## Shale Gas and Hydraulic Fracturing in Yukon

### Q: What is Shale gas?

Shale is a fine-grained sedimentary rock, frequently rich in organic material and composed largely of clay mineral grains. The intergranular space within the rock where fluids are found is called porosity; this volume can range from nearly zero to 20% or more of the total rock volume. The size of these pore spaces also determines the degree to which fluids can flow through the rock, known as permeability.

Over geologic time – millions of years – heat and pressure degrades the organic material into hydrocarbons (oil, gas or both) which then occupy the spaces between the mineral grains. These shale reservoirs are often very large both in terms of the amount of hydrocarbons and geographic size.

### Q: How does shale gas differ from conventional gas?

The only difference between shale and conventional gas is the type of rock in which you find it. Oil and gas are normally generated in shale but can migrate to more porous and permeable reservoirs over geologic time. Shale gas and conventional gas are chemically identical and are composed of 70%-90% methane with smaller amounts of heavier hydrocarbons such as ethane, propane and butane.

### Q: Why is shale gas considered an unconventional gas?

Shale gas, natural gas in coal, and tight gas are considered unconventional hydrocarbon resources because they are contained in geological formations that require more involved production techniques to release the gas and achieve economic production.

**Q: Where is shale gas found in Yukon?**

Shale is likely found in all of Yukon's oil and gas basins. Whether or not the shale formations contain natural gas in sufficient quantity to produce has yet to be determined. The Yukon Geological Survey is currently conducting a scoping study to identify the presence of shale gas and other unconventional oil and gas resources in the Yukon. The results of this study are expected in the spring of 2012 and will be published on both the Yukon Geological Survey and Oil and Gas Resources websites.

**Q: How much shale gas is there in Yukon?**

At present, there is no information on exactly how much gas resides in Yukon's shale formations. The lack of geological information about unconventional hydrocarbons within Yukon's sedimentary basins makes resource estimates very difficult to calculate. The Yukon Geological Survey is compiling information about shale formations where they are exposed at surface, along the fringes of sedimentary basins. This information is then used to estimate if the rocks have hydrocarbon potential in the deeper part of the basins. This study, however, will not define actual shale gas volumes. Defining shale gas volumes will require further geological work incorporating widespread subsurface information.

**Q: What is hydraulic fracturing or "fracking"?**

"Fracking" is the non-technical term for hydraulic fracturing, a well stimulation technique developed about sixty years ago and now widely used in the oil and gas industry. The technique involves pumping a mixture of liquids and suspended solids into a rock formation to enlarge

existing fractures in the rock or create new ones (of approximately 2mm in width). The solids remain in the fractures to prop them open allowing natural gas to flow more freely back to the wellbore. The liquid in fracking is typically 99% water with polymers added to help suspend the solids, normally sand but sometimes plastic beads or ground walnut shells.

**Q: Is fracking dangerous for the environment?**

The Yukon government is aware of public concerns related to water and waste disposal. Shale gas wells are often very deep and the target reservoirs are typically several thousand meters below near-surface freshwater aquifers and ground water. The fractures are confined to the target formation so there is no path through which liquids can flow to the surface. This makes contamination of fresh water sources highly unlikely. Furthermore, oil or gas wells are completed by cementing multiple concentric strings of steel pipe, called casing, from top to bottom for the sole purpose of containing any fluids that enter the wellbore. Strict water management and protection is part of any drilling operation and is monitored and highly regulated.

**Q: Is Yukon prepared to regulate shale gas development?**

Yukon's oil and gas legislation and regulations already thoroughly address modern oil and gas extraction methods, including unconventional sources like shale. Any potential shale gas activity would be subject to full environmental and regulatory review before proceeding. Any natural gas development in Yukon must be undertaken responsibly and in full compliance with Yukon law. Additionally, the Yukon government is active in reviewing other

Canadian and American jurisdictions' regulations of hydraulic fracturing so we can learn and incorporate best practices.

**Q: How would shale gas be developed in Yukon?**

Exploration and development of any oil or gas resource is conducted and led by the private sector. The Yukon government holds a regular disposition process to issue rights for oil and gas exploration. If a company holds rights to and oil and gas disposition in Yukon, they are able to explore and develop natural gas resources, including shale in accordance with Yukon's regulations and environmental assessment regimes.