

The Railroad Commission of Texas (Commission) proposes new Chapter 5, relating to Carbon Dioxide, to implement Senate Bill (SB) 1387, 81st Legislature (Regular Session, 2009), which was effective September 1, 2009. SB 1387 amended the Texas Water Code and the Texas Natural Resources Code to provide for the implementation of projects involving the capture, injection, sequestration, or geologic storage of carbon dioxide. The purpose of the proposed rules is to protect underground sources of drinking water while promoting the capture and storage of anthropogenic carbon dioxide.

SB 1387 delegates to the Commission jurisdiction over the injection of anthropogenic carbon dioxide into productive formations and saline formations directly above and below the productive formations for the purpose of geological storage. The bill establishes an Anthropogenic Carbon Dioxide Storage Trust Fund to include fees established by the Commission for implementation. The bill also authorizes the Commission to issue a permit if the Commission finds that injection and geologic storage of anthropogenic carbon dioxide will not endanger or injure any oil, gas, or other mineral formation; that with proper safeguards, both ground and surface fresh water can be adequately protected from carbon dioxide migration or displaced formation fluids; that the injection of carbon dioxide will not endanger or injure human health and safety; that the reservoir into which the carbon dioxide is injected is suitable for or capable of being made suitable for protecting against the escape or migration of carbon dioxide from the reservoir; and that the permit applicant meets all of the other statutory and regulatory requirements for the issuance of the permit.

SB 1387 requires the Commission to adopt rules and procedures, including rules for geologic site characterization; area of review and corrective action; well construction; operation; mechanical integrity testing; plugging; monitoring; post-injection site care and site closure; long-term stewardship of the geologic storage; enforcement; and the collection and administration of fees and penalties to cover the cost of permitting, monitoring, inspection, enforcement, and implementation associated with the program. SB 1387 requires coordination between the Commission and the Texas Commission on Environmental Quality (TCEQ) to ensure the regulation of carbon dioxide storage in Texas is being performed in an economically and environmentally sound manner. SB 1387 also requires that the permit applicant obtain and submit to the Commission a letter from the Executive Director of the TCEQ certifying that

underground fresh water supplies will not be injured by the permitted activity.

SB 1387 also requires the Commission, TCEQ, and the University of Texas Bureau of Economic Geology (BEG) to conduct a study of, and report back to the legislature on, the appropriate agency to regulate the long-term storage of carbon dioxide into non-oil, gas, or geothermal producing geologic formations. SB 1387 further requires the Texas General Land Office (GLO), in conjunction with the Commission, TCEQ, and BEG, to develop recommendations for managing geologic storage of carbon dioxide on state-owned lands, including an assessment of storage capacity and new legal and regulatory frameworks that might be necessary. SB 1387 clearly states that the storage operator owns the anthropogenic carbon dioxide in a geologic storage facility and authorizes the Commission to regulate the withdrawal of any stored carbon dioxide. Finally, SB 1387 requires the Commission's rules to be consistent with the regulations of the United States Environmental Protection Agency (EPA) and requires the Commission to seek enforcement primacy from the EPA for the program.

PROPOSED EPA REGULATIONS

On July 25, 2008, EPA proposed requirements for underground injection of carbon dioxide for geologic storage under the authority of the federal Safe Drinking Water Act (SDWA). The goal of the proposed regulations is to protect underground sources of drinking water (USDWs) while promoting carbon capture and storage. EPA proposed to create a new Class VI injection well class. EPA used as the beginning framework the program for Class I hazardous injection wells, then added requirements to address the unique nature of carbon dioxide injection for geologic storage, relative buoyancy of carbon dioxide, corrosivity in the presence of water, potential presence of impurities in the carbon dioxide stream, mobility within subsurface formations, and large injection volumes expected. EPA's proposed rules would establish technical criteria for geologic site characterization; area of review and corrective action; well construction and operation; mechanical integrity testing and monitoring; monitoring of the carbon dioxide plume and pressure front; groundwater monitoring; well plugging; extended post-injection site care; long-term financial assurance to ensure proper site care and closure; and site closure. The Commission understands that EPA plans to make its rules final in September 2010.

As noted above, SB 1387 requires the Commission to seek enforcement authority (primacy) for the Underground Injection Control (UIC) program for geologic storage of anthropogenic carbon dioxide and the associated injection wells. Section 1425 of the federal SDWA allows states seeking primacy for Class II wells to demonstrate that their existing standards are effective in preventing endangerment of USDWs. These programs must include requirements for permitting, enforcement, inspection, monitoring, record-keeping, and reporting that demonstrate the effectiveness of their requirements. However, under Section 1422 of the federal SDWA, states applying to EPA for primary enforcement responsibility to administer the UIC program (primacy) must show that the state programs meet EPA's minimum federal requirements for UIC programs, including construction, operating, monitoring and testing, reporting, and closure requirements for well owners or operators.

Absent some action from Congress, states will be required to apply for primacy for the UIC program for geologic storage of carbon dioxide under Section 1422 of the federal SDWA. Therefore, the state's program must be at least as stringent as EPA's program. Where states do not seek this responsibility or fail to demonstrate that they meet EPA's minimum requirements, EPA is required to implement a UIC program for the state.

BACKGROUND

Increases in the demand for energy have contributed to increases in the levels of atmospheric carbon dioxide. One of the promising ways to reduce the amount of carbon dioxide in the atmosphere is to sequester, or store, it by injecting it into underground reservoirs. Geologic storage technology has been proven through successful pilot projects and over 35 years of experience in injecting carbon dioxide for enhanced oil recovery (EOR).

Carbon dioxide can be sequestered at the same time it is being used for enhanced recovery of oil or natural gas. Today approximately 90 percent of the carbon dioxide used in enhanced recovery operations is produced from naturally occurring geologic accumulations, primarily geologic domes in New Mexico, Colorado, and Mississippi. In the future, rather than using this naturally occurring carbon dioxide, operators will be using anthropogenic carbon dioxide. Sources of large volumes of

anthropogenic--or man-made--carbon dioxide include power generation, iron and steel manufacturing, natural gas processing, cement manufacture, ammonia production, hydrogen production, helium plants, and ethanol manufacturing plants.

The Commission has regulated the injection of carbon dioxide since the early 1970s, when the Commission permitted the first carbon dioxide enhanced recovery project in the world (SACROC Unit, Kelly-Snyder Field, Scurry County). Half of all the carbon dioxide enhanced recovery projects in the entire world are in the Permian Basin of Texas. The Commission has permitted over 10,000 wells for carbon dioxide injection, of which over 5,000 are currently active. Half of the production of Oxy Permian, Texas' top oil producer, comes from carbon dioxide EOR projects. Oxy Permian injects over one billion cubic feet per day (Bcf/day) of carbon dioxide in its EOR projects. This accounts for over 70 million barrels per day, which is about seven percent of the State's daily total crude oil production. Texas also has an outstanding safety record related to the much more toxic hydrogen sulfide operations and has a long and successful history of regulating the storage of natural gas in geologic formations.

In the course of a typical enhanced recovery operation, even where there is no intent to sequester, 30 to 50 percent of the injected carbon dioxide will remain in the reservoir after production operations cease. The balance is either dissolved within the produced oil or recycled for use in other reservoirs; it is not emitted to the atmosphere. Oil and gas reservoirs have proved capable of containing water-buoyant fluids and gases for millions of years. These reservoirs are well studied and offer the best opportunity to begin large-scale geologic storage of carbon dioxide. Accordingly, enhanced recovery operations using the same procedures now in place would result in sequestering anthropogenic carbon dioxide. Enhanced recovery operations that include carbon dioxide injection for the purpose of sequestration will remain regulated as Class II wells under 16 Tex. Admin. Code §3.46, relating to Fluid Injection into Productive Reservoirs. Existing injection regulations require that injected fluids be confined to the authorized injection interval--the same goal as that of carbon dioxide storage. Many of the functions of geologic storage are effectively the same as those for the carbon dioxide enhanced recovery activities the Commission has historically regulated.

There is a wealth of information and experience in the industry and regulations, regulatory

experience, and industrial best practices related to the injection of carbon dioxide. In areas where there are unknowns, however, extra care must be taken during initial stages of excursions into large-scale commercial storage. Because of the intense study of oil and gas reservoirs in Texas, there is much information regarding the characteristics of oil and gas reservoirs, but because of the intense development of these reservoirs, there are many more potential penetrations into the confining zones--in the form of oil and gas wells--which must be closely examined to prevent them from becoming conduits for the escape of the carbon dioxide from the storage reservoir. Generally there is a dearth of information about non-oil and gas reservoirs, but those may have fewer penetrations that could act as conduits for the escape of the carbon dioxide. In addition, because oil and gas and formation fluids have been produced from the oil and gas reservoirs, the pressure is reduced; in a non-oil and gas reservoir, such a pressure decrease has not occurred.

The Commission proposes new Chapter 5, relating to Carbon Dioxide.

The Commission proposes new Subchapter A, relating to General Provisions, and §5.101, relating to Purpose. The purpose of the proposed new chapter is to implement the portion of the state program for geologic storage of anthropogenic carbon dioxide over which the Commission has jurisdiction consistent with state and federal law related to protection of USDWs and mitigation of carbon dioxide emissions.

The Commission proposes new §5.102, relating to Definitions. Many of the terms defined in this new section are the same as or consistent with definitions of the same terms that are ubiquitous in the underground injection control program. These include definitions of "area of review," "confining zone," "corrective action," "enhanced recovery operation," "fracture pressure," "injection zone," "mechanical integrity," "pressure front," "transmissive fault or fracture," "well stimulation," and "workover." The Commission has modified a few of these definitions as necessary for geologic sequestration.

The Commission proposes to define the term "underground source of drinking water," a term used in the federal UIC program. Heretofore, the Commission has used the terms "fresh water" and "usable quality water" because they are used in the Texas statutes relating to underground injection. However, as noted before, use of the term "underground sources of drinking water" in the Commission's

rules will make it easier for the EPA to approve the Commission's request for enforcement primacy. The Commission proposes to define "underground source of drinking water" as an aquifer or its portion which is not an exempt aquifer as defined in 40 Code of Federal Regulations §146.4 and which supplies any public water system; or contains a sufficient quantity of ground water to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 mg/l total dissolved solids.

The Commission proposes to define other terms necessary to regulation of geologic storage of anthropogenic carbon dioxide. The Commission proposes to define the terms "anthropogenic carbon dioxide," "geologic storage," "geologic storage facility or storage facility," and "reservoir" as those terms are defined in Texas Water Code, §27.002, as added by SB 1387.

The Commission's proposed definitions of the terms "carbon dioxide plume," "carbon dioxide stream," "post-injection facility care," and "facility closure" are modifications of the definitions of those terms proposed by EPA.

The Commission proposes new Subchapter B, relating to Geologic Storage and Associated Injection of Anthropogenic Carbon Dioxide. The Commission proposes new §5.201, relating to Applicability and Compliance, which states that Subchapter B applies to the geologic storage of anthropogenic carbon dioxide in, and the injection of anthropogenic carbon dioxide into, a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir. A saline formation that is directly above or below a reservoir that may be productive means a geologic formation containing saline fluids that is located immediately above the confining zone of a reservoir or that is located immediately below the bottom confining zone of such a reservoir. A reservoir that may be productive means an identifiable geologic unit that has had production in the past, which is similar to productive or previously productive reservoirs along the same or a similar trend, or potentially contains oil, gas, or geothermal resources based on analysis of geophysical and/or seismic data. If a well is authorized as or converted to an anthropogenic carbon dioxide injection well for geologic storage, this subchapter would apply to the well.

The Commission is aware of research possibly indicating accumulation of methane in reservoirs

where carbon dioxide has been injected (Taggart, Ian, "Extraction of Dissolved Methane in Brines by CO₂ Injection: Implication for CO₂ Sequestration, Society of Petroleum Engineers," SPE 124630, 2009). In some cases this may occur in areas not previously known to produce oil or gas. The Commission intends to address this issue as the program evolves and more information is available.

In accordance with SB 1387, the proposed section further states that Subchapter B does not apply to the injection of fluid through the use of an injection well regulated under 16 Tex. Admin. Code §3.46 (relating to Fluid Injection into Productive Reservoirs) for the primary purpose of enhanced recovery operations from which there is reasonable expectation of more than insignificant future production volumes of oil, gas, or geothermal energy and operating pressures are no higher than reasonably necessary to produce such volumes or rates. However, the operator of an enhanced recovery project may propose simultaneously to permit the enhanced recovery project as a carbon dioxide geologic storage facility. There may not be much difference between injection pressures used for enhanced recovery and those for geologic storage; however, this may depend on the geology and hydrology of the storage facility and whether the operator proposes to allow the reservoir pressure to increase above the hydrostatic pressure on a long-term basis. The proposed new section requires the operator of a geologic storage facility to comply with all other applicable Commission rules and orders and states that, if a provision of Subchapter B conflicts with any provision or term of a Commission order or permit, the provision of the order or permit controls.

The Commission proposes new §5.202, relating to Permit Required. Proposed new subsection (a) states that a person may not begin drilling or operating an anthropogenic carbon dioxide injection well for geologic storage or constructing or operating a geologic storage facility regulated under this subchapter without first obtaining the necessary permits from the Commission. Proposed new subsection (b) outlines the requirements for amendment of an existing geologic storage facility permit. Proposed new subsection (c) sets forth the requirements for transfer of a permit for a geologic storage facility permit from one operator to another operator.

Proposed new subsection (d) states that the Commission has the authority to modify, cancel, or suspend a geologic storage facility permit after notice and opportunity for hearing under specific

circumstances, listed in the subsection. Proposed new subsection (d) further states that in the event of an emergency that presents an imminent danger to life or property, or an imminent threat of uncontrolled escape of carbon dioxide, or an imminent threat of pollution, the director may immediately order suspension of the operation of the geologic storage facility until a final order is issued pursuant to a hearing, if any.

The Commission proposes new §5.203, relating to Application Requirements. Subsection (a) establishes the general requirements for the form of a permit application, the filing requirements, and providing general information. This subsection also states that the Commission may not issue a permit before receiving a complete application. The subsection further states that all reports must be prepared by a qualified and knowledgeable person that includes an interpretation of the results of all logs, surveys, sampling, and tests required in this subchapter and that a professional geoscientist or engineer, as appropriate and necessary, must conduct the logging, sampling, and testing, and affix the appropriate seal on the resulting reports required under this subchapter. Proposed new §5.203(b) establishes the requirements for surface map and information. Proposed new §5.203(c) establishes the geologic, geochemical, and hydrologic information required with an application. These requirements are consistent with EPA's proposed requirements.

Proposed new §5.203(d) establishes the application requirements for the area of review and corrective action. Paragraph (1) establishes the permit application requirements for the initial delineation of the area of review and the initial corrective action. Permit applicants must perform the initial delineation of the area of review using computational modeling and the proposed pressure and volume of carbon dioxide injection to predict the lateral and vertical migration of the carbon dioxide plume, the formation fluids, and the pressure differentials sufficient to cause movement of injected fluids or formation fluids into a USDW in the subsurface for three periods after initiation of injection: (1) five years after initiation of injection; (2) from initiation of injection to the end of the injection period proposed by the applicant; and (3) from initiation of injection to 10 years after the end of the injection period proposed by the applicant. The Commission has determined that delineation of the probable area of review after five years from commencement of injection will provide the operator and the Commission

use information gathered in that time to verify the adequacy of the methods and programs used to delineate the areas of review throughout the life of the storage facility and to make any adjustments necessary shortly after the first five years of operation.

Proposed new §5.203(d) also establishes the application requirements for identification of penetrations and table of wells, which are generally the existing requirements for Class II wells, and establishes the application requirements for any necessary corrective action. These requirements are consistent with the existing requirements for Class II injection wells, except that the operator is required to perform corrective action using materials suitable for use with the carbon dioxide stream. Proposed new subsection (d) further requires that the applicant submit an area of review and corrective action plan, and details what that plan must include. The requirements in this subsection are consistent with those in EPA's proposed regulation.

Proposed new §5.203(e) establishes the requirements for construction of anthropogenic carbon dioxide injection wells. These requirements are consistent with the requirements for Class II injection wells, with the addition of one requirement included in EPA's proposed rules, *i.e.*, verification of the integrity and location of the cement using technology capable of radial evaluation of cement quality and identification of the location of channels to ensure that underground sources of drinking water will not be endangered. Existing wells that have been associated with injection of carbon dioxide for the purpose of enhanced recovery may be exempt from provisions of these casing and cementing requirements if the applicant demonstrates that the well construction meets the general performance criteria. Proposed new §5.203(e) also establishes the requirements for the well construction information that must be submitted with a permit application, including a well construction plan and a well stimulation plan. Such information is necessary to allow the director to determine whether the wells will be constructed to prevent endangerment of USDWs and will isolate the injected fluids to the storage reservoir.

Proposed new §5.203(f), relating to logging, sampling, and testing, establishes the logging, sampling and testing results to be submitted with the application sufficient to determine the depth, thickness, porosity, permeability, and lithology of, and the geochemistry of any formation fluids in, all relevant geologic formations. Proposed new subsection (f) also requires the applicant to submit a plan for

logging, sampling, and testing the injection well(s), after permitting but prior to injection well operation, that describes the logs, surveys, and tests to be conducted to verify the depth, thickness, porosity, permeability, and lithology of, and the salinity of any formation fluids in, the formations that are to be used for monitoring, storage, and confinement to assure conformance with the injection well construction requirements, and to establish accurate baseline data against which future measurements may be compared. The subsection further requires the applicant to submit a sampling plan. The subsection establishes the criteria and information for both plans. These requirements are a modification of the requirements in EPA's proposed rule §146.87 for Class VI wells, except that the Commission has included more performance requirements and fewer mandates that operators perform specific tests to allow the operator to use whatever tests provide the necessary demonstration and to allow for technological advancements in testing methods.

Proposed new §5.203(g), relating to compatibility determination, requires an applicant to submit a determination of the compatibility of the carbon dioxide stream with the materials to be used to construct the well; fluids in the injection zone; and minerals in both the injection and the confining zone, based on the results of the formation testing program.

Proposed new §5.203(h), relating to mechanical integrity testing information, sets forth the criteria and information to be submitted in a mechanical integrity testing plan. These requirements are a modification of the requirements in EPA's proposed rule §146.89. The requirements include an initial annulus pressure test; continuous monitoring of the injection pressure, rate, injected volumes, and pressure on the annulus between tubing and long string casing; an annual confirmation that the injected fluids are confined to the injection zone using a method approved by the director (*e.g.*, diagnostic surveys, such as oxygen-activation logging or temperature or noise logs); and injection well testing after any workover that disturbs the seal between the tubing, packer, and casing, and at least once every five years to determine if leaks exist in the tubing, packer, or casing. The subsection further requires that the applicant submit a mechanical integrity testing plan and outlines the requirements of the plan.

Proposed new §5.203(i), relating to operating information, establishes the maximum injection pressure and the requirement for an operating plan. This requirement is consistent with EPA's proposed

rules, but does not set the limit to 90 percent of the fracture pressure of the injection zone, as in EPA's proposed regulations. Rather, the Commission proposes to set the maximum injection pressure to one that takes into account the risks of tensile failure and, where appropriate, geomechanical or other studies that assess the risk of tensile failure and shear failure; that with a reasonable degree of certainty will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults transecting the confining zone to become transmissive; and that in no case may cause the movement of injection or formation fluids in a manner that endangers USDWs.

Proposed new §5.203(j), relating to monitoring, sampling, and testing plan, requires the applicant to prepare and submit a plan to verify that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone. The subsection establishes the requirements of the plan, which are consistent with EPA's proposed rules.

Proposed new §5.203(k), relating to well plugging plan, sets forth the requirements for injection and monitor wells. In accordance with 16 Tex. Admin. Code §3.14 (relating to Plugging), operators must plug monitor wells that penetrate the base of usable quality water and, upon abandonment, all injection wells. Operators must plug all monitoring wells that do not penetrate the base of usable quality water, in accordance with 16 Tex. Admin. Code Chapter 76, relating to Water Well Drillers and Water Well Plump Installers.

Proposed new §5.203(l), relating to emergency and remedial response plan, requires that the applicant submit an emergency and remedial response plan that describes actions to be taken to address escape from the permitted injection interval or movement of the injection or formation fluids that may cause an endangerment to USDWs during construction, operation, closure and post-closure periods; includes a safety plan that includes emergency response procedures, provisions to provide security against unauthorized activity, and carbon dioxide release detection and prevention measures; and includes a description of the training and testing that will be provided to each employee at the storage facility on operational safety and emergency response procedures to the extent applicable to the employee's duties and responsibilities.

Proposed new §5.203(m), relating to financial responsibility, requires that an applicant

demonstrate that the applicant has met the financial responsibility requirements under §5.205 of this subchapter. Such requirements are consistent with Texas Water Code, §27.050, and EPA's proposed rule §146.85.

Proposed new §5.203(n), relating to post-injection facility care and facility closure plan, requires that an applicant submit a plan that includes the pressure differential between pre-injection and predicted post-injection pressures in the injection zone; the predicted position of the carbon dioxide plume and associated pressure front at closure as demonstrated in the area of review evaluation; a description of post-injection monitoring location, methods, and proposed frequency; a proposed schedule for submitting post-injection storage facility care monitoring results to the Commission; and the estimated cost of proposed post-injection care and closure.

Proposed new §5.203(o), relating to letter from the TCEQ, implements the requirement in Texas Water Code, §27.046, that an applicant submit a letter from the Executive Director of the TCEQ stating that drilling and operating the anthropogenic carbon dioxide injection well for geologic storage or operating the geologic storage facility will not injure any freshwater strata in that area and that the formation or stratum to be used for the geologic storage facility is not a freshwater formation or stratum.

Proposed new §5.203(p), relating to other information, requires that an applicant submit any other information requested by the director as necessary to discharge the Commission's duties under Texas Water Code, Chapter 27, Subchapter B-1, or deemed necessary by the director to clarify, explain, and support the required attachments, consistent with Texas Water Code, §27.044, as amended by SB 1387.

The Commission proposes new §5.204, relating to Notice, Hearing, and Public Meeting. Proposed new subsection (a) requires the applicant to make a complete copy of the permit application available for the public to inspect and copy by filing a copy of the application with the County Clerk at the courthouse of the county or counties where the storage facility is to be located, or if approved by the director, at another equivalent public office. In addition, proposed new subsection (a) requires the applicant to make a copy of the complete application on an Internet website. The applicant must file any subsequent revision of an application with each County Clerk or other approved public office and update the information on the website at the same time the revision is submitted to the Commission.

Proposed new §5.204(b), relating to notice requirements, establishes the notice requirements for a permit application under this subchapter. Such notice is consistent with the notice requirements for a gas storage facility under 16 Tex. Admin. Code §3.96 (relating to Underground Storage of Gas in Productive or Depleted Reservoirs), except that here the Commission proposes additional notice to surface owners and the groundwater conservation district (if one exists), as well as mineral leaseholders and surface lease holders within one half mile of the outermost boundary of the area of review. Proposed new §5.205(c), relating to hearing requirements, is consistent with the hearing requirements for an enhanced recovery injection well under 16 Tex. Admin. Code §3.46 (relating to Fluid Injection into Productive Reservoirs). If the Commission receives a protest regarding an application for a new, or amendment of a permitted, geologic storage facility permit from a person who was notified pursuant to subsection (b) or from any other affected person within 30 days of the date of receipt of the application by the division, receipt of individual notice, or last publication of notice, whichever is later, or if the director determines that a hearing is in the public interest, then the applicant will be notified that the application cannot be administratively approved. The director will schedule a hearing on the application upon request of the applicant. The Commission must give notice of the hearing to all affected persons, local governments, and other persons who express, in writing, an interest in the application. After hearing, the examiner will recommend a final action by the Commission. If the Commission receives no protest regarding an application for a new, or amendment of a permitted, geologic storage facility permit from a person notified pursuant to subsection (a), or from any other affected person, the director may administratively approve the application. If the permit application for a new, or amendment of a permitted, geologic storage facility is administratively denied, a hearing will be scheduled upon written request of the applicant. After hearing, the examiner will recommend a final action by the Commission.

Proposed new §5.204(d), requires that, after the director has declared the application to be complete, the applicant schedule a public meeting to be held in the area of the proposed location of the geologic storage facility.

Proposed new §5.205 relates to Fees and Financial Assurance. Proposed new subsection (a), relating to fees, includes three non-refundable fees. The Commission proposes a base fee for each

application to cover the Commission's costs for processing the application; an annual fee based on the number of metric tons injected into the geologic storage facility; and an annual post-injection care fee to be paid each year the operator does not inject into the geologic storage facility until the director has authorized storage facility closure. These fees are in addition to the fee required for each injection well by 16 Tex. Admin. Code §3.78 (relating to Fees and Financial Security Requirements). Proposed new subsection §5.205(b), relating to financial responsibility, is consistent with of the Texas Water Code, §27.050, as added by SB 1387.

Proposed new §5.205(c) establishes financial assurance requirements as required by Texas Water Code, §27.073, as added by SB 1387. The operator must comply with the requirements of 16 Tex. Admin. Code §3.78 (relating to Fees and Financial Security Requirements), for all monitoring wells that penetrate the base of usable quality water and all injection wells. In addition, an applicant for a geologic storage facility must file a bond or letter of credit that is in an amount approved by the director under this subsection and that meets the requirements of this subsection as to form and issuer. The Commission must approve the bond or letter of credit before issuing a permit.

Proposed new §5.205(d), relating to notice of adverse financial conditions, requires an operator notify the Commission of adverse financial conditions that may affect the operator's ability to carry out injection well plugging, post-injection storage facility care, and storage facility closure. Proposed new subsection (d) requires that notice of bankruptcy be filed in accordance with 16 Tex. Admin. Code §3.1 (relating to Organization Report; Retention of Records; Notice Requirements). The bond must provide a mechanism for the bond or surety company to give prompt notice to the Commission and the operator of any action filed alleging insolvency or bankruptcy of the surety company or the bank or alleging any violation that would result in suspension or revocation of the surety or bank's charter or license to do business. Upon the incapacity of a bank or surety company by reason of bankruptcy, insolvency, or suspension, or of revocation of its charter or license, the operator will be deemed to be without bond coverage. The Commission must issue a notice to any operator who is without bond coverage and specify a reasonable period to replace bond coverage, not to exceed 90 days.

The Commission proposes new §5.206, relating to Permit Standards. Proposed new subsection (a)

establishes the general criteria for issuance of a permit. The language is consistent with Texas Water Code, §27.051(b-1), as added by SB 1387. The Commission proposes additional requirements, such as the applicant's submission of the letter from the Executive Director of the TCEQ required by Texas Water Code, §27.046; the applicant's demonstration that the applicant has a good faith claim to the necessary and sufficient property rights for construction and operation of the geologic storage facility; the applicant's payment of the fee required in §5.205(a) of this subchapter; the director's determination that the applicant has sufficiently demonstrated financial responsibility; and the applicant submitted to the director the required financial security.

Proposed new §5.206(b) requires that construction of anthropogenic carbon dioxide injection wells meet the criteria in §5.203(e) of this subchapter; that within 30 days after the completion or conversion of an injection well, the operator file a complete record of the well on the Commission's approved form showing the current completion; and that an operator of a geologic storage facility must notify the director and obtain the director's approval prior to conducting any well workover.

Proposed new §5.206(c) establishes the requirements for operating a geologic storage facility. The proposed new subsection requires the operator to maintain and comply with the approved operating plan and adhere to certain operating criteria relating to metering, injection pressure, annulus fluid, recording devices, and alarms and automatic shut-off systems.

Proposed new §5.206(d) requires that the operator maintain and comply with the approved monitoring, sampling, and testing plan to verify that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone.

Proposed new §5.206(e) requires that the operator maintain and comply with the approved mechanical integrity testing plan submitted in accordance with §5.203(h) of this subchapter, and maintain mechanical integrity of the injection well at all times, except during periods of well workover.

Proposed new §5.206(f) requires that, at the frequency specified in the approved area of review and corrective action plan or permit, or when monitoring and operational conditions warrant, the operator of a geologic storage facility: (1) re-evaluate the area of review through computational modeling; (2) identify all wells in the re-evaluated area of review that require corrective action; (3) perform

corrective action on wells requiring corrective action in the re-evaluated area of review; and (4) submit an amended area of review and corrective action plan or demonstrate to the director through monitoring data and modeling results that no change to the area of review and corrective action plan is needed.

Proposed new §5.206(g) requires that the operator maintain, update as necessary, and comply with the approved emergency and remedial response plan required by proposed new §5.203(l) that describes actions to be taken to address movement of the injection or formation fluids that may cause an endangerment to USDWs during construction, operation, closure and post-closure periods. Proposed new subsection (g) also states the action an operator must take if the operator obtains evidence that the injected carbon dioxide stream and associated pressure front may cause an endangerment to USDWs and states that the director may allow the operator to resume injection prior to remediation if the operator demonstrates that the injection operation will not endanger underground sources of drinking water. These requirements are consistent with the requirements in EPA's proposed regulations at §146.94.

Proposed new §5.206(h) requires the operator to give the division the opportunity to witness all logging and testing.

Proposed new §5.206(i) requires the operator to maintain and comply with the approved well plugging plan required by proposed new §5.203(k).

Proposed new §5.206(j) requires the operator of an injection well to maintain and comply with the approved post-injection storage facility care and closure plan required under proposed new §5.203(n). Upon cessation of injection, the operator must either submit an amended plan or demonstrate to the director, through monitoring data and modeling results, that no amendment to the plan is needed, and must continue to conduct monitoring as specified in the approved plan until the director determines that the position of the carbon dioxide plume and pressure front are such that the geologic storage facility will not endanger USDWs. Prior to authorization for storage facility closure, the operator must submit to the director a demonstration, based on monitoring and other site-specific data, that the carbon dioxide plume and pressure front have stabilized and that no additional monitoring is needed to assure that the geologic storage facility will not endanger USDWs. Proposed new subsection (j) establishes the requirements necessary for the Commission to authorize closure. These requirements are generally consistent with

EPA's proposed regulation §146.93.

Proposed new §5.206(k) requires the operator of a geologic storage facility to record specific information in a notation on the deed to the facility property or any other document to put any potential purchaser of the property on notice of certain facts, including the fact that the land has been used to geologically store carbon dioxide.

Proposed new §5.206(l) requires that the operator retain for three years following storage facility closure certain records collected during the post-injection storage facility care period. The proposed new subsection further requires that the operator deliver those records to the director at the conclusion of the retention period and that the records be retained at the Austin Headquarters of the Commission.

Proposed new §5.206(m) requires identification of each location at which geologic storage activities take place, including each injection well, by a sign that meets the requirements specified in §3.3 of this title (relating to Identification of Properties, Wells, and Tanks). In addition, each sign must include a telephone number at which the operator, or a representative of the operator, can be reached in the event of an emergency.

Proposed new §5.206(n) states that, in any permit for a geologic storage facility, the director will impose terms and conditions reasonably necessary to protect USDWs from pollution, including the necessary casing. The subsection further states that the permits issued under this subchapter continue in effect until revoked, modified, or suspended by the Commission. Operators must comply with each requirement set forth in this subchapter as a condition of the permit unless specifically modified by the terms of the permit.

The Commission proposes new section §5.207 which establishes record-keeping and reporting requirements. The operator must file a complete record of all tests in duplicate with the district office within 30 days after the testing. In reporting the results of mechanical integrity tests to the director, the operator must include a description of the test(s) and the method(s) used. Various operating reports are due within 24 hours, within 30 days, semi-annually, annually, or on a cumulative basis. The operator must report to the district office orally as soon as practicable upon the discovery of any pressure changes or other monitoring data that indicate the presence of leaks in the well or the lack of confinement of the

injected carbon dioxide stream to the geologic storage reservoir, and must confirm the report in writing within five working days. Operators must report to the appropriate District Office within 24 hours any significant pressure changes or other monitoring data indicating the presence of leaks in the well.

Within 30 days, the operator must report the results of periodic tests for mechanical integrity; the results of any other test of the injection well conducted by the operator if required by the director; and a description of any well workover. These reports must include summary cumulative tables of the required information.

Semi-annually, the operator must report a summary of well head pressure monitoring; changes to the physical, chemical and other relevant characteristics of the carbon dioxide stream from the proposed operating data; monthly average, maximum, and minimum values for injection pressure, flow rate and volume, and annular pressure; a description of any event that significantly exceeds operating parameters for annulus pressure or injection pressure as specified in the permit; a description of any event that triggers a shutdown device and the response taken; and the results of monitoring prescribed under proposed new §5.206(d).

Other information that may be obtained annually includes but it not limited to reports of corrective action performed; new wells installed and the type, location, number and information required in proposed new §5.203(e); re-calculated area of review; tons of carbon dioxide injected; and other information that may be required by a particular permit. Proposed new §5.207 also prescribes the reporting formats and record retention requirements.

The Commission proposes new §5.208, relating to Penalties, which states that violations of this subchapter may subject the operator to penalties and remedies specified in the Texas Natural Resources Code, Title 3, Texas Water Code, Chapter 27, and other statutes administered by Commission, and that the certificate of compliance for any oil, gas, or geothermal resource well may be revoked in the manner provided in §3.73 of this title (relating to Pipeline Connection; Cancellation of Certificate of Compliance; Severance) for violation of this subchapter.

Leslie Savage, Planning and Administration, Oil and Gas Division, has determined that for each year of the first five years that the proposed new rules will be in effect there will be negative fiscal

implications for state government.

SB 1387 provided the Commission with a method for funding this new program by establishing the Anthropogenic Carbon Dioxide Storage Trust Fund through Texas Natural Resources Code, §120.003, and allowing the Commission to charge fees under Texas Water Code, §27.045. However, the Commission cannot collect any fees to fund the program until it receives applications. Therefore, for the first two years, the Commission will bear the costs of rulemaking, preparation of the EPA primacy application, and initial implementation without any offsetting revenue.

EPA estimates that the cost to the Commission of preparing its primacy application for oversight of Class VI wells will be approximately \$43,852. EPA further estimates that the annual burden of its proposed rules to primacy agencies such as the Railroad Commission is approximately \$12,228, based on oversight of four Class VI facilities. The Commission finds that this estimate is low and has estimated that its total annual cost will be closer to \$250,000, which is the basis for the Commission's proposed fees. *See* "Information Collection Request for the Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells--Proposed Rule," OMB Control No. 2040-NEW, EPA ICR No. 2309.01, July 2008.

Staff estimates that the program will require at least one Engineering Specialist VII and an attorney for the first two fiscal years to help draft rules, coordinate with TCEQ and BEG, and prepare the Commission's package for primacy of the federal program for injection wells for the purpose of geologic storage of carbon dioxide. Staff estimates that the Engineering Specialist VII and an Administrative Assistant II, as well as some assistance from an attorney, will be needed in subsequent fiscal years to administer the program. In addition, the Commission will need to perform computer programming to add a new Underground Injection Control (UIC) type code and a new Drilling Permit purpose of filing code to both the mainframe and open system applications. This change affects 24 mainframe programs totaling 768 hours and open system programs totaling 380 hours for a total cost of \$32,718 in fiscal year 2011. Commission personnel would perform these modifications.

Staff estimates the costs to be approximately \$250,000, for fiscal year 2010 and 2011, and approximately \$235,404 in subsequent fiscal years.

Texas Government Code, §2006.002, relating to Adoption of Rules with Adverse Economic Effect, directs that, as part of the rulemaking process, a state agency prepare an Economic Impact Statement that assesses the potential impact of a proposed rule on small businesses and micro-businesses, and a Regulatory Flexibility Analysis that considers alternative methods of achieving the purpose of the rule if the proposed rule will have an adverse economic effect on small businesses or micro-businesses.

The Commission's proposed new rules in Chapter 5 are anticipated to have a potential cost impact on those persons performing geologic storage of anthropogenic carbon dioxide in depleted oil and gas reservoirs in this state, but because the Commission has issued no permits for geologic storage of carbon dioxide, the Commission has no historic information on which to base its analysis of the cost of compliance. Further, companies performing activities under the jurisdiction of the Commission are not required to make filings with the Commission reporting the number of employees or annual gross receipts, which are elements of the definitions of "micro-business" and "small business" in Texas Government Code, §2006.001; therefore, the Commission has no factual bases for determining whether any persons that will be engaged in geologic storage of carbon dioxide will be classified as small businesses or micro-businesses, as those terms are defined.

Specifically, Texas Government Code, §2006.001(2), defines a "small business" as a legal entity, including a corporation, partnership, or sole proprietorship, that is formed for the purpose of making a profit; is independently owned and operated; and has fewer than 100 employees or less than \$6 million in annual gross receipts. Texas Government Code, §2006.001(1), defines "micro-business" as a legal entity, including a corporation, partnership, or sole proprietorship, that is formed for the purpose of making a profit; is independently owned and operated; and has not more than 20 employees. The Commission expects that the companies that will operate large-scale commercial facilities for the geologic storage of carbon dioxide in Texas are large companies having at least 500 employees or companies under common control of large companies, such as Denbury Resources, Tenaska, Summit Power Group, Occidental Petroleum, and SandRidge Energy; those companies do not meet two of the three elements of either definition.

Based on the information the Commission has received regarding the companies that are likely to

pursue permits for facilities for the geologic storage of anthropogenic carbon dioxide, Ms. Savage concludes that it is extremely unlikely that any company that potentially could be affected by the proposed rules would be classified as a small business or micro-business, as those terms are defined in Texas Government Code, §2006.001. However, for purposes of performing the analysis mandated by Texas Government Code, §2006.002(c), the Commission assumes that at least one small business or micro-business will apply for a permit to operate a carbon dioxide geologic storage facility in Texas.

The North American Industrial Classification System (NAICS) sets forth categories of business types. There is no category for geologic storage of carbon dioxide. This category is not listed on the Texas Comptroller of Public Accounts website page entitled "HB 3430 Reporting Requirements-Determining Potential Effects on Small Businesses." The most suitable category on that website is business type 2212 (Natural Gas Distribution), for which there are listed 144 companies in Texas. This source further indicates that 119 companies (82 percent) are small businesses or micro-businesses as defined in Texas Government Code, §2006.002.

The Commission used information provided by EPA as support documentation for its proposed rules to estimate the cost of compliance with the Commission's proposed rules. EPA estimated an overall cost of approximately \$2.20 per ton of carbon dioxide stored over the lifetime of a commercial geologic storage project. See *Federal Register*, Vol. 73, No. 144, July 25, 2008, pages 43528-43529.

EPA estimated the cost of performing the necessary work for and preparing the application at approximately \$1,481,775 per application, with which the Commission agrees. The Commission proposes to require a base application fee of \$75,000 for a total estimated application cost of \$1,556,775. EPA also estimated that the recurring costs for a facility that has been permitted and is operating will be \$1,705,294 a year; the cost of post-injection monitoring and reporting at \$216,092 a year; and the cost for a site closure report at \$3,154. The Commission also agrees with these estimates. See "Information Collection Request for the Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells--Proposed Rule," OMB Control No. 2040-NEW, EPA ICR No. 2309.01, July 2008.

The Commission's proposed fee structure for applications and for monitoring during the post-

injection care period is based on the estimated cost to the Commission of reviewing applications and monitoring geologic storage facilities. Because the Commission's proposed annual fee, intended to provide revenue to the Trust Fund, is based on the volume of carbon dioxide injected, the fee generally will be proportional to the size of the facility. That does not necessarily mean, however, that the fee will be proportional to the size of the entity operating the facility, although it could tend to reduce the likely actual annual costs for smaller businesses and modestly increase the actual annual costs for the larger businesses. Other factors that might affect the distribution of the economic burden of regulating geologic storage of anthropogenic carbon dioxide, such as net value of carbon dioxide as established by the Federal government in a carbon credit program, cannot be calculated because Congress has not yet established such a program.

The Commission has determined that the economic impact of the proposed new rules will be the same for small businesses and micro-businesses as for larger businesses. The Commission has also determined that consideration of the use of regulatory methods that will achieve the purpose of the proposed rules while minimizing the adverse impacts on small businesses is not consistent with the health, safety, and environmental and economic welfare of the state, and therefore has not prepared a regulatory flexibility analysis. The primary reason for this is that absent some action from Congress, states will be required to apply for primacy for the UIC program for geologic storage of carbon dioxide under Section 1422 of the federal SDWA. Under that section, states must show that the state programs meet EPA's minimum federal requirements for UIC programs, including construction, operating, monitoring and testing, reporting, and closure requirements for well owners or operators. The state's program must be at least as stringent as EPA's program.

The Commission anticipates that the creation of a facility for the geologic storage of carbon dioxide would likely affect a local economy; however, because the Commission has not issued any permits for such activities, the Commission has no historic information on which to base an analysis of the impact on a local economy. The Commission recognizes that some geologic storage facilities might be large enough to create new jobs in a local economy, but the Commission does not have any information regarding where such facilities might be located, how large the operations might be, or when such

facilities might begin operations; therefore, the Commission has no factual bases on which to estimate the impact on any particular local economy. The Commission anticipates that the effect on any local economy would be similar to that of the oil and gas industry as a whole. Therefore, the Commission has not prepared a local employment impact statement pursuant to Texas Government Code, §2002.022.

The Commission has determined that the proposed new rules in Chapter 5 are not major environmental rules, because the rules do not meet the requirements set forth in Texas Government Code, §2001.0225(a).

Ms. Savage has determined that for each year of the first five years that the new rules will be in effect the public benefit will be a reduction in the amount of anthropogenic carbon dioxide released to the atmosphere and an enhanced ability of Texas industries to comply with future federal climate regulations.

Comments on the proposal may be submitted to Rules Coordinator, Office of General Counsel, Railroad Commission of Texas, P.O. Box 12967, Austin, Texas 78711-2967; online at www.rrc.state.tx.us/rules/commentform.php; or by electronic mail to rulescoordinator@rrc.state.tx.us. The Commission is particularly interested in comments regarding the financial assurance provisions in proposed new §5.205 (relating to Fees and Financial Assurance). Comments should refer to O&G Docket No. 20-0264802, and will be accepted until 5:00 p.m. on April 26, 2010, which is 31 days after publication in the *Texas Register*. The Commission finds that this comment period is reasonable because the proposal and an online comment form will be available on the Commission's web site at least 16 days prior to *Texas Register* publication of the proposal, giving interested persons more than two additional weeks to review, analyze, draft, and submit comments. The Commission encourages all interested persons to submit comments no later than the deadline. The Commission cannot guarantee that comments submitted after the deadline will be considered. For further information, call Ms. Savage at (512) 463-7308. The status of Commission rulemakings in progress is available at www.rrc.state.tx.us/rules/proposed.php.

The Commission proposes the rules in new Chapter 5 pursuant to Texas Natural Resources Code, §§81.051 and 81.052, which give the Commission jurisdiction over all persons owning or engaged in drilling or operating oil or gas wells in Texas and the authority to adopt all necessary rules for governing

and regulating persons and their operations under the jurisdiction of the Commission; Texas Natural Resources Code, Chapter 91, Subchapter R, as enacted by SB 1387, relating to authorization for multiple or alternative uses of wells; Texas Water Code, Chapter 27, Subchapter C-1, as enacted by SB 1387, which gives the Commission jurisdiction over the geologic storage of carbon dioxide in, and the injection of carbon dioxide into, a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir; and Texas Water Code, Chapter 120, as enacted by SB 1387, which establishes the Anthropogenic Carbon Dioxide Storage Trust Fund, a special interest-bearing fund in the state treasury, to consist of fees collected by the Commission and penalties imposed under Texas Water Code, Chapter 27, Subchapter C-1, and to be used by the Commission for only certain specified activities associated with geologic storage facilities and associated anthropogenic carbon dioxide injection wells.

Texas Natural Resources Code, §§81.051, 81.052; Texas Natural Resources Code, Chapter 91, Subchapter R; and Texas Water Code, Chapters 27 and 120, are affected by the proposed new rules.

Statutory authority: Texas Natural Resources Code, §§81.051, 81.052; Texas Natural Resources Code, Chapter 91, Subchapter R; and Texas Water Code, Chapters 27 and 120.

Cross-reference to statute: Texas Natural Resources Code, §§81.051, 81.052; Texas Natural Resources Code, Chapter 91, Subchapter R; and Texas Water Code, Chapters 27 and 120.

CHAPTER 5. CARBON DIOXIDE

SUBCHAPTER A. General Provisions

§5.101. Purpose.

The purpose of the this chapter is to implement the portion of the state program for geologic storage of anthropogenic carbon dioxide over which the Railroad Commission has jurisdiction consistent with state and federal law related to protection of underground sources of drinking water and mitigation of carbon dioxide emissions.

§5.102. Definitions.

The following terms, when used in this subchapter, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Affected person--A person who, as a result of actions proposed by an application for a geologic storage facility permit or an amendment or modification of an existing geologic storage facility permit, has suffered or may suffer actual injury or economic damage other than as a member of the general public.

(2) Anthropogenic carbon dioxide--

(A) carbon dioxide that would otherwise have been released into the atmosphere that has been:

(i) separated from any other fluid stream; or

(ii) captured from an emissions source, including:

(I) an advanced clean energy project as defined by Health and Safety Code, §382.003, or another type of electric generation facility; or

(II) an industrial source of emissions; and

(iii) any incidental associated substance derived from the source material for, or from the process of capturing, carbon dioxide described by clause (i) of this subparagraph; and

(iv) any substance added to carbon dioxide described by clause (i) of this subparagraph to enable or improve the process of injecting the carbon dioxide; and

(B) does not include naturally occurring carbon dioxide that is recaptured, recycled, and reinjected as part of enhanced recovery operations.

(3) Anthropogenic carbon dioxide injection well--An injection well used to inject or transmit anthropogenic carbon dioxide into a reservoir.

(4) Aquifer--A geologic formation, group of formations, or part of a formation that

is capable of yielding a significant amount of water to a well or spring.

(5) Area of review-- The three-dimensional area of a geologic storage facility that may be impacted by the injection activity as determined by computational modeling that considers the volumes and the physical and chemical properties of the carbon dioxide stream to be injected, the physical and chemical properties of the formation into which the carbon dioxide stream is to be injected, and available data including data available from logging or testing of wells.

(6) Carbon dioxide plume--The underground extent, in three dimensions, of an injected carbon dioxide stream.

(7) Carbon dioxide stream--Carbon dioxide that has been captured from an emission source, incidental associated substances derived from the source materials and the capture process, and any substances added to the stream to enable or improve the injection process. The term does not include any carbon dioxide stream that meets the definition of a hazardous waste under 40 Code of Federal Regulations Part 261.

(8) Commission--A quorum of the members of the Railroad Commission of Texas convening as a body in open meeting.

(9) Confining zone--A geologic formation, group of formations, or part of a formation that is capable of limiting fluid movement from an injection zone.

(10) Corrective action--Methods to assure that wells within the area of review do not serve as conduits for the movement of fluids into or between underground sources of drinking water, including the use of corrosion resistant materials, where appropriate.

(11) Delegate--The person authorized by the director to take action on behalf of the Railroad Commission of Texas under this subchapter.

(12) Director--The director of the Oil and Gas Division of the Railroad Commission of Texas or the director's delegate.

(13) Division--The Oil and Gas Division of the Railroad Commission of Texas.

(14) Enhanced recovery operation--The use of any process for the displacement of

hydrocarbons from a reservoir other than primary recovery and includes the use of any physical, chemical, thermal, or biological process and any co-production project. This term does not include pressure maintenance or disposal projects.

(15) Facility closure --The point at which the operator of a geologic storage facility is released from post-injection storage facility care responsibilities.

(16) Formation fluid--Fluid present in a formation under natural conditions.

(17) Fracture pressure--The pressure that, if applied to a subsurface formation, would cause that formation to physically fracture.

(18) Geologic storage--The long-term containment of anthropogenic carbon dioxide in a reservoir.

(19) Geologic storage facility or storage facility--The underground reservoir, underground equipment, injection wells, and surface buildings and equipment used or to be used for the geologic storage of anthropogenic carbon dioxide and all surface and subsurface rights and appurtenances necessary to the operation of a facility for the geologic storage of anthropogenic carbon dioxide. The term includes any reasonable and necessary areal buffer, subsurface monitoring zones, and pressure fronts. The term does not include a pipeline used to transport carbon dioxide from the facility at which the carbon dioxide is captured to the geologic storage facility. The storage of carbon dioxide incidental to or as part of enhanced recovery operations does not in itself automatically render a facility a geologic storage facility.

(20) Groundwater conservation district--Any district or authority created under Texas Constitution, Article III, §52, or Texas Constitution, Article XVI, §59, that has the authority to regulate the spacing of water wells, the production from water wells, or both.

(21) Injection zone--A geologic formation, group of formations, or part of a formation that is of sufficient areal extent, thickness, porosity, and permeability to receive carbon dioxide through a well or wells associated with a geologic storage facility.

(22) Mechanical integrity--An anthropogenic carbon dioxide injection well has

mechanical integrity if:

(A) there is no leak in the casing, tubing, or packer; and

(B) there is no fluid movement into a stratum containing an underground source of drinking water through channels adjacent to the injection well bore as a result of operation of the injection well.

(23) Monitoring well-- A well either completed or re-completed for the purpose of observing subsurface phenomena, including the presence of anthropogenic carbon dioxide, pressure fluctuations, fluid levels and flow, temperature, and in situ water chemistry.

(24) Operator--A person, acting for himself or as an agent for others, designated to the Railroad Commission of Texas as the person with responsibility for complying with the rules and regulations regarding the permitting, physical operation, closure, and post-closure care of a geologic storage facility, or such person's authorized representative.

(25) Person--A natural person, corporation, organization, government, governmental subdivision or agency, business trust, estate, trust, partnership, association, or any other legal entity.

(26) Pollution--Alteration of the physical, chemical, or biological quality of, or the contamination of, water that makes it 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.

(27) Post-injection facility care--Monitoring and other actions (including corrective action) needed following cessation of injection to assure that underground sources of drinking water are not endangered and that the anthropogenic carbon dioxide remains confined to the permitted injection interval.

(28) Pressure front--The zone of elevated pressure that is created by the injection of the carbon dioxide stream into the subsurface where there is a pressure differential sufficient to cause movement of the carbon dioxide stream or formation fluids from the injection zone into a

underground source of drinking water.

(29) Reservoir--A natural or artificially created subsurface sedimentary stratum, formation, aquifer, cavity, void, or coal seam.

(30) Transmissive fault or fracture--A fault or fracture that has sufficient permeability and vertical extent to allow fluids to move beyond the confining zone.

(31) Underground source of drinking water--An aquifer or its portion which is not an exempt aquifer as defined in 40 Code of Federal Regulations §146.4 and which:

(A) supplies any public water system; or

(B) contains a sufficient quantity of ground water to supply a public water system; and

(i) currently supplies drinking water for human consumption; or

(ii) contains fewer than 10,000 mg/l total dissolved solids.

(32) Well stimulation--Any of several processes used to clean the well bore, enlarge channels, and increase pore space in the interval to be injected thus making it possible for fluid to move more readily into the formation including, but not limited to, surging, jetting, blasting, acidizing, and hydraulic fracturing.

(33) Workover--An operation in which a down-hole component of a well is repaired or the engineering design of the well is changed. Workovers include operations such as sidetracking, the addition of perforations within the permitted injection interval, and the addition of liners or patches. For the purposes of this chapter, workovers do not include well stimulation operations.

SUBCHAPTER B. Geologic Storage and Associated Injection of Anthropogenic Carbon Dioxide.

§5.201. Applicability and Compliance.

(a) This subchapter applies to the geologic storage of anthropogenic carbon dioxide in, and the injection of anthropogenic carbon dioxide into, a reservoir that is initially or may be productive

of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir. A saline formation that is directly above or below a reservoir that may be productive means a geologic formation containing saline fluids that is located immediately above the confining zone of a reservoir or that is located immediately below the bottom confining zone of such a reservoir. A reservoir that may be productive means an identifiable geologic unit that has had production in the past, which is similar to productive or previously productive reservoirs along the same or a similar trend, or potentially contains oil, gas, or geothermal resources based on analysis of geophysical and/or seismic data.

(b) This subchapter applies to a well that is authorized as or converted to an anthropogenic carbon dioxide injection well for geologic storage.

(c) This subchapter does not apply to the injection of fluid through the use of an injection well regulated under §3.46 of this title (relating to Fluid Injection into Productive Reservoirs) for the primary purpose of enhanced recovery operations from which there is reasonable expectation of more than insignificant future production volumes of oil, gas, or geothermal energy and operating pressures are no higher than reasonably necessary to produce such volumes or rates. However, the operator of an enhanced recovery project may propose to also permit the enhanced recovery project as a carbon dioxide geologic storage facility simultaneously.

(d) If a provision of this subchapter conflicts with any provision or term of a Commission order or permit, the provision of such order or permit controls.

(e) The operator of a geologic storage facility must comply with the requirements of this subchapter as well as with all other applicable Commission rules and orders, including the requirements of Chapter 8 of this title (relating to Pipeline Safety Regulations) for pipelines and associated facilities.

§5.202. Permit Required.

(a) Permit required. A person may not begin drilling or operating an anthropogenic carbon

dioxide injection well for geologic storage or constructing or operating a geologic storage facility regulated under this subchapter without first obtaining the necessary permits from the Commission.

(b) Permit amendment.

(1) An operator must file an application to amend an existing geologic storage facility permit with the director:

(A) prior to expanding the areal extent of the storage reservoir;

(B) prior to increasing the injection pressure;

(C) prior to adding injection wells; or

(D) at any time that conditions at the geologic storage facility materially deviate from the conditions specified in the permit or permit application.

(2) Compliance with plan amendments required by this subchapter does not necessarily constitute a material deviation in conditions.

(c) Permit transfer. An operator may transfer its geologic storage facility permit to another operator if the requirements of this subsection are met. A new operator may not begin operating the geologic storage facility without a valid permit.

(1) Notice. An applicant must submit written notice of an intended permit transfer to the director at least 60 days prior to the date the transfer is proposed to take place.

(A) The applicant's notice to the director must contain all of the following:

(i) the name and address of the person to whom the geologic storage facility will be sold, assigned, transferred, leased, conveyed, exchanged, or otherwise disposed;

(ii) the name and location of the geologic storage facility and a legal description of the land upon which the storage facility is situated;

(iii) the date that the sale, assignment, transfer, lease conveyance, exchange, or other disposition is proposed to become final; and

(iv) the date that the transferring operator will relinquish possession

as a result of the sale, assignment, transfer, lease conveyance, exchange, or other disposition.

(B) The person acquiring a geologic storage facility, whether by purchase, transfer, assignment, lease, conveyance, exchange, or other disposition, must notify the director in writing of the acquisition as soon as it is reasonably possible but not later than the date that the acquisition of the geologic storage facility becomes final. The director may not approve the transfer of a geologic storage facility permit until the new operator provides all of the following:

(i) the name and address of the operator from which the geologic storage facility was acquired;

(ii) the name and location of the geologic storage facility and a description of the land upon which the geologic storage facility is situated;

(iii) the date that the acquisition became or will become final;

(iv) the date that possession was or will be acquired; and

(v) the financial assurance required by this subchapter.

(2) Evidence of financial responsibility. The operator acquiring the permit must provide the director with evidence of financial responsibility satisfactory to the director in accordance with §5.205 of this subchapter (relating to Fees and Financial Assurance).

(3) Transfer of responsibility. An operator remains responsible for the geologic storage facility until the director approves in writing the sale, assignment, transfer, lease, conveyance, exchange, or other disposition and the person acquiring the storage facility complies with all applicable requirements.

(d) Modification, cancellation, or suspension of a geologic storage facility permit.

(1) General. The director may modify, suspend, or cancel a geologic storage facility permit after notice and opportunity for hearing under any of the following circumstances:

(A) There is a material change in conditions in the operation of the geologic storage facility, or there are material deviations from the information originally furnished to the director. A change in conditions at a facility that does not affect the ability of the facility to operate

without causing a release of carbon dioxide is not considered to be material;

(B) Underground sources of drinking water are likely to be polluted as a result of the continued operation of the geologic storage facility;

(C) There are material violations of the terms and provisions of the permit or of applicable Commission orders or regulations;

(D) The operator misrepresented material facts during the permit application or issuance process; or

(E) Injected fluids are escaping or are likely to escape from the geologic storage facility.

(2) Imminent danger. Notwithstanding the provisions of paragraph (1) of this subsection, in the event of an emergency that presents an imminent danger to life or property, or an imminent threat of uncontrolled escape of carbon dioxide, or an imminent threat of pollution, the director may immediately order suspension of the operation of the geologic storage facility until a final order is issued pursuant to a hearing, if any.

§5.203. Application Requirements.

(a) General.

(1) Form and filing. Each applicant for a permit to construct and operate a geologic storage facility must file an application with the division in Austin on a form prescribed by the Commission. The applicant must file one copy of the application and all attachments with the division in an electronic format. On the same date, the applicant must file one copy with the appropriate district office(s) and one copy with the Executive Director of the Texas Commission on Environmental Quality. An applicant must ensure that the application is executed by a party having knowledge of the facts entered on the form and included in the required attachments. A professional geoscientist or engineer, as appropriate, must conduct the geologic and hydrologic evaluations required under this section and must affix the appropriate seal on the resulting reports

of such evaluations.

(2) General information. On the application, the applicant must include the name, mailing address, and location of the facility for which the application is being submitted and the operator's name, address, telephone number, Commission Organization Report number, and ownership of the facility.

(3) Application completeness. The Commission may not issue a permit before receiving a complete application. A permit application is complete when the director determines that the application contains information addressing each application requirement of the regulatory program and all information necessary to initiate the final review by the director.

(4) Reports. An applicant must ensure that all descriptive reports are prepared by a qualified and knowledgeable person and include an interpretation of the results of all logs, surveys, sampling, and tests required in this subchapter. A professional geoscientist or engineer, as appropriate and necessary, must conduct the logging, sampling, and testing required under this subchapter and affix the appropriate seal on the resulting reports. The applicant must include in the application a quality assurance and surveillance plan for all testing and monitoring, which includes, at a minimum, validation of the analytical laboratory data, calibration of field instruments, and an explanation of the sampling and data acquisition techniques.

(b) Surface map and information. Only information of public record is required to be included on this map.

(1) The applicant must file with the director a surface map delineating the proposed location(s) of injection well(s) and the boundary of the geologic storage facility for which a permit is sought and the applicable area of review.

(2) The applicant must show within the area of review on the map the number or name and the location of:

(A) all known artificial penetrations through the confining zone, including injection wells, producing wells, inactive wells, plugged wells, or dry holes;

(B) the locations of cathodic protection holes, subsurface cleanup sites, bodies of surface water, springs, surface and subsurface mines, quarries, and water wells; and

(C) other pertinent surface features, including pipelines, roads, and structures intended for human occupancy.

(3) The applicant must identify on the map any known or suspected faults expressed at the surface.

(c) Geologic, geochemical, and hydrologic information.

(1) The applicant must submit a descriptive report prepared by a knowledgeable person that includes an interpretation of the results of appropriate logs, surveys, sampling, and testing sufficient to determine the depth, thickness, porosity, permeability, and lithology of, and the geochemistry of any formation fluids in, all relevant geologic formations.

(2) The applicant must submit information on the geologic structure and reservoir properties of the proposed storage reservoir and overlying formations, including the following information:

(A) geologic and topographic maps and cross sections illustrating regional geology, hydrogeology, and the geologic structure of the area from the ground surface to the base of the injection zone within the area of review that indicate the general vertical and lateral limits of all underground sources of drinking water within the area of review, their positions relative to the storage reservoir and the direction of water movement, where known;

(B) the depth, areal extent, thickness, mineralogy, porosity, permeability and capillary pressure of, and the geochemistry of any formation fluids in, the storage reservoir and confining zone and any other relevant geologic formations, including geology/facies changes based on field data, which may include geologic cores, outcrop data, seismic surveys, well logs, and lithologic descriptions, and the analyses of logging, sampling, and testing results used to make such determinations;

(C) the location, orientation, and properties of known or suspected

transmissive faults or fractures that may transect the confining zone within the area of review and a determination that such faults or fractures would not compromise containment;

(D) the seismic history, including the presence and depth of seismic sources, and a determination that the seismicity would not compromise containment;

(E) geomechanical information on fractures, stress, ductility, rock strength, and in situ fluid pressures within the confining zone;

(F) a description of the formation testing program and the analytical results to determine the chemical and physical characteristics, including the fracture pressures, of the injection zone and the confining zone; and

(G) baseline geochemical data for subsurface formations that will be used for monitoring purposes, including all formations containing underground sources of drinking water within the area of review.

(d) Area of review and corrective action. This subsection describes the standards for the information regarding the delineation of the area of review, the identification of penetrations, and corrective action that an applicant must include in an application.

(1) Initial delineation of the area of review and initial corrective action. The applicant must delineate the area of review, identify all wells that require corrective action, and perform corrective action on those wells. Corrective action may be phased.

(A) Delineation of area of review.

(i) Using computational modeling and the proposed pressure and volume of carbon dioxide injection, the applicant must predict the lateral and vertical migration of the carbon dioxide plume, the formation fluids, and the pressure differentials sufficient to cause movement of injected fluids or formation fluids into an underground source of drinking water in the subsurface for the following time periods:

(I) five years after initiation of injection;

(II) from initiation of injection to the end of the injection

period proposed by the applicant; and

(III) from initiation of injection to 10 years after the end of the injection period proposed by the applicant.

(ii) The applicant must use a computational model that:

(I) is based on geologic and reservoir engineering information collected to characterize the injection zone and the confining zone;

(II) is based on anticipated operating data, including injection pressures, rates, and total volumes over the proposed duration of injection;

(III) takes into account relevant geologic heterogeneities and data quality, and their possible impact on model predictions;

(IV) considers the physical and chemical properties of injected and formation fluids; and

(V) considers potential migration through known faults, fractures, and artificial penetrations and beyond lateral spill points.

(iii) The applicant must provide the name and a description of the software, the assumptions used to determine the area of review, and the equations solved.

(B) Identification and table of penetrations. The applicant must identify, compile, and submit a table listing of, all known or reasonably discoverable penetrations, including active, inactive, plugged, and unplugged wells and underground mines in the area of review that may penetrate the confining zone. The applicant must provide a description of each penetration's type, construction, date drilled or excavated, location, depth, and record of plugging and/or completion or closure.

(C) Corrective action. The applicant must demonstrate whether each of the wells on the table of penetrations has or has not been plugged and whether each of the underground mines on the table of penetrations has or has not been closed in a manner that prevents the movement of injected fluids or displaced formation fluids that may endanger underground sources

of drinking water or allow the injected fluids or formation fluids to escape the permitted injection zone. The applicant must perform corrective action on all wells and underground mines in the area of review that are determined to need corrective action. The operator must perform corrective action using materials suitable for use with the carbon dioxide stream. Corrective action may be phased.

(2) Area of review and corrective action plan. As part of an application, the applicant must submit an area of review and corrective action plan that includes the following information:

(A) the method for delineating the area of review, including the model to be used, assumptions that will be made, and the site characterization data on which the model will be based;

(B) for the area of review, a description of:

(i) the minimum frequency at which the applicant proposes to re-evaluate the area of review during the life of the geologic storage facility;

(ii) how monitoring and operational data will be used to re-evaluate the area of review; and

(iii) the monitoring and operational conditions that would warrant a reevaluation of the area of review prior to the next scheduled reevaluation;

(C) a corrective action plan that describes:

(i) how the corrective action will be conducted;

(ii) how corrective action will be adjusted if there are changes in the area of review;

(iii) if a phased corrective action is planned, how the phasing will be determined; and

(iv) how site access will be secured for future corrective action.

(e) Injection well construction.

(1) Criteria for construction of anthropogenic carbon dioxide injection wells. This paragraph establishes the criteria for the information about the construction and casing and cementing of, and special equipment for, anthropogenic carbon dioxide injection wells that an applicant must include in an application.

(A) General. The operator of a geologic storage facility must ensure that all anthropogenic carbon dioxide injection wells are constructed and completed in a manner that will:

(i) prevent the movement of injected carbon dioxide or displaced formation fluids into any unauthorized zones or into any areas where they could endanger underground sources of drinking water;

(ii) allow the use of appropriate testing devices and workover tools;
and

(iii) allow continuous monitoring of the annulus space between the injection tubing and long string casing.

(B) Casing and cementing of anthropogenic carbon dioxide injection wells.

(i) The operator must ensure that injection wells are cased and the casing cemented in compliance with §3.13 of this title (relating to Casing, Cementing, Drilling, and Completion Requirements).

(ii) Casing, cement, cement additives, and/or other materials used in the construction of each injection well must have sufficient structural strength and must be of sufficient quality and quantity to maintain integrity over the design life of the injection well. All well materials must be suitable for use with fluids with which the well materials may be expected to come into contact and must meet or exceed test standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards as approved by the director.

(iii) Surface casing must extend through the base of the lowermost underground source of drinking water above the injection zone and must be cemented to the

surface.

(iv) At least one long string casing, using a sufficient number of centralizers, must extend through the injection zone. The long string casing must isolate the injection zone and other intervals as necessary for the protection of underground sources of drinking water and to ensure confinement of the injected and formation fluids to the permitted injection zone using cement and/or other isolation techniques.

(v) Circulation of cement may be accomplished by staging. The director may approve an alternative method of cementing in cases where the cement cannot be circulated to the surface, provided the applicant can demonstrate by using logs that the cement does not allow fluid movement between the casing and the well bore.

(vi) The applicant must verify the integrity and location of the cement using technology capable of radial evaluation of cement quality and identification of the location of channels to ensure that underground sources of drinking water will not be endangered.

(vii) The director may exempt existing wells that have been associated with injection of carbon dioxide for the purpose of enhanced recovery from provisions of these casing and cementing requirements if the applicant demonstrates that the well construction meets the general performance criteria in subsection (e)(1)(A) of this section.

(C) Special equipment.

(i) Tubing and packer. All injection wells must inject fluids through tubing set on a mechanical packer. Packers must be set no higher than 100 feet above the top of the permitted injection interval or at a location approved by the director.

(ii) Pressure observation valve. The wellhead of each injection well must be equipped with a pressure observation valve on the tubing and each annulus of the well.

(2) Construction information. The applicant must provide the following information for each well to allow the director to determine whether the proposed well construction and completion design will meet the general performance criteria in paragraph (1) of this subsection:

(A) depth to the injection zone;

(B) hole size;

(C) size and grade of all casing and tubing strings (e.g., wall thickness, external diameter, nominal weight, length, joint specification and construction material, tubing tensile, burst, and collapse strengths);

(D) proposed injection rate (intermittent or continuous), maximum proposed surface injection pressure, and maximum proposed volume of the carbon dioxide stream;

(E) type of packer and packer setting depth;

(F) a description of the capability of the materials to withstand corrosion when exposed to a combination of the carbon dioxide stream and formation fluids;

(G) down-hole temperatures and pressures;

(H) lithology of injection and confining zones;

(I) type or grade of cement and additives;

(J) chemical composition and temperature of the carbon dioxide stream; and

(K) schematic drawings of the surface and subsurface construction details.

(3) Well construction plan. The applicant must submit an injection well construction plan that meets the criteria in paragraph (1) of this subsection.

(4) Well stimulation plan. The applicant must submit, as applicable, a description of the proposed well stimulation program and a determination that well stimulation will not compromise containment.

(f) Plan for logging, sampling, and testing of injection wells after permitting but before injection. The applicant must submit a plan for logging, sampling, and testing of each injection well after permitting but prior to injection well operation. The plan must describe the logs, surveys, and tests to be conducted to verify the depth, thickness, porosity, permeability, and lithology of, and the salinity of any formation fluids in, the formations that are to be used for monitoring, storage, and confinement to assure conformance with the injection well construction requirements set forth in

subsection (e) of this section, and to establish accurate baseline data against which future measurements may be compared. The plan must meet the following criteria and must include the following information.

(1) Logs and surveys of the injection well.

(A) During the drilling of any hole that is constructed by drilling a pilot hole that is enlarged by reaming or another method, the operator must perform deviation checks at sufficiently frequent intervals to determine the location of the borehole and to assure that vertical avenues for fluid movement in the form of diverging holes are not created during drilling.

(B) Before surface casing is installed, the operator must run appropriate logs, such as resistivity, spontaneous potential, and caliper logs.

(C) After each casing string is set and cemented, the operator must run logs, such as a cement bond log, variable density log, and a temperature log, to ensure proper cementing.

(D) Before long string casing is installed, the operator must run logs appropriate to the geology, such as resistivity, spontaneous potential, porosity, caliper, gamma ray, and fracture finder logs, to gather data necessary to verify the characterization of the geology and hydrology.

(2) Testing and determination of hydrogeologic characteristics of injection and confining zone.

(A) Upon injection well completion, but prior to operation, the operator must conduct tests to verify hydrogeologic characteristics of the injection zone.

(B) The operator must perform an initial pressure fall-off or other test and submit to the director a written report of the results of the test, including details of the methods used to perform the test and to interpret the results, all necessary graphs, and the testing log, to verify permeability and injectivity.

(C) The operator must determine the fracture pressures for the injection and confining zone.

(3) Sampling.

(A) The operator must record and submit the formation fluid temperature, pH, and conductivity, the reservoir pressure, and the static fluid level of the injection zone.

(B) The operator must submit analyses of whole cores or sidewall cores representative of the injection zone and confining zone and formation fluid samples from the injection zone. The director may accept data from cores and fluid samples from nearby wells if the operator can demonstrate that such data are representative of conditions at the proposed injection well.

(g) Compatibility determination. Based on the results of the formation testing program required by subsection (f) of this section, the applicant must submit a determination of the compatibility of the carbon dioxide stream with:

(1) the materials to be used to construct the well;

(2) fluids in the injection zone; and

(3) minerals in both the injection and the confining zone.

(h) Mechanical integrity testing.

(1) Criteria. This paragraph establishes the criteria for the mechanical integrity testing plan for anthropogenic carbon dioxide injection wells that an applicant must include in an application.

(A) Other than during periods of well workover in which the sealed tubing-casing annulus is of necessity disassembled for maintenance or corrective procedures, the operator must maintain mechanical integrity of the injection well at all times.

(B) Before beginning injection operations and at least once every five years thereafter, the operator must demonstrate mechanical integrity for each injection well by pressure testing the tubing-casing annulus.

(C) Following an initial annulus pressure test, the operator must continuously monitor injection pressure, rate, injected volumes, and pressure on the annulus

between tubing and long string casing to confirm that the injected fluids are confined to the injection zone.

(D) At least once every five years, the operator must confirm that the injected fluids are confined to the injection zone using a method approved by the director (e.g., diagnostic surveys such as oxygen-activation logging or temperature or noise logs).

(E) The operator must test injection wells after any workover that disturbs the seal between the tubing, packer, and casing in a manner that verifies mechanical integrity of the tubing and long string casing.

(F) An operator must either repair and successfully retest or plug a well that fails a mechanical integrity test.

(2) Mechanical integrity testing plan. The applicant must prepare and submit a mechanical integrity testing plan as part of a permit application. The plan must include a schedule for the performance of a series of tests at a minimum frequency of five years. The performance tests must be designed to demonstrate the internal and external mechanical integrity of each injection well. These tests may include:

(A) a pressure test with liquid or inert gas;

(B) a tracer survey such as oxygen-activation logging;

(C) a temperature or noise log;

(D) a casing inspection log; and/or

(E) any alternative method that provides equivalent or better information

and that are required and/or approved by the director.

(i) Operating information.

(1) Operating plan. The applicant must submit a plan for operating the injection wells and the geologic storage facility that complies with the criteria set forth in §5.206(c) of this title (relating to Permit Standards), and that outlines the steps necessary to conduct injection operations. The applicant must include the following proposed operating data in the plan:

(A) the average and maximum daily injection rates and volumes of the carbon dioxide stream;

(B) the average and maximum surface injection pressure;

(C) the source(s) of the carbon dioxide stream and the volume of carbon dioxide from each source; and

(D) an analysis of the chemical and physical characteristics of the carbon dioxide stream prior to injection.

(2) Maximum injection pressure. The director will approve a maximum injection pressure limit that:

(A) considers the risks of tensile failure and, where appropriate, geomechanical or other studies that assess the risk of tensile failure and shear failure;

(B) with a reasonable degree of certainty will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults transecting the confining zone to become transmissive; and

(C) in no case may cause the movement of injection fluids or formation fluids in a manner that endangers underground sources of drinking water.

(j) Plan for monitoring, sampling, and testing after initiation of operation. The applicant must submit a monitoring, sampling, and testing plan for verifying that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone. The plan must include the following:

(1) the analysis of the carbon dioxide stream prior to injection with sufficient frequency to yield data representative of its chemical and physical characteristics;

(2) the installation and use of continuous recording devices to monitor injection pressure, rate and volume; and the pressure on the annulus between the tubing and the long string casing, except during workovers;

(3) after initiation of injection, the performance on a semi-annual basis of corrosion

monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion to ensure that the well components meet the minimum standards for material strength and performance set forth in subsection (e)(1)(A) of this section. The operator must report the results of such monitoring annually. Corrosion monitoring may be accomplished by:

(A) analyzing coupons of the well construction materials in contact with the carbon dioxide stream;

(B) routing the carbon dioxide stream through a loop constructed with the materials used in the well and inspecting the materials in the loop; or

(C) using an alternative method, materials, or time period approved by the director;

(4) monitoring of reservoir formation fluid and ground water quality and geochemical changes, including:

(A) periodic sampling of the fluid temperature, pH, conductivity, reservoir pressure and static fluid level of the injection zone and for monitoring for pressure changes in a permeable and porous formation as near to and above the confining zone;

(B) periodic monitoring of the quality and geochemistry of the formation fluid in a permeable and porous formation as near to and above the confining zone to detect any movement of the injected carbon dioxide through the confining zone into that monitored formation;

(C) the location and number of monitoring wells justified on the basis of the area of review, injection rate and volume, geology, and the presence of artificial penetrations and other factors specific to the geologic storage facility; and

(D) the monitoring frequency and spatial distribution of monitoring wells based on baseline geochemical data collected under subsection (c)(2) of this section and any modeling results in the area of review evaluation;

(5) tracking the extent of the carbon dioxide plume and the position of the pressure front by using indirect, geophysical techniques, which may include seismic, electrical, gravity, or

electromagnetic surveys and/or down-hole carbon dioxide detection tools; and

(6) additional monitoring as the director may determine to be necessary to support, upgrade, and improve computational modeling of the area of review evaluation and to determine compliance with the requirements that the injection activity not allow the movement of fluid containing any contaminant into underground sources of drinking water and that the injected fluid remain within the permitted interval.

(k) Well plugging plan. The applicant must submit a well plugging plan for all injection wells and monitoring wells that penetrate the base of usable quality water that includes:

(1) a proposal for plugging all monitoring wells that penetrate the base of usable quality water and all injection wells upon abandonment in accordance with §3.14 of this title (relating to Plugging);

(2) proposals for activities to be undertaken prior to plugging an injection well, specifically:

(A) flushing each injection well with a buffer fluid;

(B) performing tests or measures to determine bottomhole reservoir pressure;

(C) performing final tests to assess mechanical integrity; and

(D) ensuring that the material to be used in plugging must be compatible with the carbon dioxide stream and the formation fluids;

(3) a proposal for giving notice of intent to plug monitoring wells that penetrate the base of usable quality water and all injection wells. The applicant's plan must ensure that:

(A) the operator notifies the director at least 60 days before plugging a well.

At this time, if any changes have been made to the original well plugging plan, the operator must also provide a revised well plugging plan. At the discretion of the director, an operator may be allowed to proceed with well plugging on a shorter notice period; and

(B) the operator will file a notice of intention to plug and abandon (Form

W-3A) a well with the appropriate Commission district office and the division in Austin at least five days prior to the beginning of plugging operations;

(4) a plugging report for monitoring wells that penetrate the base of usable quality water and all injection wells. The applicant's plan must ensure that within 30 days after plugging the operator will file a complete well plugging record (Form W-3) in duplicate with the appropriate district office. The operator and the person who performed the plugging operation (if other than the operator) must certify the report as accurate;

(5) a plan for plugging all monitoring wells that do not penetrate the base of usable quality water in accordance with 16 Tex. Admin. Code Chapter 76, relating to Water Well Drillers and Water Well Plump Installers; and

(6) a plan for certifying that all monitoring wells that do not penetrate the base of usable quality water will be plugged in accordance with 16 Tex. Admin. Code Chapter 76, relating to Water Well Drillers and Water Well Plump Installers.

(l) Emergency and remedial response plan. The applicant must submit an emergency and remedial response plan that:

(1) accounts for the entire area of review, regardless of whether or not corrective action in the area of review is phased;

(2) describes actions to be taken to address escape from the permitted injection interval or movement of the injection fluids or formation fluids that may cause an endangerment to underground sources of drinking water during construction, operation, closure and post-closure periods;

(3) includes plans to update the plan as changes require;

(4) includes a safety plan that includes emergency response procedures, provisions to provide security against unauthorized activity, and carbon dioxide release detection and prevention measures; and

(5) includes a description of the training and testing that will be provided to each

employee at the storage facility on operational safety and emergency response procedures to the extent applicable to the employee's duties and responsibilities. The operator must train all employees before commencing injection and storage operations at the facility. The operator must train each subsequently hired employee before that employee commences work at the storage facility. The operator must hold a safety meeting with each contractor prior to the commencement of any new contract work at a storage facility. Emergency measures specific to the contractor's work must be explained in the contractor safety meeting. Training schedules, training dates, and course outlines must be provided to Commission personnel upon request for the purpose of Commission review to determine compliance with this subparagraph.

(m) Financial responsibility. The applicant must demonstrate that it has met the financial responsibility requirements under §5.205 of this title (relating to Fees and Financial Assurance). The applicant's demonstration of financial responsibility must account for the entire area of review, regardless of whether corrective action in the area of review is phased.

(1) The applicant must demonstrate financial responsibility and resources for corrective action, injection well plugging, post-injection storage facility care and storage facility closure, and emergency and remedial response until the director has provided to the operator a written verification that the director has determined that the facility has reached the end of the post-injection storage facility care period.

(2) In determining whether the applicant is financially responsible, the director must rely on the following:

(A) the person's most recent audited annual report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78(d)). The date of the audit may not be more than one year before the date of submission of the application to the division; and

(B) the person's most recent quarterly report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C.

Section 78m or 78o(d); or

(C) if the person is not required to file such a report, the person's most recent audited financial statement. The date of the audit must not be more than one year before the date of submission of the application to the division.

(n) Post-injection storage facility care and closure plan. The applicant must submit a post-injection storage facility care and closure plan. The plan must include:

(1) the pressure differential between pre-injection and predicted post-injection pressures in the injection zone;

(2) the predicted position of the carbon dioxide plume and associated pressure front at closure as demonstrated in the area of review evaluation required under subsection (d) of this section;

(3) a description of the proposed post-injection monitoring location, methods, and frequency;

(4) a proposed schedule for submitting post-injection storage facility care monitoring results to the division; and

(5) the estimated cost of proposed post-injection storage facility care and closure.

(o) Letter from the Texas Commission on Environmental Quality. The applicant must submit a letter from the Executive Director of the Texas Commission on Environmental Quality in accordance with Texas Water Code, §27.046, stating that drilling and operating the anthropogenic carbon dioxide injection well for geologic storage or operating the geologic storage facility will not injure any freshwater strata in that area and that the formation or stratum to be used for the geologic storage facility is not freshwater stratum.

(p) Other information. The applicant must submit any other information requested by the director as necessary to discharge the Commission's duties under Texas Water Code, Chapter 27, Subchapter B-1, or deemed necessary by the director to clarify, explain, and support the required attachments.

§5.204. Notice, Hearing, and Public Meeting.

(a) Placement of copy of application for public inspection. The applicant must make a complete copy of the permit application available for the public to inspect and copy by filing a copy of the application with the County Clerk at the courthouse of each county where the storage facility is to be located, or if approved by the director, at another equivalent public office. The applicant also must provide a copy of the complete application on an Internet website. The applicant must file any subsequent revision of the application with the County Clerk or other approved public office and must update the information on the Internet website at the same time the revision is submitted to the Commission.

(b) Notice requirements.

(1) General notice by publication. To give general notice to local governments and interested or affected persons, the applicant must publish notice of the application for an original or amended storage facility permit. The applicant must use the appropriate form of notice, include the information as set forth in subparagraph (A) or (B) of this paragraph, and cause the notice to be published once a week for three consecutive weeks in each newspaper of general circulation in each county where the storage facility is located or is to be located. The applicant must file proof of publication of the notice with the application.

(A) Form for notice by publication of an application for an anthropogenic carbon dioxide geologic storage facility permit.

**NOTICE OF PERMIT APPLICATION
FOR A MAN-MADE CARBON DIOXIDE GEOLOGIC STORAGE FACILITY**

[Company name and address] is applying to the Railroad Commission of Texas for a permit to create, operate, or maintain an anthropogenic carbon dioxide geologic storage facility. The applicant proposes to geologically store man-made carbon dioxide in the [formation name]; [lease name]; [well number(s)]. The proposed facility will be located at [address]; approximately [direction and number of miles from nearest town] in the [field name] in [County or Counties]. The legal description of the property is as follows: [legal description, including section/survey/abstract]. The geologic storage reservoir will be located in the subsurface depth interval from _____ to _____ feet.

The following map shows the location of the proposed facility. [Include a United States Geological Survey 7.5-minute quadrangle map or maps showing towns; rivers, streams, or other bodies of water; local landmarks; and any other information, including routes, streets, or roads and accurate distance measurements necessary to allow local residents to readily identify the proposed location of the facility; showing the exact location and boundaries of the proposed facility; stating the name of the United States Geological Survey 7.5-minute quadrangle map(s) that contains the area shown or described; and indicating the north direction.]

A copy of the application is available for public inspection in the clerk's office in the [name of each county] County courthouse [address of each courthouse] and online at [website address].

LEGAL AUTHORITY: Texas Natural Resources Code, Title 3, and the Railroad Commission's Oil and Gas Division Rules (Statewide Rules) at 16 Tex. Admin. Code, Chapters 3 and 5.

Requests for more information about the application may be made to: Technical Permitting Section, Oil and Gas Division, Railroad Commission of Texas, P.O. Box 12967, Austin, Texas 78711, (512) 463-6760. Persons who can show they may be adversely affected by the proposed storage facility may request a public hearing on the application. Such a request must be in writing and received within 30 days of the last date of publication of this notice. Requests for hearing should be sent to the Technical Permitting Section at the address above.

(B) Form for notice by publication of an application for amendment of an existing carbon dioxide geologic storage facility permit.

NOTICE OF APPLICATION TO AMEND A PERMIT
FOR A MAN-MADE CARBON DIOXIDE GEOLOGIC STORAGE FACILITY

[Company name and address] is applying to the Railroad Commission of Texas for a amendment to an existing man-made carbon dioxide geologic storage facility permit. The applicant is storing man-made carbon dioxide in the [formation name]; [lease name]; [well number(s)]. The facility is located at [address]; approximately [direction and number of miles from nearest town] in the [field name] in [County or Counties]. The legal description of the property is as follows: [legal description, including section/survey/abstract]. The geologic storage reservoir is located in the subsurface depth interval from _____ to _____ feet.

The following map shows the location of the proposed facility. [Include a United States Geological Survey (USGS)7.5-minute quadrangle map or maps showing towns; rivers, streams, or other bodies of water; local landmarks; and any other information, including routes, streets, or roads and accurate distance measurements necessary to allow local residents to readily identify the proposed location of the facility; showing the exact location and boundaries of the proposed facility; stating

the name of the USGS 7.5-minute quadrangle map(s) that contains the area shown or described; and indicating the north direction.]

The purpose of the requested permit amendment is to [state the purpose of amendment].

A copy of the application is available for public inspection in the clerk's office in the [name of each county] County courthouse [address of each courthouse] and online at [website address].

LEGAL AUTHORITY: Texas Natural Resources Code, Title 3, and the Railroad Commission's Oil and Gas Division Rules (Statewide Rules) at 16 Tex. Admin. Code, Chapters 3 and 5.

Requests for more information about the application may be made to: Technical Permitting Section, Oil and Gas Division, Railroad Commission of Texas, P.O. Box 12967, Austin, Texas 78711, (512) 463-6760. Persons who can show they may be adversely affected by the proposed storage facility may request a public hearing on the application. Such a request must be in writing and received within 30 days of the last date of publication of this notice. Requests for hearing should be sent to the Technical Permitting Section at the address above.

(C) The applicant must submit proof of publication of notice

in the following form:

Affidavit of Publication

STATE OF TEXAS

COUNTY OF _____

Before me, the undersigned authority, on this day personally appeared [name of person], the [title of person] of the [name of newspaper], a newspaper having general circulation in [name(s) of county(ies)] County(ies), Texas, who being by me duly sworn, deposes and says that the foregoing attached notice was published in said newspaper on the following date(s), to wit: [list all dates of publication].

[signature of person]
[typed or printed name of person]

Subscribed and sworn to before me this the [day] of [month], [year], to certify which witness my hand and seal of office.

[signature of notary]
[typed or printed name of notary]

Notary Public in and for

[name of county] County, Texas.

(2) Individual notice.

(A) Persons to notify. By no later than the date the application is mailed to or filed with the director, the applicant must give notice of an application for a permit to operate a carbon dioxide storage facility, or to amend an existing storage facility permit to:

(i) each mineral interest owner, other than the applicant, of the proposed storage reservoir within one-half mile of the outmost boundary of the proposed geologic storage facility;

(ii) each leaseholder of minerals lying above or below the proposed storage reservoir;

(iii) each leaseholder of minerals offsetting the proposed storage reservoir within one-half mile of the outermost boundary of the proposed geologic storage facility;

(iv) each owner or leaseholder of any portion of the surface overlying the proposed storage reservoir and the area within one-half mile of the outermost boundary of the proposed geologic storage facility;

(v) the groundwater conservation district for the area in which the storage reservoir is located;

(vi) the clerk of the county or counties where the proposed storage reservoir is located;

(vii) the city clerk or other appropriate city official where the proposed storage reservoir is located within city limits; and

(viii) any other class of persons that the director determines should receive notice of the application.

(B) Content of notice. Individual notice must consist of:

(i) the applicant's intention to construct and operate an anthropogenic carbon dioxide geologic storage facility;

(ii) a description of the geologic storage facility location;

(iii) each physical location and the Internet address at which a copy of the application may be inspected; and

(iv) a statement that:

(I) affected persons may protest the application;

(II) protests must be filed in writing and must be mailed or delivered to Technical Permitting, Oil and Gas Division, Railroad Commission of Texas, P. O. Box 12967, Austin, Texas 78711; and

(III) protests must be received by the director within 30 days of the date of receipt of the application by the division, receipt of individual notice, or last publication of notice, whichever is later.

(3) Individual notice by publication. The applicant must make diligent efforts to ascertain the name and address of each person identified under subsection (b)(2)(A) of this section. The exercise of diligent efforts to ascertain the names and addresses of such persons requires an examination of county records where the facility is located and an investigation of any other information that is publicly and/or reasonably available to the applicant. If, after diligent efforts, an applicant has been unable to ascertain the name and address of one or more persons required to be notified under subsection (b)(2)(A) of this section, the applicant satisfies the notice requirements for those persons by the publication of the notice of application as required in subsection (b)(1) of this section. The applicant must submit an affidavit to the director specifying the efforts that the applicant took to identify each person whose name and/or address could not be ascertained.

(c) Hearing requirements.

(1) If the Commission receives a protest regarding an application for a new permit or for an amendment of an existing permit for a geologic storage facility from a person notified pursuant to subsection (b) of this section or from any other affected person within 30 days of the date of receipt of the application by the division, receipt of individual notice, or last publication of notice, whichever is later, or if the director determines that a hearing is in the public interest, then

the director will notify the applicant that the director cannot administratively approve the application. Upon the written request of the applicant, the director will schedule a hearing on the application. The Commission must give notice of the hearing to all affected persons, local governments, and other persons who express, in writing, an interest in the application. After the hearing, the examiner will recommend a final action by the Commission.

(2) If the Commission receives no protest regarding an application for a new permit or for the amendment of an existing permit for a geologic storage facility from a person notified pursuant to subsection (b) of this section or from any other affected person, the director may administratively approve the application.

(3) If the director administratively denies an application for a new permit or for the amendment of an existing permit for a geologic storage facility, upon the written request of the applicant, the director will schedule a hearing. After hearing, the examiner will recommend a final action by the Commission.

(d) Public meeting requirement. After the director has declared an application to be complete, the applicant must schedule a public meeting to be held in the area of the proposed location of the geologic storage facility.

(1) Purpose. The purpose of the meeting is to educate the local public about the proposed carbon dioxide geologic storage facility. At the public meeting, the applicant must give a brief presentation on geologic storage of carbon dioxide in general and on the proposed geologic storage facility. After the presentation, the applicant must allow time for questions from the participants.

(2) Notice. The applicant must send individual notice of this meeting to all persons listed in subsection (b)(2) and must publish notice of the public meeting for an original or amended storage facility permit application. Such notice must contain the same general information outlined in subsection (b)(1)(A) of this section and must be published by the applicant once a week for three consecutive weeks in a newspaper(s) of general circulation in the county(ies) where the storage

facility is located or is to be located. The applicant must notify the director by sending a copy of the notice as soon as possible. The applicant must file proof of publication of the notice with the director in the same format outlined in subsection (b)(1)(C) of this section.

§5.205. Fees and Financial Assurance.

(a) Fees. In addition to the fee for each injection well required by §3.78 of this title (relating to Fees and Financial Security Requirements), the following non-refundable fees must be remitted to the Commission with the application:

(1) Base application fee.

(A) The applicant must pay to the Commission an application fee of \$75,000 for each permit application for a geologic storage facility.

(B) The applicant must pay to the Commission an application fee of \$50,000 for each application to amend a permit for a geologic storage facility.

(2) Injection fee. The operator must pay to the Commission an annual fee of \$0.10 per metric ton of carbon dioxide injected into the geologic storage facility.

(3) Post-injection care fee. The operator must pay to the Commission an annual fee of \$50,000 each year the operator does not inject into the geologic storage facility until the director has authorized storage facility closure.

(b) Financial responsibility.

(1) A person to whom a permit is issued under this subchapter must provide annually to the director evidence of financial responsibility that is satisfactory to the director. The operator must demonstrate and maintain financial responsibility and resources for corrective action, injection well plugging, post-injection storage facility care and storage facility closure, and emergency and remedial response until the director has provided written verification that the director has determined that the facility has reached the end of the post-injection storage facility care period.

(2) In determining whether the person is financially responsible, the director must rely on:

(A) the person's most recent audited annual report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78o(d)); and

(B) the person's most recent quarterly report filed with the U. S. Securities and Exchange Commission under Section 13 or 15(d), Securities Exchange Act of 1934 (15 U.S.C. Section 78m or 78o(d)); or

(C) if the person is not required to file such a report, the person's most recent audited financial statement. The date of the audit must not be more than one year before the date of submission of the application to the director.

(c) Financial assurance.

(1) Injection and monitoring wells. The operator must comply with the requirements of §3.78 of this title (relating to Fees and Financial Security Requirements) for all monitoring wells that penetrate the base of usable quality water and all injection wells.

(2) Geologic storage facility.

(A) The applicant must include in an application for a geologic storage facility permit:

(i) a written estimate of the maximum dollar amount necessary to perform post-injection monitoring and closure of the facility that shows all assumptions and calculations used to develop the estimate;

(ii) a copy of the form of the bond or letter of credit that will be filed with the Commission; and

(iii) information concerning the issuer of the bond or letter of credit including the issuer's name and address and evidence of authority to issue bonds or letters of credit in Texas.

(B) A geologic storage facility may not receive carbon dioxide until a bond or letter of credit in an amount approved by the director under this subsection and meeting the requirements of this subsection as to form and issuer has been filed with and approved by the director.

(C) The determination of the amount of financial assurance for a geologic storage facility is subject to the following requirements:

(i) The director must approve the dollar amount of the financial assurance. The amount of financial assurance required to be filed under this subsection must be equal to or greater than the maximum amount necessary to perform post-injection monitoring and closure of the geologic storage facility, exclusive of plugging costs for any well or wells at the facility, at any time during the permit term in accordance with all applicable state laws, Commission rules and orders, and the permit;

(ii) A qualified professional engineer licensed by the State of Texas must prepare or supervise the preparation of a written estimate of the maximum amount necessary to close the geologic storage facility. The operator must submit to the director the written estimate under seal of a qualified licensed professional engineer; and

(iii) The Commission may use the proceeds of financial assurance filed under this subsection to pay the costs of plugging any well or wells at the facility if the financial assurance for plugging costs filed with the Commission is insufficient to pay for the plugging of such well or wells.

(D) Bonds and letters of credit filed in satisfaction of the financial assurance requirements for a geologic storage facility must comply with the following standards as to issuer and form.

(i) The issuer of any geologic storage facility bond filed in satisfaction of the requirements of this subsection must be a corporate surety authorized to do business in Texas. The form of bond filed under this subsection must provide that the bond be

renewed and continued in effect until the conditions of the bond have been met or its release is authorized by the director.

(ii) Any letter of credit filed in satisfaction of the requirements of this subsection must be issued by and drawn on a bank authorized under state or federal law to operate in Texas. The letter of credit must be an irrevocable, standby letter of credit subject to the requirements of Texas Business and Commerce Code, §§5.101-5.118. The letter of credit must provide that it will be renewed and continued in effect until the conditions of the letter of credit have been met or its release is authorized by the director.

(E) The operator of a geologic storage facility must provide to the director annual written updates of the cost estimate to increase or decrease the cost estimate to account for any changes to the area of review and corrective action plan, the injection well plugging plan, and the post-injection storage facility care and closure plan. The operator must provide to the director upon request an adjustment of the cost estimate if the director has reason to believe that the original demonstration is no longer adequate to cover the cost of injection well plugging and post-injection storage facility care and closure.

(d) Notice of adverse financial conditions.

(1) The operator must notify the Commission of adverse financial conditions that may affect the operator's ability to carry out injection well plugging and post-injection storage facility care and closure. An operator must file any notice of bankruptcy in accordance with §3.1(e) of this title (relating to Organization Report; Retention of Records; Notice Requirements.

(2) The operator filing a bond must ensure that the bond provides a mechanism for the bond or surety company to give prompt notice to the Commission and the operator of any action filed alleging insolvency or bankruptcy of the surety company or the bank or alleging any violation that would result in suspension or revocation of the surety or bank's charter or license to do business.

(3) Upon the incapacity of a bank or surety company by reason of bankruptcy,

insolvency or suspension, or revocation of its charter or license, the Commission must deem the operator to be without bond coverage. The Commission must issue a notice to any operator who is without bond coverage and must specify a reasonable period to replace bond coverage, not to exceed 90 days.

§5.206. Permit Standards.

(a) General criteria. The director may issue a permit under this subchapter if the director finds:

(1) that the injection and geologic storage of anthropogenic carbon dioxide will not endanger or injure any oil, gas, or other mineral formation;

(2) that, with proper safeguards, both underground sources of drinking water and surface water can be adequately protected from carbon dioxide migration or displaced formation fluids;

(3) that the injection of anthropogenic carbon dioxide will not endanger or injure human health and safety;

(4) that the reservoir into which the anthropogenic carbon dioxide is injected is suitable for or capable of being made suitable for protecting against the escape or migration of anthropogenic carbon dioxide from the storage reservoir;

(5) that the geologic storage facility will be sited in an area with suitable geology, which at a minimum must include:

(A) an injection zone of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the carbon dioxide stream; and

(B) a confining zone(s) that is laterally continuous and free of known transecting transmissive faults or fractures over an area sufficient to contain the injected carbon dioxide stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without compromising the confining zone or causing the movement of fluids that

endangers underground sources of drinking water;

(6) that the applicant for the permit meets all of the other statutory and regulatory requirements for the issuance of the permit;

(7) that the applicant has provided a letter from the Executive Director of the Texas Commission on Environmental Quality stating that drilling and operating the anthropogenic carbon dioxide injection well for geologic storage or operating the geologic storage facility will not injure any underground sources of drinking water in that area and that the formation or stratum to be used for the geologic storage facility is not an underground source of drinking water;

(8) that the applicant has provided a good faith claim to the necessary and sufficient property rights for construction and operation of the geologic storage facility;

(9) that the applicant has paid the fees required in §5.205(a) of this title (relating to Fees and Financial Assurance);

(10) that the director has determined that the applicant has sufficiently demonstrated financial responsibility as required in §5.205(b) of this title; and

(11) that the applicant submitted to the director financial assurance in accordance with §5.205(c) of this title.

(b) Injection well construction.

(1) Construction of anthropogenic carbon dioxide injection wells must meet the criteria in §5.203(e) of this title (relating to Application Requirements).

(2) Within 30 days after the completion or conversion of an injection well subject to this subchapter, the operator must file with the division a complete record of the well on the appropriate form showing the current completion.

(3) The operator of a geologic storage facility must notify the director and obtain the director's approval prior to conducting any well workover.

(c) Operating a geologic storage facility.

(1) Operating plan. The operator must maintain and comply with the approved

operating plan.

(2) Operating criteria.

(A) Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.

(B) The total volume of carbon dioxide injected into the storage facility must be metered through a master meter. The volume of carbon dioxide injected into each injection well must be metered through an individual well meter.

(C) The operator must comply with a maximum surface injection pressure limit approved by the director and specified in the permit. In approving a maximum surface injection pressure limit, the director must consider the results of well tests and, where appropriate, geomechanical or other studies that assess the risks of tensile failure and shear failure. The director must approve limits that, with a reasonable degree of certainty, will avoid initiation or propagation of fractures in the confining zone or cause otherwise non-transmissive faults or fractures transecting the confining zone to become transmissive. In no case may injection pressure cause movement of injection fluids or formation fluids in a manner that endangers underground sources of drinking water. The director may approve a plan for controlled artificial fracturing of the injection zone.

(D) The operator must fill the annulus between the tubing and the long string casing with a corrosion inhibiting fluid approved by the director.

(E) The operator must install and use continuous recording devices to monitor the injection pressure, and the rate, volume, and temperature of the carbon dioxide stream. The operator must monitor the pressure on the annulus between the tubing and the long string casing. The operator must continuously record, continuously monitor, or control by a preset high-low pressure sensor switch the wellhead pressure of each injection well.

(F) The operator must comply with the following requirements for alarms and automatic shut-off systems.

(i) The operator must install and use alarms and automatic shut-off systems designed to alert the operator and shut-in the well when operating parameters such as annulus pressure, injection rate or other parameters diverge from permitted ranges and/or gradients. On offshore wells, the automatic shut-off systems must be installed down-hole.

(ii) If an automatic shutdown is triggered or a loss of mechanical integrity is discovered, the operator must immediately investigate and identify as expeditiously as possible the cause. If, upon investigation, the well appears to be lacking mechanical integrity, or if monitoring otherwise indicates that the well may be lacking mechanical integrity, the operator must:

(I) immediately cease injection;

(II) take all steps reasonably necessary to determine whether there may have been a release of the injected carbon dioxide stream into any unauthorized zone;

(III) notify the director as soon as practicable, but within 12 hours;

(IV) restore and demonstrate mechanical integrity to the satisfaction of the director prior to resuming injection; and

(V) notify the director when injection can be expected to resume.

(d) Monitoring, sampling, and testing requirements. The operator of an anthropogenic carbon dioxide injection well must maintain and comply with the approved monitoring, sampling, and testing plan to verify that the geologic storage facility is operating as permitted and that the injected fluids are confined to the injection zone. The director may require additional monitoring as necessary to support, upgrade, and improve computational modeling of the area of review evaluation and to determine compliance with the requirement that the injection activity not allow movement of fluid that would endanger underground sources of drinking water.

(e) Mechanical integrity.

(1) The operator must maintain and comply with the approved mechanical integrity testing plan submitted in accordance with §5.203(j) of this title (relating to Application Requirements).

(2) Other than during periods of well workover in which the sealed tubing-casing annulus is of necessity disassembled for maintenance or corrective procedures, the operator must maintain mechanical integrity of the injection well at all times.

(3) The operator must either repair and successfully retest or plug a well that fails a mechanical integrity test.

(4) The director may require additional or alternative tests if the results presented by the operator do not demonstrate to the director that there is no leak in the casing, tubing, or packer or movement of fluid into or between formations containing underground sources of drinking water resulting from the injection activity.

(f) Area of review and corrective action. At the frequency specified in the approved area of review and corrective action plan or permit, or when monitoring and operational conditions warrant, the operator of a geologic storage facility must:

(1) re-evaluate the area of review through computational modeling;

(2) identify all wells in the re-evaluated area of review that require corrective action;

(3) perform corrective action on wells requiring corrective action in the re-evaluated area of review; and

(4) submit an amended area of review and corrective action plan or demonstrate to the director through monitoring data and modeling results that no change to the area of review and corrective action plan is needed.

(g) Emergency, mitigation, and remedial response.

(1) Plan. The operator must maintain and comply with the approved emergency and remedial response plan required by §5.203(l) of this title (relating to Application Requirements)

that describes actions to be taken to address movement of the injection fluids or formation fluids that may cause an endangerment to underground sources of drinking water during construction, operation, closure, and post-closure periods. The plan must also include a safety plan that includes emergency response procedures, provisions to provide security against unauthorized activity, and carbon dioxide release detection and prevention measures. The operator must update the plan as changes require. The operator must make copies of the plan available at the storage facility and at the company headquarters.

(2) Training.

(A) The operator must train all employees before commencing injection and storage operations at the facility. The operator must train each subsequently hired employee before that employee commences work at the storage facility.

(B) The operator must hold a safety meeting with each contractor prior to the commencement of any new contract work at a storage facility. The operator must explain emergency measures specific to the contractor's work in the contractor safety meeting.

(C) The operator must provide training schedules, training dates, and course outlines to Commission personnel upon request for the purpose of Commission review to determine compliance with this subparagraph.

(3) Action. If an operator obtains evidence that the injected carbon dioxide stream and associated pressure front may cause an endangerment to underground sources of drinking water, the operator must:

(A) immediately cease injection;

(B) take all steps reasonably necessary to identify and characterize any release;

(C) notify the director as soon as practicable but within at least 12 hours;

and

(D) implement the approved emergency and remedial response plan.

(4) Resumption of injection. The director may allow the operator to resume injection prior to remediation if the operator demonstrates that the injection operation will not endanger underground sources of drinking water.

(h) Commission witnessing of testing and logging. The operator must provide the division with the opportunity to witness all logging and testing. The operator must submit a schedule of such activities to the Commission at least 30 days prior to conducting the first test and submit any changes to the schedule at least 48 hours prior to the next scheduled test. No logging or testing required by this subchapter may commence until a Commission representative is present to witness the test or the director has waived its right to witness an event.

(i) Well plugging. The operator of a geologic storage facility must maintain and comply with the approved well plugging plan required by §5.203(k) of this title (relating to Application Requirements).

(j) Post-injection storage facility care and closure.

(1) Post-injection storage facility care and closure plan.

(A) The operator of an injection well must maintain and comply with the approved post-injection storage facility care and closure plan.

(B) The operator must submit for review and approval a revised plan to account for any proposed significant modification to the plan.

(C) Upon cessation of injection, the operator of a geologic storage facility must either submit an amended plan or demonstrate to the director through monitoring data and modeling results that no amendment to the plan is needed.

(2) Post-injection storage facility monitoring.

(A) Following cessation of injection, the operator must continue to conduct monitoring as specified in the approved plan until the director determines that the position of the carbon dioxide plume and pressure front are such that the geologic storage facility will not endanger underground sources of drinking water.

(B) Prior to authorization for storage facility closure, the operator must submit to the director a demonstration, based on monitoring and other site-specific data, that the carbon dioxide plume and pressure front have stabilized and that no additional monitoring is needed to assure that the geologic storage facility will not endanger underground sources of drinking water.

(3) Prior to closure. Prior to authorization for storage facility closure, the operator must demonstrate to the director, based on monitoring, other site-specific data, and modeling that is reasonably consistent with site performance that no additional monitoring is needed to assure that the geologic storage facility will not endanger underground sources of drinking water. The operator must demonstrate, based on the current understanding of the site, including monitoring data and/or modeling, all of the following:

(A) the estimated magnitude and extent of the facility footprint (the carbon dioxide plume and the area of elevated pressure);

(B) that there is no leakage of either carbon dioxide or displaced formation fluids that will endanger underground sources of drinking water;

(C) that the injected or displaced fluids are not expected to migrate in the future in a manner that encounters a potential leakage pathway into underground sources of drinking water;

(D) that the injection wells at the site completed into or through the injection zone or confining zone are plugged and abandoned in accordance with these requirements; and

(E) any remaining facility monitoring wells are properly plugged or are being managed by a person and in a manner approved by the director.

(4) Notice of intent for storage facility closure. The operator must notify the director at least 120 days before storage facility closure. At the time of such notice, if the operator has made any changes to the original plan, the operator also must provide the revised plan. The director may approve a shorter notice period.

(5) Authorization for storage facility closure. No operator may initiate storage facility closure until the director has approved closure of the storage facility in writing. After the director has authorized storage facility closure, the operator must plug all wells in accordance with the approved plan required by §5.203(k) of this title (relating to Application Requirements).

(6) Storage facility closure report. Once the director has authorized storage facility closure, the operator must submit a storage facility closure report within 90 days that must thereafter be retained by the Commission in Austin. The report must include the following information:

(A) documentation of appropriate injection and monitoring well plugging. The operator must provide a copy of a survey plat that has been submitted to the Regional Administrator of Region 6 of the United States Environmental Protection Agency. The plat must indicate the location of the injection well relative to permanently surveyed benchmarks;

(B) documentation of appropriate notification and information to such State and local authorities as have authority over drilling activities to enable such State and local authorities to impose appropriate conditions on subsequent drilling activities that may penetrate the injection and confining zones; and

(C) records reflecting the nature, composition and volume of the carbon dioxide stream.

(k) Deed notation. The operator of a geologic storage facility must record a notation on the deed to the facility property or any other document that is normally examined during title search that will in perpetuity provide any potential purchaser of the property the following information:

(1) the fact that land has been used to geologically storage carbon dioxide;

(2) the fact that the survey plat has been filed with the Commission;

(3) the address of the office of the United States Environmental Protection Agency, Region 6, to which the operator sent a copy of the survey plat; and

(4) the volume of fluid injected, the injection zone or zones into which it was

injected, and the period over which injection occurred.

(l) Retention of records. The operator must retain for five years following storage facility closure records collected during the post-injection storage facility care period. The operator must deliver the records to the director at the conclusion of the retention period, and the records must thereafter be retained at the Austin headquarters of the Commission.

(m) Signs. The operator must identify each location at which geologic storage activities take place, including each injection well, by a sign that meets the requirements specified in §3.3(1), (2), and (5) of this title (relating to Identification of Properties, Wells, and Tanks). In addition, each sign must include a telephone number where the operator or a representative of the operator can be reached twenty-four hours a day, seven days a week in the event of an emergency.

(n) Other permit terms and conditions. In any permit for a geologic storage facility, the director must impose terms and conditions reasonably necessary to protect underground sources of drinking water from pollution. Permits issued under this subchapter continue in effect until revoked, modified, or suspended by the Commission. The operator must comply with each requirement set forth in this subchapter as a condition of the permit unless modified by the terms of the permit.

§5.207. Reporting and Record-Keeping.

(a) The operator of a geologic storage facility must provide, at a minimum, the following reports to the director and retain the following information.

(1) Test records. The operator must file a complete record of all tests in duplicate with the district office within 30 days after the testing. In conducting and evaluating the tests enumerated in this subchapter or others to be allowed by the director, the operator and the director must apply methods and standards generally accepted in the industry. When the operator reports the results of mechanical integrity tests to the director, the operator must include a description of

the test(s) and the method(s) used. In making this evaluation, the director must review monitoring and other test data submitted since the previous evaluation.

(2) Operating reports. The operator also must include summary cumulative tables of the information required by the reports listed in this paragraph.

(A) Report within 24 hours. The operator must report to the appropriate district office the discovery of any pressure changes or other monitoring data that indicate the presence of leaks in the well or the lack of confinement of the injected gases to the geologic storage reservoir. Such report must be made orally as soon as practicable following the discovery of the leak, and must be confirmed in writing within five working days. The operator must report to the appropriate district office within 24 hours any significant pressure changes or other monitoring data indicating the presence of leaks in the well.

(B) Report within 30 days. The operator must report:

- (i) the results of periodic tests for mechanical integrity;
- (ii) the results of any other test of the injection well conducted by the operator if required by the director; and
- (iii) a description of any well workover.

(C) Semi-annual report. The operator must report:

- (i) a summary of well head pressure monitoring;
- (ii) changes to the physical, chemical, and other relevant characteristics of the carbon dioxide stream from the proposed operating data;
- (iii) monthly average, maximum and minimum values for injection pressure, flow rate and volume, and annular pressure;
- (iv) a description of any event that significantly exceeds operating parameters for annulus pressure or injection pressure as specified in the permit;
- (v) a description of any event that triggers a shutdown device and the response taken; and

(vi) the results of monitoring prescribed under §5.206(d) of this title (relating to Permit Standards).

(D) Annual reports. Other information that may be obtained less frequently, including but not limited to:

(i) corrective action performed;

(ii) new wells installed and the type, location, number, and information required in §5.203(e) of this title (relating to Application Requirements);

(iii) re-calculated area of review;

(iv) tons of carbon dioxide injected; and

(v) other information as required by the permit.

(b) Report format. The operator must report the results of injection pressure and injection rate monitoring of each injection well on Form H-10, Annual Disposal/Injection Well Monitoring Report, and the results of mechanical integrity testing on Form H-5, Disposal/Injection Well Pressure Test Report. Operators must submit other reports in a format acceptable to the Commission. At the discretion of the director, other formats may be accepted.

(c) Record retention. The operator must retain all wellhead pressure records, metering records, and integrity test results for at least five years.

§5.208. Penalties.

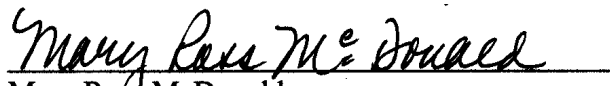
(a) General. An operator that violates this subchapter may be subject to penalties and remedies specified in the Texas Natural Resources Code, Title 3, Texas Water Code, Chapter 27, and other statutes administered by the Commission.

(b) Certificate of compliance. The Commission may revoke a certificate of compliance for any oil, gas, or geothermal resource well in the manner provided in §3.73 of this title (relating to Pipeline Connection; Cancellation of Certificate of Compliance; Severance) for violation of this subchapter.

This agency hereby certifies that the proposal has been reviewed by legal counsel and found to be within the agency's authority to adopt.

Issued in Austin, Texas on March 9, 2010.

Filed with the Office of the Secretary of State on March 9, 2010.

A handwritten signature in cursive script that reads "Mary Ross McDonald". The signature is written in black ink and is positioned above a horizontal line.

Mary Ross McDonald
Managing Director - Special Counsel
Office of General Counsel
Railroad Commission of Texas