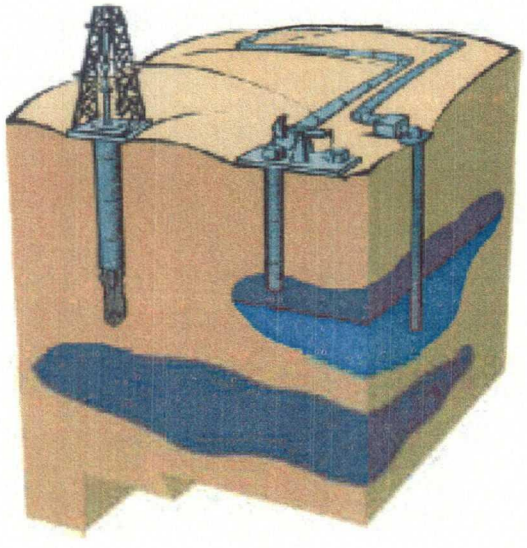
NEW MEXICO'S

Underground Injection Control (UIC) Program

CLASS II WELL FACTS



Injection Wells Related To Oil and Gas Activity

Oil Conservation Division
Energy, Minerals and Natural Resources Department
Santa Fe, New Mexico

NMOCD CASE NO. 13598
FEBRUARY 9, 2006
SMITH, SNYDER & A.C.
EXHIBIT NO. 13

INTRODUCTION

Regulated by the Oil Conservation Division for several decades, underground injection has been an essential production practice utilized by the petroleum industry in New Mexico to dispose of produced liquid and to enhance the recovery of oil in producing fields (Please see Figure 1). In the past, the realization that subsurface injection could contaminate ground water prompted New Mexico and other states to develop State programs or methods to protect subsurface sources of usable water. Additionally, to increase ground water protection, a Federal Underground Injection Control (UIC) program was established under the provisions of the Safe Water Drinking Act of 1974 for the purpose of establishing minimum requirements for effective state UIC programs. Since ground water is a major source of drinking water in New Mexico, the UIC program requirements were designed to prevent contamination of underground sources of drinking water (USDW) by the operation on injection wells.

Since the passage of the Safe Drinking Water Act, New Mexico has modified existing and developed new strategies to protect ground water by establishing more effective regulation and rules to control the permitting, construction, operation, monitoring, and abandonment of injection wells.

The United States Environmental Protection Agency (USEPA) has delegated primary regulatory authority (primacy) to those states, including New Mexico, that have implemented UIC programs that meet USEPA requirements. Many states like New Mexico have had oil and gas programs in place for decades. We have been able to demonstrate that our existing programs for Class II wells represent an effective measure to prevent endangerment of drinking water sources by underground injection well practices.

A well, as defined in Title 40 of the Code of Federal Regulations, is either a dug hole or a bored, drilled or driven shaft the depth of which is greater than its largest surface dimension. Injection is defined as the subsurface emplacement of fluids in a well, where a fluid is any material that flows or moves whether it is semi-solid, liquid, sludge or gas.

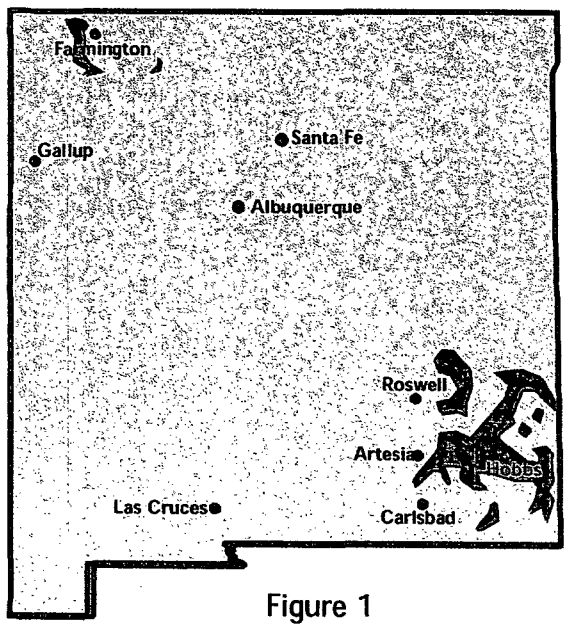


Figure 1

Major Waterflood Injection Areas of the State

Waterflooding and disposal are most often associated with oil production. The southeast portion of New Mexico accounts for approximately 95% of the injection activity as well as oil production. The northwest portion produces the majority of New Mexico's natural gas; consequently there is substantially less underground injection going on.

INJECTION WELL CLASSIFICATION

Injection wells covered by the UIC program are divided into the following five groups:

Class I: Subclassifications: Hazardous and Non-Hazardous. Wells used to inject liquid [non] hazardous wastes or dispose of industrial and municipal waste waters beneath the lower-most USDW.
Class II: Wells used to dispose of fluids associated with the production of oil and natural gas (hydrocarbons); to inject fluids for enhanced oil recovery; or for the storage of liquid hydrocarbons.
Class III: Wells used to inject fluids for the extraction of minerals (i.e. solution mining).
Class IV: Wells used to dispose of hazardous or radioactive wastes into or above a USDW. The USEPA has banned the use of these wells.
Class V: Wells not included in the other classes used generally to inject non-hazardous fluid into or above a USDW.

CLASS II INJECTION WELL TYPES

Class II injection wells have been used in oil field related activities since the 1930's. Today, there are approximately 6,000 active Class II wells located in New Mexico.
Class II injection wells are categorized into three main groups. They are (1) Salt Water Disposal Wells, (2) Enhanced Oil Recovery (EOR) Wells, and (3) Hydrocarbon Storage Wells.

SALT WATER DISPOSAL WELLS

The production of oil and gas is often accompanied by salt water. On average, approximately 10 barrels of salt water are produced with every barrel of crude oil. This water is reinjected into authorized geologic formations through disposal wells and EOR wells. One of the common forms of liquid waste disposal by the oil and gas industry is injection into non-hydrocarbon bearing geologic formations. These disposal wells have been used extensively to return the salt water associated with oil and gas production to the subsurface. Industry sources state that 30% of salt water produced with oil and gas onshore in the United States is disposed of via salt water disposal wells.

ENHANCED OIL RECOVERY WELLS

Enhanced Oil Recovery (EOR) injection wells are used to increase and prolong oil production from depleting oil producing fields. SECONDARY RECOVERY is an EOR process, commonly referred to as waterflooding. In this process salt water co-produced with oil and gas is reinjected into the oil producing horizon to drive oil into pumping wells, resulting in greater recovery of oil. TERTIARY RECOVERY is an EOR process which is employed after secondary recovery methods become inefficient or uneconomical. Tertiary recovery methods include the injection of gases, enhanced waters and steam in order to maintain and extend oil production. Approximately 60% of salt water produced with oil and gas onshore in the United States is injected into EOR wells. New Mexico is a leader in legislating tax incentives that encourage oil companies to institute these types of projects to boost the nation's supply of oil.

HYDROCARBON STORAGE WELLS

These wells are used for the underground storage of crude oil, liquified petroleum gas (LPG), and other liquid hydrocarbon products in naturally occurring rock formations. Often the same wells are designed for both injection and removal of the stored hydrocarbon storage wells are vital to our nation's strategic reserves.

CONSTRUCTION OF CLASS II WELLS

Construction of new Class II injection wells is subject to State and Federal regulations. Construction design must adequately confine injected fluids to the authorized zone as well as prevent the migration of fluids into USDWs. Through the permitting process for Class II injection wells, site-specific construction regulations can be imposed to meet any unusual circumstances.

Injection wells are drilled in to geologic rock formations that will accept the injected fluids. The fluid pressure, fracture pressure, and geological characteristics of the injection zone must be considered when evaluating a zone that may be suitable for injection. Confining zones generally overlie the injection zones. Confining zones are non-permeable zones that add to the environmental security of the well by restricting the upward movement of the injected fluids.

New injection wells are drilled and cased with steel pipe. The pipe is cemented in place to prevent the migration of fluids into USDWs. Figure 2 depicts an injection well construction diagram. It should be noted that the surface casing is commonly set below the base of the lowermost USDW and cemented back to the surface, preventing the movement of fluids into USDWs. Secondly, cement is placed behind the long string casing for several hundred feet above the injection zone to prevent injected fluids from migrating upward into the USDW. The long string casing and cement sheath are perforated in the injection zone to allow for fluid emplacement.

As shown in Figure 2, a typical injection well also has an interior string of pipe called tubing through which injection takes place. A packer is used to isolate the injection zone from the casing above the packer, and also helps to facilitate the detection of any leakage.

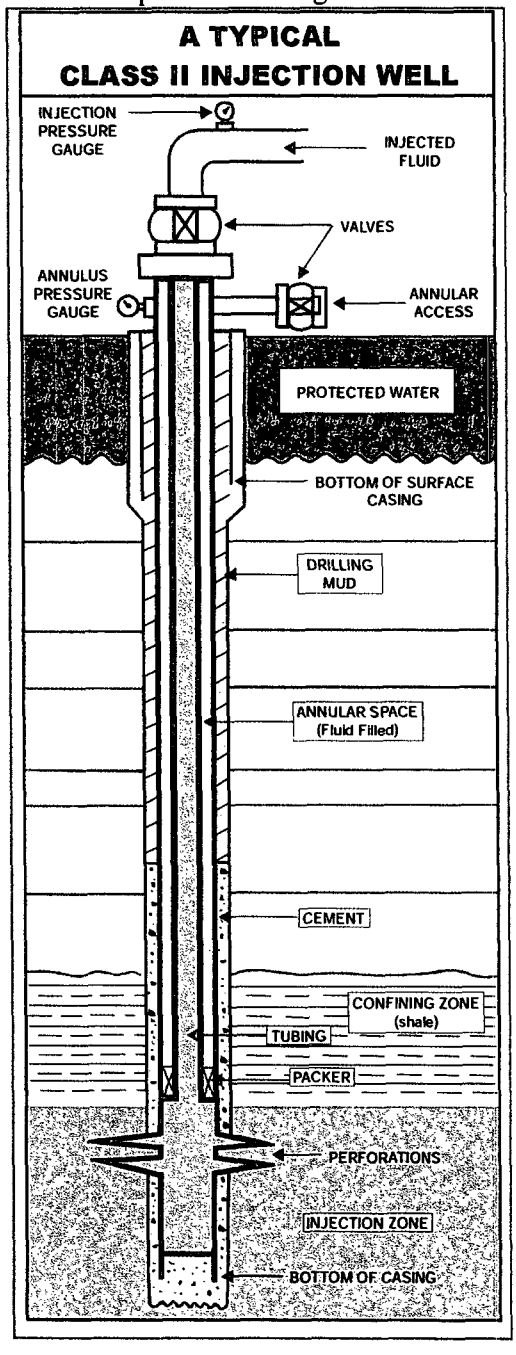


Figure 2

OPERATIONS

Injection well operations must be directed in such a manner as to prevent the contamination of USDWs and to ensure fluid emplacement and confinement within the authorized injection zone.

Typically, the oil, gas and salt water are separated at the oil and gas production facility. The salt water is then either piped or trucked to the injection site for disposal or EOR operations. There, the salt water is transferred to holding tanks and pumped down the injection well. For EOR, the salt water may be treated or augmented by other fluids prior to injection to maximize oil recovery in some EOR operations.

New Mexico, as well as other primacy states, has adopted its own regulations, which meet or exceed federal standards, concerning injection well operations in terms of maximum allowable injection pressures, mechanical integrity testing, pressure monitoring and reporting.

TESTING AND MONITORING

Continuous ground water protection is accomplished by testing and monitoring the injection wells after placing them in service. Injection pressures and volumes are monitored as a valuable indicator of well performance.

Downhole problems normally can be recognized through the monitoring of injection well pressures. Effective monitoring is important so that corrective action can be taken quickly to prevent endangerment of USDWs. Monitoring reports must be submitted to the appropriate State or Federal Agency for review.

Mechanical Integrity Tests (MITs) are required prior to initial injection and at a minimum of once every five years thereafter. Variations of acceptable tests and frequencies of the tests are determined on a state- by-state basis. For example, New Mexico utilizes a bradenhead test on an annual basis in addition to the pressure test every five years. These tests are utilized to evaluate the operational integrity of the well so that USDWs will not be endangered.

New Mexico's newest tool for monitoring operations and conditions of injection wells, in addition to scheduling all MITs, is known as the Risk Based Data Management System (RBDMS). The core system was developed by the Ground Water Protection Council, a national organization made up of State and Federal regulatory agencies, industry representatives and municipal officials. RBDMS New Mexico has been highly customized to meet the needs of New Mexico's program. It is used on notebook computers by inspectors in the field to record and track all relevant data in the constant business of protecting New Mexico's underground sources of drinking water.

For More Information:

Oil Conservation Division
P. O. Box 6429
Santa Fe, New Mexico 87505
(505) 476-3466

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL
RESOURCES DEPARTMENT

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

FORM C-108
Revised June 10, 2003

APPLICATION FOR AUTHORIZATION TO INJECT

PURPOSE: _____Secondary Recovery _____Pressure Maintenance _____Disposal _____Storage
Application qualifies for administrative approval? _____Yes _____No

II. OPERATOR: _____

ADDRESS: _____

CONTACT PARTY: _____ PHONE: _____

III. WELL DATA: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? _____Yes _____No
If yes, give the Division order number authorizing the project: _____

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and,
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

*VIII. Attach appropriate geologic data on the injection zone including appropriate lithologic detail, geologic name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

*X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted).

*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

E-MAIL ADDRESS: _____

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstances of the earlier submittal: _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and the name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the Section, Township, and Range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and,

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

Side 1

INJECTION WELL DATA SHEET

OPERATOR: _____

WELL NAME & NUMBER: _____

WELL LOCATION: _____
FOOTAGE LOCATION UNIT LETTER SECTION TOWNSHIP RANGE

WELLBORE SCHEMATIC

WELL CONSTRUCTION DATA

Surface Casing

Hole Size: _____ Casing Size: _____

Cemented with: _____ sx. ***or*** _____ ft^3

Top of Cement: _____ Method Determined: _____

Intermediate Casing

Hole Size: _____ Casing Size: _____

Cemented with: _____ sx. ***or*** _____ ft^3

Top of Cement: _____ Method Determined: _____

Production Casing

Hole Size: _____ Casing Size: _____

Cemented with: _____ sx. ***or*** _____ ft^3

Top of Cement: _____ Method Determined: _____

Total Depth: _____

Injection Interval

_____ feet to _____

(Perforated or Open Hole; indicate which)

INJECTION WELL DATA SHEET

Tubing Size: _____ Lining Material: _____

Type of Packer: _____

Packer Setting Depth: _____

Other Type of Tubing/Casing Seal (if applicable): _____

Additional Data

1. Is this a new well drilled for injection? _____Yes _____No

   If no, for what purpose was the well originally drilled? _____

   _____

2. Name of the Injection Formation: _____

3. Name of Field or Pool (if applicable): _____

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e. sacks of cement or plug(s) used. _____

   _____

5. Give the name and depths of any oil or gas zones underlying or overlying the proposed injection zone in this area: _____

   _____

   _____

   _____