

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

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

APPLICATION OF TARGA MIDSTREAM SERVICES,
LIMITED PARTNERSHIP TO AMEND ORDER NO.
R-13052, LEA COUNTY, NEW MEXICO

CASE NO. 14161 (Reopened)
Order No. R-13052-A

ORDER OF THE COMMISSION

IN THIS MATTER, having come before the New Mexico Oil Conservation Commission ("Commission") on September 22, 2011 at Santa Fe, New Mexico, on Targa Midstream Services, Limited Partnership's ("Targa") First Amended Application to Amend Order No. R-13052 ("Application"), the Commission, having carefully considered the evidence and other materials submitted by the parties, now, on this 17th day of November, 2011:

FINDS THAT:

1. Due public notice of the hearing of this matter has been given.

The Issues

2. Targa is the operator of the Monument AGI Well No. 1 ("Monument No. 1"), located in Section 36, Township 19 South, Range 36 East, NMPM, in Lea County, New Mexico. November 18, 2008, Order of the Division No. R-13052 ("Order R-13052"), p. 4.

3. Order R-13052 authorizes Targa to inject into the Monument No. 1 for the purpose of disposing gas processing wastes solely from Targa's Monument Gas Plant ("Gas Plant"). The authorization allows Targa to inject into the Devonian and Fusselman formations through an open hole interval from approximately 8350 feet to 9200 feet below the surface, through 3-½ inch plastic coated tubing set in a packer located within 100 feet of the top injection perforation. Id.

4. At the time Order R-13052 was entered, the Monument No. 1 was to replace the Graham State NCT-F Well No. 7 ("Graham No. 7") for disposal of Gas Plant waste waters.

5. NMGSAU Well No. 285 ("Well No. 285") is approximately 2900 feet northwest of Monument No. 1. Transcript ("Tr.") p. 26.¹

6. Order R-13052 requires Targa, before injecting into Monument No. 1, to reenter to 9755 feet and replug the Well No. 285 back to the Grayburg-San Andres producing interval with new cement plugs above and below the equivalent Devonian/Fusselman injection interval. Id.

7. In its Application, Targa asks the Commission to amend Order R-13052 to (i) delete the requirement to reenter and replug Well No. 285 and (ii) allow Targa to continue using the Graham No. 7 as a salt water only disposal well. R.²

8. In support of its Application, Targa argues that it has diligently attempted to comply with Order R-13052, but cannot, and that the area geological conditions and the conditions of the area wells are such that it is unnecessary to replug Well No. 285. Tr. pp. 4-7.

9. More specifically Targa claims that (i) it has made a costly and time consuming, though failed, effort to reenter Well No. 285, (ii) existing plugs in Well No. 285 are of good quality, (iii) fractures in the Monument Well No. 1 are cross gradient of Well No. 285, which discourages flow from the former to the latter, (iv) there are six wells within a one mile radius of the Monument Well No. 1 that are drilled to a depth in excess of 6000 feet, which do not penetrate as deeply as the Monument No. 1's injection interval, and those six wells are well cemented and cased. Thus, argues Targa, it is unlikely that material injected into Monument No. 1 will escape to Well No. 285, and migrate to other area wells. Id.

10. To reduce the plume of injectate from the Monument No. 1, Targa proposes to limit injection into that well to a total of 5000 barrels a day, 1400 of which would be acid gas and the remainder of which would be water. Any additional salt water, and only salt water, will be injected into the Graham No. 7.

11. Apache Corporation ("Apache") and Monument Operating Company, Inc. ("Monument") (together, "Opponents") argue that Targa has it wrong with respect to the direction of the fractures in Monument Well No. 1 and that the fractures are such that they encourage flow directly to Well No. 285. Opponents also argue that Targa's plume model is incorrect and that the plume can reach Well No. 285.

12. Opponents further say that Well No. 285 and others in the area could act as a conduit for acid gas that is injected into the Monument No. 1 to enter other, shallower formations, like the Abo. There was good reason for the requirements of Order R-13052, argue Opponents, and it is not worth the risk to potential development of the Devonian to the north and west of Monument No. 1 and of the Abo to allow Targa to avoid its existing obligation to reenter and replug Well No. 285.

¹ References to the Transcript are to the transcript of the September 22, 2011 hearing of this matter.

² Citations to the record proper will be indicated by "R."

Area Formations

13. Michael L. Pierce, accepted by the Commission as an expert in geology (Tr. pp. 20-21), testified that the injection interval for the Monument No. 1 is from 8350 feet to 9200 feet, which is into the Devonian formation, and below. Tr. p. 33.

14. Mr. Pierce also testified that the Drinkard, Abo, Wolfcamp, Pennsylvanian, Mississippian, and the Montoya are zones that are shallower than the Devonian. Tr. p. 45.

15. Mr. Pierce testified that the Devonian is capped by a layer of shale that is approximately 100 feet thick, including in the area of Well No. 285. T. p. 33

16. John Nelson, accepted by the Commission as an expert reservoir engineer (Tr. p. 73), testified that Apache has significant interest in the area at issue in this case, and that Apache wishes to protect the Abo for future development. Tr. p. 74. Mr. Nelson also testified that there has been a "fair amount" of production from some of the Abo wells in the area. Tr. pp. 73-74.

17. Robert Johnson, accepted by the Commission as an expert geologist in the area at issue in this case (Tr. p. 61), testified that there is shallow production in the area of the Monument No. 1, including from the Grayburg-San Andres and Abo formations. Tr. p. 67.

18. Mr. Pierce testified that, based on his review of Oil Conservation Division records, there is no production from the Devonian in the immediate vicinity of the Monument No. 1, and that drill stem tests of the area performed in the 1950s and 1960s did not show producible hydrocarbons. Tr. p. 44.

19. Mr. Johnson testified that he did not know whether there are commercial hydrocarbons in the Devonian and Fusselman formations to the north and west of the Monument No. 1 (the area between the Monument No. 1 and Well No. 285). Tr. p. 64.

The Reentry of Well No. 285

20. Targa contracted with Apache to perform the reentry and related work required under Order R-13052. Tr. p. 10. The decision to cease re-plugging operations on Well No. 285, however, was made by Targa. Tr. p. 87.

21. Between February 24, 2011 and May 19, 2011, Apache, as contractor for Targa, made repeated failed efforts to reenter Well No. 285. During May, 2011, Apache utilized a gyroscope and directional tools in an effort to find the original wellbore and reenter the well. Tr. pp. 12-13; Targa Ex. 1.

22. Bobby Lee Smith, accepted by the Commission as an expert drilling engineer (Tr. p. 84), testified that, despite its efforts to do so, Apache was never confident that it was following the original wellbore when trying to reenter Well No. 285. Tr. p. 94.

23. James R. Lignau, regional engineering manager for Targa (Tr. p. 9), testified that Targa and Apache consulted with other drilling experts including Cambrian and Scientific Drilling concerning other options for reentering Well No. 285. Tr. pp. 14-15. No drilling expert was able to provide an alternative that would provide reasonable confidence of being able to reenter Well No. 285. Tr. pp. 14-15.

24. Mr. Smith testified that there was no guarantee that continued efforts to relocate and reenter Well No. 285 well bore would be successful. Tr. pp. 94-95.

25. Mr. Pierce testified that sometimes a plug is harder than the formation into which it is placed, and that there is almost no chance of being able to reenter the original well bore of Well No. 285. Tr. p. 23. Based upon the repeated, but unsuccessful, efforts to reenter Well No. 285, it is unlikely that further efforts to reenter the well would be successful. Id.

26. Mr. Lignau testified that Targa has incurred in excess of \$1,000,000 in its efforts to reenter Well No. 285. Tr. p. 15.

27. Efforts to reenter Well No. 285 were suspended on or about May 19, 2011 (Targa Exhibit 1; Tr. pp. 11-15), and Targa proposes no further work on Well No. 285 (Tr. p. 16).

The Plume of Injectate

28. Mr. Pierce calculated the plume that would result from injecting 5000 barrels per day for thirty years, and concluded that the plume radius would be approximately 1981 feet. He also concluded that injecting for the same period at 3500 barrels per day would result in a plume radius of approximately 1654 feet (Tr. pp. 29-30; Targa Exs. 4A and 11) and that it was unlikely that the plume would reach Well No. 285 (Tr. p. 121).

29. In making his calculation, Mr. Pierce used 318 feet as the reservoir thickness, a figure that he obtained by examining open hole logs. Tr. p. 28.

30. John Nelson, accepted by the Commission as an expert reservoir engineer (Tr. p. 73), also calculated the plume that would result from injecting 3500 barrels per day, and concluded that the plume radius would be 4778 feet. Tr. p. 75; Apache Ex. 6. Mr. Nelson testified that he assumed a reservoir thickness of 50 feet because he did not believe that it was realistic to assume that the entire net pay is homogenous and that the entire leading edge of the injectate will be equidistant from the well. Tr. p. 78. Mr. Nelson testified that he had not reviewed the well logs or well data for the Monument No. 1 in preparing his calculations. Tr. p. 80.

31. Mr. Nelson testified that he also performed his calculations using a range of values, including 300 feet for the high end of the net pay and 50 feet for the low end, and 5000 barrels for the high end of injectate volume and 3500 barrels for the low end of injectate volume. The smallest radius that these calculations yielded was approximately 1950 feet. The largest is 4778, the amount reflected on Apache Ex. 6. Tr. 81.

32. Mr. Nelson's calculations assumed a radial flow, though the flow is more likely to be elliptical. Tr. pp. 76-77. Mr. Nelson could not predict the direction of the flow of the ellipse. Tr. pp. 76-77.

33. Mr. Nelson testified that there is a good chance that the injection zone is not homogenous. Tr. p. 76

34. Michael Donovan, accepted by the Commission as an expert petroleum geologist (Tr. p. 101), testified that he reviewed the open hole log for the Monument No. 1 for the first time on the day of the hearing, that porosity of the injection zone should have been calibrated on a dolomite matrix, not a limestone matrix, and that the reservoir thickness should have been calculated to 34 feet. Tr. pp. 107-11. Mr. Donovan concluded that the plume of injectate would be much larger than that estimated by Targa witnesses and that the plume could reach Well No. 285. Tr. p. 112-13.

35. Mr. Donovan testified that Mr. Pierce's model failed to account for the acid gas portion of the injectate, and that the model was based only on water injection. Tr. p. 105. He testified that, in his experience, in addition to 5000 barrels of water, the acid gas would probably be in the range of 1000 to 2000 barrels. Tr. p. 106.

36. Mr. Donovan also testified that, in order to calculate the plume, the thermodynamic properties of the injectate would have to be known. Id.

37. Mr. Donovan testified that his understanding is that there is an interval in Well No. 285 that spans a portion of both the Abo formation and the Devonian. If the injectate in the Devonian, from Monument No. 1, travels to Well No 285, this interval presents the opportunity for communication between the Devonian and the Abo, and a pathway for the injectate to migrate into the Abo. Tr. p. 113. Mr. Donovan further testified that if the Abo is depleted, the injectate could flash into gas, which would enhance its ability to migrate in the Abo. Id.

38. Mr. Pierce testified that industry practice is to calibrate on a limestone matrix in the Permian Basin and that he had never seen a dolomite matrix used in the Permian Basin. Tr. p. 118-19.

39. Mr. Pierce also testified that when he calculated the porosity, which yielded a reservoir thickness of 318 feet, he used not only the well log for the Monument No. 1, but well logs for other, older wells in the area. In order to compare those logs he used a neutron log, as opposed to a gamma ray log, because the latter was not available for the

older wells. He testified that using a neutron yields a thickness of 318 feet at six percent porosity or greater. Tr. pp. 119-21.

40. Mr. Pierce testified that his calculations were based on an injection limit of 5000 barrels per day, including both water and gas, injected in the fluid base. Tr. p. 121.

Fracturing

41. A Conductive Natural Fractures Plot ("CNFP") that was prepared by Mr. Pierce indicates that fractures at the bore of Monument No. 1 are oriented northeast to southwest. Tr. p. 27; Targa Ex. 3. Drilling induced fractures follow the same approximate orientation. Id. Mr. Pierce testified that injectate would migrate along the northeast to southwest orientation, and not toward Well No. 285. Tr. p. 32. Mr. Pierce further testified that if the regional trend were from the northwest to the southeast, the injection would push away from the Monument No. 1, and flow to the southeast, away from Well No. 285. Mr. Pierce also testified that a dipmeter run for the Monument No. 1 showed no faults or micro faults in the open hole interval of the Devonian. Tr. pp. 26-27.

42. Mr. Johnson testified that the rose diagrams associated with the CNFP are indications of what is happening in the immediate wellbore area and do not necessarily represent regional or areal fracture trends. Tr. p. 62.

43. Mr. Johnson testified that areal geological studies indicate a northwest-southeast regional fracture orientation. Id.

44. Mr. Donovan testified that the CNFP shows fractures going in all directions in the interval of 8400 feet to 9150 feet. It is a heavily fractured interval with varying orientations, and difficult to read. Tr. p. 100.

Condition of Well No. 285

45. Well records indicate that plugs were set for Well No. 285 at 10,333 to 9,900 feet, 9,800 to 9,755 feet, 6,350 to 6,305 feet, 5,700 to 5,655 feet, and 4,050 to 3,700 feet. Tr. pp. 21-23; Targa Ex. 2.

46. Mr. Pierce testified that the plugs in Well No. 285 are of good quality. Id.

47. Mr. Pierce testified that the plugs in Well No. 285 were not tagged and their exact locations are not guaranteed. Tr. p. 47.

48. Mr. Pierce testified that he believed that the plugs in Well No. 285 were set with a drilling rig right after the well was drilled and not after a pulling unit. Tr. p. 22.

Other Wells in the Area

49. A study conducted by Mr. Pierce indicates that there are six wells within a one mile radius of Well No. 285 that are deeper than 6000 feet, but which do not penetrate as deeply as the Monument No. 1's injection interval. Six thousand feet is just above the shallowest plug in Well No. 285. Based on the casing diagrams that were developed from the well files for those six wells, Mr. Pierce concluded that they were properly cased, cemented and plugged, and that it is unlikely that they would suffer contamination. Tr. pp. 34-36; Targa Exs. 5 and 8.

50. The six wells referred to in Finding No. 49 are: the Weir No. 15, the Maveety No. 11, the Maveety No. 12, the State D No. 6, the Phillips No. 10, and Graham State No. 7. Tr. pp. 37-42. These wells are, respectively, 5133 feet, 4485 feet, 4316 feet, 5330 feet, 5003 feet and 3529 feet from Well No. 285. Id.; Targa Ex. 6. In order for injectate from Monument No. 1 to reach these wells via Well No. 285, it would need to travel these distances after it had travelled the 2900 feet between Monument No. 1 and Well No. 285. Id.

51. Mr. Pierce testified that he believed it to be highly unlikely that injectate from the Monument No. 1 would impact any of the six wells referred to in Finding No. 49 because of the adequacy of their casing and cementing, and the distances that injectate would have to travel to reach any of the wells. Tr. p. 42.

AND CONCLUDES THAT:

- A. The Commission has jurisdiction over this matter and the parties hereto.
- B. Further efforts to reenter and replug Well No. 285 will not likely meet with success.
- C. Plugs in Well No. 285 appear to be properly set and in good condition.
- D. It appears that wells that could arguably be at risk within 1 mile of Monument No. 1 are properly cased, cemented and plugged.
- E. Porosity, fracturing and other reservoir characteristics are sufficiently complex that neither the low plume estimate of Targa nor the high plume estimate of Opponents is likely to obtain.
- F. It is unlikely that injection of gas plant waste into the Devonian from Monument No. 1 will contaminate other formations in the area via Well No. 285 because of the following: (i) the adequate plugging and condition of Well No. 285; (ii) the adequate plugging and condition of the other area wells; (iii) the significant distance of Well No. 285 from Monument No. 1; (iv) the significant distance of Well No. 285 from Weir No. 15, the Maveety No. 11, the Maveety No. 12, the State D No. 6, the Phillips No. 10, and the Graham State No. 7; (v) the thick, dense barrier shale cap on the Devonian and (vi)

Targa has agreed, and will be ordered by this Commission, to observe the injection limit of 5000 barrels, total, per day, with no more than 1400 of the 5000 being gas plant waste and the remainder being water.

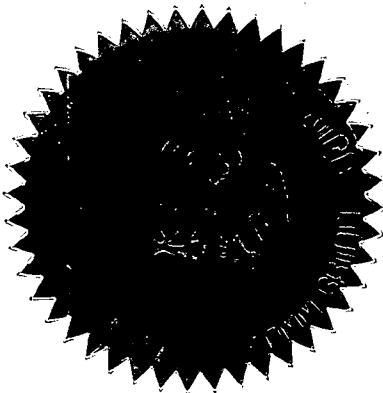
G. No evidence or objection was raised in opposition to Targa's use of Graham No. 7 for the sole purpose of salt water disposal.

H. The granting of Targa's request to amend Order No R-13052 is more likely to protect correlative rights and to prevent waste than the denying of it.

NOW THEREFORE, the Application of Targa Midstream Services, Limited Partnership's application to amend Order No. R-13052 should be and hereby is approved consistent with this Order. Order No. R-13052 is amended as follows:

- (i) Targa is authorized to inject gas processing wastes from the Monument Gas Plant into the Monument AGI Well No. 1 as set forth in Order No. R-13052, except that Targa may inject no more than 5000 barrels, total, per day, into the Monument AGI Well No. 1 with no more than 1400 barrels of the 5000 barrels being gas processing wastes and the remainder of the 5000 barrels being water.
- (ii) Targa is not required to reenter or replug NMGSAU Well No. 285 as a condition of injecting into Monument AGI Well No. 1.
- (iii) Targa may continue using the Graham No. 7 as a salt water only disposal well.
- (iv) All other terms, conditions, restrictions, and requirements of Order No. R-13052 remain in full force and effect.

DONE at Santa Fe, New Mexico on the 17th day of November, 2011.



SEAL

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION


SCOTT DAWSON, Member


ROBERT BALCH, Member


JAMI BAILEY, Chair