



MEMORANDUM

August 30, 2010

To: Honorable Michael Burgess
Attention: James Decker

From: Mary Tiemann, Specialist in Environmental Policy

Subject: Comparison of Selected Oil and Gas Regulations in Texas and Colorado

As you requested, this memorandum broadly compares and contrasts selected provisions in oil and gas exploration and production (E&P) regulations for Texas and Colorado that primarily concern water quality protection. Topics discussed herein include elements of each state's requirements for well construction and siting, pit design and reclamation, exploration and production waste management, water well testing, property setbacks, chemical disclosure, and stormwater management.¹ Although this memorandum focuses primarily on regulations administered by the oil and gas authorities in these states, it also identifies several water quality protection regulations pertinent to oil and gas development activities administered by state environmental agencies.²

The oil and gas regulations in both states are extensive, detailed, and share many general features. They also contain numerous differences in scope and specificity, and in particular approaches to controlling similar activities. For example, although Texas regulations do not specifically mention hydraulic fracturing, the state's regulations regarding well construction, cementing, pressure testing, isolation of aquifers, etc., address aspects of this practice. Some regulatory differences may reflect differences between the two states' geology, hydrocarbon formations and groundwater resources, while several major differences reflect Colorado's recent revision of its oil and gas law and rules in response to the rapid growth in drilling there.

Along with regulatory differences, the type and number of wells and production levels in each state also differ significantly. Texas is the leading crude oil producing state in the nation for onshore production. Texas is also the nation's leading natural gas (methane) producer, providing approximately 30% of total U.S. natural gas production, and this gas is derived increasingly from deeply buried shale formations.

¹ This memo does not attempt to comprehensively compare the full, extensive array of each state's oil and gas rules. For detailed information on oil and gas commission regulations in Texas, please refer to the Texas Administrative Code, Title 16, Part 1, Railroad Commission of Texas (<http://www.rrc.state.tx.us/rules/rule.php>). For Colorado information, see the Code of Colorado Regulations, Oil and Gas Conservation Commission, 2 CCR 404 (<http://www.sos.state.co.us/CCR/Welcomedo>); and *Final Amended Rules of the Colorado Oil and Gas Conservation Commission* (<http://cogcc.state.co.us/>).

² This memo does not review state underground injection control (UIC) programs regulating injections related to enhanced recovery of oil and gas, and disposal of brines and associated oil and gas production wastes through deep wells. These Class II injection wells are regulated under the federal Safe Drinking Water Act (42 U.S.C. § 300h – 300h-4), and both states directly implement this EPA program. Colorado has some 800 Class II wells. Texas has roughly 51,000 Class II wells, and reports that approximately 99% of produced water is disposed of by injection into UIC wells.

Colorado produces more than one-fourth of all coalbed methane (CBM) produced in the United States, and CBM accounts for roughly one-half of Colorado's natural gas production.³ Tight gas sands are another important unconventional gas source in Colorado. Unlike tight gas sands and gas shales (such as the Barnett Shale in Texas), which typically lie thousands of feet below groundwater aquifers, CBM often is found in comparatively shallow locations, and frequently occurs in or adjacent to an aquifer. (The depth of the Barnett Shale averages 7,500 feet in key producing areas of the formation, while CBM wells generally range from 1,000-4,000 feet deep.⁴) Hydraulic fracturing is relied on in each of these formations, and the Texas Railroad Commission reports that more than 13,000 gas wells have been hydraulically fractured in the Barnett Shale.

According to the U.S. Department of Energy's Energy Information Administration (EIA), in 2008, Texas had 119,442 natural gas wells — more than three times as many as Colorado's 35,634 gas wells.⁵ Similarly, the EIA reported that Texas had 140,409 oil wells in 2008, compared to 5,779 oil wells in Colorado.⁶

In both states, the number of wells (particularly gas wells) drilled has increased markedly over the past decade, and regulatory staff face large workloads related to permitting and oversight of wells. According to a recent survey, Colorado had 11 enforcement staff in 2008 and more than 41,000 oil and gas wells combined, while Texas had 106 enforcement staff for roughly 260,000 wells in that same year.⁷ In 2009, the number of regulatory staff increased from 11 to 19 in Colorado and decreased by one to 105 staff in Texas. The survey noted that the number of new wells drilled each year in Texas increased 75% between 2003 and 2008, while staffing increased 5% and enforcement actions increased 6% during that same period. **Table 1** provides estimates of the number of active oil and natural gas wells in the two states for 2007 and 2008, the most recent years for which EIA data were available.

Table 1. Gas and Oil Wells in Colorado and Texas

Number of Producing Wells and Increase over Prior Year	Colorado		Texas	
	2007	2008	2007	2008
Gas wells	32,135	35,634	111,984	119,442
Oil wells	4,954	5,779	137,812	140,409
Gas well increase over prior year	+3,357	+3,499	+3,572	+7,458
Oil well increase over prior year	+232	+825	+521	+2,597

Source: U.S. Department of Energy, Energy Information Agency. Additional state data are available at: http://www.eia.doe.gov/pub/oil_gas/petrosystem/petrosysog.html.

³ U.S. Energy Information Administration. Independent Statistics and Analysis, Natural Gas Navigator, Coalbed Methane Proved Reserves and Production, Department of Energy, 2010, http://tonto.eia.doe.gov/dnav/ng/ng_enr_cbm_a_epg0_r51_bcf_a.htm.

⁴ La Plata Energy Council, *Gas Facts – Production Overview*, <http://energycouncil.org/gasfacts/prodover.htm>.

⁵ U.S. Department of Energy, *Number of Producing Gas Wells*, Energy Information Administration, Independent Statistics and Analysis, June 2010, http://www.eia.doe.gov/dnav/ng/ng_prod_wells_s1_a.htm.

⁶ U.S. Department of Energy, *Distribution and Production of Oil and Gas Wells by State*, Energy Information Administration, Independent Statistics and Analysis, June 2010, http://www.eia.doe.gov/pub/oil_gas/petrosystem/petrosysog.html.

⁷ Staffing statistics are taken from Abraham Lustgarten, "State Oil and Gas Regulators Are Spread Too Thin to Do Their Jobs," December 30, 2009, pp. <http://www.propublica.org/feature/state-oil-and-gas-regulators-are-spread-too-thin-to-do-their-jobs-1230>. These figures do not include staff from other state agencies that may play a role in regulating aspects of the oil and gas industry. For example, states have separate programs for permitting underground injection wells used to dispose of fluids related to oil and gas production. Well statistics are from the EIA. The number of producing oil and gas wells varies continuously.

Principal Regulatory Agencies

In Texas, the Railroad Commission (RRC) has authority to regulate oil and gas operations for the purposes of conserving hydrocarbon resources and protecting water resources. The RRC has jurisdiction over oil and gas exploration, development, and production operations and activities, including well drilling associated with oil and gas activities, gas plants, gas processing, and activities associated with storage, handling, and well site reclamation. The RRC is solely responsible for overseeing the management and disposal of waste, and abatement and prevention of pollution of surface and ground water, resulting from oil and gas development activities. Regulations include requirements and standards for well construction, spacing, integrity testing and plugging, and pollution prevention, spill response, and oil and gas waste management. The Texas Commission on Environmental Quality (TCEQ) also plays a role in protecting groundwater quality during oil and gas drilling. For example, the TCEQ issues permits regulating discharges into surface waters, and may make a recommendation to an operator regarding the depth to which groundwater should be protected by cement and steel casing before a well is drilled. More generally, the RRC participates in the interagency Texas Groundwater Protection Committee which coordinates groundwater protection efforts across the state.

The Colorado Oil and Gas Conservation Commission (COGCC) has broad authority to regulate oil and gas operations in Colorado. Among other things, the commission issues permits for drilling and operation of oil and gas wells and enforces rules for well spacing and construction, and well site reclamation. The COGCC also regulates closure and abandonment of wells, and the treatment and disposal of oil and gas exploration and production waste. Although the COGCC is the principal agency administering requirements to prevent water contamination, the Colorado Department of Public Health and Environment (CDPHE) has a role in regulating oil and gas exploration and production through the issuance of surface water and stormwater discharge permits. Recent state legislation strengthened the environmental protection language of the Oil and Gas Conservation Act, and required greater consultation with CDPHE. The law also directed COGCC to develop regulations in cooperation with the Colorado Wildlife Commission to minimize the adverse impacts of oil and gas operations on wildlife.

Selected Contrasts in State Requirements Related to Water Quality Protection

In response to new legislation and the rapid expansion of drilling activities in Colorado, changes were made to Colorado's oil and gas rules in 2008, which generally became effective in Spring 2009.⁸ Largely as a result of these changes, Colorado's regulations have several elements that have no parallel in the Texas oil and gas regulations. For example, the COGCC now requires operators to maintain inventories of chemicals stored onsite for use downhole, and to provide a list of the chemicals of 'trade secret chemical products' to commission officials upon request. Furthermore, operators must disclose chemical information to treating medical professionals. (Although Texas oil and gas rules do not require disclosure of chemical information to medical professionals, such disclosure broadly parallels federal requirements under the Occupational Safety and Health Act (OSHAct).⁹)

⁸ Colorado Oil and Gas Conservation Commission, Statement of Basis, Specific Statutory Authority, and Purpose: New Rules and Amendments to Current Rules of the Colorado Oil and Gas Conservation Commission, DNR, 2CCR 404-1, 2009.

⁹ The Occupational Safety and Health Administration has promulgated a set of regulations under Occupational Safety and Health Act (OSHAct), referred to as the Hazard Communication Standard (29 C.F.R. § 1910.1200). Additionally, OSHAct regulations require operators to maintain Material Safety Data Sheets (MSDS) for hazardous chemicals at the job site. The federal Emergency Planning and Community Right to Know Act (EPCRA) requires that facility owners submit an MSDS for each (continued...)

Other elements of Colorado's regulations for which we identified no parallel in Texas regulations include requirements for (1) synthetic liners for pits and monitoring of freeboard in pits, (2) landowner notification in advance of well stimulation (e.g., hydraulic fracturing), (3) wellhead and related facility setbacks from water supplies, (4) permits for stormwater discharges associated with oil and gas exploration and production activities, and (5) financial assurance to cover any damage to non-lease holding farmers. Further, for surface locations within ½ mile of public water system surface water supply intakes, Colorado imposes additional secondary containment, notification of downstream water systems, monitoring, reporting, and emergency response requirements.

As noted, in contrast to gas shales, coalbed methane frequently occurs in or adjacent to aquifers which may contain water of usable quality. To protect groundwater, Colorado COGCC regulations require operators to meet additional requirements, including conducting baseline and post-completion testing of water wells in proximity to CBM wells to determine whether drilling, completion, and production of CBM are affecting groundwater resources. (The Energy Information Agency reported no CBM production in Texas as of 2008.¹⁰) Colorado also imposes additional requirements in various specially designated areas.

Table 2 compares and contrasts several selected elements of oil and gas regulations for Texas and Colorado, and primarily those related to water quality protection. It should be noted that this table is not comprehensive, and one should refer to a state's complete regulations or contact state agencies to determine fully how, or whether, a particular activity is covered. Moreover, it is difficult to draw conclusions regarding the complete scope and relative effectiveness of a state's program by looking only at regulatory language. Although regulations are fundamental, state programs typically are supplemented by policies, technical guidance, (16 TAC §3.8) and other elements that, taken together, provide the full framework for promoting protection of water resources from oil and gas exploration and development activities.

(...continued)

hazardous chemical present that exceeds an EPA-determined threshold level, or a list of such chemicals, to the local emergency planning committee (LEPC), the state emergency response commission, and the local fire department. For non-proprietary information, EPCRA generally requires a LEPC to provide an MSDS to a member of the public on request.

¹⁰ U.S. Department of Energy, Energy Information Administration, Coalbed Methane Production 2003-2008, http://tonto.eia.doe.gov/dnav/ng/ng_prod_coalbed_s1_a.htm.

Table 2. Comparison of Selected Features of Texas and Colorado Regulations for Oil and Gas Exploration and Production Related to Water Quality Protection

Regulatory Provision	Texas	Colorado
General Water Quality Protection Authority	<p>The Texas Railroad Commission (RRC) regulates the exploration and production of oil and natural gas, and authorities include protection of ground and surface water. RRC rules state that no person conducting activities subject to regulation by the commission may cause or allow pollution of surface or subsurface water in the state.</p> <p>“Pollution of surface or subsurface water” is defined broadly as, “[t]he alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any surface or subsurface water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.”</p> <p>(16 Texas Administrative Code (TAC) §3.8)</p>	<p>The Colorado Oil and Gas Conservation Commission (COGCC) has the authority to regulate “oil and gas operations so as to prevent and mitigate significant adverse environmental impacts on air, water, soil, or biological resources resulting from oil and gas operations to the extent necessary to protect public health, safety, and welfare, including protection of the environment and wildlife resources taking into consideration cost-effectiveness and technical feasibility.”</p> <p>(Recent amendments to Colorado oil and gas rules were promulgated pursuant to the authority granted to COGCC in 2007 by House Bills 07-1298 and 07-1341, amending the Oil and Gas Conservation Act.)</p>
Setback Rules for Oil and Gas Wells, Pits, Tanks, and Equipment from Residential and other Structures	<p>The RRC does not regulate how close a gas well may be drilled to a residential property.</p> <p>However, Texas Legal Code, section 253.005(c) states that “[a] well may not be drilled in the thickly settled part of the municipality or within 200 feet of a private residence.”</p> <p>A municipality may enact setback ordinances for wells within the city limits. (For example, <i>Dish</i>, <i>Denton</i>, and <i>Flower Mound</i> have adopted ordinances that generally prohibit wells within 1,000 ft of residential or public structures. <i>Fort Worth</i> generally requires a setback from a well pad or bore of 600 ft from protected use structures (such as, residences, hospitals, and schools) and 200 ft from fresh water wells.)</p>	<p><i>Statewide Setbacks:</i> A well must be located a minimum of</p> <ul style="list-style-type: none"> • 150 feet from a surface property line; and • 150 feet, or one and 1-1/2 times the height of the derrick, whichever is greater, from any building, public road, major above-ground utility line, and railroad. (Rule 603.a) <p>In <i>high density areas</i>, wells must be located at least 350 feet from any building unit.</p> <p>Production tanks, pits, or associated on-site production equipment must be at least 350 feet from any building unit, and at least 500 feet from schools, hospitals, and other specified buildings. (Before recent revisions, setback requirements did not apply to pits.) (Rule 603.e)</p>

Regulatory Provision	Texas	Colorado
Well construction	<p>Casing requirements have been established to protect hydrocarbon horizons and groundwater.</p> <p>The RRC requires that all casing cemented in wells must be pressure-tested steel casing. Area well logs around proposed wells are evaluated by Texas Commission on Environmental Quality (TCEQ).</p> <p>Surface casing: Operators must set and cement sufficient surface casing to protect all usable-quality water strata, as defined by the TCEQ. Before drilling any well in any field or area in which no field rules are in effect or in which surface casing requirements are not specified in the field rules, an operator must obtain a letter from the TCEQ stating the protection depth. Surface casing may not be set deeper than 200 feet below the specified depth without approval from the RRC.</p> <p>Alternative water protection methods may be approved for certain reasons (e.g., economic and well control) and where specified conditions are met. Cement quality is specified, and strength test (72 hr compressive strength of 1,200 psi in critical zones, and at least 250 psi at 60° F above critical zone); cementing reports are required.</p> <p>All wells must be equipped with a bradenhead. RRC must be notified immediately whenever pressure develops between any 2 strings of casing.</p> <p>Blowout preventer or control head must be installed as soon as surface casing is set. A blowout preventer or control head must be able to keep the well under control at all times and be installed as soon as surface casing is set. This equipment must be capable of satisfying any reasonable test which may be required by the commission.</p> <p>Intermediate casing: cementing methods and depths are specified.</p> <p>Production casing: cementing methods and other requirements are specified.</p> <p>Drilling Completion Report: Upon completion of a well, a cementing report must be filed with the RRC providing complete cementing data and signed, attesting to compliance with cementing requirements. (16 TAC §3.13, §3.17)</p>	<p>Casing requirements have been established to protect hydrocarbon horizons and groundwater.</p> <p>The casing program for each well must be planned and maintained to prevent migration of oil, gas or water from one horizon to another that may result in the degradation of ground water.</p> <p>Surface casing: Casing must be run to a depth below all known or estimated usable freshwater levels and to prevent blowout or uncontrolled flows. All surface casing must be cemented with a continuous column from the bottom of the casing to the surface.</p> <p>Alternative water protection methods allowed where depth of aquifer makes it impractical or uneconomical to set the full amount of surface casing. Additional, stricter requirements apply to specially protected areas.</p> <p>COGCC requires bradenhead testing (pressure testing of the annulus between the surface and production casing) to ensure well integrity. COGCC must be notified if the pressure exceeds 200 psi. Cement strength is specified for all surface and intermediate casing (72 hr compressive strength of 800 psi at 95° F).</p> <p>Operators must take all necessary precautions to keep wells under control while being drilled or deepened. Blowout prevention equipment (BOPE), if any, must be indicated on the permit application to drill, deepen, reenter, or recomplete and operate along with known subsurface conditions (e.g. under or over-pressured formations). The working pressure of BOPE may not exceed the expected surface pressure to which it may be subjected. [For BOPE requirements in high density areas see Rule 603.b.(4)B. For statewide BOPE specification, inspection, operation and testing requirements see Rule 603.f.] COGCC has authority to designate specific areas, fields or formations as requiring certain BOPE.</p> <p>Intermediate casing: cementing methods and depths are specified.</p> <p>Production casing: cementing methods, pressure testing, cement bond logs, and other requirements are specified.</p> <p>Drilling Completion Report: Within 30 days of setting production casing, plugging a dry hole, deepening or sidetracking a well, or any time the wellbore configuration is changed, the operator must transmit completion report to the COGCC. (300 Series, Rule 301-308, 317)</p>

Regulatory Provision	Texas	Colorado
Oil and Gas Well Siting Near Drinking Water Supplies	<p>No state requirements identified establishing special protection requirements near private water wells, domestic supply springs or surface water bodies.</p> <p>RRC rules state that no person conducting activities subject to regulation by the commission may cause or allow pollution of surface or subsurface water in the state. (16 TAC §3.8)</p> <p><i>City of Fort Worth:</i></p> <p>The city generally requires a setback from a well bore or pad of 200 feet from fresh water wells.</p>	<p>COGCC rules create protection zones and performance requirements that apply within certain distances of drinking water tributaries for a distance of 5 miles upstream from a drinking water intake. The rules establish buffer zones and impose different requirements for oil and gas activities depending on distance from water supplies.</p> <p>Internal buffer zone (0-300 ft):</p> <ul style="list-style-type: none"> • new oil and gas activities are prohibited, unless variance is granted. Buffer zones are determined by measuring from the ordinary high water line of each bank to the nearest edge of the disturbed area at the oil and gas location at which the drilling, completion, production and storage operations will occur. <p>Intermediate Buffer Zone (301-500 ft): new oil and gas locations require:</p> <ul style="list-style-type: none"> • pitless drilling systems; • flowback and stimulation fluids in tanks on well pad or with berms/containment devices constructed around oil, condensate and produced water storage tanks; • collection of baseline surface water data; • notification to potentially impacted Public Water Systems 15 miles downstream; and • emergency spill and response plan. <p>External Buffer Zone (501-2640 ft): new oil and gas locations require:</p> <ul style="list-style-type: none"> • pitless drilling systems or containment of all drilling flowback and stimulation fluids; • baseline surface water data notification of potentially impacted Public Water Systems 15 miles downstream; and • emergency spill and response program. • (Rule 317-Rule 318B)
Oil and Gas Well Location Assessment	No RRC provision identified.	<p>Operators must submit a Oil and Gas Location Assessment for any new oil or gas location at a previously undisturbed site, unless exempted. Oil and gas locations covered by comprehensive drilling plans may be exempted if specified criteria are met (e.g., consultation with surface owners, local governments, Colorado Department of Public Health and Environment (CDPHE) or Colorado Division of Wildlife, public notice and comment). The assessment must identify all improvements within 400 feet (e.g., water wells, sewers, plugged wells, canals, springs and water bodies. (Rule 303d)</p>

Regulatory Provision	Texas	Colorado
<p>Pit Construction and Liners</p>	<p>Permits to dispose of oil and gas waste in any manner, including into a pit, may only be issued if the RRC determines that the disposal will not result in the waste of oil or gas or the pollution of surface or ground waters.</p> <p>The applicant must give notice of the permit application to the surface owners of the tract where the pit will be located or disposal will occur.</p> <p>Permits for storage or disposal of oil field brines and other mineralized waters in unlined pits may be issued if the applicant has shown conclusively the pit cannot cause pollution of productive agricultural land or pollution of surface or ground water.</p> <p>Permits issued for any lined brine pit or lined pit for storage or disposal of oil field brines or other mineralized water will contain requirements regarding liner materials, thickness, installation, inspection and/or liner replacement.</p> <p>Permits for storage and disposal of gas wastes, brines, or mineralized water may contain requirements for design and construction of pit.</p> <p>(16 TAC §3.8)</p> <p>No requirements identified for synthetic liners for drilling pits or hydraulic fracturing water pits.</p> <p>Local governments may require the use of lined pits.</p> <p><i>Fort Worth ordinances:</i></p> <ul style="list-style-type: none"> • require closed-loop mud systems with steel tanks for all gas drilling; • allow earthen pits on lots >25 acres and set back >1,000 ft from homes, parks, schools, and other specified structures; • restrict location of fracture ponds; and • prohibit placement of flowback water in an open pit. 	<p>Liner requirements and numerous material specifications are established for pits constructed after May 1, 2009 (federal land) or April 2009 (all other land). require an impervious synthetic liner that is resistant to degradation and failure and has been installed according to manufacturer specifications: A permit is required for earthen pits used for recycling fluids at multi-well sites.</p> <p>The following pits must now be lined:</p> <ul style="list-style-type: none"> • drilling pits when total petroleum hydrocarbons or chloride exceed specified limits; • production pits (other than skim pits) must have synthetic liner unless the operator demonstrates that the quality of produced water is as good or better than the underlying groundwater or that seepage will not reach the aquifer or water of the state at contamination levels in excess of applicable standards (the effective date of this requirement is May 2011 for specified counties); • skim pits; and • pits used for exploration and production (E&P) of oil and gas must be constructed and operated to protect public health, safety, and welfare and the environment, including soil, waters of the state, and wildlife, from significant adverse environmental, public health or welfare impacts from E&P waste. <p>Such pits require an impervious synthetic liner that is resistant to degradation and failure and has been installed according to manufacturer specifications.</p> <p>Pits must be constructed, monitored, and operated to provide for a minimum of 2 feet of freeboard at all times.</p> <p>Produced water must meet treatment requirements before being placed in production pits.</p> <p>For sensitive areas, COGCC may impose requirements for leak detection, monitoring, and record-keeping.</p> <p>(Rule 902, 903, 904, and 900 Series)</p>

Regulatory Provision	Texas	Colorado
Pit Closure and Reclamation	<p>Dewatering, backfill and compaction requirements and schedules are specified for various pit types. Workover and completion pits must be dewatered within 30 days and backfilled and compacted within 120 days of completion of workover operations. Reserve pits and mud circulation pits must be backfilled and compacted within 120 days after drilling operations cease. (16 TAC §3.8(d))</p> <p><i>City of Fort Worth</i> has additional rules:</p> <ul style="list-style-type: none"> • Operator must have agreement with landowner re: disposition of fracturing pit, or land must be returned to original condition. • Flowback water from fracture operations cannot be placed in pit without city permit. • Operator may not discharge refuse, brine or wastewater without city permit. • City permit required to use freshwater pit for disposal of other fluids. 	<p>Pits not used exclusively for drilling operations must be closed in accordance with an approved Site Investigation and Remediation Workplan.</p> <p>Liners must be disposed of in accordance with solid waste disposal regulations, and soil beneath liners must meet specified standards. Constructed soil liners must be removed for treatment or disposal or liner may be mixed with native soils to prevent formation of an impermeable barrier.</p> <p>Operators must ensure that soils and ground water meet specified concentration levels.</p> <p>Drilling pits must be closed and reclaimed within 3 months after drilling and completion activities cease on crop land or within a 100 year floodplain, and within 6 months after such activities conclude on other land.</p> <p>At least 3 feet of soil must be placed over the pit centers in cropland. If subsidence occurs within 2 years, more soil must be added. (Rule 900 Series)</p>
Stormwater Runoff	<p>Neither TCEQ nor RRC regulates stormwater discharges associated with oil and gas exploration and production activities.</p> <p>RRC regulations broadly state that no person conducting activities subject to regulation by the commission may cause or allow pollution of surface or subsurface water in the state. (16 TAC §3.8(b))</p> <p>Regulations for cleanup of soil contaminated by crude oil spills include specific actions that must be taken to prevent stormwater contamination. (16 TAC §3.91)</p>	<p>Stormwater permit required, issued by the Colorado Dept. of Public Health and Environment (CDPHE).</p> <p>All oil and gas locations are subject to the Best Management Practice (BMP) requirements contained in state rules, and all producing facilities that have completed interim reclamation or have inactivated a CDPHE stormwater construction permit are required to be in compliance with these rules until final reclamation is achieved.</p> <p>Oil and gas operators must implement and maintain BMPs at all oil and gas locations to control stormwater runoff in a manner that minimizes erosion, transport of sediment offsite, and site degradation. BMPs must be maintained until the facility is abandoned and final reclamation is achieved. Operators must employ BMPs at all oil and gas locations, including well pads, soil stock piles, access roads, tank batteries, compressor stations, and pipeline rights of way.</p> <p>BMPs include covering materials, and stormwater diversion activities; materials handling and spill prevention practices; and applying erosion controls designed to minimize erosion from unpaved areas, including well pads, road surfaces, stream crossings, and cut and fill slopes, etc.</p> <p>Operators must develop a post-construction stormwater program that reflects good faith efforts by operators to select and implement BMPs. The regulation identifies numerous pollutant sources that the BMPs must address (e.g., stored chemicals, produced water and drilling fluids). (Rule 1002.f)</p>

Regulatory Provision	Texas	Colorado
<p>Water Well Testing and Related Monitoring for Coalbed Methane Wells and Wells in Specified Areas</p>	<p>No requirements identified. (DOE’s Energy Information Agency reports no CBM production in Texas as of 2008.)</p> <p><i>City of Fort Worth:</i></p> <ul style="list-style-type: none"> • The city requires testing of fresh water wells for specified quality parameters and for flow rate for drilling in the Barnett shale. • Water quality and quantity testing must be conducted pre-drilling and after a gas well is completed for fresh water wells within 500 feet of the gas well. 	<p><i>Coalbed methane (CBM Wells):</i> CBM often is found in or adjacent to aquifers. (In contrast, relatively impermeable gas shales typically are located far beneath aquifers and contain little water). COGCC requires baseline and follow-up testing of the 2 water wells closest to planned unconventional CBM wells before a permit to drill is issued. Baseline testing must be done for numerous specified analytical parameters (e.g., all major cations and ions, dissolved methane, pH, salinity, nitrates, hydrogen sulfide, and bacteria).</p> <p>Post-completion tests must be performed for the same parameters at 1, 3, and 6 years. Additional tests are required if methane concentrations increase or if other water quality changes are detected in water samples.</p> <p>Test results must be provided to the COGCC and the water well owners within 3 months of sample collection.</p> <p>Biennial casing head testing is required for CBM wells.</p> <p>Periodic gas seep monitoring at nearby coal outcrops and mines within 2 miles is required.</p> <p>Operators must assess and monitor plugged and abandoned (P&A) wells within ¼ mile of proposed CBM wells. Periodic soil gas surveys around P&A wells are required to ensure that methane is not migrating to the old wellbore and into groundwater.</p> <p><i>Special Areas:</i> Initial baseline testing of nearest well for same range of chemicals and other parameters is required prior to gas well development in specially designated areas. (Rule 608)</p>
<p>Well Stimulation, Hydraulic Fracturing: pressure monitoring</p>	<p>Specific stimulation monitoring provisions were not identified.</p> <p>Generally, RRC rules require that all wells must be equipped with a Bradenhead (casing head). Whenever pressure develops between any two strings of casing, the RRC must be notified immediately. No cement may be pumped between any two strings or pipe at the top of the hole, unless the RRC has granted permission.</p> <p>Any well showing pressure on the Bradenhead, or leaking gas or oil between the surface and the production or oil string must be tested as follows. The well shall be killed and pump pressure applied through the tubing head. If the pressure gauge on the Bradenhead reflects the applied pressure, the casing must be condemned and a new production or oil string must be run and cemented. This method must be used when the origin of the pressure cannot be determined. (16 TAC §3.17)</p>	<p>Revised rule requires continuous monitoring and recording of bradenhead pressure during stimulation operations. Operators must keep specific records regarding bradenhead pressures recorded during a stimulation process and report any high (>200 psi gauge) bradenhead pressure increase to the COGCC to ensure no groundwater is affected. (A high pressure may indicate that stimulation fluid has entered the open space in the well casing, which could lead to groundwater contamination.) Variances may be sought if certain requirements are met.</p> <p>COGCC requires notification and approval prior to conduction hydraulic fracturing of a well.</p> <p>Required corrective action may include periodic monitoring of the bradenhead or sampling of nearby water wells (Rule 3.41, COGCC, 2009)</p>

Regulatory Provision	Texas	Colorado
Chemical Inventories and Disclosure	<p>No RRC requirements identified.</p> <p>(Federal Occupational Safety and Health Act (OSHAAct) regulations require operators to maintain Material Safety Data Sheets (MSDS) for hazardous chemicals at the job site. The federal Emergency Planning and Community Right to Know Act (EPCRA) requires that facility owners submit an MSDS for each hazardous chemical present that exceeds a reporting quantity (10,000 pounds for most chemicals), or a list of such chemicals, to the local emergency planning committee (LEPC), the state emergency response commission, and the local fire department. For non-proprietary information, EPCRA generally requires a LEPC to provide an MSDS to a member of the public on request. (For more federal and state information, see <i>Local Emergency Planning Committee (LEPC): A Primer for Local Planning for Hazardous Materials</i>, published by the Governor’s Division of Emergency Management, State of Texas, July 2006.)</p> <p><i>Disclosure to health professionals:</i> No state requirements; however, federal disclosure provisions apply under EPCRA and OSHAAct regulations (29 C.F.R. § 1910.1200).</p>	<p><i>Chemical Inventory:</i> Oil and gas producers and operators must maintain an inventory of trade secret chemical products (but not their specific chemical constituents) if more than 500 pounds are used or stored for use at the site for downhole use, or if more than 500 pounds of fuel is stored at the well site during a quarterly reporting period. The chemical inventory is not submitted to the COGCC unless requested.</p> <p>The chemical inventory includes the MSDS for each chemical product.</p> <p><i>Disclosure to state:</i> Information regarding chemical constituents contained in a product whose composition is a trade secret must be disclosed by vendors or operators only under limited circumstances, specifically to state staff or county health or emergency officials only where necessary to respond to a spill or release of a chemical product or a complaint by a potentially adversely affected landowner. Trade secret chemical information provided to the COGCC will not become part of the Chemical Inventory and will not be considered publicly available.</p> <p><i>Disclosure to health professionals:</i> The vendor or service provider must disclose the chemical constituents contained in a trade secret chemical product, upon request, to any health professional when that professional has reason to believe the information is needed to diagnose and treat an individual who may have been exposed to the product and knowledge of the chemical constituents will assist in diagnosis or treatment. The health professional is generally required to sign a confidentiality agreement, and information must be provided immediately based on an oral or written acknowledgement of confidentiality. (Rule 205.d)</p> <p>COGCC may grant a variance to the disclosure requirements for an operator, if the operator can demonstrate that he lacks the legal right to obtain the requested information. (Rule 205.i)</p>
Surface Owner Protections: Financial Assurance	<p>No provisions identified.</p>	<p>Operators must provide financial assurance to protect surface owners (including those not parties to a mineral lease or other relevant agreement) from unreasonable crop losses or land damage. (Rule 703)</p>
Comprehensive Drilling Plans	<p>No provisions identified.</p>	<p>Comprehensive drilling plans may be developed by 1 or more operators identifying future oil and gas activities in a defined geographic area within a geologic basin. These voluntary plans: (1) identify natural features, vegetation, wildlife resources, etc; (2) describe future oil and gas operations; (3) identify impacts; (4) develop measures to avoid, minimize, and mitigate impacts; and (5) provide other relevant information. (Rule 216)</p>

Regulatory Provision	Texas	Colorado
Well Plugging and Abandonment	<p>Dry or inactive wells must be plugged to insure that all formations bearing usable quality water, oil or gas are protected. Cementing operations during plugging must be supervised. The operator and the cementer are both responsible for complying with plugging requirements and for plugging the well in conformity with the procedure set forth in an approved notice of intent to plug and abandon the well.</p> <p>Cement plugs must be set to isolate each productive horizon and usable quality water strata. Plugs must be set to separate multiple usable quality water strata by placing the required plug at each depth as determined by the TCEQ. The operator must verify the placement of the plug required at the base of the deepest usable quality water stratum using an approved method.</p> <p>Operators must give RRC advanced notice of intent to plug a well. The notice must include the proposed plugging procedure as well as the complete casing record. An operator may not begin plugging the well or wells until the proposed procedure has been approved by the RRC. The operator may not initiate approved plugging operations before the date set out in the notification unless authorized.</p> <p>An operator's duty to properly plug a well ends only when: (i) the operator has properly plugged the well up to the base of the usable quality water zone following RRC requirements; (ii) the surface owner has registered the well with, or has obtained a permit for the well from, the groundwater conservation district, if applicable; and (iii) the RRC has approved the application of the surface owner to condition an abandoned well for fresh water production.</p> <p><i>Report:</i> Within 30 days after plugging operations are completed, operators must file with the RRC a verified plugging record, on the appropriate form. A cementing report made by the party cementing the well must be included in the plugging report.</p> <p><i>Surface owner notification:</i> Operators must notify the surface owners or residents before plugging wells, but plugging may not be delayed because of lack of actual notice to landowner if operator has served notice.</p> <p>For wells more than 25 years old that become inactive, operators must plug well or conduct a fluid level or hydraulic pressure test establishing that the well does not pose a potential threat to surface or ground water, oil, or gas. (TAC §3.14)</p>	<p>Dry or abandoned wells must be plugged so that oil, gas, water, or other substance will be confined to the reservoir in which it originally occurred. Cement plugs must be at least 50 feet in length and extend at least 50 feet above each zone to be protected. The material used in plugging (cement, mechanical plug, or equivalent method approved by COGCC) must be placed in the well to permanently prevent migration of oil, gas, water, or other substance from its original formation or horizon.</p> <p>Operators must give COGCC advanced notice of intent to abandon a well. Operators must obtain approval of the plugging method prior to plugging, notify COGCC of the estimated time a well will be plugged, and identify the depth and thickness of all known sources of groundwater. Notice must include proposed depths of mechanical plugs and casing cuts, the proposed depths and volumes of all cement plugs, the amount, size and depth of casing and junk to be left in the well, the volume and weight of fluid to be left in the wellbore and the nature and quantities of any other materials to be used in the plugging. If the well is not plugged within 6 months of approval, a new notice must be filed.</p> <p><i>Report:</i> Within 30 days after abandonment, operators must file a Well Abandonment Report with the COGCC. Plugging Verification Reports detailing all procedures are also required. A Plugging Verification Report must be submitted for each person or contractor actually setting plugs. The Well Abandonment Report and the Plugging Verification Reports must detail the depths of mechanical plugs and casing cuts, the depths and volumes of all cement plugs, the size and depth of casing left in the well, etc. Plugging Verification Reports must conform with the operator's report and both must show that plugging procedures are at least as extensive as those approved by COGCC.</p> <p>To protect fresh water, no surface casing may be pulled from any well unless authorized by COGCC.</p> <p><i>Surface owner notification:</i> In preparing for final reclamation and plugging and abandonment, operators must use best efforts to consult with affected surface owners or tenants. Such good faith consultation shall allow the surface owner (or appointed agent) the opportunity to provide comments concerning preference for timing of such operations and all aspects of final reclamation, including, but not limited to, the desired final land use and seed mix to be applied.</p> <p>(Rules 311 and 319)</p>

Regulatory Provision	Texas	Colorado
<p>Selected Notification and Consultation Requirements for Well Location, Drilling and Subsequent Operations</p>	<p>Permits are required to drill, deepen, plug back, reenter, and operate oil or gas wells. (16 TAC §3.5) Related forms and reports required.</p> <p>Operators must file a completion or recompletion report and log with RRC within 30 days of completion or 15 days of test.</p> <p>Annual oil well tests and status reports are required. Reports must include oil, gas and water volumes resulting from the test. (16 TAC § 3.53)</p> <p>A permit is required to appropriate public water.</p> <p>In drilling a water well associated with oil and gas development, a driller must notify the Texas Dept. of Licensing and Regulation (TDLR) and the landowner (or person having a well drilled) on encountering water injurious to vegetation, land, or other water and determining that the well must be plugged, repaired, or properly completed in order to avoid injury or pollution. The driller must ensure that the well is plugged, repaired, or properly completed under standards and procedures adopted by TDLR. (16 TAC §3)</p> <p>Operators generally must notify RRC immediately of leaks, spills, and fires. (16 TAC §3.20) (See also §3.91)</p>	<p>Permits are required to drill, deepen, reenter, recomplete, and operate oil and gas wells. (Rule 303) Related forms and reports required.</p> <p>Operators must submit a form to the COGCC within 30 days of the completion of an interval, including recompletion, reperforation, and restimulation or commingling.</p> <p>Operators must notify COGCC within 10 days of significant downhole problem or mechanical failure.</p> <p>Operators must give notice to landowners within 500 feet of proposed well upon receipt of approval to drill, and at least 30 days before starting heavy equipment operations for well drilling. (Rule 305e)</p> <p>Operators must provide surface owner at least 7 days advance notice of subsequent well operations that will materially impact surface areas beyond access road and well site, such as refracturing or recompletion of a well. (Rule 305e)</p> <p>Operator must consult in good faith with surface owner in locating roads, production facilities, well sites, or other activities. Consultation shall occur at an agreed upon time, prior to the start of heavy equipment operations on the land. (Rule 306a)</p> <p>Local governments may be given an opportunity to engage in consultation with COGCC concerning an application to drill (Rule 306b). A local government may request the CDPHE to consult on a proposed well location, based on concerns regarding public health, safety, welfare, or environment. (Rule 306c)</p> <p>Operators must and notify COGCC immediately when public health or safety is in jeopardy, and must report spills. (See also Rule 906b)</p>
<p>Cleanup of Contaminated Soil and Ground Water</p>	<p>Soil may contain no more than 5% hydrocarbons, or must be removed to an approved disposal site, or to a secure interim storage location for future remediation or disposal. The storage site must be designed to prevent stormwater contamination.</p> <p>Final cleanup level of 1% hydrocarbons by weight must be achieved as soon as feasible, but no later than 1 year after spill incident. The RRC may approve alternative approaches if they provide equal or greater environmental protection.</p> <p>Specific spill reporting requirements vary with size of spill. (16 TAC §3.91)</p>	<p>Regulations specify permissible concentrations of various pollutants in ground water and soil and specify methods for sampling and analysis. Remediation and reclamation generally are complete upon compliance with statewide standards or established site-specific standards. (Rules 909, 910)</p> <p>The COGCC revised rule makes soil standards consistent with those used by CDPHE, Hazardous Materials and Waste Management Division, for clean up of soil from similar materials. Prior to the amendments, standards for remediation of impacted soils used by COGCC for oil and gas operations were less comprehensive than those used by CDPHE. (Rule 910)</p> <p>Specific requirements for spill reporting vary with size of spill. (Rule 906b)</p>

Regulatory Provision	Texas	Colorado
<p>Exploration and Production (E&P) Waste Disposal</p> <p>(See also pit construction and use provisions above.)</p>	<p>A permit to dispose of oil and gas wastes by any method may only be issued if the RRC determines that the disposal will not result in the waste of oil, gas, or in the pollution of surface or ground water.</p> <p>Applicant for a permit to use a pit or dispose of oil and gas wastes must give notice of the permit application to the surface owners where the pit will be located or disposal will take place. When the land lies within the corporate limits of a city, town, or village, the applicant must also give notice to the city clerk or appropriate official. If discharge will be to surface water, the applicant must notify the surface owners of each waterfront tract (or the city clerk, if relevant) between the discharge point and ½ mile downstream.</p> <p>Permit may be terminated if pollution of surface water or ground water is occurring or is likely to occur.</p> <p>Land application without a permit, with surface owners' permission, is allowed for water-based drilling fluids, drill cuttings, sands, silts, inert solid wastes and water condensate. Pit disposal (burial) without a permit is allowed for the above wastes.</p> <p>Special rules apply in coastal areas. Discharges of oil and gas waste in coastal zone management areas may not violate TCEQ water quality standards.</p> <p>(16 TAC §3.8)</p>	<p>The rules of the 900 series establish the permitting, construction, operating and closure requirements for pits, methods of E&P waste management, procedures for spill/release response and reporting, and sampling and analysis for remediation activities.</p> <p>General obligations: E&P waste management activities must be conducted, and facilities constructed and operated, to protect waters of the state from significant adverse impacts, except as permitted by law and regulations. Operators must ensure that E&P waste is properly stored, handled, and disposed to prevent adverse environmental impacts to air, water, soil or biological resources or to the extent necessary to ensure compliance with specified concentration levels (Table 910-1, with consideration to ground water standards and classifications. (Rule 907)</p> <p>In general, all disposal options for E&P waste, including produced water, requires a permit. Wastes must be treated to regulatory standards or disposed in accordance with regulations.</p> <p>Specified secondary containment is required around tanks containing oil, condensate, or produced water that is saline (greater than 3,500 mg/L TDS).</p> <p>Discharges to surface waters must meet state water quality standards adopted by CDPHE. (Rule 905)</p>

Source: Prepared by CRS with information from Colorado and Texas Administrative Codes and regulatory agencies; *State Oil and Natural Gas Regulations Designed to Protect Water Resources: Regulations Reference Document* (2009), prepared by the Ground Water Protection Council; and *Technical Consulting Reports Prepared in Support of the Draft Supplemental Generic Environmental Impact Statement for Natural Gas Production in New York State*, Alpha Environmental Consultants, Inc. (2009).

Notes: This memo highlights selected regulatory provisions and does not attempt to comprehensively compare the full, extensive array of each state's oil and gas rules. For detailed information on RRC regulations in Texas, please refer to the Texas Administrative Code, Title 16, Part 1, Railroad Commission of Texas (<http://www.rrc.state.tx.us/rules/rule.php>). For Colorado information, see the Code of Colorado Regulations, Oil and Gas Conservation Commission, 2 CCR 404 (<http://www.sos.state.co.us/CCR/Welcome.do>).