

THE APPLICATION OF TEXSTAR MIDSTREAM UTILITY, LP FOR AUTHORITY PURSUANT TO STATEWIDE RULES 9 AND 36 TO DISPOSE OF OIL AND GAS WASTE CONTAINING HYDROGEN SULFIDE INTO THE LANCASTER AGI LEASE, WELL NO. 1, DERBY (GLEN ROSE H2S DISPOSAL) FIELD, FRIO COUNTY, TEXAS

HEARD BY: Richard D. Atkins, P.E. - Technical Examiner

DATE OF HEARING: September 1, 2011

APPEARANCES:

REPRESENTING:

APPLICANT:

Kerry A. Pollard
Gallon E. Gray
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Texstar Midstream Utility, LP

EXAMINER'S REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

Texstar Midstream Utility, LP ("Texstar") requests authority to inject acid gas into its Lancaster AGI Lease, Well No. 1. Texstar also requests that a new field, the Derby (Glen Rose H2S Disposal) Field, be set up for this disposal well.

Statewide Rule 36(c)(10)(A) requires that a public hearing be held before the injection of fluid containing hydrogen sulfide ("H2S" or "sour gas"), when the "injection fluid is a gaseous mixture....where the 100 ppm radius of exposure ("ROE") is in excess of 50 feet and includes any part of a public area except a public road; or, if the 500 ppm ROE is in excess of 50 feet and includes any part of a public road; or, if the 100 ppm ROE is 3,000 feet or greater." In this case, the 500 ppm ROE is greater than 50 feet and includes parts of State Highway 85.

The Commission's Field Operations section has reviewed the application and has approved the contingency plan which incorporates the injection well. The Commission's Technical Permitting staff recommends approval of the application contingent on a showing by applicant that the proposed disposal will not cause acid gas migration into productive horizons not known to contain hydrogen sulfide. This application was unopposed and the examiner recommends approval.

To satisfy Statewide Rule 9, notice of the subject application was published in the

Frio-Nueces Current, a newspaper of general circulation in Frio County, on June 9, 2011. To satisfy Statewide Rule 36, notice of the hearing was published in the *Frio-Nueces Current*, a newspaper of general circulation in Frio County, on August 18, 2011. Additionally, notice of the application was sent to the Frio County Clerk, and offset operators within ½ mile of the proposed injection well on June 27, 2011. Finally, notice of the application was sent to all surface owners of each tract which adjoins the tract where the proposed well is located and to all surfaces owners of tracts located within the 100 ppm ROE on June 27, 2011.

DISCUSSION OF THE EVIDENCE

Texstar's Lancaster Gas Processing Facility has been recently constructed and is removing carbon dioxide ("CO₂") and H₂S from the gas stream produced by wells in the area. The waste gas stream contains 68% CO₂, 32% H₂S and less than 1% methane. The current daily throughput for the Lancaster Facility is approximately 3 MMCFGPD, but the total capacity at the completion of the facility is anticipated to be 90 MMCFGPD. Currently, Texstar is flaring the waste gas, or acid gas.

Texstar is proposing that the waste gas be compressed into a liquid and disposed into the proposed Lancaster AGI Lease, Well No. 1. This well has not yet been drilled, but is proposed to be located on the northwest side of the 5.0 acre tract containing the Lancaster Gas Processing Facility operated by Texstar, which is situated approximately nine miles northeast of Dilly, Texas. Texstar requests authority to dispose of a maximum of 3,500 MCFPD of compressed acid gas. The requested maximum surface injection pressure is 4,200 psig.

The Lancaster AGI Lease, Well No. 1, will be drilled to a total depth of approximately 12,000 feet. The well will have 10 3/4" surface casing set at 3,700 feet and will be cemented to surface. The 7 5/8" long string casing will be set at 9,850 feet and will be cemented to surface. The Texas Commission on Environmental Quality ("TCEQ") recommends that useable quality water be protected down to a depth of 3,650 feet. Injection will be through tubing set on a packer no higher 100 feet above the proposed injection interval (See attached Texstar Exhibit No. 13 - Wellbore Diagram). All of the tubular equipment which may come in contact with CO₂ and H₂S are resistant stainless steels and alloys that meet all Commission and industry standards for handling CO₂ and H₂S.

The proposed disposal interval is the non-productive Glen Rose formation which occurs in the correlative interval between 8,280 feet and 9,710 feet as shown on the log of the Pan American Petroleum - T. Culpepper Lease, Well No. 1 (API No. 42-163-01531), Section 2, BS&F RR Co. Survey, A-904, Frio County, Texas. The Glen Rose formation is not productive for at least several miles in all directions. Establishing a new field designation called the Derby (Glen Rose H₂S Disposal) Field will identify the proposed disposal zone as a formation now containing hydrogen sulfide. Any operators drilling in the area will be aware of the potential of H₂S existing in an otherwise non-sour formation.

There are two plugged wellbores located within a 1/2 mile radius of the proposed well. These wells had a total depth of less than 7,400 feet and, because they are properly plugged and did not penetrate the proposed injection interval, they will not be a conduit for the migration of injected fluids.

The closest well to penetrate the Glen Rose formation is the Pan American Petroleum - T. Culpepper Lease, Well No. 1, located approximately 2 miles northwest of the proposed well. The well is a plugged Sligo formation dry hole that was drilled to 10,900 feet. A structure map demonstrates that the Glen Rose formation is laterally extensive with approximately 113 feet per mile of dip trending from the north-northwest to the south-southeast. The gross thickness of the Glen Rose formation in the area is approximately 1,400 feet.

Computer simulations of pressure and fluid migration were performed to predict the maximum probable extent of underground waste migration. The numerical model SWIFT was used for the predictions. Input data included an average net pay thickness of 150 feet, a project life of 20 years, the geologic structure map and an average daily injection rate of 3,500 MCFGPD. This model has been accepted nationally for hazardous waste wells by the EPA and has been previously accepted by the Railroad Commission.

The waste being disposed of consists of approximately 32% hydrogen sulfide and 68% carbon dioxide. Acid gas concentrations were calculated and mapped based on the modeling. The outer edge of the underground injection plume is represented by a 1% contour line, where the fluid is 99% formation fluid and 1% acid gas. The maximum extent of the 1% line is approximately 2,000 feet from the proposed injection well after 20 years of injection. After 100 years, allowing for 80 years of buoyant migration up-dip, the maximum extent of the 1% line is approximately 3,300 feet from the proposed injection well. Since no existing wellbore within the injection plume penetrated the Glen Rose formation, there will not be a conduit for the migration of the injected fluid outside the disposal interval.

The maximum escape rate is estimated to be 166.5 MMCFGPD, which assumes worst case conditions with escape through the 7 5/8" casing. Texstar employed Quest Consultants, Inc. to perform gas dispersion modeling based on the results of the maximum escape rate. Quest used a dispersion model called CANARY to determine the ROE to H₂S. This model calculates release conditions, initial dilution of the vapor, and subsequent vapor dispersion. The model accounts for thermodynamics, mixture behavior, transient release rates, gas cloud density, initial velocity of the gas and heat transfer effects. This model has been previously accepted by the Railroad Commission. The calculated ROE for 100 ppm H₂S, due to the maximum catastrophic release at the proposed injection well, is 4,695 feet. For 500 ppm H₂S, the calculated ROE is 2,550 feet.

Both of the calculated ROE's encompass the Lancaster Gas Facility. Texstar has created a contingency plan for the Lancaster Gas Processing Facility to incorporate the proposed disposal operations. There are no residences located within the 100 ppm ROE

for the proposed disposal well, but parts of State Highway 85 are located within the 500 ppm ROE for the well. The contingency plan has been reviewed and approved by the Commission's Field Operations section.

The proposed injection well is designed to meet all safety requirements of Rule 36. The wellhead will be equipped with emergency shut-down controls. Four permanent H2S detectors will be installed at locations 100 feet from the wellhead, with continuous monitoring at the adjacent Lancaster gas processing facility. The Lancaster facility is a full-time manned installation which has been Rule 36 certified.

FINDINGS OF FACT

1. Notice of this hearing was provided to all persons entitled to notice at least ten (10) days prior to the date of the hearing.
2. To satisfy Statewide Rule 9, notice of the subject application was published in the *Frio-Nueces Current*, a newspaper of general circulation in Frio County, on June 9, 2011.
3. Notice of the application was sent to the Frio County Clerk, offset operators within 1/2 mile of the proposed injection well, surface owners of each tract which adjoins the disposal tract and to the surface owners of all tracts located within the 100 ppm ROE on June 27, 2011.
4. To satisfy Statewide Rule 36, notice of the hearing was published in the *Frio-Nueces Current*, a newspaper of general circulation in Frio County, on August 18, 2011.
5. The proposed injection well, the Lancaster AGI Lease, Well No. 1, will be used to dispose of waste gas containing CO₂ and H₂S. This waste gas is removed from hydrocarbon gas at Texstar's Lancaster Gas Processing Facility.
6. The Lancaster AGI Lease, Well No. 1, will inject at rates up to 3,500 MCFPD of compressed acid gas. The acid gas contains approximately 32% hydrogen sulfide and 68% carbon dioxide.
7. The proposed Lancaster AGI Lease, Well No. 1, will be drilled, cased and cemented to confine the injected fluid to the proposed Glen Rose disposal zone.
 - a. The proposed disposal interval includes the non-productive Glen Rose formation which occurs in the correlative interval between 8,280 feet and 9,710 feet as shown on the log of the Pan American

Petroleum - T. Culpepper Lease, Well No. 1 (API No. 42-163-01531).

- b. The TCEQ recommends that useable quality water be protected down to a depth of 3,650 feet.
 - c. The well is proposed to have 10 3/4" surface casing set at 3,700 feet and will be cemented to surface. The 7 5/8" long string casing will be set at 9,850 feet and will be cemented to surface.
 - d. Injection will be through tubing set on a packer no higher than 100 feet above the proposed disposal interval.
 - e. All of the equipment installed that might come in contact with CO₂ and H₂S will be stainless steel and alloys that meet all Commission and industry safety standards.
 - f. If the injection fluid is not confined to the approved strata, then the disposal well permit will be suspended and disposal will cease until the fluid migration from such strata is eliminated.
8. The field name of Derby (Glen Rose H₂S Disposal) should be approved for the disposal interval to alert other operators in the area to the possibility of encountering sour gas in this otherwise non-sour formation.
 9. The proposed disposal well will be located on the northwest side of the 5.0 acre tract containing the Lancaster Gas Processing Facility operated by Texstar, which is situated approximately nine miles northeast of Dilly, Texas.
 10. The requested maximum surface injection pressure is 4,200 psig.
 11. The injection well, compressor and flow lines transmitting sour gas, will be designed to contain the sour gas, and monitoring devices will immediately shut down the system if any leakage of sour gas is detected.
 12. Texstar has created a contingency plan for the Lancaster Gas Processing Facility to incorporate the proposed disposal operations.
 13. The calculated ROE for 100 ppm H₂S, due to the maximum catastrophic release at the proposed injection well, is 4,695 feet. For 500 ppm H₂S, the calculated ROE is 2,550 feet.
 14. There are no residences located within the 100 ppm ROE, but parts of State Highway 85 are located within the 500 ppm ROE for the proposed disposal well.

15. Since no existing wellbore within the injection plume penetrated the Glen Rose formation, there will not be a conduit for the migration of the injected fluid outside the disposal interval.
16. The outer edge of the underground injection plume is represented by a 1% contour line, where the fluid is 99% formation fluid and 1% acid gas. The maximum extent of the 1% line is approximately 2,000 feet from the proposed injection well after 20 years of injection. After 100 years, allowing for 80 years of buoyant migration up-dip, the maximum extent of the 1% line is approximately 3,300 feet from the proposed disposal well.
17. Texstar has met the conditions for approval set forth by the Field Operations and Technical Permitting sections of the Railroad Commission.

CONCLUSIONS OF LAW

1. Proper notice was issued as required by Statewide Rules 9 and 36.
2. All things have occurred and been accomplished to give the Commission jurisdiction in this matter.
3. The application of Texstar Midstream Utility, LP to inject hydrogen sulfide gas into the Lancaster AGI Lease, Well No. 1, Derby (Glen Rose H2S Disposal) Field, Frio County, complies with the applicable provisions of Statewide Rules 9 and 36.

EXAMINERS' RECOMMENDATION

Based on the above findings of fact and conclusions of law, the examiner recommends that the Commission approve the authority to inject acid gas into the Lancaster AGI Lease, Well No. 1, and a new field designation of Derby (Glen Rose H2S Disposal) Field for the disposal interval, as requested by Texstar Midstream Utility, LP.

Respectfully submitted,

Richard D. Atkins, P.E.
Technical Examiner