

**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 TO CONSIDER:**

**CASE NO. 15720
ORDER NO. R-14427**

**APPLICATION OF BLACK RIVER WATER MANAGEMENT COMPANY, LLC
TO AMEND ADMINISTRATIVE ORDER SWD-1627 FOR A SALT WATER
DISPOSAL WELL, EDDY COUNTY, NEW MEXICO.**

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 8:15 a.m. on June 8, 2017, at Santa Fe, New Mexico, before Examiner William V. Jones.

NOW, on this 28th day of August, 2017, 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 its subject matter.

(2) The applicant, Black River Water Management Company, LLC (OGRID 371287) ("Black River"), seeks to amend Division administrative order SWD-1627 to allow an increase in the size of the disposal tubing to five-inch in its Black River SWD Well No. 1 (API No. 30-015-43807, the "subject well"). Order SWD-1627 allows the use of 4-1/2-inch or smaller diameter, internally plastic coated ("IPC"), tubing.

(3) The subject well has been drilled and is located 250 feet from the North line and 2461 feet from the West line (Unit C) of Section 31, Township 23 South, Range 28 East, NMPM, Eddy County, New Mexico. The well has been used since December of 2016 for disposal of produced water into the Devonian formation through an open hole from a depth of 13,785 feet to 14,734 feet using 4-1/2-inch IPC tubing.

(4) The subject well has four strings of casing protecting, in order of date installed, the fresh water, the salt interval, the Permian aged rocks through the middle of the Wolfcamp formation, and depths through the Woodford shale. The deepest casing is seven-inch, 32 pounds per foot ("ppf"), American Petroleum Institute ("API") grade P-

110, high collapse ("HC"), buttress thread casing ("BTC") casing set in an 8.5-inch hole from surface to 13,785 feet and cemented to an estimated 9,500 feet with 500 sacks of cement.

(5) Black River had requested administratively by letter to the Division dated March 1, 2017 to increase tubing size in this well from the existing 4-1/2-inch up to 5-1/2-inch tubing. The Division did not approve the request and suggested a solution through hearing, possibly in conjunction with the hearing request by Mesquite SWD, Inc. to upsize disposal tubing in numerous wells. Mesquite presented Case No. 15654 to the Examiners on March 30, 2017, and Order No. R-14392 was issued July 21, 2017. Said order denied Mesquite's requests to upsize disposal tubing, indicating further study is needed.

(6) Black River made application for hearing on May 9, 2017, asking to increase tubing size from 4-1/2-inch to five-inch in diameter.

(7) No other party appeared at the hearing or otherwise opposed this application.

(8) Black River appeared at the hearing through counsel and presented evidence demonstrating the following.

- (a) Black Mountain showed that 85 percent of the surface pressure it was encountering using 4-1/2-inch tubing was simply friction pressure. Increasing the tubing size from 4-1/2-inch to five-inch would reduce friction somewhat and would allow disposal at a rate of 30,000 barrels per day, an increase of 8,000 barrels per day.
- (b) Data obtained during testing on this well indicates that movement of fluids into this Devonian formation, even at very high disposal rates, is through matrix porosity and permeability and not into fractures.
- (c) Measured reservoir pressure in this formation is approximately 6,200-psi. Twenty years of disposal at 40,000 barrels of water per day would increase this pressure near the well by approximately 250-psi. Ten kilometers from this well, that increased pressure in the reservoir would be reduced to 50-psi.
- (d) There is an older, nearby Devonian disposal well that has disposed at much lower rates than the subject well, but for a longer time. The effect of both wells on the reservoir pressure in the Devonian could be estimated by superposition modeling of both wells. That was not done, but based on the modeling of the subject well, the summed pressures would be insignificant.

- (e) Notice was provided of this proposed change to the existing permit to all affected parties as defined in Rule 19.15.26.8 NMAC.

The Division concludes as follows:

(9) Black River had originally asked by letter for 5-1/2-inch tubing, but did not specify whether the connection ends were "integral joint" or "external upset" ("IJ" or "EUE"). In addition, its letter did not mention what size casing existed in the well. In its hearing case, Black River reduced this request to five-inch diameter, EUE tubing, perhaps realizing the casing size was seven-inch and not 7-5/8-inch.

(10) The Division requires proper plugging of wells to prevent communication of fluids and pressures between formations and to prevent waste. If tubing becomes stuck and cannot be fished economically, then the operator may abandon fishing attempts and proper well plugging may not occur, the well then becoming a conduit for fluids and pressures between formations, enabling waste.

(11) The evidence presented indicates that the proposed tubing inside the subject well's casing can be fished. The fishing specification books available to the Examiner indicate that the proposed five-inch EUE tubing coupling cannot be fished with an overshot inside seven-inch, 32-ppf casing, but the body of the tubing could be fished with overshot slim-hole tools. It is also true that the five-inch diameter tubing is more likely to be successfully fished using internal "spear" tools even with the presence of the internal plastic coating. It seems that installing this larger tubing will increase risks of fishing to some degree, but it also seems that parted tubing could still be recovered.

(12) The Division as part of its primacy agreement with the US EPA manages the Class II UIC program in New Mexico except on certain Indian Lands. Properly equipped disposal wells, regularly tested for mechanical integrity, prevent threats to fresh waters and waste of oil and gas. The Division requires in its rules a fluid-filled, annular space between injection tubing and casing, extending down to within 100 feet of the injection or disposal interval. The annular space using five-inch steel tubing inside seven-inch steel casing should be adequate to hold inert fluid and communicate induced pressures from the surface to the packer depths necessary to investigate the tubulars and to achieve a properly conducted mechanical integrity test.

(13) To prevent propagation of fractures in the disposal interval, the Division restricts surface tubing pressures under disposal operations to a surface pressure gradient of 0.2 psi per foot above the top of the disposal formation interval - unless the operator justifies higher allowable pressures through step-rate-testing. While disposing of salt water at a specific gravity equating to a pressure of 0.45 psi per foot, this results in a maximum allowed bottom hole pressure gradient of 0.65 psi per foot.

(14) The encountered tubing friction while pumping reduces this bottom hole disposal pressure and therefore reduces the disposal rate that otherwise could be safely

achieved without propagating fractures in the formation. Reducing tubing friction by installing larger tubing will result in an increase in disposal rates but would never result in a higher bottom hole pressure gradient than 0.65 psi per foot – which is the default allowed gradient. With the deep Devonian formation completions capable of higher disposal rates, these high rates through 14,000 feet of pipe result in significant realized friction; therefore, disposal operators such as Black Mountain seek to increase tubing diameters to reduce this friction.

(15) Black Mountain ran electric logs, a mudlog, injection tests, and a falloff test of this well to obtain the reservoir parameters needed to properly analyze the well. It determined that the well does not have native fracturing near the wellbore and can take higher disposal rates directly into matrix porosity without propagating new fractures.

(16) Black Mountain input this data into a reservoir model which indicates the pore pressure will hardly change after many years of disposal at high rates. A nodal analysis was then run which indicates an increase in tubing diameter as proposed will result in higher disposal rates without exceeding allowable surface or bottom hole pressures.

(17) Black Mountain submitted adequate, but less testimony than Mesquite in its Case No. 15654, as to the feasibility of fishing heavy, large diameter, parted tubing from depths up to three miles. However, Black Mountain went to considerable time and expense to submit convincing evidence on several additional concerns that were not covered adequately in the Mesquite case.

(18) A requirement in Administrative Order No. SWD-1627 is to drill, log, and finalize the “as drilled” Devonian open hole disposal interval with the Division. The new permitted depths should reflect the completed well and should extend from 13,785 feet to 14,734 feet.

IT IS THEREFORE ORDERED THAT:

(1) The application of Black River Water Management Company, LLC, to amend Administrative Order No. SWD-1627 to allow the use of five-inch IPC disposal tubing inside seven-inch, 32-ppf, BTC casing, is hereby approved.

(2) Administrative Order No. SWD-1627 is also amended to recognize the “as drilled” Devonian open hole disposal interval. The new permitted depths for disposal shall extend from 13,785 feet to 14,734 feet.

(3) All other provisions of Administrative Order No. SWD-1627 remain in full force and effect.

(4) Jurisdiction is hereby retained for the entry of such further orders as the Division may deem necessary.

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



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David R. Catanach

DAVID R. CATANACH
Director