

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

**APPLICATION OF EMPIRE NEW MEXICO  
LLC TO REVOKE THE INJECTION  
AUTHORITY GRANTED UNDER ORDER NO.  
R-21190 FOR THE SOSA SA 17 NO. 2 WELL  
OPERATED BY GOODNIGHT MIDSTREAM  
PERMIAN LLC, LEA COUNTY, NEW  
MEXICO.**

**CASE NO. 24025**

**APPLICATION OF GOODNIGHT  
MIDSTREAM PERMIAN, LLC TO AMEND  
ORDER NO. R-7765, AS AMENDED TO  
EXCLUDE THE SAN ANDRES FORMATION  
FROM THE UNITIZED INTERVAL OF THE  
EUNICE MONUMENT SOUTH UNIT,  
LEA COUNTY, NEW MEXICO.**

**CASE NO. 24278**

**APPLICATIONS OF GOODNIGHT MIDSTREAM  
PERMIAN, LLC FOR APPROVAL OF  
SALTWATER DISPOSAL WELLS  
LEA COUNTY, NEW MEXICO.**

**CASE NOS. 23614-23617**

**APPLICATIONS OF EMPIRE NEW MEXICO LLC  
TO REVOKE INJECTION AUTHORITY,  
LEA COUNTY, NEW MEXICO.**

**CASE NOS. 24018-24020**

**APPLICATION OF GOODNIGHT MIDSTREAM**

**PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403  
TO INCREASE THE APPROVED INJECTION RATE  
IN ITS ANDRE DAWSON SWD #1,  
LEA COUNTY, NEW MEXICO.**

**CASE NO. 23775**

**APPLICATION OF GOODNIGHT PERMIAN MIDSTREAM,  
LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL,  
LEA COUNTY, NEW MEXICO; ORDER NO. R-22869-A.**

**CASE NO. 24123**

**RICE OPERATING COMPANY AND PERMIAN LINE SERVICE,  
LLC'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW**

## BACKGROUND

1. On June 20, 2024, Rice Operating Company and Permian Line Service, LLC intervened in these cases before the Oil Conservation Commission.
2. On February 20, 2025, the Oil Conservation Commission commenced the hearing in Case Nos. 23614-17, 23775, 24018-24020, 24025, 24123, and 24278, which Hearing concluded on May 21, 2025.

### THE LOWER SAN ANDRES, WHERE GOODNIGHT INJECTS, IS SEPARATED FROM THE ZONES ABOVE

#### A. The Evidence Establishes that the Lower San Andres is Separate From, and Does Not Communicate Vertically With, the Upper San Andres.

3. All of Goodnight Midstream Permian LLC's existing SWD wells in the EMSU inject into the Lower San Andres.<sup>1</sup> Apr. 22, 2025 Tr., at 52:9-13 (Knights).
4. The gamma ray marker in the well logs shows an interval that contains bedded anhydrites that create an impermeable barrier to vertical flow, which isolates the Lower San Andres from the Upper San Andres. Apr. 21, 2025 Tr., at 218:1-10, 219:1-220:14 (Davidson).
5. The pressure gradient in the Lower San Andres, below the impermeable barrier at the gamma ray marker identified, is under-pressured: the pressure gradient is currently approximately .38, and the normal pressure gradient for that interval should be .43-.44. Apr. 21, 2025 Tr., at 207:5-13, 208:1-24 (Davidson).
6. The mineralogical analysis Goodnight's experts performed on the Rhino well established that there is a section at the top of the permeability barrier in the San Andres aquifer that has elevated anhydrite. May 20, 2025 Tr., at 124:5-22 (McGuire).
7. The Upper San Andres and the Lower San Andres – where the injection activities are taking place – “are two different systems” that do not communicate with each other, and that there's currently enough data before the Commission, including the lack of interference in Empire's Grayburg waterflood production, and the loss of circulation when operators drill through the permeability barrier, to conclude that the systems are separate. Apr. 21, 2025 Tr., at 237:1-4, 238:11-17 (Davidson).
8. The confining layer between the San Andres aquifer and the Grayburg reservoir is confirmed by the differing pressures confirmed when drilling through the Grayburg and the differing pressure in the San Andres, which was observed “across the field,” showing that they operate as two separate reservoirs. May 20, 2025 Tr., at 116:3-18 (McGuire).
9. There were significant numbers of permeability barriers, across each well analyzed by William Knights, that are concentrated strata that prevent vertical migration which, when presented with a visual depiction of the lost circulation intervals that Preston McGuire

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<sup>1</sup> The Findings of Fact and Conclusions of Law uses the term “Lower San Andres” to refer to the separate zone in the San Andres aquifer into which Goodnight injects wastewater. In Goodnight's filed testimony and exhibits, Goodnight refers to this layer as the San Andres. During the Hearing testimony of Preston McGuire, he referred to this zone as the “water management” zone. Goodnight refers to the zone above the separate injection zone as the Grayburg in its filed testimony and exhibits. These Findings of Fact and Conclusions of Law refer to that separate upper zone above the injection zone as the “Upper San Andres.”

- observed, are proven to exist throughout the EMSU. Apr. 23, 2025 Tr., at 108:14-109:11; *see id.* at 115:2-18 (Knights).
10. Mr. Knights testified that, if advising investors who were looking at investing in or pursuing EOR in the EMSU, he would advise them that -500 foot subsea is the lowest elevation that EOR exploration and production should occur. Apr. 22, 2025 Tr., at . Mr. Knights testified that his research revealed “a lot of petrophysical events, that there's multiple perm barriers, both very, very extremely low and very moderately low. But a number of those barriers in amalgamation, I think, is an incredibly strong barrier to vertical fluid flow.” Apr. 22, 2025 Tr., at 212:11-20.
  11. All of Mr. Knights, Dr. Jim Davidson, Dr. Bob Lindsay, and OPS Geologic (Scott Birkhead and Ryan Bailey) identified significant permeability in concentrated strata between the Upper San Andres and Lower San Andres that act as a barrier to vertical flow. Apr. 22, 2025 Tr., at 241:5-242:24; *see* Apr. 23, 2025 Tr., at 114:3-21 (Knights).
  12. The EMSU 679 core report contains 29 sections, over 179 feet between -500 and -700 feet subsea, which observe permeability barriers to vertical flow, that when aggregated together over that interval “are significant barriers to vertical flow.” Apr. 23, 2025 Tr., at 12:8-21:25 (Knights).
  13. Mr. Knights conceded that he is unaware of any literature or definitive map that shows a permeability barrier to vertical flow from the Lower San Andres to the Upper San Andres, but said that “he has spent a lot of time rebutting some what I think are very unrealistic data use” by Empire to attempt to show vertical communication, but based on “the geologic system here, I don’t think there’s any realistic way there’s any communication between the two.” Apr. 22, 2025 Tr., at 249:15-250:11 (Knights).
  14. The San Andres aquifer, unlike the Grayburg reservoir, is under-pressured. Apr. 23, 2025 Tr., at 221:12-18 (McBeath).
  15. Larry Lake confirmed that the record evidence, including the disparate pressures between the San Andres aquifer and Grayburg reservoir, and the two- to four-foot sections of the EMSU 679 core with less than .1 millidarcy, establish that there exists a barrier to communication between the disposal zone in the San Andres and the Grayburg in the EMSU. Apr. 24, 2025 Tr., at 212:9-213:11; *see id.* at 217:18-25 (Lake).
  16. Mr. Knights could not opine where the exterior boundary of the Lower San Andres aquifer may be, but stated that the fact that the Lower San Andres is under-pressured by about .38 psi per square foot after it has received approximately over 100 million barrels of injections, shows that it is vast and that the 340 million barrels removed is just “a very small component” of the size of the aquifer. Apr. 22, 2025 Tr., at 211:2-16; *see id.*, at 213:6-214:5 (Knights).
  17. The San Andres aquifer has been under-pressured since the time that measurements were taken in 1959, and the withdrawal of 340 million barrels of water likely brought the pressure down even more. Apr. 25, 2025 Tr., at 112:7-25 (Tomastik).
  18. Mr. Knights testified that he identified “three different intervals in the San Andres,” the (1) “Upper San Andres, [(2)] a permeability barrier, and [(3)] the Lower San Andres that Goodnight injects in . . . that is separated from the Upper San Andres and the Grayburg.” Apr. 23, 2025 Tr., at 11:14-24 (Knights).
  19. The Lower San Andres, where Goodnight is injecting produced water, is “the large aquifer.” Apr. 22, 2025 Tr., at 209:13-22 (Knights).

20. The Lower San Andres aquifer that Goodnight injects into is a confined aquifer that is open laterally, and, as confirmed by Dr. Trentham, the San Andres flows East and South through the Central Basin fairway. Apr. 25, 2025 Tr., at 99:10-25, 122:2-25 (Tomastik).
21. In relation to whether there was communication from the San Andres to the Grayburg, Dr. Lindsay testified that there is insufficient data to know, with just two cores to analyze, and agreed with the recommendation to the OCD that “any well that would be drilled through this unit . . . should be FMI run or there should be a detailed fracture study performed to establish whether there’s going to be an impairment” to production because of fractures between the two zones. Tr. Vol. II, at 213:16-25 (Lindsay).
22. Thomas Tomastik described that, after studying Dr. Lindsay’s outcrop study, the fractures that Dr. Lindsay observed in the EMSU 679 core of only a few feet of length do not extend hundreds of feet to connect the San Andres and Grayburg; rather, they evidence a horizontal bedding plane which causes liquid to flow horizontally rather than vertically, which bedding planes explain the high water volumes in isolated wells in the EMSU. Apr. 25, 2025 Tr., at 96:5-98:8 (Tomastik).
23. The separation between the Grayburg and the Lower San Andres disposal zone is confirmed by the “very, very different” pressures measured in wells drilled into the Grayburg and Goodnight’s disposal zone. May 20, 2025 Tr., at 118:4-13 (McGuire).
24. Goodnight’s impermeability barrier is confirmed by the EMSU 679 core, which shows zero permeability that would prevent vertical flow in the zone that Goodnight mapped as the permeability barrier in the San Andres aquifer across the EMSU. May 20, 2025 Tr., at 121:2-13 (McGuire). *See id.* at 173:12-174:9 (McGuire).
25. Mr. McBeath testified that he has never seen the Kinder Morgan CO2 screening tool that Empire used to estimate the economics of a CO2 EOR project used for an EOR project; only for a main pay project. He testified that there is a distinction in using it for an EOR project versus main pay, because of the dimensionless curve in Empire’s model. Apr. 23, 2025 Tr., at 209:21-210:24 (McBeath).
26. History has shown that to pick “the exact chronostratigraphic” top for the San Andres aquifer is very “difficult,” and the experts, including Empire’s own experts, but also including Chevron versus Empire, disagree on where the top of the San Andres aquifer lies. But the evidence shows that there is a confining layer that separates the Lower San Andres disposal zone, or “water management zone,” from the Upper San Andres and Grayburg. May 20, 2025 Tr., at 131:3-134:15; *see id.* at 177:4-24.

**B. The Evidence of Communication from the San Andres Aquifer is Unreliable and Speculative.**

27. Dr. Jim Buchwalter admitted that, in creating his reservoir model, he did not correlate the porosity and permeability to the geology and the core measurements, but instead found a value that would “match” what he was told was the “influx” of water from the San Andres aquifer. Tr. Vol. VI, at 1088-25-1089:24 (Buchwalter).
28. Dr. Buchwalter admitted that his model, which posited that there had to be communication between the Grayburg reservoir and San Andres aquifer to account for the water produced from the Grayburg, “miss[ed] some of the water-supply wells” in the EMSU. Tr. Vol. VI, at 1108:15-1109:4 (Buchwalter)

29. In relation to the prospect of a successful tertiary recovery project, Dr. Buchwalter testified that, after almost a full year working on the model for Empire, he could not get a match for the EMSU without adding in the other units – the EMSU-B and AGU – to act as one single reservoir. Tr. Vol. VI, at 1117:20-1118:6 (Buchwalter).
30. Dr. Buchwalter's model did not model the San Andres aquifer as having a Lower and Upper San Andres. Tr. Vol. VI, at 1118:21-1119:3 (Buchwalter).
31. To fit the communication assumed between the Grayburg reservoir and San Andres aquifer in the EMSU, Dr. Buchwalter had to extend the San Andres to a "150-plus billion barrel aquifer," but he could not extend the model for the Grayburg to match. Tr. Vol. VI at 1120:5-21 (Buchwalter).
32. Permeability in the San Andres aquifer varies between "the single to tens of millidarcy range," and that he has never seen, and was "surprise[d]" by the "high" range that Dr. Buchwalter used in his model to prove communication between the San Andres and Grayburg – from 500 to 550 millidarcies. Apr. 7, 2025 Tr., at 113:24-115:8.
33. Mr. McBeath criticized Dr. Buchwalter's reservoir model, because Dr. Buchwalter did not tie the high permeability values to the core and logs where high permeability was observed, and built his model to fit water permeating up vertically from the San Andres into the Grayburg, rather than testing the other theories for localized high water plumes, including bedding plains for migration and high karsted intervals identified in 1939. Apr. 23, 2025 Tr., at 214:18-216:21 (McBeath).
34. Mr. McBeath also criticized Dr. Buchwalter's reservoir model as using too high a value of connate water and reduced the gas-oil ratio, which starved the Grayburg of water and gas, using the residual oil calculation as a known value, which values are contrary to the testimony about gas, water and unknown oil at the Unitization hearing. Apr. 23, 2025 Tr., at 216:22-218:13 (McBeath).
35. Dr. Lindsay testified that the Goat Seep reservoir is in connection with the EMSU, which allows for edge water to encroach into the EMSU through the downdip part of the Grayburg. Tr. Vol. II, at 190:13-19 (Lindsay).
36. In response to the Commission's question how Dr. Knights could explain the high water cuts from some wells throughout the field that Mr. West showed in his testimony, Mr. Knights pointed out that water was documented at the crest of the structure in 1934-1937 in a research paper from 1939, which evidences lateral flow through bedding plains, as Dr. Lindsay has written about. Mr. Knights pointed out that this is consistent with the sequence boundaries that Dr. Lindsay also has written about and were observed in the EMSU 679 core. Mr. Knights opines that all of these observations are evidence of "permeability horizontally, which, in my opinion, is the way all the water got into those wells." Apr. 22, 2025 Tr., at 252:10-254:10 (Knights).
37. Dr. Davidson opined that, seeing the high water cuts in certain wells in the EMSU, rather than evidencing water migrating up from the San Andres aquifer into the Grayburg, those high water cuts resulted from edge water coming in through a tortuous pathway from the edge, or water entering in the wellbores because the open hole completions were completed with nitroglycerin. Apr. 21, 2025 Tr., at 224:5-17 (Davidson).
38. In response to Commission questioning, Empire Senior VP of Operations William West could not answer why Chevron, which Empire agrees studied in-depth the EMSU and did



a good job at that study, never concluded that water was communicating up into the Grayburg from the San Andres through fractures. Apr. 11, 2025 Tr., at 9:2-10:19 (West).

39. Empire conceded that the only direct evidence of fractures in the core came from the EMSU 679 core reported by Dr. Lindsay, and conceded to the Commission that it should “never use one data point to make a decision.” Apr. 11, 2025 Tr., at 12:3-17 (West).

**C. Empire Produced No Evidence of Goodnight’s Operations Interfering or Affecting Empire’s Operations.**

40. Empire could not say whether commercial saltwater injection adversely impacts Empire’s recovery from the Grayburg reservoir, because Empire “Does not have the type of data that [it] would need to see if it’s affected or not,” and would need data, such as well logs, from additional offsetting wells. Apr. 8, 2025 Tr., at 116:16-117:12 (McShane).
41. In response to the Commission’s question whether Empire can show any impact to the Grayburg waterflood production from Goodnight’s SWD injections, Mr. West could not point to evidence other than “the start of indications,” and alleged production declines that the Commission pointed out the data does not support. Apr. 11, 2025 Tr., at 43:7-49:13, 50:11-15 (West).
42. Dr. Lindsay’s fracture study was done using the EMSU 679 well core, which “focused on lower Grayburg Formation strata in zones 4, 5, and 6,” and, while it identified fractures, because the core went down to only approximately -700 feet subsea, it identified fractures only in the “upper San Andres.” Empire, Ex. J ¶ 10, at 7-8 (Lindsay).
43. Presented with a table that shows Empire is injecting almost exactly the same amount of water from the Grayburg water as it is removing, Empire conceded that “it’s hard to say what has been coming in . . . . You can’t tell where it’s coming in.” Apr. 11, 2025 Tr., at 51:13-52:4 (West).
44. Empire concedes that it does not know how many, if any, barrels of water are coming into the Grayburg, and it doesn’t know “from which way” those barrels of water, if any, are coming. Apr. 11, 2025 Tr., at 54:13-21 (West).
45. Mr. Knights also said that the perm barriers that he identified as confirmed by Dr. Lindsay’s fracture study and lost drilling circulation, was confirmed by the Grayburg waterflood performance. Apr. 23, 2025 Tr., at 117:7-23 (Knights).
46. Incompatible water has been injected into the Grayburg from the San Andres since the 1950s. May 20, 2025 Tr., at 141:7-11 (McGuire).
47. There is no evidence that the San Andres water and the Grayburg water are incompatible. May 20, 2025 Tr., at 141:13-17 (McGuire).
48. There is no evidence that the chemistry in the water supply well in the EMSU has changed or that injected water has made it into the water supply well. May 20, 2025 Tr., at 141:18-142:5 (McGuire).
49. There is no evidence that disposal into the San Andres aquifer, which has been ongoing for over 65 years, has affected oil production in the Grayburg, establishing that disposal into the Lower San Andres disposal zone, or water management zone, can coexist with Empire’s extraction. May 20, 2025 Tr., at 154:2-20 (McGuire).
50. Based on the integrity of the well bore and casings in Goodnight’s injection wells, the injected saltwater is being disposed only in the intended perforations in the Lower San

Andres, and cannot move up the wellbore or escape above the targeted injection zone. Apr. 23, 2025 Tr., at 209:8-16 (McBeath).

**BECAUSE THE LOWER SAN ANDRES DOES NOT COMMUNICATE VERTICALLY ABOVE, EMPIRE MAY PURSUE THE ALLEGED ROZ WHILE GOODNIGHT OPERATES ITS INJECTION WELLS**

51. Dr. Davidson does not opine that there is or is not an ROZ in “the Upper San Andres;” there could be, Dr. Davidson opines that he instead views the evidence, including the oil saturations on the cores, to instead show that they are “migration pathways” that “may or may not be aerially continuous.” Apr. 21, 2025 Tr., at 232:2-18, 235:5-11 (Davidson).
52. Dr. Davidson opines that, even if there is an ROZ as Empire claims in the Upper ROZ, Goodnight’s “injection operations that are occurring below this yellow band [the gamma ray markers], are not likely to impact it.” Apr. 21, 2025 Tr., at 232:23-25. Dr. Davidson’s opinion is that Empire can exploit “their potential ROZ development in the Upper San Andres” and Goodnight can “continue on” with its SWD disposal in the Lower San Andres and the operations will “not interfere with one another.” Apr. 21, 2025 Tr., at 233:6-14 (Davidson).
53. Dr. Davidson opines that there is nothing that prevents “Empire from moving forward with the development” of the potential ROZ in the Upper San Andres, as the injection operations in the Lower San Andres are not “endangering that project.” Apr. 21, Tr., at 233:19-24 (Davidson).
54. Asked how the Commission may avoid the risk of vertical flow of fluids from the Lower San Andres up into the Grayburg, Mr. Knights stated that the Commission may continue with the status quo and require monitoring of the pressure in the San Andres, which, particularly if Goodnight’s four additional permits are granted, would show whether the zones are in communication and whether the Lower San Andres is as vast as everyone believes that it is. Apr. 22, 2025 Tr., at 250:22-251:23 (Knights).
55. In response to a question from the Commission counsel on how the Commission may properly divide up the unit for production versus injection, Mr. Knights testified that the Commission properly may place -500 feet subsea as the bottom of the production interval, and -700 feet subsea as the top of the injection interval, leaving the two-hundred feet in between an undisturbed interval that could be monitored for evidence of communication. Apr. 22, 2025 Tr., at 257:20-258:5 (Knights).
56. Mr. McBeath testified that the data, which shows that the Lower San Andres has taken disposal water on vacuum for decades and that operators encounter a circulation loss when drilling into the Lower San Andres, establishes that there is a barrier to communication between the disposal zone in the Lower San Andres and the Upper San Andres, which will allow for Empire to do an ROZ EOR in the Upper San Andres without impact from the SWD disposal. Apr. 23, 2025 Tr., at 223:6-224:9 (McBeath).
57. Because pressure in the San Andres has not increased from disposal, and because, if there is oil in the alleged ROZ, it is, by definition, immobile, saltwater disposal has not and will not impact Empire’s ability to recover any residual oil in the EMSU. Apr. 23, 2025 Tr., at 226:3-23 (McBeath).
58. Dr. Davidson opined that, even if Empire wants at some point to attempt to produce residual oil that it believes is in the Lower San Andres, Goodnight’s operations are not

interfering with that potential, because of “the fact that it’s an ROZ and the oil is not mobile . . . . [T]he injection is not moving the oil anywhere.” Apr. 21, 2025 Tr., at 256:3-20 (Davidson).

59. Mr. McBeath opined that the disposal of saltwater into the Lower San Andres will not result in higher costs to Empire to produce any alleged ROZ in the Lower San Andres if it were to do so, because the lack of any pressure increase establishes that the disposal is displacing water, and not increasing water under the EMSU, which will require Empire to remove the same amount of water as it would if there were no injection. Apr. 23, 2025 Tr., at 227:8-24 (McBeath).

**THERE IS NO ESTABLISHED ROZ IN THE SAN ANDRES AQUIFER, AND  
CERTAINLY NOT IN THE LOWER SAN ANDRES**

60. Dr. Lindsay testified that an ROZ is classified as having between 20%-40% residual oil, with 20% as “a good number to start at, then you just hope it gets higher.” Tr. Vol. II, at 185:23-186:3 (Lindsay).
61. Empire could not delineate the oil-in-place saturation estimates in the Upper San Andres versus the Lower San Andres, because “only one or two of the logs cover the complete San Andres interval.” Apr. 8, 2025 Tr., at 108:7-17 (McShane).
62. The geology team at Empire has no ROZ experience. Apr. 8, 2025 Tr., at 113:6-12 (McShane).
63. Dr. Bob Lindsay testified that he observed some oil saturation in the EMSU 679 and RR Bell #4 cores, to the bottom of the cores, but he does not know how much further, or if at all, the oil saturation goes further, than the bottom of the cores. Tr. Vol. II, at 184:3-9 (Lindsay).
64. In relation to the base of the oil saturations, Dr. Trentham opined that the EMSU 679 that penetrated into the San Andres to negative 700 ft. subsea may not be the bottom of the saturation, and opined that, at most, it may “extend . . . another 200 feet.” Tr. Vol. V, at 822:19-25 (Trentham).
65. When Empire purchased the EMSU, EMSU-B, and AGU, Empire understood that the base of the ROZ was -700 feet subsea. Apr. 8, 2025 Tr., at 181:11-14 (Wheeler).
66. Dr. Lindsay likened the Goldsmith Field to what he observed in the cores of the EMSU 679 and RR Bell #4, where the Goldsmith had core showing oil in the San Andres for 100 feet, starting with the higher residual oil at the top of the 100-foot section and diminishing to zero at the bottom of the 100-foot section. Tr. Vol. II, at 191:24-192:15 (Lindsay).
67. The only quality check on OPS Geologic’s oil saturation across the entire EMSU was two cores: the EMSU 679 and RR Bell #4, which Empire did not match with the petrophysical models. *See* Tr. Vol. III, at 411:14-17, 412:8-415:24 (Bailey).
68. In response to the question from the Commission whether Empire’s expert Dr. Robert Trentham believes that Empire has “done enough analysis to solidify the argument about the existence of . . . potential recoverable ROZ in the San Andres,” Dr. Trentham testified that they have not; rather, Empire’s “money is well spent doing further evaluation.” Tr. Vol. V, at 822:6-18 (Trentham).
69. Dr. Trentham opined, to establish whether there is a recoverable ROZ in the San Andres – at any depth in the San Andres – “More work needs to be done in the form of gathering



- more data, core analysis and good logs, maybe even FMIs, those kind of things. . . . [W]e have to quantify how good it is, how thick it is.” Tr. Vol. V, at 823:1-5 (Trentham).
70. Mr. Bailey could not offer an explanation why Empire’s water supply well, which went into the San Andres where OPS Geologic posits there are oil saturations of 40-50%, did not produce oil. Tr. Vol. III, at 400:24-401:22 (Bailey).
71. In relation to the high saturation levels that OPS Geologic calculated, even on the low side, Mr. Bailey testified that the only reason it is not a conventional primary play is that the saturations are below the oil-water contact. Tr. Vol. III, at 406:8-25 (Bailey).
72. OPS Geologic was unable to provide any information about the uncertainty associated with the oil-in-place calculations; it could only say that it “put a low case and a high case, based on our model.” Tr. Vol. III, at 415:25-416:9 (Bailey).
73. NuTech Consulting Chemical Engineer Galen Dillewyn testified that NuTech did not have enough information to doubt or confirm the oil saturation values from the core analysis, and testified that, in his experience, “saturation values from core can be suspect.” Apr. 7, 2025 Tr., at 217:14-21 (Dillewyn).
74. Overall, the trend in the San Andres aquifer is that there “tended to be more water in the Lower San Andres than in the Upper San Andres.” Tr. Vol. IV, at 676:4-14 (Birkhead).
75. The salinity of the water could change the actual oil saturation with the oil saturation observed in the EMSU 679 and RR Bell #4 cores in the negative direction – meaning that there is less residual oil than reflected in the cores. Tr. Vol. IV, at 668:13-24 (Birkhead).
76. In response to Commission questioning, Mr. Dillewyn testified that, based on his experience, there is “quite” a bit “of uncertainty associated with [NuTech’s oil-in-place] estimates.” Apr. 7, 2025 Tr., at 219:24-220:5 (Dillewyn).
77. Mr. Dillewyn testified that, given additional data and time, including additional cores, the uncertainty in quantifying the “m” and “n” values that NuTech used would “be reduced drastically.” Apr. 7, 2025 Tr., at 220:6-16 (Dillewyn).
78. Mr. Dillewyn admitted that, when deposed in December of 2024, he did not endorse the revised models that NuTech created, but stood by only the original models. He admitted that he changed his testimony to say that he now endorsed the revised model as a low-end estimate and the original model as a high end estimate only after talking with his lawyers between his deposition and the hearing. Apr. 7, 2025 Tr., at 198:19-203:11 (Dillewyn).
79. Empire has not compared the saturation level in the more recently drilled wells with those calculated from the EMSU 679 and RR Bell #4 to determine whether there are variations in the residual oil calculations that would show oil-in-place deterioration from injection. Tr. Vol. IV, at 669:20-670:6 (Birkhead).
80. Mr. Birkhead testified that the suggestion by the Commission to check the oil saturation calculation from the wells drilled early versus the wells drilled later, checking the calculated volumes “over time” would be a “really good” analysis. Tr. Vol. IV, at 686:24-688:1 (Birkhead).
81. In relation to the “economics of the ROZ within the EMSU,” Dr. Lindsay testified that the economics cannot be known, because “[t]here’s just that little bit of information in the upper part, where we go core analysis;” Dr. Lindsay opined that “we need to get a core down through the deeper part of the section so we know what the oil saturations look like and how big - . . . how in-depth the ROZ might be. And that’s a real problem.” Tr. Vol. II, at 194:22-195:11 (Lindsay).

82. Dr. Lindsay testified that there is not enough “direct evidence in the core” of recoverable oil to warrant revoking any of Goodnight’s existing SWD permits. Tr. Vol. II, at 195:24-196:4 (Lindsay); *see id.* at 226:22-227:3 (Lindsay).
83. In relation to FMIs, Dr. Trentham opined that Empire should do FMIs because it will assist the Commission to know whether there “are any existing fractures,” it will allow Empire to match the FMI to the core, and then Empire should take at least “two or three cores.” Tr. Vol. V, at 823:6-16 (Trentham).
84. Mr. McShane testified that, if Empire “had full logs,” then Empire could break down the oil-in-place saturation estimates by the Upper San Andres versus the Lower San Andres. Apr. 8, 2025 Tr., at 108:18-23 (McShane).
85. Dr. Jim Davidson also testified that when he found oil shows in the logs for disposal wells in the San Andres aquifer, the residual oil does not correspond across the several well logs: “there’s not a layer that exists . . . over long intervals or a big aerial extent where they’re correlatable. That’s part of the reason that I came to the conclusion that I think they’re migration paths.” Apr. 21, 2025 Tr., at 258:2-11 (Davidson).
86. Mr. Knights testified that he identified a potential ROZ in the San Andres between -350 and -500 feet subsea, but cannot say definitively that an ROZ exists there. Apr. 22, 2025 Tr. at 224:12-21 (Knights). Mr. Knights testified that between -500 and -700 feet subsea is a transition zone, with very little oil in place, and he does not see evidence of hydrocarbons, but sees a lot of evidence of significant water, below -700 feet subsea. Apr. 22, 2025 Tr., at 227:8-23 (Knights).
87. In relation to the oil saturations calculated by Empire, Consulting Engineer Frank Marek testified that oil saturations above 45% - calculated to 60% - “does not strike [him] as a ROZ,” and would “expect” there to have been oil produced in the water supply wells from that zone. Apr. 7, 2025 Tr., at 116:23-118:5 (Trentham).
88. Dr. Davidson identified that there are residual oil saturations in the San Andres, but they are very thin, are not continuous, primarily under 20% saturation (which Dr. Trentham, OPS Geologic, and Dr. Davidson exclude from the definition of an ROZ) and likely evidence migration pathways, rather than an ROZ. Apr. 21, 2025 Tr., at 242:2-245:2 (Davidson).
89. Dr. Davidson testified, if there is residual oil still left in any portion of the San Andres aquifer: “[T]here’s just not going to be enough down there . . . to be economically attractive to go after. And if they’re migration paths, they’re not going to have any aerial continuity. And if there’s major karsting down there, it’s going to steal the CO2 and prevent it from being able to displace any of that [oil] in the first place.” Apr. 21, 2025 Tr., at 245:1-9 (Davidson).
90. Mr. Knights testified that he observed some oil staining in the San Andres in the EMSU, but that he has not observed sufficient saturations in a continuous interval to be classified as an ROZ. Apr. 22, 2025 Tr., at 220:5-21 (Knights).
91. In the Lower San Andres disposal zone, there are intermittent shows of very low saturations of oil; those shows do not meet the definition of an ROZ. May 20, 2025 Tr., at 119:2-15 (McGuire).
92. Table 1 in Mr. Birkhead’s rebuttal testimony shows estimated oil-in-place in the Lower San Andres (based on Goodnight’s definition of the San Andres aquifer), but does not show or even assert that this oil in place is found in sufficient saturations (20% and

above) to constitute a ROZ, and shows that the oil-in-place calculations reduce significantly, including:

- a. In the SNYDER Ryno SWD #1, by 65% for the low case and by 79% from the high case;
- b. EMSU 746, by 68% for the low case and by 81% for the high case;
- c. EMSU 713, by 100% for both the low case and high case, meaning that OPS Geologic calculates no residual oil in the Lower San Andres in the EMSU 713 well;
- d. EMSU 673, by 76% for the low case and by 77% for the high case;
- e. EMSU 660, by 81% for the low case and by 90% for the high case;
- f. EMSU 628, by 76% for the low case and by 86% for the high case;
- g. EMSU 658, by 100% for both the low case and high case, meaning that OPS Geologic calculates no residual oil in the Lower San Andres in the EMSU 658 well.

Empire Ex. L ¶ 13 Table 1, at 5.

93. The tops of the San Andres that Empire picked are inconsistent with the top of the San Andres that the New Mexico Bureau of Geology picked and the OCD Picked. Tr. Vol. III, at 399:10-15 (Bailey).

**THE UNRELIABILITY OF EMPIRE'S OIL-IN-PLACE CALCULATIONS IS EVIDENCED BY THE CONFLICT WITH EMPIRE'S CONTENTION THAT COMMERCIAL INJECTION INTERFERES WITH THE ALLEGED ROZ**

94. Disposal into the Eunice Monument Eumont Saltwater Disposal System operates on vacuum injection only, and has operated by vacuum only since it began SWD operations in the late 1950s. Apr. 9, 2025 Tr., at 15:13-18 (Wheeler).
95. Dr. Trentham is unaware of any ROZ where there was a high volume of water injection into the ROZ and then ROZ oil was recovered. Tr. Vol. V, at 825:18-826:4 (Trentham).
96. Frank Marek testified that he believes the large volumes of produced water injected into the ROZ "can be very detrimental" to the oil-in-place calculation. Apr. 7, 2025 Tr., at 110:15-111:11 (Marek).
97. Given the amount of injection into the San Andres, and that Mr. Birkhead posits that there have been changes in the wettability in the reservoir, there probably has been migration of the residual oil calculated out of the larger porosities. Tr. Vol. IV, at 672:2-10 (Birkhead).
98. Mr. Birkhead testified that the increased pressure in the San Andres from injection would likely have moved some of the calculated residual oil out of the San Andres aquifer particularly in the "lower porosities," resulting in "uncertainty with the calculation of oil in place." Tr. Vol. IV, at 672:22-673:18 (Birkhead).
99. Mr. McShane testified that Empire was not able to assess whether the saltwater injection in the Grayburg or San Andres aquifer affected oil saturations over time, because Empire has not had "any new wells after many years of injection," but also testified that, to have that additional petrophysical work and log analysis . . . would be great." Apr. 8, 2025 Tr., at 111:21-112:8 (McShane).

100. Mr. Dillewyn testified that his models are based on the logs only at the time they were taken, and he cannot estimate what happened to any oil saturations since that time because of water injected into the San Andres aquifer. Apr. 7, 2025 Tr., at 210:25-212:21 (Dillewyn).
101. Since acquiring the EMSU (and EMSU-B and AGU), all that Empire has done is file two applications to permit three additional wells in the EMSU in February or March of 2025; Empire has not taken any cores of any wells, has not taken mud logs, has not taken any logs of any kind, and has not drilled any new wells. Apr. 9, 2025 Tr., at 26:4-25 (Wheeler).

**THE EVIDENCE DID NOT ESTABLISH THAT, IF THERE IS A ROZ ANYWHERE IN THE SAN ADNRES, IT IS PRODUCIBLE**

**A. The Evidence Does Not Establish that Any Alleged Hydrocarbons in the Alleged ROZs Can Be Produced.**

102. There has never been any production of hydrocarbons from the San Andres aquifer in the EMSU. May 20, 2025 Tr., at 156:7-15 (McGuire).
103. Dr. Lindsay testified that a CO2 flood will not work in an “oil wet” zone, because, in an oil wet zone, the water flows through the larger pores removing the oil, and the CO2 will flood back into the vacated moldic pores and not displace the residual oil. Tr. Vol. II, at 224:-225:19 (Lindsay).
104. Mr. Dillewyn testified that, based on his experience, “changes in wettability can cause recoverable hydrocarbons to be vastly different,” and that he is not aware of the wettability of the San Andres aquifer. Apr. 7, 2025 Tr., at 218:17-23 (Dillewyn).
105. Stephen Melzer classifies the San Andres aquifer underlying the EMSU as an “oil wet” reservoir. Tr. Vol. VI, at 1166:3-5 (Melzer).
106. Scott Birkhead testified that the San Andres aquifer is “somewhere in between mixed wet and oil wet.” Tr. Vol. IV, at 657:15-16 (Birkhead).
107. Dr. Davidson testified that, while there are portions of the San Andres aquifer that could be mixed wet, it predominantly, if not totally, is an oil wet reservoir, because of the relative ratio of asphaltenes to the lighter hydrocarbon components in the crude. Apr. 21, 2025 Tr., at 226:13-230:4 (Davidson).
108. Mr. McShane was unable to even estimate how much of Empire’s estimated oil in place is recoverable. Apr. 8, 2025 Tr., at 109:13-110:2 (McShane).
109. In response to Commission questioning how “CO2 that is going to be injected into the San Andres is going to be contained and not impede the correlative rights,” Mr. McShane testified that, “at this point in time, [I] cannot speak to that.” Apr. 8, 2025 Tr., at 124:24-125:5 (McShane).
110. Empire admitted that it has not applied for a tertiary Enhanced Oil Recovery project, does not have a plan to do so, and before applying for the project, Empire would have to obtain consents – which it estimates would take two years – it would have to drill and core the three wells for which it submitted applications only in March or February of 2025, and likely would be required to drill and core at least three more wells. Apr. 9, 2025 Tr., at 54:15-56:3 (Wheeler).

111. Mr. Knights explained that the migration pathways in the San Andres through the Central Basin Platform, including in the EMSU, are “complex,” because there is no “simple” migration path to explain how oil migrated through the San Andres and where it came to reside, resulting in operators’ experience that “in some areas where you may expect to find oil, you don’t. . . . [I]t’s just unusual where the oil is. And I can’t really explain how it got there.” Apr. 22, 2025 Tr., at 208:22-209:12 (Knights).
112. Mr. Knights testified that he has not encountered a situation in which a company that does not have a producing interest in the production unit brings in external wastewater, but he testified that, “in this situation[,] there would be a distinct physical geologic reason why they both can coexist,” referring to the barrier to communication between the Lower San Andres where Goodnight injects wastewater and the Upper San Andres and Grayburg formations. Apr. 22, 2025 Tr., at 210:11-21 (Knights).

**B. Empire’s Projections Are Unreliable.**

113. Dr. Trentham opined that, in a tertiary recovery using a CO2 flood, an operator may expect to recover 10-20% of the oil in place. Tr. Vol. V, at 824:22-825:13 (Trentham).
114. Mr. Knights testified that he disagrees with Mr. West’s and Empire’s projection of an 18% recovery factor of the alleged residual oil based on analogizing the EMSU to the Seminole field; Mr. Knights testified that EMSU’s reservoir quality is “significantly less” than Seminole’s, and Mr. Knights believes the recovery potential is more analogous to the Tall Cotton field. Apr. 22, 2025 Tr., at 205:8-23 (Knights).
115. Empire did not compare the oil-in-place calculations done to the oil-in-place calculations at the other ROZ sites it referenced throughout its testimony, including the Seminole Field, Tall Cotton, or Goldsmith. Tr. Vol. III, at 4075-23 (Bailey).
116. Mr. Tomastik criticized Empire’s projection to 2030 of injection volumes for the wells that Goodnight is applying to permit, because they assume that Goodnight will inject continuously up to the permitted capacity, which is not how Class 2 injection wells operate. Apr. 25, 2025 Tr., at 114:4-25, 116:18-117:3 (Tomastik).
117. Mr. McBeath testified that Empire’s economic model for EOR tertiary recovery is built on the assumption that Empire will start with one of 72 portions of the project, but in the four years since Empire purchased the Unit in 2021, they have not identified even the first – or any – part of the Unit where Empire intends to start the EOR project. Apr. 23, 2025 Tr., at 192:17-194:7 (McBeath).
118. An EOR project at the EMSU will require “a very significant” larger amount of CO2 to move residual oil than did the Seminole or Tall Cotton fields – a factor of two to three times what Empire projects in its model – because those fields had “relatively continuous thick intervals of ROZ,” whereas, the EMSU has “disperse shows of oil, . . . not all bunched together,” which will lead to the CO2 dispersing regardless of the amount of oil saturation. Apr. 23, 2025 Tr., at 203:5-24 (McBeath).
119. John McBeath testified that Empire’s economic model is premised on a discounted purchase price of CO2 based on the use of 45Q tax credits by the CO2 seller, but testified that there is no evidence that Empire has any contract to purchase CO2 and does not know how the new administration’s Internal Revenue Service plans to administer 45 Q tax credits. Apr. 23, 2025 Tr., at 191:13-192:15 (McBeath).



**THE EVIDENCE MADE CLEAR, AND EMPIRE ADMITTED, IT IS IMPROEPRLY TRYING TO USE THE COMMISSION TO RIGHT A WRONG IT DID TO ITSELF BY NOT DOING ITS DUE DILIGENCE BEFORE PURCHASING THE EMSU**

120. Jack Wheeler, Empire's Senior VP – Land and Legal, testified that, because Empire failed to do its due diligence as provided for in the purchase and sale agreement to acquire the EMSU, EMSU-B, and AGU, it is instead “trying to utilize the Commission . . . to more or less right some wrongs that Empire should have known better” than to incur. Apr. 9, 2025 Tr., at 33:3-11 (Wheeler).
121. Jack Wheeler testified that, in the offering for sale of the EMSU, EMSU-B, and AGU, ExxonMobil represented that there was a potential ROZ from -400 feet subsea to -700 feet subsea, with an average oil saturation of 25%. Apr. 8, 2025 Tr., at 146:3-15 (Wheeler).
122. Mr. Wheeler admitted that, when Empire purchased the assets – EMSU, EMSU-B, and AGU – from ExxonMobil, the closing value on the purchase and sale agreement and reported to the SEC was \$17.8 Million. Apr. 8, 2025 Tr., at 168:5-24 (Wheeler).
123. Mr. Wheeler admitted that, when deciding to purchase the assets from ExxonMobil, Empire hired an outside company to perform due diligence, but stopped the due diligence in December of 2020, when Mr. Mulacek came in to finance the purchase without receiving anything from that company. Apr. 8, 2025 Tr., at 171:7-172:1, 174:1-4 (Wheeler).
124. Mr. Wheeler represented to the Commission under oath that he knew that the sale of the assets to Empire was the sale of a “security” under “the Federal Securities Act of 1934 [sic],”<sup>2</sup> a misstatement in connection with, he opined, would subject ExxonMobil to “hundreds of millions of dollars of penalties,” Apr. 8, 2025 Tr., at 172:2-173:3; however, he later admitted on cross-examination that he does not know whether that's true, Apr. 9 Tr., at 121:1-18 (Wheeler).
125. In the purchase agreement, Empire agreed that the “seller disclaims and negates any representation of a warranty as to the contents or character or nature of any report, interpretation relating to the asset, quantity or quality of recoverability of hydrocarbons, or future revenues granted,” which provision was highlighted in bold in the agreement. Apr. 8, 2025 Tr., at 242:24-243:17 (Wheeler).
126. Although Mr. Wheeler emphasized, under oath, distinguishing between representations made by ExxonMobil in the sales brochure versus those made by XTO in the sale, on cross-examination, in response to the question whether it matters who made the representations when XTO is a wholly-owned subsidiary of ExxonMobil, Mr. Wheeler admitted that he “do[esn't] believe” that it makes any legal distinction since XTO is a wholly-owned subsidiary. Apr. 9, 2025 Tr., at 121:19-122:6 (Wheeler).

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<sup>2</sup> There is no Federal Securities Act of 1934; presumably, the act to which Mr. Wheeler was referring was The Securities Act of 1933.

127. Despite purchasing the assets in March of 2021, Empire was unaware of the SWD disposal in the units until 2023. Apr. 8, 2025 Tr., at 216:15-24 (Wheeler).
128. Although Empire was permitted to enter the lands at the EMSU, EMSU-B, and AGU before the purchase, Empire never inspected the lands. Apr. 8, 2025 Tr., at 240:7-17 (Wheeler).
129. Mr. Wheeler testified that it's Empire's position that all injection wells within a 2-mile radius of the EMSU, EMSU-B, and AGU should be shut in. Apr. 8, 2025 Tr., at 212:18-22-213:14 (Wheeler).
130. Mr. Wheeler testified that Empire filed lawsuits against Goodnight, Rice, Permian, and Pilot; although it hasn't filed lawsuits against all SWD operators within a 1-mile radius of the EMSU, it intends to. Apr. 8, 2025 Tr., at 213:18-215:18 (Wheeler).
131. Empire agreed that, as part of the purchase, Empire assumed "the obligation to plug and abandon all the wells that it was acquiring," which Mr. Wheeler testified "is a provision that a good lawyer would never approve." Apr. 8, 2025 Tr., at 243:18-25 (Wheeler).
132. Empire executed the Joinder and Ratification of Articles of Agreement of the Eunice Monument Eumont Saltwater Disposal System in November 2021, agreeing to become a new System partner in the Eunice Monument Eumont Saltwater Disposal System, which includes SWD wells that dispose within the EMSU. Apr. 9, 2025 Tr., at 10:12-11:23 (Wheeler); *see* Rice Ex. 4.
133. By virtue of the Joinder and Ratification of Articles of Agreement of the Eunice Monument Eumont Saltwater Disposal System, Empire became party to the Articles of Agreement for the Eunice Monument Eumont Saltwater Disposal System, which was made between the parties, including Empire's predecessor-in-interest, Gulf Oil Corporation, on June 10, 1958. Apr. 9, 2025 Tr., at 12:21-13:18 (Wheeler); *see* Rice Ex. 1.
134. Empire does not consider SWD disposal in the Eunice Monument Eumont Saltwater Disposal System to be "commercial disposal." Apr. 9, 2025 Tr., at 15:3-12 (Wheeler).
135. Empire became aware of calculated \$56 million in plugging and abandonment liability that it contends is part of the cost of the acquisition of the assets in 2024. Apr. 9, 2025 Tr., at 18:17-19:24, 24:5-10 (Wheeler).
136. Empire became aware of approximately \$16 million in surface remediation in August of 2023, when it received an Order of Compliance from the State Land Office to remediate 288 well sites. Apr. 9, 2025 Tr., at 20:5-15, 23:5-22, 24:5-10 (Wheeler).
137. Empire is currently allowed to do primary, secondary and tertiary recovery, so long as they go through the proper application process for that production – which application process Empire has not started. Apr. 9, 2025 Tr., at 24:21-25:7 (Wheeler).
138. The order for Empire not to proceed further on applications for production from the EMSU came from only Empire. Apr. 9, 2025 Tr., at 25:8-26:3 (Wheeler).

139. In response to Commission questioning, Mr. Wheeler initially testified under oath that the State Land Office provided a letter of support to Empire in connection with its Applications here, *see* Apr. 9, 2025 Tr., at 48:48:2-16, 58:2-59:5; after consulting with Empire's attorneys over a break, however, Mr. Wheeler admitted that the State Land Office had not voiced support for Empire's Applications, *see* Apr. 9, 2025 Tr., at 71:14-72:4 (Wheeler).

### CONCLUSIONS OF LAW

1. The Commission has jurisdiction over the subject matter and over the parties.
2. Section 70-2-11 of the NMSA 1978 provides that Commission has the power and duty "to prevent waste prohibited by this act and to protect correlative rights . . . ."
3. The definition of "waste" is found in NMSA 1978, § 70-2-3, which provides that, in addition to its ordinary meaning, underground waste includes waste as it is "generally understood in the oil and gas business," and includes operation of that business "in a manner to reduce or tend to reduce the total quantity of crude petroleum oil or natural gas ultimately recovered from any pool."
4. The definition of "correlative rights" is found in NMSA 1978, § 70-2-33(H), which relates to each owner's opportunity to produce "without waste" the owner's share of the oil or gas or both, but only "so far as it is practicable to do so."
5. The weight of the evidence does not establish that Goodnight's SWD operations are operating in a manner to reduce or tend to reduce the total quantity of crude petroleum oil that Empire will ultimately recover from the Grayburg reservoir.
6. The weight of the evidence does not establish that there exists a ROZ in the San Andres aquifer.
7. There is not evidence of the existence of a ROZ in the Lower San Andres.
8. The weight of the evidence does not establish that produced water injected into the Lower San Andres is communicating vertically up above the impermeability barrier that separates the Upper San Andres from the Lower San Andres.
9. The weight of the evidence does not show that there is a "quantity of crude petroleum oil or natural gas" that may "ultimately be recovered" from the San Andres aquifer. NMSA 1978, § 70-2-3.3041
10. The weight of the evidence, therefore, establishes that Goodnight's SWD injection operations are not causing waste or impairing correlative rights.
11. Empire, therefore, has failed to meet its burden in its Applications to show that the Commission should revoke Goodnight's SWD injection permits because they cause waste or impair correlative rights.
12. Goodnight, therefore, has met its burden in its Applications to show that granting Goodnight's Applications for additional SWD wells will not cause waste and will not impair correlative rights.
13. The Commission, therefore, denies Empire's Applications in Case Nos. 24018-24020, & 24025 to revoke Goodnight's injection permits, and grants Goodnight's Applications in Case Nos. 23614-17, 23775, 24123, & 24278.

Respectfully submitted,

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### **CERTIFICATE OF SERVICE**

I hereby certify that a true and correct copy of the forgoing was served to counsel of record by electronic mail this 3<sup>rd</sup> day of July 2025, as follows:

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

**APPLICATION OF EMPIRE NEW MEXICO  
LLC TO REVOKE THE INJECTION  
AUTHORITY GRANTED UNDER ORDER NO.  
R-21190 FOR THE SOSA SA 17 NO. 2 WELL  
OPERATED BY GOODNIGHT MIDSTREAM  
PERMIAN LLC, LEA COUNTY, NEW  
MEXICO.**

**CASE NO. 24025**

**APPLICATION OF GOODNIGHT  
MIDSTREAM PERMIAN, LLC TO AMEND  
ORDER NO. R-7765, AS AMENDED TO  
EXCLUDE THE SAN ANDRES FORMATION  
FROM THE UNITIZED INTERVAL OF THE  
EUNICE MONUMENT SOUTH UNIT,  
LEA COUNTY, NEW MEXICO.**

**CASE NO. 24278**

**APPLICATIONS OF GOODNIGHT MIDSTREAM  
PERMIAN, LLC FOR APPROVAL OF  
SALTWATER DISPOSAL WELLS  
LEA COUNTY, NEW MEXICO.**

**CASE NOS. 23614-23617**

**APPLICATIONS OF EMPIRE NEW MEXICO LLC  
TO REVOKE INJECTION AUTHORITY,  
LEA COUNTY, NEW MEXICO.**

**CASE NOS. 24018-24020**

**APPLICATION OF GOODNIGHT MIDSTREAM**

**PERMIAN LLC TO AMEND ORDER NO. R-22026/SWD-2403  
TO INCREASE THE APPROVED INJECTION RATE  
IN ITS ANDRE DAWSON SWD #1,  
LEA COUNTY, NEW MEXICO.**

**CASE NO. 23775**

**APPLICATION OF GOODNIGHT PERMIAN MIDSTREAM,  
LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL,  
LEA COUNTY, NEW MEXICO; ORDER NO. R-22869-A.**

**CASE NO. 24123**

**RICE OPERATING COMPANY AND PERMIAN  
LINE SERVICE, LLC'S LEGAL BRIEF**

Over the course of four weeks, the Oil Conservation Commission (the "Commission")

took evidence and testimony – including direct, cross, and Commission questions – from 19 expert witnesses presented by Applicants Goodnight Midstream Permian LLC (“Goodnight”) and Empire New Mexico LLC (“Empire”). The evidence did not establish that the produced water in the interval into which Goodnight injects (referred to throughout this Brief as the “Lower San Andres”) is communicating vertically up above the confining layer. The evidence did not establish that there is a Residual Oil Zone (a “ROZ”) in the San Andres aquifer, and certainly not in the Lower San Andres. And the evidence did not establish that, if there is a ROZ anywhere in the San Andres aquifer, Empire can produce the residual oil in any alleged ROZ.

The evidence that the Commission heard over four weeks established clearly one thing, however: That the San Andres aquifer in the Eunice Monument South Unit (“EMSU”) is not well-defined and is not well-understood for an oil saturation perspective. The best that even Empire’s new rebuttal witnesses from OPS Geologic could offer was that, to determine whether there exists a ROZ – especially in the Lower San Andres – “[f]uture core must be taken in the EMSU to . . . get an accurate reservoir saturation.” Empire Ex. L ¶ 22.

After years of litigation before the Oil Conservation Division, over a year before before the Commission and four weeks of a Commission Hearing, it is clear that Empire did not meet its burden to show that there exists a ROZ in the Lower San Andres injection interval or that produced water from the Lower San Andres is communicating up out of the Lower San Andres. Empire has not, therefore, proved that Goodnight’s current operations cause waste or impair correlative rights. Goodnight, on the other hand, proved that its current operations and the operations planned in the Applications do not cause waste or impair correlative rights. The Commission should, therefore, deny Empire’s Applications in Case Nos. 24018-24020, & 24025 to revoke Goodnight’s injection permits, and grant Goodnight’s Applications in Case Nos.

23614-17, 23775, 24123, & 24278.

## FACTS

### **A. The Lower San Andres, Where Goodnight Injects Produced Water, is Separated from the Zones Above.**

1. All of Goodnight's SWD wells in the EMSU inject in the Lower San Andres.<sup>1</sup>

### **Rice Operating Company and Permian Line Service, LLC's Proposed Finding of Fact ("FOF") 3.**

2. There is an impermeability barrier, which is identified by the gamma ray marker in the logs and which contains bedded anydrites, that separates and isolates the Lower San Andres from the Upper San Andres. **FOF 4.**

3. Mineralogical analysis of Goodnight's Rhino well established that a section at the top of the permeability barrier that has elevated anhydrite. **FOF 6.**

4. There is a difference in pressure gradients between the Upper San Andres and the Lower San Andres, which establishes that the Lower San Andres is separated by an impermeable barrier to vertical flow. **FOF 5.**

5. The difference in pressure gradients between the Lower San Andres and the Upper San Andres is evidenced by the lost circulation when operators drill through the permeability barrier into the Lower San Andres. **FOF 7.**

6. The difference in pressure gradients and the lost circulation between the Upper San Andres and the Lower San Andres has been observed across the EMSU. **FOF 8.**

7. Evidence established "a lot of petrophysical events" and concentrated strata that

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<sup>1</sup> This Brief uses the term "Lower San Andres" to refer to the separate zone in the San Andres aquifer into which Goodnight injects wastewater. In Goodnight's filed testimony and exhibits, Goodnight refers to this layer as the San Andres. During the Hearing testimony of Preston McGuire, he referred to this zone as the "water management" zone. Goodnight refers to the zone above the separate injection zone as the Grayburg in its filed testimony and exhibits. This Brief refers to that separate upper zone above the injection zone as the "Upper San Andres."

include “multiple perm[eability] barriers, both very, very extremely low and moderately low,” which, in the close vertical proximity in which they appear, the concentrated strata provide between the Upper San Andres and Lower San Andres “an incredibly strong barrier to vertical fluid flow.” **FOF 9, 10.**

8. All of William Knights, Dr. Jim Davidson, Dr. Bob Lindsay, and OPS Geologic (Scott Birkhead and Ryan Bailey) identified significant permeability in concentrated strata between the Upper San Andres and Lower San Andres that act as a barrier to vertical flow. **FOF 11.**

9. The EMSU 679 core report contains 29 sections, over 179 feet between -500 and -700 feet subsea, which observe permeability barriers to vertical flow, that when aggregated together over that interval “are significant barriers to vertical flow.” **FOF 12; see FOF 15.**

10. The Lower San Andres is under pressured, as it currently has a pressure gradient of .38, and the normal pressure gradient would be .43-.44. **FOF 5; FOF 16; FOF 14.**

11. The Lower San Andres is a “large aquifer,” which is under pressured, even after having received injection of over one hundred million barrels of produced water. **FOF 19; FOF 16; FOF 17.**

12. The pressure in the Lower San Andres has not noticeably increased from over 60 years and more than 100 million barrels of produced water injected. **FOF 17.**

13. Dr. Lindsay testified that there is insufficient information available to opine whether there is communication from the San Andres aquifer to the Grayburg reservoir with only two cores available, and agreed that “any well that would be drilled through this unit . . . should be FMI run or there should be a detailed fracture study performed to establish whether there’s going to be an impairment” to production because of fractures between the two zones.



**FOF 21.**

14. Dr. Jim Buchwalter admitted that, in creating his reservoir model, he did not correlate the porosity and permeability to the geology and the core measurements, but instead found a value that would “match” what he was told was the “influx” of water from the San Andres aquifer. **FOF 27.**

15. In creating the reservoir model, Dr. Buchwalter “miss[ed] some of the water-supply wells.” **FOF 28.**

16. Empire’s reservoir model did not model the San Andres aquifer as having a Lower and Upper San Andres. **FOF 30.**

17. To fit the communication Dr. Buchwalter assumed between the Grayburg reservoir and San Andres aquifer in the EMSU, Dr. Buchwalter had to extend the San Andres to a “150-plus billion barrel aquifer,” but he could not extend the model for the Grayburg to match. **FOF 31.**

18. Empire’s expert consulting engineer Frank Marek testified that the permeability in the San Andres aquifer varies between “the single to tens of millidarcy range,” and that he has never seen, and was “surprise[d]” by the “high” range permeability that Dr. Buchwalter used in his model to prove communication between the San Andres and Grayburg: from 500 to 550 millidarcies. **FOF 32.**

19. Empire did not, and – as Empire’s expert petroleum geologist, Joseph McShane, testified – Empire cannot, present evidence that commercial water injection in the EMSU has affected Empire’s production from the Grayburg reservoir, because Empire “Does not have the type of data that [it] would need to see if it’s affected or not,” and would need data, such as wells logs, from additional offsetting wells. **FOF 41.**

20. While Dr. Linday identified fractures in the fracture study of the EMSU 679 well core, because that core only went down to only approximately -700 feet subsea, the study identified fractures only in the “upper San Andres.” **FOF 42.**

21. Empire has been injecting almost the exact same amount of water that it has taken out of the Grayburg while operating the EMSU and the trend of oil recovered is consistent. **FOF 43.**

22. Empire concedes that it does not know how many, if any, barrels of water are coming into the Grayburg, and it doesn’t know “from which way” those barrels of water, if any, are coming. **FOF 44.**

23. The Goat Seep reservoir is in connection with the EMSU, which allows for edge water to encroach into the EMSU through the downdip part of the Grayburg. **FOF 35.**

24. Empire admits that Chevron, which Empire agreed studied in-depth the EMSU and did a good job at that study, never concluded water was communicating up into the Grayburg from the San Andres. **FOF 38.**

25. A research paper from 1939 documented water on the crest of the EMSU structure in 1934-1937, documenting that water communicated into the Grayburg laterally through bedding plains, which Dr. Bob Lindsay has also written about, and which lateral communication is consistent with sequence boundaries that Dr. Lindsay has also written about, which explain unexpected high water cuts associated with some of the EMSU wells. **FOF 36.**

26. The high water cuts observed in Grayburg wells resulted from edge water coming in through a tortuous pathway from the edge, or water entering in the wellbores because the open hole completions were completed with nitroglycerin. **FOF 37.**

27. Because of the impermeable barrier between the Lower San Andres and Upper

San Andres, all of Goodnight's experts agree that, if there is a potential ROZ in the Upper San Andres (which is the only location in the San Andres a potential ROZ was identified, although Goodnight's experts believe that the oil saturations are migration pathways instead), then Empire may attempt to produce those hydrocarbons without any affect from ongoing injection in the EMSU. **FOF 43; FOF 52; FOF 53; FOF 85; FOF 54; FOF 55; FOF 56; FOF 57.**

**B. Empire Has Not Established That there Exists a ROZ in the San Andres Aquifer, and Certainly Not in the Lower San Andres.**

28. A ROZ is defined as having between 20%-40% of residual oil, with 20% as "a good number to start at, then you just hope it gets higher." **FOF 60.**

29. Empire could not delineate the oil-in-place saturation estimates in the Upper San Andres versus the Lower San Andres, because "only one or two of the logs cover the complete San Andres interval." **FOF 61.**

30. Empire's geology team has no ROZ experience. **FOF 62.**

31. Oil saturations were observed in the EMSU 679 and RR Bell #4 well cores to the bottom, with the EMSU 679 going the deepest, to approximately -700 feet subsea, and how much further, if any, oil saturations might be shown is unknown. **FOF 63; FOF 64.**

32. When Empire purchased the EMSU, EMSU-B, and AGU, Empire understood that the base of the ROZ was -700 feet subsea. **FOF 65.**

33. Dr. Lindsay likened the Goldsmith Field to what he observed in the cores of the EMSU 679 and RR Bell #4, where the Goldsmith had core showing oil in the San Andres for 100 feet, starting with the higher residual oil at the top of the 100-foot section and diminishing to zero at the bottom of the 100-foot section. **FOF 66.** Dr. Bob Trentham opined that the oil shows in the EMSU 679 well might, at most, "extend . . . another 200 feet." **FOF 64.**

34. The only quality check on Empire's residual oil calculations are the EMSU 679

and RR Bell #4 cores, which Empire did not match with the petrophysical models. **FOF 67.**

35. NuTech did not have enough information to doubt or confirm the oil saturation values from the core analysis, and consulting chemical engineer Galen Dillewyn testified that, in his experience, “saturation values from core can be suspect.” **FOF 73.**

36. Overall, the trend in the San Andres aquifer is that there “tended to be more water in the Lower San Andres than in the Upper San Andres.” **FOF 74.**

37. In response to Commission questioning, Mr. Dillewyn testified that, based on his experience, there is “quite” a bit “of uncertainty associated with [NuTech’s oil-in-place] estimates.” **FOF 76.**

38. Mr. Dillewyn testified that, given additional data and time, including additional cores, the uncertainty in quantifying the “m” and “n” values that NuTech used would “be reduced drastically.” **FOF 77.**

39. OPS Geologic was unable to provide any information about the uncertainty associated with the OPS Geologic oil-in-place calculations; it could only say that it “put a low case and a high case, based on our model.” **FOF 72.**

40. Mr. Dillewyn admitted that, when deposed in December of 2024, he did not endorse the revised models that NuTech created, but stood by only the original models. He admitted that he changed his testimony to say that he now endorsed the revised model as a low-end/high-end estimate only after talking with Empire’s lawyers after his deposition. **FOF 78.**

41. Empire has not compared the saturation level in the more recently drilled wells with those calculated from the EMSU 679 and RR Bell #4 to determine whether there are variations in the residual oil calculations that show deterioration of the oil in place. **FOF 79.**

42. Scott Birkhead testified that the suggestion by the Commission to check the oil

saturation calculation from the wells drilled early versus the wells drilled “over time” would be a “really good” analysis. **FOF 80.**

43. Dr. Trentham testified that Empire has not “done enough analysis to solidify the argument about the existence of . . . potential recoverable ROZ in the San Andres,” and stated that Empire’s “money is well spent doing further evaluation.” **FOF 68.**

44. Dr. Trentham opined, to establish whether there is a recoverable ROZ in the San Andres – at any depth in the San Andres – “More work needs to be done in the form of gathering more data, core analysis and good logs, maybe even FMIs, those kind of things. . . . [W]e have to quantify how good it is, how thick it is.” **FOF 69.**

45. Dr. Lindsay opined that “we need to get a core down through the deeper part of the section so we know what the oil saturations look like and how big - . . . how in-depth the ROZ might be. And that’s a real problem.” **FOF 81.**

46. Dr. Lindsay testified that there is not enough “direct evidence in the core” of recoverable oil to warrant revoking any of Goodnight’s SWD permits. **FOF 82.**

47. Dr. Trentham opined that Empire should do FMIs because it will assist the Commission to know whether there “are any existing fractures,” it will allow Empire to match the FMI to the core, and then Empire should take at least “two or three cores.” **FOF 83.**

48. Empire’s geologist, Mr. McShane, testified that, if Empire “had full logs,” then Empire could break down the oil-in-place saturation estimates by the Upper San Andres versus the Lower San Andres. **FOF 84.**

49. When Dr. Davidson analyzed the injection well logs in the San Andres aquifer, the residual oil does not correlate across the several well logs: “there’s not a layer that exists . . . over long intervals or a big aerial extent where they’re correlatable. That’s part of the reason



that I came to the conclusion that I think they're migration paths." **FOF 85.**

50. Mr. Knights likewise observed some oil staining in the San Andres in the EMSU, but he has not observed sufficient saturations in a continuous interval to be classified as an ROZ. **FOF 86.**

51. In relation to the oil-in-place estimates provided by Empire, Ryan Bailey could not offer any explanation why Empire's water supply well, which went into the San Andres where OPS Geologic posits there are oil saturations of 40-50%, did not produce oil. **FOF 70.** Mr. Bailey testified that the only reason OPS Geologic does not define the zone as a conventional primary play, given the oil-in-place estimates they put forward, is that the alleged saturations are below the oil-water contact. **FOF 71.**

52. In relation to the oil saturations calculated by Empire, Mr. Marek testified that oil saturations above 45% - calculated to 60% - "does not strike [him] as a ROZ," and would "expect" there to have been oil produced in the water supply wells from that zone. **FOF 85.**

53. Goodnight's experts uniformly agreed that there is no potential ROZ in the Lower San Andres. **FOF 51; FOF 88; FOF 89; FOF 85; FOF 90; FOF 86; FOF 91.**

54. OPS Geologic calculated only total oil-in-place over the entire Lower San Andres (based on Goodnight's San Andres top pick), but does not show or even assert that there exist sufficient saturations (20% and above) in the Lower San Andres to constitute a ROZ; and, indeed, Table 1 to Scott Birkhead's rebuttal testimony shows that, when looking only at the Lower San Andres, the estimated oil-in-place for the seven wells analyzed reduces by between 68% for the low case and 77% for the high case on the lowest end, to 100% in two of the seven wells (meaning that OPS Geologic admits that there exists no residual oil in 2 of the 7, or approximately 30%, of the wells analyzed in the EMSU). **FOF 92.**

**C. Empire Has Not Established That its Oil-in-Place Calculations Are Reasonable Given its Contention That Commercial Injection Interferes with the Alleged ROZ.**

55. Disposal of produced water in the San Andres aquifer via the Eunice Monument Eumont Saltwater Disposal System began in the late 1950s, and has operated on vacuum since that time. **FOF 94.**

56. Dr. Trentham is unaware of any ROZ where there was a high volume of water injection into the ROZ and then ROZ oil was recovered. **FOF 95.**

57. Mr. Marek testified that he believes the large volumes of produced water injected into the ROZ “can be very detrimental” to the oil-in-place calculation. **FOF 96.**

58. Given the amount of injection into the San Andres, and possible changes in the wettability in the reservoir, the residual oil calculated probably has migrated out of the larger porosities. **FOF 97.**

59. Mr. Birkhead testified that the increased pressure in the San Andres from injection would likely have moved some of the calculated residual oil out of the San Andres aquifer particularly in the “lower porosities,” resulting in “uncertainty with the calculation of oil in place.” **FOF 98.**

60. Mr. McShane testified that Empire was not able to assess whether the saltwater injection in the Grayburg or San Andres aquifer affected oil saturations over time, because Empire has not had “any new wells after many years of injection,” but also testified that, to have that additional petrophysical work and log analysis . . . would be great.” **FOF 99.**

61. Mr. Dillewyn testified that his models are based on the logs only at the time they were taken, and he cannot estimate what happened to any oil saturations since that time because of water injected into the San Andres aquifer. **FOF 100; see FOF 77.**

62. Since acquiring the EMSU (and EMSU-B and AGU), all that Empire has done

is file two applications to permit three additional wells in the EMSU in February or March of 2025; Empire has not taken any cores of any wells, has not taken mud logs, has not taken any logs of any kind, and has not drilled any new wells. **FOF 101.**

**D. There Is No Application or Plan to Perform an Enhanced Oil Recovery Project to Produce from Any Alleged ROZ and the Evidence Shows Any ROZ is Not Recoverable.**

63. In relation to a CO2 Enhanced Oil Recovery (“EOR”) that Empire asserts it intends to pursue, a CO2 flood will not work in an “oil wet” zone, because, in an oil wet zone, the water flows through the larger pores removing the oil, and the CO2 will flood back into the vacated moldic pores and not displace the residual oil. **FOF 103.**

64. Mr. Dillewyn testified that, while he is unaware of the wettability of the San Andres aquifer, “changes in wettability can cause recoverable hydrocarbons to be vastly different.” **FOF 104.**

65. Empire’s consulting geological engineer, Stephen Melzer, classifies the San Andres aquifer as “oil wet.” **FOF 105.**

66. Mr. Birkhead opined that the San Andres aquifer is “somewhere in between mixed wet and oil wet.” **FOF 106.**

67. Dr. Davidson testified that, while there are portions of the San Andres aquifer that could be mixed wet, it predominantly, if not totally, is an oil wet reservoir, because of the relative ratio of asphaltenes to the lighter hydrocarbon components in the crude. **FOF 107.**

68. In relation to the “economics of the ROZ within the EMSU,” Dr. Lindsay testified that the economics cannot be known, because “[t]here’s just that little bit of information in the upper part, where we go core analysis;” Dr. Lindsay opined that “we need to get a core down through the deeper part of the section so we know what the oil saturations look

like and how big - . . . how in-depth the ROZ might be. And that's a real problem." **FOF 81.**

69. Mr. McShane is unable to even estimate how much of Empire's estimated oil in place is recoverable. **FOF 108.**

70. Empire's projection of an 18% recovery factor of any ROZ in the EMSU is based on analogy to the Seminole field, which is not a good field for analogy and overly optimistic, because the EMSU reservoir is of "significantly less" quality than the Seminole field, and more like the Tall Cotton field, which had a lower recovery factor. **FOF 114.**

71. Empire put forth no evidence on how the CO2 will be injected into the San Andres aquifer in a way that it will be contained and will not impair correlative rights. **FOF 109.**

72. Empire has not applied for a tertiary EOR project, does not have a plan to do so, and before applying for the project, Empire would have to obtain consents – which it estimates would take two years – it would have to drill and core the three wells for which it submitted applications only in March or February of 2025, and likely would be required to drill and core at least three more wells. **FOF 110.**

73. The migration pathways in the San Andres through the Central Basin Platform, including in the EMSU, are "complex," because there is no "simple" migration path to explain how oil migrated through the San Andres and where it came to reside, resulting in operators' experience that "in some areas where you may expect to find oil, you don't. . . . [I]t's just unusual where the oil is. And I can't really explain how it got there." **FOF 111.**

74. Empire's economic model for EOR tertiary recovery is built on the assumption that Empire will start with one of 72 portions of the project, but in the four years since Empire purchased the Unit in 2021, they have not identified even the first – or any – part of the Unit

where Empire intends to start the EOR project. **FOF 117.**

75. An EOR project at the EMSU will require “a very significant” larger amount of CO2 to move residual oil than did the Seminole or Tall Cotton fields – a factor of two to three times what Empire projects in its model – because those fields had “relatively continuous thick intervals of ROZ,” whereas, the EMSU has “disperse shows of oil, . . . not all bunched together,” which will lead to the CO2 dispersing regardless of the amount of oil saturation.

**FOF 118.**

76. The price of CO2 in Empire’s economic model – the most significant variable to affect the project’s economics – is based on assumptions coming from 45Q tax credits, which no one was able to forecast how those would be granted by the current federal government administration. **FOF 119.**

77. Empire used the Kinder Morgan screening tool to build its EOR economic model, which Kinder Morgan tool is designed only for a main pay project (not a ROZ), and does not fit with the dimensionless curve that Empire used. **FOF 25.**

78. Allowing injection to continue until Empire develops more data to prove the ROZ and applies for an EOR project will not affect any alleged ROZ, because, by definition, the oil in a ROZ does not mobilize by water only. **FOF 57; FOF 58.**

79. Empire, when deciding to purchase the assets from ExxonMobil, hired an outside company to perform due diligence, but stopped the due diligence in December of 2020, when Mr. Mulacek came in to finance the purchase without receiving anything from that company. **FOF 123.**

80. Despite purchasing the assets in March of 2021, Empire was unaware of the SWD disposal in the units until 2023. **FOF 127.**

81. Because Empire failed to do its due diligence as provided for in the purchase and sale agreement to acquire the EMSU, EMSU-B, and AGU, Empire is instead “trying to utilize the Commission . . . to more or less right some wrongs that Empire should have known better” than to incur. **FOF 120.**

### **ANALYSIS**

The Commission has provided the standard under which it will make its decision: whether the granting of Goodnight’s or Empire’s applications would prevent waste or the impairment of correlative rights. Empire’s applications seek revocation of Goodnight’s existing disposal permits because it contends that the injection interferes with its current EMSU production and prevents it from producing alleged hydrocarbons in an alleged ROZ. Empire opposes Goodnight’s applications for additional injection permits, because it contends that injection would have the same effect, again, allegedly causing waste and impairing correlative rights. But Empire failed to produce evidence that Goodnight’s injection interferes with its operations in the EMSU, and failed to establish that a ROZ exists, let alone that it is economically producible. Indeed, all of Empire’s witnesses all testified that more data is needed to evaluate whether the potential ROZ exists and is producible. The Commission should therefore deny Empire’s Applications and grant Goodnight’s Applications.

#### **A. THE REQUIRED FINDINGS FOR WASTE AND IMPAIRMENT OF CORRELATIVE RIGHTS.**

In the Joint Order on the motion for the Scope of the Hearing, the Commission ordered that “the parties shall submit all evidence, testimony, and legal argument on the issue of the existence, extent of and possible interference with a residual oil zone [in] the [EMSU] by produced water injection activities undertaken by Goodnight.” Joint Order ¶ 2 (Jul. 2, 2024). On February 2, 2025 the Commission revised the Joint Order to reflect that the Commission to



determine:

(A) Whether the granting of the application[s] by Goodnight would (1) impair correlative rights or cause waste, pursuant to § 70-2-11; . . . and

(B) Whether the granting of the applications by Empire would prevent the impairment of correlative rights or waste, pursuant to § 10-2-11.

Tr. Vol. IV, at 503:11-504:2.

Section 70-2-11 of the NMSA 1978 provides that Commission has the power and duty “to prevent waste prohibited by this act and to protect correlative rights . . . .”

The definition of “waste” is found in NMSA 1978, § 70-2-3, which provides that, in addition to its ordinary meaning, underground waste includes waste as it is “generally understood in the oil and gas *business*,” and includes operation of that business “in a manner to reduce or tend to reduce the total quantity of crude petroleum oil or natural gas *ultimately recovered* from any pool.” (Emphasis added.)

The definition of “correlative rights” is found in NMSA 1978, § 70-2-33(H), which relates to each owner’s opportunity to produce “without waste” the owner’s share of the oil or gas or both, but only “so far as it *is practicable* to do so.” (Emphasis added.)

Both of these definitions add qualifications to the ordinary meaning of these terms in the oil and gas business, including that waste requires that the hydrocarbons must be “ultimately recovered” and that correlative rights protect the opportunity to produce hydrocarbons only if it is “practicable” to do so. The Supreme Court has interpreted these definitions strictly, and held that the party seeking relief from the Commission to prevent waste or protect correlative rights must prove each of: (1) that there exists “*a certain amount* of” oil in the pool; and (2) that “*a determined amount* of [oil] *could be produced and obtained* without waste.” *Cont’l Oil Co. v.*

*Oil Conservation Comm'n*, 1962-NMSC-062, ¶ 28, 70 N.M. 310, 373 P.2d 809 (emphasis added).

**B. EMPIRE HAS FAILED TO ESTABLISH THAT GOODNIGHT'S OPERATIONS IMPAIR RECOVERY OF A CERTAIN AMOUNT OF OIL THAT CAN BE PRODUCED.**

All of Goodnight's EMSU SWD wells inject disposal waters into the Lower San Andres. Fact No. 1. Empire presented no evidence showing, and admitted that it could not show, that Goodnight's injections affected Empire's current operations, which take place in the Grayburg reservoir. *See* Fact Nos. 19, 21. Thus, for the Commission to find that Goodnight's operations cause waste or impair correlative rights in the EMSU, the Commission must find that Empire proved by greater weight of the evidence that there is a certain amount of oil in the Lower San Andres and that a determined amount of oil could be produced and obtained without waste. Empire proved neither of those required facts.

**1. Empire Did Not Prove That There Exists a ROZ in the Lower San Andres Where Goodnight Injects.**

Empire's and Goodnight's experts agree that (setting aside the precarious economics of recovery) there is a ROZ in the Grayburg reservoir. Empire's experts opine that there exists a ROZ in the San Andres aquifer, but don't distinguish between the Lower San Andres and the Upper San Andres. But most telling, when OPS Geologic's data is analyzed for the Lower San Andres, the oil-in-place estimates for the Lower San Andres diminish the oil-in-place in the San Andres between 68% and 100%, establishing that lack of a ROZ in the Lower San Andres. And while Empire's experts do not opine on a ROZ in the Lower San Andres, Goodnight's experts disagree any ROZ exists in the San Andres and the evidence shows that there does not exist a ROZ in the Lower San Andres.

Empire cannot delineate the oil-in-place saturation in the Upper San Andres versus the

Lower San Andres. Fact No. 29. Empire's experts Dr. Lindsay and Dr. Trentham testified that, while oil saturations were observed in the EMSU 679 and RR Bell #4 well cores to the bottom, with the EMSU 679 going the deepest, to approximately -700 feet subsea, how much further, if any, oil saturations might be shown is unknown. Fact No. 31. Empire acknowledges that, if Empire "had full logs," then Empire could breakdown the oil-in-place saturations in the Upper San Andres and the Lower San Andres, but it hasn't done that. Fact No. 48. And the lack of that evidence is entirely Empire's own fault: despite having owned the EMSU for over four years, Empire admits that it has not taken any cores of any wells, has not taken mud logs, has not taken any logs of any kind, and has not drilled any new wells. Fact No. 62.

Goodnight's experts, on the other hand, testified uniformly that there does not exist a ROZ in the Lower San Andres. Fact No. 53. And the most telling evidence of the lack of an ROZ is the disparate oil-in-place calculations – and the humongous reduction in the low case and high case oil-in-place estimates – in Table 1 of OPS Geologic petrophysicist Scott Birkhead's rebuttal testimony when OPS Geologic analyzed the oil in place in the Lower San Andres. *See* Fact No. 54. While that analysis does not show any saturations grouped together to analyze a residual oil percentage for purposes of a ROZ, for the seven wells analyzed, the low and the high cases reduced by 68% and 77% to 100%, finding 0% saturations in two of the seven (or about 30%) of the wells analyzed. *Id.*

Even if Empire could have proved from the data available that the alleged ROZ existed in the Lower San Andres – which it didn't – even its experts uniformly agreed that they cannot reasonably estimate the oil saturations to show a ROZ, given the 60+ years of SWD injection into the Lower San Andres; all testified that they have never seen a ROZ where waters were injected into the formation, and believe that it may have degraded the amount of oil seen in the

historical snapshot of the cores and logs. *See* Fact Nos. 55–62. While this makes little sense – because a ROZ by definition is not moveable by water, *see* Fact No. 78– coming from Empire’s own witnesses, it illustrates the unreliability in Empire’s attempt to prove the alleged ROZ exists. And, again, the failure of Empire to prove up the historical data about the alleged ROZ (even in the Upper San Andres) is entirely Empire’s fault, as it has done nothing to gather additional data in the four years that it owned and operated the EMSU. Fact No. 62.

The Supreme Court held that, for the Commission to find waste or that operations impair correlative rights for purposes of § 70-2-11, the party alleging waste or impairment of correlative rights must prove: (1) that there exists “*a certain amount* of” oil in the pool; and (2) that “*a determined amount* of [oil] *could be produced and obtained* without waste.” *Cont’l Oil Co.*, 1962-NMSC-062, ¶ 28 (emphasis added). Empire produced no evidence at the hearing about “a certain amount” of oil in the Lower San Andres. *Id.* Given that, Empire cannot, and did not, produce evidence that “a determined amount of [oil] could be produced and obtained without waste” from the Lower San Andres. *Id.*

**2. Empire Has Not Proved That Goodnight’s Injected Water Communicates Up from the Lower San Andres or That Goodnight’s Operations Impair or Affect Empire’s Operations.**

Goodnight’s injections in the EMSU are limited to the Lower San Andres. Fact. No. 1. To prove that those operations cause waste or impair correlative rights in relation to Empire’s production, Empire must prove by “greater of the evidence” – meaning Empire must prove that it is more likely true than not true – that Goodnight’s SWD operations affect negatively its operations. UJI 13-304 NMRA. And to the extent that Empire contends Goodnight’s operations cause waste or impair correlative rights to the alleged ROZ in the Upper San Andres, it has the burden to prove by greater weight of the evidence that Goodnight’s operations affect negatively

its ability to recover a determined amount of hydrocarbons that could be produced from the alleged ROZ. Empire proved neither of these.

In relation to Empire's current production operations in the Grayburg, the evidence established clearly and definitively that Goodnight's operations have not affected Empire's operations. Empire did not, and Empire's expert petroleum geologist, Joseph McShane, testified that Empire cannot, present evidence that commercial water injection in the EMSU has affected Empire's production from the Grayburg reservoir, because Empire "Does not have the type of data that [it] would need to see if it's affected or not," and would need data, such as wells logs, from additional offsetting wells. Fact No. 19. While Empire contends that Goodnight's injection waters migrate up into the Grayburg reservoir, the evidence at the hearing, the accuracy of which Empire's Senior VP of Operations, William West, did not dispute, established that Empire has been removing almost the exact same amount of water that it has taken out of the Grayburg while operating the EMSU and the trend of oil recovered is consistent. Fact No. 21. Empire did not prove that it is more likely true than not true that Goodnight's injection operations cause Empire to produce less hydrocarbons in its current operations than it otherwise would; thus, Empire did not prove that Goodnight's operations cause waste or impair correlative rights with respect to Empire's current operations in the Grayburg. *See* §§ 70-2-3, 70-2-33(H).

In relation to the alleged ROZ in the Upper San Andres, Empire did not prove, first, that oil in the alleged ROZ is "producible" or may be "practicabl[y]" obtained. *Id.* And second, even if it could have proved that, Empire did not prove that the greater weight of the evidence established that injection waters in the Lower San Andres communicate vertically up into the Upper San Andres.

To prove waste or impairment of correlative rights, Empire must prove that the oil in the

alleged ROZ is able to be “ultimately recovered,” and that it is “practicable” to obtain a determined amount of oil. §§ 70-2-3, 70-2-33(H); *see Cont’l Oil Co.*, 1962-NMSC-062, ¶ 28.

In attempting to meet its burden, Empire ran headstrong into the inherent dissociation – and incompatibility – of its theory that produced waters are communicating up into the Upper San Andres and Grayburg (which, as discussed below, was not proved) and that it can somehow pressure up the Upper San Andres with CO<sub>2</sub> to produce the alleged residual oil without the CO<sub>2</sub> escaping elsewhere. As the experts acknowledge, those two scenarios can’t both be true.

Empire’s expert petroleum geologist, Mr. McShane, acknowledged that Empire put forth no evidence on how the CO<sub>2</sub> will be injected into the San Andres aquifer in a way that it will be contained and will not impair correlative rights. Fact No. 71. John McBeath testified that a EOR project at the EMSU will require “a very significant” larger amount of CO<sub>2</sub> to move residual oil than did the Seminole or Tall Cotton fields – a factor of two to three times what Empire projects in its model – because those fields had “relatively continuous thick intervals of ROZ,” whereas, the EMSU has “disperse shows of oil, . . . not all bunched together,” which will lead to the CO<sub>2</sub> dispersing regardless of the amount of oil saturation. Fact No. 75.

Second, Empire failed to establish as more likely true that water injected into the Lower San Andres is migrating up above the Lower San Andres. The only direct evidence to which Empire could point were fractures from Dr. Lindsay’s EMSU 679 well fracture study. But that core only went into the Upper San Andres, and Dr. Lindsay testified that the study identified fractures only in the “upper San Andres.” Fact No. 20. Dr. Lindsay did not study, and there is no evidence, of fractures in the confining layer between the Upper San Andres and Lower San Andres. *See id.* Empire admitted that Chevron, which Empire agreed studied in-depth the EMSU and did a good job at that study, never concluded water was communicating up into the



Grayburg from the San Andres aquifer. Fact No. 24. And Empire concedes that, after four years of operation of the EMSU, and after reviewing studies going back almost 100 years to 1939, Empire does not know how many, if any, barrels of water are coming into the Grayburg, and it doesn't know "from which way" those barrels of water, if any, are coming. Fact No. 22. While Empire had a reservoir model for the EMSU, that model was unreliable and unreasonable, as the evidence established: (1) Dr. Jim Buchwalter did not correlate the porosity and permeability to the geology and the core measurements, but instead found a value that would "match" what he was told was the "influx" of water from the San Andres aquifer; (2) Dr. Buchwalter admitted that he "miss[ed] some of the water-supply wells" while creating the model; (3) he did not model the San Andres aquifer as having a Lower and Upper San Andres; and (4) to model the communication that Dr. Buchwalter assumed, he had to extend the San Andres to a "150-plus billion barrel aquifer," but could not extend the Grayburg to match. Fact Nos. 14–17.

The Hearing evidence established on the other hand, however, a long and well-documented history of waters migrating into the Grayburg from other than up through the San Andres: The Goat Seep reservoir is in connection with the EMSU, which allows for edge water to encroach into the EMSU through the downdip part of the Grayburg. Fact No. 23. And a 1939 study documented water on the crest of the EMSU structure in 1934-1937, documenting that water communicated into the Grayburg laterally through bedding plains, which Dr. Lindsay has also written about, and which lateral communication is consistent with the karsted intervals that Dr. Lindsay has also written about, which is the way that unexpected high plumes of water got into some of the EMSU wells. Fact No. 25. Thus, as opposed to migration vertically up from the San Andres, the evidence at the Hearing established that the high plumes of water resulted from edge water coming in through a karsted system through a tortuous pathway from the edge, or

water entering in the wellbores because the open hole completions were completed with nitroglycerin. Fact No. 26.

And this conclusion comports with common sense. The evidence was undisputed that, for over 60 years, SWD operations have disposed of produced water into the Lower San Andres on vacuum. Fact No. 55. Vacuum injection into the Lower San Andres could not be possible if the Lower San Andres was pressured up so that it was communicating up into the Upper San Andres, let alone the Grayburg. And the experts all testified that historic and recent pressures in the Lower San Andres show that it is under-pressured. Fact Nos. 10, 11. And the pressure in the Lower San Andres has not noticeably increased from over 60 years and over a hundred million barrels of produced water injected. Fact Nos. 11-12.

Moreover, even if Goodnight's produced water were to communicate vertically up into the Upper San Andres, which it does not, the evidence established that because a ROZ is by definition a percentage of saturation that is not mobile other than through EOR, water flowing in the Upper San Andres would not mobilize the oil or affect the alleged saturations in the alleged ROZ. Fact No. 78.

Finally, it bears repeating that, to prove Goodnight's operations are causing waste or impairing correlative rights in relation to the alleged ROZ in the Upper San Andres, Empire bears the burden to prove the weight of the evidence shows that there is a "certain amount of" oil in the alleged ROZ that "could be produced and obtained." *Cont'l Oil Co.*, 1962-NMSC-062, ¶ 28. Although Empire built a model based on starting with one of 72 sections of the Project, it has not identified where it intends to start. Fact No. 74. Empire admits that, in addition to putting forth no evidence how CO<sub>2</sub> could be injected into the Upper San Andres to produce the alleged ROZ, Fact No. 72, Empire has not applied for a tertiary EOR project, does not have a plan to do

so, and before applying for the project, Empire would have to obtain consents – which it estimates would take two years – it would have to drill and core the three wells for which it submitted applications only in March or February of 2025, and likely would be required to drill and core at least three more wells. Fact No. 72. If *any* ROZ were producible economically, Empire would have done something to explore that production other than filing lawsuits and these Applications only after it finally realized – because it performed no due diligence – that SWD operations were ongoing as they had been for 60 years before Empire’s purchase. Fact Nos. 79-81.

Thus, in relation to its current operations, as opposed to the mere weight of the evidence, the Hearing evidence established conclusively and definitively that Goodnight’s operations are not causing waste or impairing correlative rights. In relation to the alleged ROZ in the Upper San Andres, Empire did not prove that the weight of the evidence establishes that Goodnight’s injection of produced water is communicating vertically up into the Upper San Andres or, even if it did, that those waters would affect the ROZ (as the oil is, by definition, immobile), and did not prove that there is a certain amount of oil that could be produced and obtained via EOR.

**3. The Commission Should Deny Empire’s Applications and Grant Goodnight’s Applications.**

Empire has not proved that (A) “the granting of the application[s] by Goodnight would (1) impair correlative rights or cause waste, pursuant to § 70-2-11,” or (B) that “the granting of the applications by Empire would prevent the impairment of correlative rights or waste, pursuant to § 10-2-11.” Tr. Vol. IV, at 503:11-504:2. The Commission must, therefore, deny Empire’s Applications in Case Nos. 24018-24020, & 24025 to revoke Goodnight’s injection permits, and grant Goodnight’s Applications in Case Nos. 23614-17, 23775, 24123, & 24278.

Even Empire’s expert Dr. Lindsay agrees that Empire failed to prove that Goodnight’s

operations – whether ongoing or planned in the Applications at issue – cause waste or impair correlative rights. As he stated: There is not enough “direct evidence in the core” of recoverable oil to warrant revoking any of Goodnight’s permits. Fact No.46.

This required resolution of these cases, of course, merely maintains the status quo: it allows SWD operations to continue in the Lower San Andres as they have for over 60 years without any evidence of waste or impairment of correlative rights.

Empire’s experts, Dr. Lindsay, Mr. Dillewyn, Mr. Birkhead, Dr. Trentham, Mr. McShane, and even Mr. West, all testified that Empire needs more data to know whether the alleged ROZ exists and is producible, or whether disposal water in the Lower San Andres is communicating up into the Upper San Andres or if any water from the San Andres aquifer is communicating up into the Grayburg reservoir. Fact Nos. 13, 19, 35, 38, 42–48, 60. This lack of necessary data to prove Empire’s cases is entirely Empire’s own doing: Empire has not done anything in the four years it owned and operated the EMSU to even attempt to gather this data (until, of course, filing applications for four wells after this Hearing started). Fact No. 62.

So denying Empire’s Applications and granting Goodnight’s Applications additionally allows Empire to do what the lion’s share of, if not every, expert witness from both Empire and Goodnight suggested: to collect more data – more cores, more logs, more mud logs, among other data – to determine whether the alleged ROZ exists in either of the Upper San Andres or Lower San Andres, or to determine – as opposed to speculate – that water from the Lower San Andres is communicating up vertically. But as it stands today, Empire failed to meet its burden to prove that Goodnight’s ongoing operations or the operations applied for in the Applications at issue waste or impair of correlative rights.

Respectfully submitted,

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### **CERTIFICATE OF SERVICE**

I hereby certify that a true and correct copy of the forgoing was served to counsel of record by electronic mail this 3<sup>rd</sup> day of July 2025, as follows:

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CONDITIONS

Action 481625

CONDITIONS

Operator: RICE OPERATING COMPANY PO Box 5630 Hobbs, NM 88241	OGRID: 19174
	Action Number: 481625
	Action Type: [HEAR] Post Hearing Statement (POST HEARING STATEMENT)

CONDITIONS

Created By	Condition	Condition Date
sheila.apodaca	None	7/7/2025