

CBM-Produced Water Injection Wells: Requirements to Ensure Protection of Ground Water

The federal Safe Drinking Water Act of 1974 required the US EPA to develop minimum standards for the Underground Injection Control (UIC) Program to ensure that drinking water sources, actual and potential, would not be rendered unfit by underground injection of contaminants. These standards were promulgated by US EPA in the Code of Federal Regulations (CFR), Parts, 35, 124, and 144 through 148. By adoption of regulations containing standards at least as stringent as US EPA's, Wyoming was delegated the authority to regulate the underground injection of wastes in the state.¹

Wyoming's Oil and Gas Conservation Commission (WOGCC) administers regulations governing the injection of produced water into brackish, or saline (> 10,000 mg/L Total Dissolved Solids (TDS)) aquifers for both disposal and enhanced recovery purposes. However, operator interest in disposal of coalbed methane (CBM) produced water has focused primarily upon injection into relatively shallow, 'fresh water' aquifers containing < 10,000 mg/L TDS; many contain < 5,000 mg/L TDS. Regulations governing the construction and operation of wells that inject into fresh water aquifers are administered by the DEQ.

Wells used to dispose of produced water (including that derived from CBM operations) are classified as Class I wells if the disposal operation is a commercial venture, or Class V if used solely by an operator to dispose of his own produced water. The vast majority of wells used to dispose of CBM-produced water in Wyoming are Class V wells. Requirements for permitting Class I wells are more stringent than those for permitting Class V wells.

Chapter 16 of Water Quality Division's rules and regulations contains requirements that must be fulfilled by the injection well owner/operator in order to obtain the necessary UIC permit to construct and operate a Class V CBM-produced water injection well. The requirements are intended to ensure that the injection of produced water into the subsurface will not degrade the quality of water within the injection zone; migrate into and degrade water bearing zones above and below the injection zone; or, migrate to the surface via other wells within the area of influence of the injection well. The following discussion describes DEQ requirements for Class V (i.e. non-commercial) wells that inject coalbed methane (CBM) produced water into the subsurface.

Construction Standards for CBM Injection Wells

Construction standards for underground injection wells include both design and siting requirements.

Design Standards: Design standards are intended to ensure that injection wells are constructed to prevent the migration of fluids into other than the intended injection zone. Design standards include requirements for: the placement of sealing materials within the annular space between well casing and

¹ DEQ regulations for injection wells include: Water Quality Division Chapter 8 (Quality Standards for Wyoming Groundwater), Chapter 11 – Part G (Well Construction Standards), Chapter 13 (Class I Hazardous and Non-Hazardous Waste Wells), and Chapter 16 (Class V Injection Wells and Facilities). In addition, the Land Quality Division's Chapter 11 (Non-Coal In-Situ Mining) regulates Class III injection wells associated with in-situ mining. Class II wells for enhanced oil recovery and disposal of brackish produced water are regulated by Wyoming's Oil and Gas Conservation Commission. Class IV wells for disposal of hazardous wastes into underground sources of drinking water are prohibited.

the borehole to ensure fluids do not migrate vertically up- or down-hole; pressure testing the casing before injection and at least once every 5 years thereafter to identify casing leaks; allowing for monitoring of the injected fluid quality; providing for metering of injectate fluid volume; and providing for disinfection of water prior to injection if bacteria are present.

Siting Standards: Siting standards are intended to ensure that injection wells do not pollute underground water or public drinking water supplies, and include requirements for: providing chemical analyses of both the injectate and water within the proposed injection zone to demonstrate that the injectate will not pollute ground water; and, prohibiting the placement of injection wells within state approved wellhead or source water protection areas, or within a water quality management area.

Operating Standards for CBM Injection Wells

Operating standards for underground injection wells include requirements for limiting injection pressure and for operational monitoring and reporting.

Injection Pressure Standards: Pressure standards are intended to ensure that, once injected, injectate will not migrate into over- or underlying formations. Pressure standards include a requirement that the pressure of injection be limited to no more the fracture pressure of the receiving formation.

Monitoring and Reporting Standards: Monitoring standards are intended to provide documentation that the injection well is operating in accordance with limitations on injection pressures, that the integrity of the constructed well is maintained, and that the quality of the injectate is not polluting under ground water within the injection zone. Owner/operators must also monitor the quality of select water wells if any are present within the area of influence of the injection well. Monitoring standards also include a requirement that monitoring data and associated information be provided to the WQD at regular intervals in order to demonstrate that operation of the injection facility is not causing damage to the environment or threatening the health and safety of humans, livestock, wildlife, or agricultural crops.

In the event that monitoring, or other information indicates that the injection well is not operating in compliance with the above requirements the owner/operator must promptly report such information to the WQD.

Finally, existing standards require that the WQD be notified in the event of transfer of ownership of an injection well and, that upon completion, each well be properly plugged and abandoned in accordance with existing standards.