

**STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION**

**IN THE MATTER OF THE HEARING CALLED
BY THE OIL CONSERVATION DIVISION
FOR THE PURPOSE OF CONSIDERING:**

**APPLICATION OF ANADARKO PETROLEUM CORPORATION FOR
APPROVAL OF AN ACID GAS INJECTION WELL, SAN JUAN COUNTY, NEW
MEXICO.**

**CASE NO. 14329
ORDER NO. R-13201**

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 8:15 a. m. on October 15, 2009 at Santa Fe, New Mexico before Examiner Richard Ezeanyim.

NOW, on this 16th day of December, 2009, the Division Director, having considered the testimony, the record and the recommendations of the Examiner,

FINDS THAT:

(1) Due public notice has been given, and the Division has jurisdiction of this case and of the subject matter.

(2) The applicant, Anadarko Petroleum Corporation ("Anadarko" or "Applicant"), [OGRID 817] as the parent corporation to the wholly owned subsidiary Western Gas Resources Asset Holding Company, LLC., seeks authority to inject acid gas (hydrogen sulfide and carbon dioxide) into the Entrada formation, at a depth interval approximately 6,500 feet to 6,700 feet below the surface, through a proposed injection well, which it proposes to drill at a location 1650 feet from the North line and 2310 feet from the West line (Unit F) of Section 1, Township 29 North, Range 15 West, NMPM, San Juan County, New Mexico. The purpose of the injection is to dispose of natural gas processing wastes from Anadarko's San Juan River Gas Plant, sequester carbon dioxide and reduce greenhouse emissions.

(3) The Division received several letters from concerned citizens of the area, each of them expressing concerns about the acid gas injection project. However, none of these citizens appeared at the hearing to oppose the application. Nonetheless, the hearing examiner took administrative notice of their letters and made them part of the record in

the proceedings.

(4) At the hearing, BHP Billiton ("BHP"), a coal mining company located in proximity to the proposed injection project, and the Oil Conservation Division ("Division") appeared through legal counsel.

(5) BHP offered testimony regarding concerns the company has with regard to the acid gas injection operations near its mining operations, but stated that BHP will be conducting its mining operations North of the injection site. However, vent shafts will remain open near the plant as well as an underground path that runs along the border of the mine and close to the proposed injection well. BHP's witness further stated that as long as Anadarko is willing to participate in BHP's internal risk assessment for the acid gas injection operations, BHP will neither be in support nor in opposition to the application.

(6) The Division's Environmental Bureau appeared as an intervenor and offered evidence relevant to Anadarko's approved hydrogen sulfide contingency plan. The Division's witness testified that Anadarko's hydrogen sulfide contingency plan has been approved in principle as long as Anadarko does not inject more than 3.8 million cubic feet of acid gas per day. If, however, Anadarko wishes to inject more than 3.8 million cubic feet of acid gas per day, the hydrogen sulfide contingency plan must be modified and amended.

The Applicant appeared at the hearing and offered the following testimony:

(7) The proposed acid gas injection well is a better solution to reducing greenhouse gas emissions by sequestering carbon dioxide (CO₂) rather than venting into the atmosphere. The acid gas injection project will eliminate the need for the sulfur recovery unit (SRU). Anadarko also needs to expand the plant's treating capabilities to continue to accept the increasing CO₂ content of typical wellhead gas. Anadarko has proposed this well to meet that need as well as to ensure future compliance with air regulations, reduce potential for plant upset and assure the long-term viability of the plant.

(8) Anadarko conducted a geologic study to find a suitable formation for acid gas injection and concluded that the Entrada formation exhibits high porosity and permeability to accept acid gas injection. The Entrada formation is sealed on top by the Todilto Limestone and Beclabito siltstones. The Caprock (Wanakah) is a low porosity siltstone and recrystallized limestone which is an effective barrier above the injection zone. In addition, overlying Jurassic and Cretaceous section provides 5,000 feet of low-permeability shales and mudstones with interbedded sandstones which effectively add to the isolation of the injection zone from BHP's mining area and fresh water resources. The suitability of the Entrada formation has also been demonstrated by over fifteen years of successful injection of produced water by several nearby saltwater disposal wells.

(9) The well will be constructed such that the surface casing will be set at 1,100 feet into the Lewis Shale, and there will be a total of three casing strings all with cement circulated to the surface. The well will also include a subsurface safety valve on the production tubing to assure that fluid cannot flow back out of the well. In addition, the annular space between the production tubing and the well bore will be filled with an inert fluid as a further safety measure.

(10) Anadarko proposes to inject at an average injection pressure of approximately 1900 psi and a maximum surface injection pressure of 1985 psi.

(11) There are seven fresh water wells within the one-mile area of review which produce water from the Kirtland and Fruitland formations. The deepest of these wells extends to 150 feet below the surface. The surface casing for the Anadarko AGI well will extend to 1,100 feet which is well below all of these zones thereby negating any potential impact by the AGI well.

(12) The Entrada formation in this area is not productive of any hydrocarbons.

(13) No wells penetrated the injection zone within the one-mile area of review (AOR).

(14) Although the SRU will be decommissioned, the tail gas incinerator of the SRU will be left in service in the event of an upset or emergency.

(15) The surface at the proposed injection site is owned by Anadarko and therefore Anadarko has all necessary easements and other rights for its surface facilities.

(16) Anadarko furnished notice to all surface owners and all operators or affected parties within one-mile radius of the wellbore.

The Division Concludes as follows:

(17) The proposed acid gas injection operation can be conducted in a safe and responsible manner without causing waste, impairing correlative rights, or endangering fresh water, public health or the environment.

(18) The proposed operation is an environmentally superior means of disposing of the acid gas wastes generated at the San Juan River Plant because it will provide for the sequestration of greenhouse gases.

(19) The application should be approved.

IT IS THEREFORE ORDERED THAT:

- (1) Anadarko Petroleum Corporation is hereby authorized to drill and complete its AGI Well which it proposes to drill at a location 1650 feet from the North line and 2310 feet from the West line (Unit F) of Section 1, Township 29 North, Range 15 West, NMPM, San Juan County, New Mexico in such a manner as to permit the injection of acid gas, consisting principally of hydrogen sulfide and carbon dioxide from its San Juan River Gas Plant, for disposal into the Entrada formation at a depth of 6,500 feet to 6,700 feet below the surface, through 2 7/8-inch tubing set in a packer located approximately 6,480 feet below the surface.
- (2) The operator of the well shall take all steps necessary to insure that the injected acid gas enters the proposed injection interval and does not escape to other formations or onto the surface.
- (3) The operator shall use 2-7/8 inch fiberglass lined tubing set in a nickel based packer or any other corrosive-resistant materials.
- (4) A one-way subsurface automatic safety valve shall be placed on the injection tubing 250 feet below the surface to prevent the injected acid gas from migrating upwards in case of an upset or emergency.
- (5) The tail gas incinerator of the SRU shall be left in service in the event of an upset or emergency.
- (6) The well shall be constructed substantially in accordance with the description in the Injection Well Data Sheet attached to Form C-108 filed by the applicant in this case. The surface casing shall be set at 1,100 feet and there shall be a total of three casing strings, all with cement circulated to the surface.
- (7) During drilling operations, the operator shall monitor the well for hydrocarbon shows. Any hydrocarbon shows within the Entrada formation shall be reported to the Division prior to commencement of injection operations.
- (8) Copies of logs of the completed well, including a full suite of geophysical logs including a Formation Micro-scanner Log over the Entrada, and a letter setting forth the estimated static bottomhole pressure of the injection formation shall be delivered to the Division's Aztec District Office prior to commencement of injection operations.
- (9) After installation of the injection tubing and prior to commencing injection operations, and at least once **every two years thereafter**, the operator shall pressure test the casing from the surface to the packer-setting depth to assure casing integrity. Further, the operator shall monitor pressure on the backside using continuous chart recorder or digital equivalent to immediately detect any leakage in the casing.

(10) Prior to injecting acid gas, the casing-tubing annulus shall be loaded with an inert fluid and equipped with a pressure gauge or approved leak-detection device to detect any leakage in the casing, tubing or packer.

(11) The operator shall record injection rates and pressures on a continuous basis and report the readings annually, or more often if requested, to the Engineering Bureau in the Division's Santa Fe Office and to the Division's Aztec District Office. Each such report shall include the well name, location, API Number and the number of this order.

(12) The injection well or system shall be equipped with a pressure limiting device that will limit wellhead pressure on the injection well to no more than 1985 psi while injecting acid gas. The operator shall maintain the injection fluid in the non-corrosive phase with minimum pressure regulating devices as necessary.

(13) The Director of the Division may authorize an increase in the injection pressure upon a proper showing that such higher pressure will not result in the migration of the injected gases from the permitted injection formation. Such showing shall consist at least of a valid step-rate test run in accordance with procedures acceptable to the Division. Any step-rate test shall be run with an inert fluid such as produced water, and not with acid gas.

(14) The operator shall notify the Aztec District Office of the Division of the time of the setting of the tubing and packer and of any mechanical integrity test so such operations can be witnessed or inspected.

(15) Without limitation on the duties of the operator as provided in Division Rules 19.15.30 and 19.15.29, the operator shall immediately notify the Aztec District Office of the Division of any failure of the tubing, casing or packer in the well, or of any leakage or release of water, oil or gas from around any produced or plugged and abandoned well in the area, and shall take such measures as may be timely and necessary to correct such failure or leakage.

(16) Applicant has received approval by the Division's Environmental Bureau of a hydrogen sulfide contingency plan that complies with Division Rule 11. However, if the operator wishes to inject more than 3.8 million cubic feet of acid gas per day, it shall secure approval from the Division of an amended hydrogen sulfide contingency plan pursuant to Division Rule 11.

(17) The operator shall submit monthly reports of injection volumes on Form C-115, in accordance with Division Rules 19.15.26.13 and 19.15.7.24.

(18) The injection authority herein granted shall terminate one year after the effective date of this order if the operator has not commenced injection operations

pursuant hereto; provided however, the Division Director, upon written request of the operator, may extend this time for good cause. The injection authority shall also terminate *ipso-facto*, one year after injection operations into the well have ceased.

(19) The injection authority granted under this order is not transferable except upon Division approval. The Division may require the operator to demonstrate mechanical integrity of the injection well that will be transferred prior to approving transfer of authority to inject.

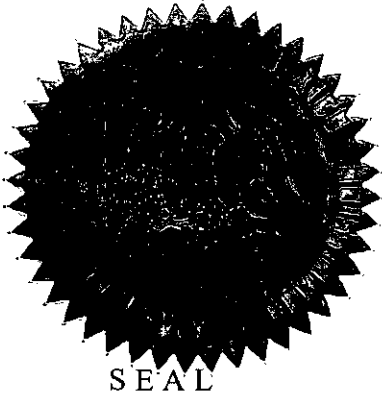
(20) The Division may revoke this injection permit at any time after notice and hearing if the operator is in violation of Rule 19.15.5.9 NMAC.

(21) Compliance with this order does not relieve the operator of the obligation to comply with other applicable federal, state or local laws or rules, or to exercise due care for the protection of fresh water, public health and safety and the environment.


(22) The Division Director may amend this order by administrative order, after proper notice, and the absence of protest.

(23) Jurisdiction of this case is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.



STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


MARK E. FESMIRE, P.E.
DIRECTOR