surface hole (12¼ inch hole) and steel surface casing is cemented; 3. Production hole and steel production casing is cemented; it has a “shoe” at the bottom to avoid cross contamination of the aquifer; (through each stage of the drilling a “wiper” plug goes down, then drill is done through the wiper plug.

When Antero begins exploring deeper Mancos reservoirs an intermediate “string” of production casings may be utilized. A “logging” tool is lowered to see if the hole is worth being a “commercial” hole. Each successive deeper portion of the well is drilled with a smaller in diameter drill-bit which results in smaller diameter “strings” of steel casing are cemented in the well as the well is drilled towards the total depth. Then fracing is done at each zone level starting at the lowest area of the production zone. Then a “Christmas Tree” is put in when the well is finished. The gas goes through the pipeline to be sold, eventually.

The water sources are protected in each stage of drilling for natural gas. Alluvium (freshwater) is found in the Wasatch level of the drilling site. Below the alluvium are water sands and gas sands. The next level is the Mesaverde. The Mesaverde water sands are essentially salt water. The “top gas” is about 4,000 to 4,600 feet beneath the surface; below the top gas line is the Williams Fork section of the Mesaverde where there are Mesaverde gas sands. The final drilling section is the Mancos section. There is no water in this area. It is made up of Mancos gas shales and siltstones. This is an exploratory target. Some Antero exploratory wells are being drilled in other areas of the Piceance Basin.

Drilling operations are 24 hours with on-site supervision. Baseline sound monitoring and noise suppression will be employed – a Texas company is being brought in to set up sound barriers. Several levels of barriers will be utilized and tracked to see which is best.

Closed-loop drill fluid system will be used to avoid having water pits. Technological gains in the drilling process will be used – via computers, the Rifle and Denver offices know what is going on in the wells. Other technological gains are in the well pad size versus the downhill accessible subsurface area. In the 1970s the well pad was much larger in proportion to the down-hole surface. In each decade since the 1970s, the well pad has grown smaller. Now in the 2000s, the down-hole size can be up to 320 acres of accessible subsurface area. This means that fewer well pads are needed.

Antero will work on light mitigation and rig orientation to avoid disturbing the community as much as possible. Antero’s minimal impact approach to drilling operations also tries to cut down on odors, traffic, dust and light. Strong safety and security are goals of the company.

Hydraulic fracturing (fracking) was explained. Fracking is where fluid and sand are pumped under high pressure into the natural gas reservoirs through a production casing into the Mesaverde section. Tiny fractures are created; sand fills the fractures; the fractures act as conduits for natural gas to flow into the well. Without “fracking” the well would not flow as “Mother Nature” would close up the fractures. The wellbore configuration is developed in such a way as to protect the groundwater (as per COGCC Rule 341). The State knows the depth of most water sources in the state. Here it is 1,000 to 2,500 feet. A conductor/surface casing is cemented to the surface; the State determines the setting depth – how high to bring up the cement. Then comes the production casing. It is cemented per State Regulations; it is subject to high pressure; testing ensures integrity. COGCC Rule 341 requires continuous monitoring of bradenhead pressure during the fracking operations. Even if there should be a problem during the fracking process, there are two cemented casings between the water and the fracking. The fracking fluid additives are as follow: Scale inhibitor (0.01% of total fluid volume (tfv)) –like antifreeze and in household cleaners. It prevents scale deposits in the pipe. Friction reducer (0.05% of tfv) – used in water treatment plants “slicks” up the water. It reduces wellhead treating pressures. Biocide (0.05% tfv) – the chemical is used in sterilization of dental and surgical equipment. It eliminates

bacteria. Acid (0.25%tfv) needed for fracking and gives access to gas. It removes drilling mud damage. The amount of chemicals to water and sand in the fracking process is 0.36% chemicals to 99.64% water and sand. This is technically less, in proportion, to what household chemicals are in the water. The completion process begins once the drilling rig leaves. Typically there are seven stages in the completion process in this area. Fracking is not done around the clock in this area – usually from 7 a.m. to 7 p.m. The steps follow. 1. Test for casing and cement integrity done through acoustic and temperature tools and through pressure test casing. Several days are spent on this. 2. Frac tanks are moved in to store water. A wireline is rigged up – a single truck and a frac crew. 3. In the first stage the wireline perforates the casing. 4. The first stage of fracking is done. 5. The wireline is used to set the plug above stage one and perforates second stage. Then the fracking of the second stage occurs. 7. Continue perforating and fracking for remainder of well. 8. Rig down the wireline and the frac crew; remove most of the frac tanks from the location. 9. Rig up (assemble) the workover rig which cleans out the well bore. 10. Drill out the plugs and clean out the wellbore. 11. Hang off tubing in wellbore. 12 Rig down (disassemble) the workover rig. 13. Flowback well. After the first sign of gas, turn the well over to sales.

Antero's "Green Completion Practices" are in place to essentially eliminate venting of natural gas produced during new well completions – spending more on separation equipment so that there will be zero venting. Produced water and stimulation fluids are recycled so as not to continually be bringing in new water. Store water in tanks so that there will be no pits on the drilling location – with primary containment and secondary containment (liners under the tanks) and the area grade up to a berm before lined. The pipelines used to transport water to lower the number of trucks. The water management plan will, on average, eliminate 460 water truck loads per well (92,000 truck loads for a 200 well development plan). It eliminates the associated dust, noise and air pollution associated with truck traffic. Road damage and traffic impact is reduced.

Completion operations will be conducted during daylight hours. Five to ten days are needed per well – the larger number is when there are multiple wells from a pad. Not all wells are drilled at once. Half of the wells are drilled on the first pad. The rig is then moved to the next pad where half the wells are drilled. At the same time, the first wells are fracked. The rig is moved back for more drilling. The second well pad is then fracked and the rig moved bag, etc. until all of the wells are drilled and fracked. This reduces the amount of drilling and fracking days in the area.

No compressing stations will be in the PUD except some wellheads may need a small compressor if there is a struggle to produce the gas. Once the pipeline infrastructure is in place, gas will go to Meeker. The water line will be below the freeze line. Antero contracts out to Frontier for the drilling process. It is a company which Antero has used for years. The Current Timeline includes Garfield County meetings during the first quarter of the year. COGCC permitting will be right behind this. By the end of the first quarter of 2010, permits should be in place. There will be community meetings every January to discuss Antero drilling plans.