

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

**APPLICATION OF LIGHTNING DOCK
GEOTHERMAL HI-01, LLC FOR APPROVAL
TO INJECT INTO A GEOTHERMAL AQUIFER
THROUGH THREE PROPOSED GEOTHERMAL
INJECTION WELLS AT THE SITE OF THE
PROPOSED LIGHTNING DOCK GEOTHERMAL
POWER PROJECT, HIDALGO COUNTY, NEW
MEXICO**

CASE NO. 15357

**APPLICATION OF LIGHTNING DOCK
GEOTHERMAL HI-01, LLC TO PLACE WELL
NO. 63A-7 ON INJECTION-GEOTHERMAL
RESOURCES AREA, HIDALGO COUNTY, NEW
MEXICO**

**CASE NO. 15365
Order No. _____**

AMERICULTURE'S PROPOSED ORDER OF THE COMMISSION

This case came before the Oil Conservation Commission for consideration on September 10 and 11, and October 7 and 8, 2015. The Commission having considered the evidence in support and opposition to the submitted applications, on the ____ day of ____ 2015,

FINDS THAT:

1. Applicant Lightning Dock Geothermal HI-01, LLC ("Lightning Dock") currently operates a geothermal electric power generation plant in Section 7, Township 25 South, Range 19 West, within Hidalgo County ("the Power Plant"). The Power Plant commenced operation in December 2013.

2. Applicant operates its Power Plant by pumping a high volume of geothermally-heated ground water from their production Well 45-7, extracting the heat to produce electricity for sale to a public utility, and reinjecting the water through their injection Wells 53-7 and 55-7.

3. The production depth of Lightning Dock's Well 45-7 is at 1,680 – 2,900 feet. The injection depths of Lightning Dock's Wells 53-7 and 55-7 are at 1,827 – 4,236 feet and 1,050 – 2,349 feet, respectively

4. At prior hearing before the OCC, Applicant presented evidence that the fluid production zone in Well 53-7 and Well LDG 55-7 is the same and that the geothermal flow intervals occur in the same geological formations and are not connected to the alluvial aquifer at

400 feet below ground surface in AmeriCulture, Inc.'s State Well No. 1." (OCC Order R-13675-B).

5. Applicant Lightning Dock plans to expand its utility-scale geothermal power facility. This proposed expansion includes the four proposed injection wells, and will increase the amount of water pumped from its production wells by a factor of seven (7).

6. On or about June 10, 2015 Applicant submitted applications to the Oil Conservation Division (OCD) to place two geothermal wells (15-8 and 76-7) on injection for re-injection of geothermal fluids. The form of these applications was a Form G-112 packet, pursuant to 19.14 NMAC, specifically 19.14.93.8 NMAC.

7. On or about June 15, 2015 Applicant submitted applications to the Oil Conservation Division (OCD) to place a geothermal well (13-7) on injection for re-injection of geothermal fluids. The form of these applications was a Form G-112 packet, pursuant to 19.14 NMAC, specifically 19.14.93.8 NMAC.

8. On or about July 21, 2015 Applicant submitted applications to the Oil Conservation Division (OCD) to place a geothermal well (63A-7) on injection for re-injection of geothermal fluids. The form of these applications was a Form G-112 packet, pursuant to 19.14 NMAC, specifically 19.14.93.8 NMAC.

9. Well 15-8 is proposed to be located in Unit L, 2141 feet from the South line and 345 feet from the West line of Section 8, Township 25 South, Range 19 West, Hidalgo County, New Mexico, with a depth of

10. Well 76-7 is proposed to be located in Unit I, 1896 feet from the South line and 1128 feet from the East line of Section 7, Township 25 South, Range 19 West, Hidalgo County, New Mexico.

11. Well 13-7 is proposed to be located in Unit E, 1537 feet from the North line and 504 feet from the West line of Section 7, Township 25 South, Range 19 West, Hidalgo County, New Mexico.

12. Well 63A-7 is proposed to be located in Unit G, 1934 feet from the North line and 1403 feet from the East line of Section 7, Township 25 South, Range 19 West, Hidalgo County, New Mexico.

13. Wells 15-8, 76-7, and 63A-7 have proposed injection volumes between 720,000 and 1,000,000 gallons per day for each well (500 to 694 gallons per minute per well) with a proposed injection zone from 150' depth to 1,500' depth. Well 13-7 has a proposed injection volume of between 720,000 and 1,000,000 gallons per day with a proposed injection zone from 500' depth to 1,500' depth.

14. Applicant proposes to utilize each of the four proposed wells to inject spent geothermal fluids into the shallow alluvial aquifer of the Animas Basin.

15. Applicant's experts testified the injection interval into the shallow alluvial aquifer was chosen to be utilized due to financial reasons, or "risk" to the Applicant.

16. The groundwater within the shallow alluvial in the Animas Basin is a source of water utilized for domestic, livestock and irrigation purposes by other water rights holders.

17. The natural groundwater flow of the waters in the shallow alluvial aquifer is to the north and away from the location of Applicant's current and proposed production and injection wells.

18. The exact composition (including faults) of the subsurface geology of the geothermal resource is uncertain; contrary evidence was presented concerning the subsurface geology.

19. Applicant testified that the waters proposed to be injected into the shallow alluvial aquifer would not migrate out of the geothermal source as part of the natural alluvial flow, based upon a corresponding increase in production that would theoretically create sufficient dynamic pressure to draw all shallow injected waters through the subsurface geology back to the deep production zone.

20. Applicant did not address the hydraulic conductivity of the subsurface geology, which is an important factor in determining whether the proposed injection into the shallow alluvial aquifer would result in migration of water to the production zone.

21. Undisputed evidence demonstrated that the water levels in the shallow (55 to 80 feet) monitoring wells adjacent to Applicant's Power Plant have all risen since commencement of the Power Plant operation.

22. Applicant's witness Mr. Janney testified that since commencement of the Power Plant operation, the water chemistry in the shallow alluvial aquifer has been altered as shown by changes in the fluoride levels in the shallow (55 to 85 feet deep) monitoring wells surrounding the Power Plant operation.

23. Mr. Janney testified that recent monitoring well data shows increases of 1 to 2 milligrams per liter of the water contaminant fluoride in the monitoring wells since commencement of the Power Plant operation. The most recent monitoring well data from June 30, 2015 was not made available to Protestant or the Oil Conservation Commission.

24. Applicant's experts testified that the proposed injection into the shallow alluvial groundwater will further alter the existing water chemistry in the shallow alluvial groundwater,

which will be shown as an increase in fluoride levels from the existing background levels known prior to commencement of the Power Plant operation.

25. Applicant admitted through its expert witness Greg Miller that the proposed injection would alter the water chemistry of AmeriCulture's domestic well A-444.

26. The OCD in May 2015 issued a letter to Applicant regarding water quality sampling of eight monitoring wells. In the letter, OCD advised Applicant that OCD must immediately be notified if the measured concentration of listed constituents exceeded the maximum levels provided in NMAC 20.6.2.3103, except for fluoride, sulfate and total dissolved solids. The letter provided notice to OCD if fluoride exceeded 17 mg/l. No well in the area has shown a background fluoride level of 17 mg/l.

27. Applicant Lightning Dock's geology expert witness Roger Bowers gave a non-expert opinion that the proposal would protect correlative rights, but failed to present supporting evidence.

28. Applicant Lightning Dock did not provide evidence that its proposal would not result in waste.

29. Protestant AmeriCulture presented evidence that since commencement of Applicant's Power Plant operation, the water level has risen in AmeriCulture's wells adjacent to Applicant's operation; the water chemistry has been changed and the TDS levels have risen in AmeriCulture's wells.

30. AmeriCulture presented expert testimony that the proposed injection into the shallow aquifer would not result in the injected water being returned to the production zone; but rather the majority of the water injected into the shallow aquifer would migrate out of the area following the natural alluvial flow.

31. AmeriCulture presented expert testimony through its expert witness James Witcher that the proposal would result in a diminishment of AmeriCulture's resource temperature.

32. AmeriCulture presented evidence that a diminishment in resource temperature constitutes waste.

33. AmeriCulture presented expert testimony through its expert witness Dan Hand that a reduction in resource temperature would dramatically reduce power output of AmeriCulture's future power plant.

34. AmeriCulture presented evidence that correlative rights cannot be properly determined based on lease acreage alone because the standard for correlative rights is each

producer's share of practically attainable geothermal resources. AmeriCulture presented evidence that Lightning Dock's right to practically obtain geothermal resources is limited to locations within the resource in excess of 250 degrees Fahrenheit since Lightning Dock does not hold water rights for geothermal power production.

35. AmeriCulture presented evidence that it's right to produce geothermal power from its geothermal resource at an approximate output of 1 megawatt net within the outflow plume of the resource is part of its correlative right and that the Applicant's proposed injection would impair existing correlative rights.

36. AmeriCulture presented evidence that waste includes a diminishment of resource temperature and thus that the proposal would result in waste.

37. AmeriCulture presented evidence that current injection activities by Lightning Dock have already caused contamination and that the proposal will result in further contamination in violation of WQCC regulations.

38. AmeriCulture presented evidence that the proposed injection will violate Section 71-5-8 of the Geothermal Resource Conservation Act by causing water passing from their native strata to other strata and causing contamination of fresh waters of present or probable future value for domestic, commercial, agricultural or stock purposes.

39. AmeriCulture presented evidence that the mounding resulting from Lightning Dock's present injection activities extends to its well A-444, and that as a result, the A-444 water chemistry has been altered resulting in TDS violating State Drinking Water standards and caused fluoride to rise above background levels.

40. The testimony of both Lightning Dock and AmeriCulture agree that the present injection activities and proposed injection activities will cause waters of the State of New Mexico to exceed applicable water quality standards as set forth in Title 20 Chapter 6 NMAC.

41. AmeriCulture provided evidence that no water mounding exists beneath AmeriCulture's fee estate.

42. AmeriCulture testified that water from its well A-444 is used for domestic purposes including bathing, drinking and washing and complies with the definition of an underground source of drinking water.

43. AmeriCulture presented evidence that the exceedances observed in well A-444 will increase further as a result of the proposed injection and thus the proposed injection will result in the contamination of an underground source of drinking water.

The Commission concludes that:

44. Due notice of the hearing on this application has been given, and the Commission has jurisdiction over the parties to this case and the subject matter thereof.

45. Lightning Dock's proposal complies with 19.14.93.8 NMAC.

46. The burden of proof required for Applicant to meet is that the proposed injection will not: 1) contaminate any underground source of drinking water; 2) cause waters of the State of New Mexico to exceed applicable water quality standards; 3) cause waste of geothermal resources; or, 4) impair correlative rights of geothermal users.

47. Lightning Dock's evidence concerning the subsurface geology presented at hearing is contradictory to its evidence presented at the 2013 hearing concerning its Wells 53-7 and 55-7.

48. Lightning Dock previously presented evidence the geologic formation of the production zone of Wells 53-7 and 55-7 is not directly connected to the shallow alluvial aquifer; Lightning Dock now contends there is a sufficient connection between these two zones that dynamic pressure created by an increase in its production wells would result in all waters injected into the shallow alluvial aquifer being drawn through the unknown subsurface geology back into the production zone.

49. Applicant's "dynamic pressure" theory is not credible, particularly based upon Applicant's failure to address the subsurface hydraulic conductivity and a showing that the current production and injection protocol has resulted in an increase in the water level in the shallow aquifer into which Applicant now proposes a seven-fold increase in the amount of injected waters.

50. The Applicant did not show that its proposed injection into the shallow alluvial aquifer would result in a corresponding return of all injected waters to the production zone and no net depletion to the production zone source.

51. The concept of "mass balance" is not the basis for which a determination of New Mexico's water quality standards are met or exceeded is made.

52. The concept of "mass balance" is not the basis for which a determination of waste or impairment of correlative rights of other geothermal users is made.

53. Applicant did not show that its proposed injection into the shallow alluvial aquifer would protect the Animas Basin underground drinking water source, nor did it show the proposed injection would not result in the source exceeding New Mexico's water quality standards.

54. The rise in fluoride and TDS levels in the Animas Basin underground drinking water source that has occurred since commencement of Applicant's operation has already resulted in these levels exceeding the prior background levels, which is a violation of NMAC 20.6.2.3103 standards.

55. The OCD's May 2015 letter to Applicant regarding water quality sampling of eight monitoring wells should not allow an exemption for notice to OCD based upon a fluoride exceedance of 17 mg/l. Applicant shall notify OCD if the measured concentration in any given monitoring well of fluoride, sulfate or TDS exceeds the pre-operation level of fluoride, sulfate or TDS in the respective well by a factor of 10 percent.

56. Applicant Lightning Dock has not met its burden of showing its proposed injection into the shallow alluvial aquifer is in the interest of conservation and will not cause waste.

57. Applicant Lightning Dock has not met its burden of showing its proposed injection into the shallow alluvial aquifer will protect correlative rights.

58. Applicant Lightning Dock has not met its burden of showing that wells 15-8, 76-7, 13-7 and 63A-7, as proposed, would not be cased, cemented, and equipped in such a manner that there will be no danger to any natural resource including geothermal resources, useable underground water supplies, or other subsurface resources.

59. Applicant Lightning Dock has a viable alternative to ensure utilization of its existing correlative rights by drilling deeper injection wells that would be sited closer to its production wells.

IT IS THEREFORE ORDERED THAT:

1. The application of Lightning Dock Geothermal HI-01, LLC to place wells 15-8, 76-7, 13-7 and 63A-7, as proposed, on injection is hereby denied.

2. Applicant Lightning Dock is encouraged to conduct further evaluation of the geothermal resource to determine the best location for deeper injection wells sited in closer proximity to its production wells.