C-MAG Drilling Recommended Practices
For Shallow Gas and Natural Gas from Coal (NGC)

Purpose

These recommended practices have been established by C-MAG to help landowners understand the steps involved when drilling a shallow gas well or Natural Gas from Coal (NGC), also referred to as Coalbed Methane (CBM), well and how groundwater resources are conserved and protected.

These practices refer to wells targeting Edmonton and Belly River formations (including Horseshoe Canyon coals) but may be applicable to deeper formations as well.

Background

The reservoirs that are being targeted in this general area are sand and coal reservoirs within the Edmonton and Belly River formations, including the Horseshoe Canyon coals. These reservoirs produce sweet natural gas and are low pressure and typically low productivity. In this area these reservoirs typically occur at depths ranging from 170 – 1200 m (or 560 – 3940 ft).

Wells targeting these reservoirs are typically drilled as vertical wells although directional drilling may be used in this area as well. The same practices apply whether a well is drilled vertically or directionally. These types of shallow gas / NGC wells are typically drilled with water / drilling fluid however air drilling may also be used. With the shallow depths of the reservoirs, drilling will typically take between 1 and 3 days to complete.

The Alberta Environment and Utilities Board (EUB) regulates the drilling of wells within Alberta and in all cases companies are required to meet or exceed the EUB requirements. Where applicable these regulations are referred to in this BMP, however not all requirements are fully defined in these practices.

Practice

- Prior to drilling, a wellsite and access route is surveyed by a third party survey company and the land required for the well / access is acquired (leased) through a qualified land agent. The landowner and/or occupant are involved in these processes, ensuring the well location and lease terms are satisfactory to all parties involved. The surveying BMP and land agent BMP already developed by C-MAG cover these up-front aspects of preparing to drill a well.
- The company will undertake a review of the water wells in the general area and will conduct baseline testing of any water wells within 400m of the proposed drilling location (or as requested by a landowner for a water well in reasonably close proximity), testing both the quantity (well yield) and quality (water chemistry). This pre-drilling test will provide suitable baseline information to understand the well's capability and quality before any industry activity occurs nearby. If, after drilling and other well activities have occurred, cause for concern arises, a post-drilling test may be requested and will be performed by the company. In the unlikely event that damage occurs to the water well as a result of the companies activities, investigation will be performed and compensation or remedial actions may be taken as appropriate.
- Prior to drilling, a source of suitable water to be used for drilling fluid must be located and secured. Companies will generally attempt to locate water within close proximity to the well and often it can be purchased from the landowner or others nearby. Depending on the water source, a water diversion permit may be required to be obtained from Alberta Environment prior to removing the water. Typically, town water is not used as a source for drilling fluid.

- Once all required documentation is in place and the well is licensed, construction of the wellsite will commence. For these type of wells typically minimal disturbance drilling is used and construction of the lease will be minor, consisting mainly of approaches and gates.
- A water well rig or conventional drilling rig will be used to drill the surface hole and set the surface casing. Surface hole is drilled in a very similar manner to water wells. (Note: conductor casing is not usually used in this area for these types of wells.) The primary purpose for surface casing is to provide a method to secure the wellbore in the unlikely event that a blowout occurs. Minimum surface casing setting depths are stipulated by EUB regulations (Guide 8) and are based on offset pressures of surrounding gas wells. Surface casing is cemented full length into place using a high-strength cement that is pumped down the inside of the casing and back up the annular space between the casing and the drill hole.
- A conventional drilling rig or coiled-tubing rig will be used to drill the main hole of the well. During the drilling process, the drilling fluid is returned to surface where volumes are carefully monitored, allowing any losses to be detected before entering groundwater aquifers.
- Loss of circulation may occur when a formation being drilled through breaks down and the drilling fluid migrates into it. Formations in which lost circulation occurs are weak and cannot support the pressure in the column of fluid in the well. To rectify this problem, lost circulation material, composed of non-toxic material such as untreated sawdust, non-toxic cellulose material, or grit (untreated calcium carbonate or limestone) is added to the drilling fluid to 'seal' up the area of concern in the wellbore.
- When the main hole has been drilled to total depth, production casing is then installed to the bottom of the well and cemented full length in place. This practice ensures hydraulic isolation of the entire wellbore from all reservoirs is obtained and ensures that all nearby groundwater aquifers are protected from any wellbore activity.
- As drilling fluids are comprised of non-toxic and environmentally approved components, the fluids are disposed of through one of two methods: landspraying or hauling off-site. Landspraying on farmland, where agreed to by the landowner, is most common, however, some fluids that are part of the drilling process (such as cement returns) cannot be landsprayed and must then be disposed of in an appropriate offsite location such as a containment site or a disposal facility. Drilling waste management and disposal is regulated by the EUB and is covered further in EUB Directive 50.
- Upon completion of drilling operations, a wellhead will be installed and the well will now be ready for completions operations.
- Oil and gas companies are required by the EUB and Alberta Disaster Services to have an area Emergency Response Plan (ERP) in place in the unlikely even that an emergency occurs. If concerned, ask your land agent for the company's toll-free emergency phone number in advance.

FAQ's

Why isn't town water typically used as the water source for drilling fluids?

- Towns or municipalities have limited water supplies and may not be able to supply the quantities required for the drilling operations. Supplying these quantities would also take away from the supply of suitable water for townspeople.
- Use of a town's water facilities would increase traffic within town limits.
- Alternative sources that have not already been treated for human consumption but are suitable for drilling are usually available.

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What is the composition of drilling fluid?

- For surface hole, the fluid consists of water and bentonite (a clay which swells when it comes into contact with water).
- For main hole, a flocculating agent containing similar components to those in agricultural or lawn fertilizer may be added.
- Components are non-toxic and environmentally friendly ensuring suitability for landspraying after usage.

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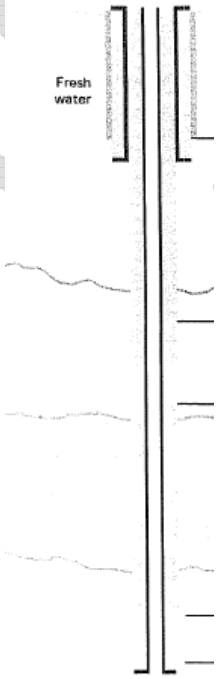
What is the function of drilling fluid?

- Carry drill cuttings to the surface.
- Control subsurface pressures.
- Cool and lubricate the drill bit.
- Provide a low permeable filter cake on the wellbore, i.e. a layer of thick semi-solid mud that forms on the walls of the borehole preventing the seepage of fluids into formations.
- Minimize damage to subsurface formations.

Well Diagram

Photo being worked on.

Show a typical water well & depths
And a typical HSC well and depths & cement layers



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References

EUB Directive 8
EUB Directive 50
EUB Directive 56
Oil and Gas Conservation Act

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