

OIL AND GAS INDUSTRY STUDY

PART I: OIL AND GAS EXPLORATION AND DEVELOPMENT OVERVIEW

PART II: SUMMARY OF ENVIRONMENTAL LAWS AND REGULATIONS RELATING TO OIL  
AND GAS ACTIVITY

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## PART I: OIL AND GAS EXPLORATION AND DEVELOPMENT OVERVIEW

This overview of oil and natural gas exploration and development processes describes the sequence of events, equipment types, and environmental impacts commonly associated with the search for and commercial development of oil and gas reserves. Oil and gas production currently occurs in five areas of Montana (see the accompanying map entitled "Montana Oil and Gas Fields, Pipelines and Refineries): the Sweetgrass Arch-Bearpaw Uplift in Northern Montana, the Big Snowy Uplift in Central Montana, the Big Horn Basin in South Central Montana, the Powder River Basin in Southeastern Montana, and the Williston Basin in Northeast Montana. The most significant recent discoveries have occurred in the Williston Basin. A sixth area, the Overthrust Belt which runs roughly parallel to the east slopes of the Continental Divide throughout western Montana, is considered to have the potential to yield significant oil and gas reserves. Exploration in this area is continuing.

Oil and gas exploration and development normally progresses through the five phases shown in Table 1 if commercial quantities are discovered.

### Preliminary Exploration

Oil and gas exploration and development has been occurring in Montana since the late 1800s commencing with initial drilling of several wells in the Red Lodge area in 1889 near locations where crude oil was naturally seeping from the ground. Theories linking the presence of oil and gas to certain types of underground geologic structures were first formulated in the mid-1800s, but exploration techniques based on stratigraphic factors were not applied in Montana until the 1920s, and use of geologic information was not a significant factor in exploration until the late 1940s, (Fanshawe, 1985). Figure 1 shows examples of typical geologic structures that may contain oil or gas.

Preliminary geological exploration involves ground and aerial surveys of a given area, along with aerial photo and geologic interpretation. Gravitational and magnetic surveys may be conducted to obtain subsurface geologic data. Some geophysical exploration can be done by air. Small trucks and jeeps with crews of several people can be used for ground surveys. Off-road travel is likely at this stage of subsurface data gathering (USDI 1981).

Seismic surveys are the most common of the geophysical exploration methods and seem to give the most reliable results (USDA 1979). Seismic surveys use artificially created shock waves to gather subsurface geologic information. Each formation reflects the shock wave back to a group of vibration detectors arrayed on the surface. Seismic testing is usually described by the methods and equipment used to generate the shock wave, which most commonly include thumpers, vibrators and explosives. The following descriptions are taken from Joslin (1981).