Drilling a Natural Gas Well in West Virginia and Floodplain Management

Reserve Oil & Gas, Inc.
Doug Douglass, Land Manager
About Reserve

- Privately owned by David & Scott Freshwater Since 1998
- Headquartered in Spencer, WV
- David doing business from same location since 1970
- Also Own:
  - Contractor Services Inc. (CSi) – earthwork, drilling, and pipeline construction
  - United Gas Pipeline (UGP) – gas gathering pipeline systems which deliver gas direct to low pressure Columbia Gas Transmission pipelines
  - Petro Services Inc. (Petro) – gas transportation management and marketing
Initial Land Work

- Evaluates target areas (geology, production, gas outlets, etc)
- Identifies the mineral owners of targeted tracts
- Contacts all the mineral owners to procure an Oil & Gas lease
- Completes any title curative Work
- Communicates with the surface owners
- Stakes the well
- Obtains the drilling permit

Reserve Land Manager Talking to a Mineral Owner Regarding a Lease
Staking The Well

- Spaced a minimum of 1,500 feet from an existing well drilled to the same formation
- Site selection based on topography, environmental impact, current land use, Surface Owner input and, of course, cost

Surveyor Staking a New Well Location (Yeager #2 Location)
Road & Location Construction

- Road and location construction normally requires the clearing & grubbing of ~1.5 total acres but Airport locations are on areas with roads already constructed and locations already cleared and leveled.

- Timber is piled near the location and available for sale; no timber to be cut for these locations.

- Brush & stumps placed in windrows on the downslope side of the location to serve as E&S barrier
Well location size is ~100 feet wide by ~200 feet length; extremely small footprint. Not Marcellus well!- which is typically 3-5 acres.

One small pit is required to collect well cuttings and produced fluids (i.e., salt water)

Pit is lined with plastic

Once construction is complete, all slopes are seeded & mulched and/or hydro-seeded to minimize erosion & sedimentation while awaiting the drilling rig.

Yeager #1 location
Already cleared and leveled from prior excavation
Rig Moving

- Normally completed on dry days to prevent mud tracking and need for dozers
- Fifteen (15) loads to the drilling rig itself
- Seven (7) loads (~20,000 gallons) of water at start-up
- Two (2) loads of pipe at start-up
- Normally, all moved to well site in one day
Rig Moving
All Reserve wells are drilled by sister company, CSi

Normally, requires two weeks (M-F) to complete one well

Wells drilled to ~4,800 feet

Use two drilling methods: air and fluid
Well Drilling

- Once reaching ~350 feet, surface casing is installed and cemented in place to protect freshwater producing formations.
- Upon reaching ~2,200 feet, intermediate casing is installed to seal off salt water bearing formations.
Well Drilling
Well Logging

- Once Reserve drills a well, we normally wait a few days and log the well.
- The well log identifies the depths/formations at which gas is entering the well bore.
- Once logged, production casing is installed/cemented in place and the drilling rig is demobilized.
Well fracturing (stimulation or fracking) is required on nearly all shale wells. It is a method of ‘breaking down’ the formation at very high pressures in order to increase production rates. Reserve uses ‘gas fracking’ techniques with nitrogen gas versus hydraulic fracturing methods used on Marcellus wells. Once complete, we permit the well to ‘blow back’ all the nitrogen into a tank for several days.
Well Fracturing
The final step
Service/Completion rig re-enters the well bore to ‘knockout’ baffle rings and swab/remove any residual fluids
Record the well’s Final Open Flow (FOF)
Shut in/close the well
All well work complete
Well Hook-Up

- This involves installation of wellhead surface equipment and a 2” gas pipeline which ties into a larger gas gathering system.
- Wellhead meters are installed and regularly tested at each well to monitor flow rate and performance.
- Once placed into production, the flow rate is adjusted until reaching an equilibrium between flow rate and wellhead pressure.
- Once in-line a few months, a well tender will visit the well site ~ 2 times per month to inspect & perform routine maintenance.
Well Reclamation

- Once the well pit fluid phase is hauled off to the next well for re-use, it is immediately backfilled.
- Well site and access roads are then reclaimed to WVDEP standards.
- All disturbed areas are then seed & mulched and/or hydro-seeded to re-vegetate.
Well Reclamation
Before & After
Well Reclamation
Marcellus Impact much Different!

- Marcellus well pad - 3-5 acres.
- Conventional wellpad - 100 feet by 200 feet.
- Marcellus well - uses 3-5 MILLION gallons of water.
- Conventional well - 21,000 gallons
- Marcellus well - Hydraulic frac - large scale operation to collect returned fluids
- Conventional well - Nitrogen frac - blows back to atmosphere.
Marcellus Drilling Site
Conventional Drilling Site
Marcellus Hydraulic Frac
Conventional Nitrogen Frac
Permits, Permits, Permits!

"OK, LET'S SEE YOUR BUILDING PERMIT"
Permits

1. DEP Well permit
2. County Building Permit
3. DOH Encroachment Permit
4. City Permit (in city limits)
5. DNR Stream Activity Permit
6. Corps of Engineers Nationwide Permit
Permits

- DEP- to build location and drill well
- County Building- to excavate; floodplain oversight
- DOH- entrances off public roads; pipeline road crossings
- DNR- if crossing stream with road/pipe
- Corps- Impacts to aquatic resources
Little Guidance from FEMA

- Interim Technical Guidance on Drilling Oil and Gas Wells in Special Flood Hazard Areas (SFHA)
- States that if drilling site is in floodway driller will have to demonstrate through engineering study that no increase in flood stages during 100 year flood discharge. (Such studies do not come cheap; we spent over $5,000 dollars to obtain one a few years back.)
- Buildings and structures elevated above BFE or floodproofed. Storage tanks, etc elevated above BFE or made watertight and anchored.
Up to Local Floodplain Managers

- State DEP does not regulate oil and gas wells in relation to floodplain issues.
- So Counties issue building permits for these activities to ensure oversight of drilling activities and their impact on floodplain.
- Many operators are unaware of the need for such permits.
Operators neglect permits

by Billy Wolfe
Daily Mail staff

CHARLESTON, W.Va.—West Virginia’s natural gas boom is going strong in Kanawha County, but you wouldn’t know it by looking at building permits.

Kanawha County officials say they think oil and gas operators are willfully ignoring the county’s powers of oversight.

“They are refusing to come in and get permits,” Director of County Planning and Development David Armstrong said. “I would say that a majority of them know what they are supposed to do, but that it is a corner they can cut.”

Industry experts, however, think most operators don’t know they are required to get building permits from the counties where they work. They argue that a lack of uniform statewide regulations leaves a confusing patchwork of county rules that are difficult to follow.

Armstrong said that Spencer, W.Va.-based Reserve Oil and Gas Co. is the only operator that has bothered to seek a building permit from the county.

According to records on the state Department of Environmental Protection’s website, 42 gas drilling permits have been issued in Kanawha County this year alone. By contrast, the county has issued just 16 building permits this year to drillers - all of them to Reserve Oil and Gas Co.

According to the DEP’s database, there are more than 3,000 active wells in Kanawha County.

But that number could be inflated by the fact that some well operators forget to file production reports with the state showing that a well is now plugged, DEP spokeswoman Kathy Cosco said.

All drilling operations must obtain a building permit from the county, even if the operators are just excavating dirt in preparation for drilling, Armstrong said.

“That helps us determine if they are in the flood plain,” he said.

The county has little oversight of oil and gas drilling in general. Most regulation comes from the DEP.

But counties are required by state law to closely regulate all construction that takes place inside the flood plain, including construction of oil and gas wells.

The DEP does not regulate oil and gas wells relating to flood plain issues, contrary to the belief of many well operators, Armstrong said.
Uniformity Needed

- Operators want to cooperate and definitely do not want to create a flood hazard with operations.
- Confusing patchwork of local laws; some counties have specific requirements for well work permits (Kanawha County); others do not.
- Training and education of floodplain managers on what these type of operations entail; as you saw their impact will vary depending on type of drilling/frac planned.
Recent case in Doddridge County in which EQT sued the county for revoking a flood plain permit after the company had spent $300,000 on the permitting process.

The county acted after its flood plain manager realized homes and livestock would be vulnerable if 20,000 cubic yards of earth were moved to build a well pad.

Still tied up in court even leading to decision that county ordinance is partially unconstitutional.
Common Sense Needed

- When should a full blown hydrologic study be required?
- If drilling site and wellhead will be located in floodplain, seems like need study, right?
- What if it is only temporary fill with road cut down into field? Fill will be removed in month or less?
In this case, common sense prevailed and we sent a letter to the county stating we would only have the fill in there for short duration and it would be removed/placed at grade with excess material wasted outside the floodplain. No Study Needed!

Need to remember temporary nature of much of this activity.
Wellhead in Floodplain - what should be required around it?

Likelihood that wellhead will be sheared off creating issue is slim in my opinion. Several redundant strings of pipe cemented into the ground thousands of feet deep. Only 300-400 lbs of pressure at wellhead regulated down to 100 lbs into pipeline.

Here is what we were instructed to do? Does this create a collection hazard?
Uniformity & Common Sense

- Uniformity in statewide requirements instead of piecemeal county by county specs would help ensure compliance.
- Common Sense application of those standards based on location and type of well and drilling process.
- Oil and gas operators want to comply and have no problem paying reasonable fees and obtaining necessary permits.
“Say, aren’t you Mrs. Wit who gave me such a hard time at the building permit office?”