

COMPARISON OF ENVIRONMENTAL REGULATION
OF THE OIL AND GAS INDUSTRY
IN THE ROCKY MOUNTAIN STATES AND ALBERTA

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employed, a rough estimate can be obtained of the inspector work load per state/province. However, it must be noted that work load allocation among inspectors is affected by the distribution of well locations, exploration areas and field offices, production characteristics, and numerous other factors. Actual work load may vary considerably from these estimates. Wyoming, New Mexico and Colorado had the highest number of wells per inspector, with 2,498, 2,403 and 2,119, respectively. Montana was again fourth, with 1,057 wells per inspector. Utah, Alberta and North Dakota had the lowest ratios with 411, 406 and 317 respectively. Current inspector workload in all the states and Alberta has lessened due to the dramatic decline in world oil prices and corresponding reductions in exploration and production.

Montana has the lowest budget for regulation of oil and gas activities, but it is also the only state that has not taken over administration of the Underground Injection Control (UIC) program from the Environmental Protection Agency (EPA). Field staff in Alberta, Colorado, North Dakota and New Mexico are responsible for UIC-related inspections in addition to other duties.

Geographic distribution of the industry varies considerably among the states. With the entire eastern two-thirds of its counties containing oil and gas production, Montana probably has more territory for inspectors to cover than the other states. Only two states, New Mexico and North Dakota, have concentrated oil and gas production. Gas deposits are located in much of Alberta except the northeast quarter and along the western border. Oil deposits are more concentrated in central Alberta but extend over three-quarters of the length of the province. Inspectors are located in nine district offices in order to cover this extensive territory.

B. Seismic Exploration

Seismic exploration regulations, shot hole plugging regulations and field inspection practices vary among the states primarily by the amount of information and level of contact with the regulatory agency that is required before seismic operations commence and during or after plugging. New Mexico is not included in this comparison because it has no seismic regulations.

In Montana, North Dakota and Colorado, counties issue permits for geophysical activity. Montana's statute requires the seismic exploration company to file a notice of intent with the state and the county, and also requires the county to notify the state when a permit has been issued. In practice, the counties normally telephone oil and gas division staff so there is an opportunity for discussion of the planned activity with the crews before work begins. Companies planning to engage in seismic exploration are also required to notify the surface user of the approximate time schedule, provide names and addresses of contact persons for the companies involved, and identify the number of its surety bond, the surface areas to be explored, and any anticipated needs for water. The North Dakota oil and gas statute contains similar requirements, and also gives counties authority to condition or restrict

oil and gas exploration through ordinances. North Dakota oil and gas agency staff do not inspect seismic shot holes at any time. This area of regulation is considered to be exclusively under the counties' jurisdiction. In Montana, a representative sample of shot holes is inspected by state oil and gas staff after plugging is completed. Colorado's inspections also occur after plugging.

In Wyoming and Utah the state oil and gas agencies issue the exploration permits. Wyoming, Utah, Alberta and Colorado require companies to file notices of intent for each exploration operation. Content of the notices varies by state/province, and includes descriptions of the plugging procedures, depth and number of holes, names and addresses of contact persons, and time and location of the operations. Wyoming requires companies intending to conduct seismic shot hole exploration to meet with oil and gas agency staff before beginning to operate in the state to discuss regulatory requirements. Seismic operations in Utah and Alberta are usually witnessed by an inspector.

All of the states and Alberta prohibit seismic shots within a specified distance (usually $\frac{1}{4}$ mile) of buildings, springs and water wells. Utah similarly protects "cultural and natural" features. Alberta also restricts exploration in certain environmentally sensitive areas such as critical wildlife habitat on public lands. This requirement appears similar to restrictions that the U.S. Forest Service and Bureau of Land Management may put on drill permits.

All of the states except Colorado require advance notice of plugging operations. Plugging requirements are similar among the states and include specifications for materials such as bentonite and water slurries or coarse ground bentonite or cement, depending on the presence or absence of water in the hole. Montana's Board of Oil and Gas Conservation is evaluating potential changes in the regulations to require plugging with coarse ground bentonite rather than a bentonite-water slurry in certain types of holes.

Montana's statute allows surface owners and companies to agree to plugging methods other than those specified by the Board. Landowners in New Mexico also specify the plugging requirements. In other states and Alberta, the company may use alternative methods only with the approval of the oil and gas agency.

All of the states require a report subsequent to completion of plugging indicating the location and date of the operations. Colorado's is the most detailed because it must also include information about the plugging materials and procedures, and identification of any water that was encountered.

C. Permits to Drill

Permits to drill were compared in terms of application content, processing time, timing of site inspections, and authority to condition permits for purposes of environmental protection. All of the states require information about the specific location of the drill site, the

name and expected depth of the targeted strata, the casing that is planned, cement points, and other aspects of the drilling program. The differences examined in this study focus on how environmental protection aspects of the drilling operation are addressed.

Alberta requires drilling plans that include descriptions of site construction and maintenance operations in addition to a description of the drilling programs. Plans for final disposal of mud and fluids must also be submitted. If the location proposed for drilling is environmentally sensitive, personnel from concerned agencies may inspect the site. The Energy Resources Conservation Board may subsequently prescribe road locations and attach environmental stipulations, as necessary, to any aspect of the drilling operation. Drill permits may also be denied.

As discussed in the next section on reserve pits, Wyoming requires certain site-specific information in a separate form that is attached to the drilling permit application. No other state requires written data describing the site location before drilling commences. However, Utah requires a pre-drill inspection before the permit is approved. The inspection includes an assessment of site soil and water characteristics in order to establish permit stipulations and pit construction requirements. North Dakota inspectors visit the drill site after the permit is approved, but before the rig arrives in order to perform the same type of assessment.

Because of the pre-drill inspection, Utah requires 7-14 days to process permits. All of the other states try to process the applications the same day they are received, unless information is missing. Montana oil and gas staff often discuss drilling plans with the crews by telephone before field work begins. In both Colorado and Montana, the first site inspection typically occurs after the permit is issued and drilling has commenced. In New Mexico site inspections typically occur after drilling is completed.

The oil and gas agencies in Utah and Wyoming may attach special stipulations concerning surface use and pit and road construction. In Montana landowners make agreements concerning road placement and surface use.

D. Reserve Pits

Drilling fluids may have very high concentrations of salt, especially chloride, and also may include concentrations of oil and grease, sulfates, total dissolved solids (TDS), and various additives that include toxic trace metal compounds. Reserve pits are potential sources of ground water contamination if the fluids are allowed to escape or migrate to the subsurface. This study does not include a comprehensive assessment of scientific literature documenting the relationship of oil and gas wastes and produced water to water quality contamination. A number of studies have been done in various states that indicate site-specific or aquifer-specific water contamination problems occur when reserve pits and produced water pits are not properly designed and/or

reclaimed. The volume and quality of produced water, drill muds and other oil field waste, proximity and quality of surface and ground water, and characteristics of soil and underground strata, must all be taken into consideration in determining the potential for water contamination.

Wyoming is unique among the states in requiring a special application form for reserve pits, which includes a site map and plan, information about sub-soils, a surface water map, a chemical analysis of water at the site, a plan for final disposal of the mud, and a description of the sealing material that will be used and how it will be installed. Following review of this data, the oil and gas agency may modify the plans on a case by case basis. As discussed above, North Dakota and Utah inspectors visit drilling sites before activity occurs, in part to determine reserve pit siting and construction requirements. In Utah reserve pits may not be sited on porous soils unless they are lined. In other areas, either tight soils must be present or the pits must be lined in a manner acceptable to the Board of Oil, Gas and Mining. Colorado and New Mexico have no specific pre-drilling information requirements or inspections for reserve pits. Both Colorado and Wyoming report that most of their drill muds are not salt-based. Alberta's reserve pit regulations are being revised. Current requirements provide that waste must be confined to the site and must be limited to 6,000 barrels unless a special application is filed and approved.

Montana has general rules for reserve pits that require construction to be "adequate to prevent undue harm to the soil or natural water." Also, "[W]hen a salt base mud system is used...., the reserve pit shall be sealed when necessary to prevent seepage." Inspections normally do not occur until after drilling has commenced. Soils data and information about depth to water table are not included in the application nor is a minimum adequacy standard for construction or sealing defined.

Drilling site reclamation methods appear fairly consistent among the states (including Colorado and New Mexico), but methods of final disposal of the muds and fluids vary. It is important to note that pit reclamation is an essential component of the effort to control undesirable discharges or escape of fluids.

North Dakota and Wyoming regulations reference piling of topsoil during pit construction. Most states require that the surface be restored to as near original condition as possible, although landowner specifications must also be followed. In New Mexico, district oil and gas supervisors have authority to specify disposal and surface restoration methods, but contouring and re-seeding are not necessarily required. In Montana, previous productive capability must be restored. North Dakota requires reseedling with native species and restoration of the access road and pad unless the landowner specifies otherwise. North Dakota and Wyoming require reclamation to be complete within at least one year. The other states do not specify a time frame. North Dakota also requires a notice of intent to reclaim and verbal approval before the company proceeds.

In Colorado drilling muds are generally not considered toxic because they are primarily bentonite and water based. Such muds are commonly removed from the pits and discharged to the surface.

The Utah Health Department requires removal of reserve pit liquids and disposal in approved ponds. With approval from the department and landowner, surface disposal of the mud is also allowed. Alberta requirements are similar to Utah's.

According to Montana's rules, waste must either be removed or buried at the well site to a minimum depth of three feet below the restored surface of the land. Methods of disposal of muds/fluids removed from the site are not specified in the rules, but include discharge down hole, or hauling to another site re-use. Oil and gas agency staff request companies to obtain prior approval for down hole disposal. In some cases the liquid may be hauled away based on landowner specifications. In most cases the mud is left in the pit. Liquid that has not evaporated is drained off by squeezing and trenching the pit prior to leveling the site.

E. Interagency Water Quality Jurisdiction

In all of the states the health/water quality agency and the oil and gas agency have somewhat overlapping responsibility for water quality protection. Oil and gas agencies are usually responsible for on-site disposal in pits and UIC (except Montana), and health/water quality agencies are responsible for permitting surface discharges and off-site disposal in commercial pits.

All of the state oil and gas statutes convey authority to the oil and gas board or commission to require that drilling, casing, producing and plugging of wells be accomplished in a manner that prevents the pollution of fresh water supplies by oil, gas or salt water. On the other hand, the health/water quality agencies are given general responsibility for protecting the quality of all state waters. All of the states report some problems in smoothly regulating protection of water quality within the oil and gas industry.

Oil and gas agencies tend to emphasize production and conservation of the oil and gas resource and prevention of waste as their primary statutory responsibility. These agencies do not typically include environmental specialists on their staffs. The one exception of the states surveyed is New Mexico. An environmental unit has been formed within the oil and gas agency to oversee those portions of the regulations concerning water quality protection and to be the liaison to the environmental/water quality agency. Agency interaction undoubtedly is enhanced because the New Mexico Water Quality Control Commission has oversight responsibility for both the oil and gas agency and the environmental agency. A special memorandum delineates the agencies' respective duties and calls for close communication and cooperation where responsibility is unclear. In such instances the agencies are charged with reaching mutual agreement as to lead agency status and