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

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY, NEW MEXICO.

CASE NO. 22626

NOTICE OF *REVISED SELF-AFFIRMED STATEMENT OF NATHAN ALLEMAN, SELF-AFFIRMED STATEMENT OF STEVE ALLEN DRAKE, EXHIBIT C-8 AND EXHIBIT C-18*

Goodnight Midstream Permian, LLC, applicant in the above-referenced case, gives notice that it is filing the attached self-affirmed statements and exhibits for acceptance into the record.

Revised Exhibit B is a corrected copy of the self-affirmed statement of Nathan Alleman.

Revised Exhibit C is a corrected copy of the self-affirmed statement of Steve Allen Drake.

Revised Exhibit C-8 is a corrected tabulation of the volume of water injected.

Revised Exhibit C-18 is a corrected statement regarding the average thickness across the Eunice Monument South Unit.

Respectfully submitted,

HOLLAND & HART LLP

Michael H. Feldewert
Adam G. Rankin
Julia Broggi
Paula M. Vance
Post Office Box 2208
Santa Fe, New Mexico 87504-2208
(505) 988-4421
(505) 983-6043 Facsimile
mfeldewert@hollandhart.com
agrankin@hollandhart.com
jbroggi@hollandhart.com
pmvance@hollandhart.com

ATTORNEYS FOR GOODNIGHT MIDSTREAM PERMIAN, LLC

CERTIFICATE OF SERVICE

I hereby certify that on September 19, 2022, I served a copy of the foregoing document to the following counsel of record via Electronic Mail to:

Ernest L. Padilla
Padilla Law Firm, P.A.
Post Office Box 2523
Santa Fe, New Mexico 87504
(505) 988-7577
padillalawnm@outlook.com

Attorney for Empire New Mexico, LLC

Adam G. Rankin

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

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY NEW MEXICO.

CASE NO. 22626

SELF-AFFIRMED STATEMENT OF NATHAN ALLEMAN

1. My name is Nathan Alleman. I work for ALL Consulting as a regulatory specialist and project manager. I was retained by Goodnight Midstream Permian, LLC ("Goodnight Midstream") (OGRID No. 372311) to help prepare the C-108 administrative application in this case.

2. I have previously testified before the New Mexico Oil Conservation Division ("Division" or "NMOCD") as an expert witness in regulatory matters and permitting saltwater disposal wells. My credentials as an expert in regulatory matters and permitting saltwater disposal wells have been accepted by the Division and made a matter of record. I have attached my curriculum vitae as **Goodnight Exhibit B-1**. I believe these credentials qualify me to testify as an expert in these areas.

3. I am familiar with the application filed by Goodnight Midstream in this case, and I am familiar with the status of the lands in the subject area.

4. This application was originally filed for administrative approval but was protested during the administrative review period by Empire Petroleum Corporation ("Empire"). **Goodnight Exhibit B-2** is a copy of the protest filed by Empire. As a result of Empire's protest, Goodnight Midstream requested that the application be set for hearing before a Division Examiner. Empire is

BEFORE THE OIL CONSERVATION DIVISION
Santa Fe, New Mexico
Revised Exhibit No. B
Submitted by: Goodnight Midstream, LLC
Hearing Date: September 15, 2022
Case No. 22626

the only entity that objected to this application. Empire opposes presentation of this case by affidavit and subsequently a pre-hearing order was filed by the Division on June 17, 2022.

5. **Goodnight Exhibit A** is a full and complete copy of the Form C-108, also attached as Exhibit A to the hearing application, that was filed by Goodnight Midstream with the Division on September 17, 2021.

6. In this application, Goodnight Midstream seeks authority to inject produced salt water for purposes of disposal through its proposed **Piazza SWD No. 1 Well** (API No. pending), which will be located 1,847 feet from the south line and 2,537 feet from the west line (Unit K), Section 9, Township 21 South, Range 36 East, NMPM, Lea County, New Mexico. Page 9 in **Exhibit A** contains a C-102 depicting the location for the proposed injection well.

7. The proposed injection disposal interval will be within the San Andres formation [SWD; San Andres (Pool Code 96121)] between approximately 4,125 feet and 5,400 feet below the ground through a perforated completion. The maximum surface injection pressure will be 825 pounds per square inch (psi) and the estimated average surface injection pressure is expected to be approximately 495 psi. The maximum injection rate will be 40,000 barrels per day (bpd) and the estimated average injection rate is expected to be approximately 25,000 bpd.

8. The proposed injection volumes can be achieved without exceeding the maximum surface injection pressure. Injection pressures and volumes will be continuously monitored through an electronic SCADA system.

9. A small acid job may be performed to clean up mud and cuttings from the formation prior to commencement of injection operations. However, no other formation stimulation is currently planned.

10. The proposed injection is a new project and will be a closed injection system. It will operate as a commercial saltwater disposal well.

11. A copy of the well bore diagram for the proposed Piazza SWD #1 is included at page 10 of **Goodnight Exhibit A**. Details on the proposed packer system are included at page 11. An overview of the well's proposed construction and casing program is included at page 3.

12. The nine and five-eighths-inch production casing will be cemented to surface and a cement bond log will be used to establish the top of the cement and the quality of the bonding to the casing.

13. The annular space between the production casing and injection tubing will be filed with an inert packer fluid to protect both the production casing and the injection tubing, and both the injection and annulus pressures will be monitored at the wellhead to confirm the mechanical integrity of the well during injection.

14. The well design and cement plan will protect freshwater and underground sources of drinking water in the area and will be protective of correlative rights.

15. Twenty-four wells are located within the half-mile area of review. Fifteen of those wells are active producers, five have been plugged and abandoned, and four are injection wells. Information on each of the wells within the half-mile area of review is tabulated at page 14 of **Goodnight Exhibit A**. Only three wells within the area of review penetrate the injection interval. Two of them are active wells: (1) the Eunice Monument South Unit #713 (API 30-025-37321), and (2) the Eunice Monument South Unit #462 (API 30-025-29622). Both of these wells are properly plugged back to a shallower zone. The third well that penetrates the injection interval is the Eunice Monument South Unit #461 (API 30-025-29621). It has been properly plugged and abandoned.

16. Copies of the well bore schematics reflecting the condition of each the wells that penetrate the injection interval within the half-mile area of review are included at pages 16-18 of **Goodnight Exhibit A**. Each of these penetrating wells are properly cased and cemented through the injection interval and do not require corrective action to contain injection fluids within the injection interval. Additionally, none of the existing wells within the half-mile area of review create a potential conduit for the migration of injection fluids out of the injection zone.

17. The proposed injection fluids to be injected will be from production in various formations, including the Delaware Mountain Group ("DMG"), Wolfcamp, and Bone Springs formations. Water chemistry analyses of representative samples of produced water that are expected to be injected are located at page 23 in **Goodnight Exhibit A**. In addition, water samples from the injection formation in the San Andres are located at page 25. Based on this water chemistry analysis and prior experience, I do not expect there will be a compatibility issue between the injection fluids and the fluids within the injection interval.

18. The surface at the location of the proposed injection well is privately owned and the minerals are owned by the U.S. and managed by the Bureau of Land Management ("BLM"). Pages 15, 19, and 20 in **Goodnight Exhibit A** include maps depicting all oil and gas leases within a two-mile radius of the proposed injection well. Goodnight Midstream has an access and injection agreement in place with the private owner of the surface location.

19. **Goodnight Exhibit A**, page 27, contains a map depicting the location of the proposed injection well and the relative location of nine water wells within a one-mile radius. The water well sampling rationale and sample analyses for available freshwater wells are included at pages 28-37 in the exhibit.

20. Notice of this application was provided to the surface owner, NMOCD District Office, and Affected Persons within a half-mile area of review that are entitled to receive notice included in the table on page 41 of **Goodnight Exhibit A**. Parties entitled to notice were identified based on a determination of the title of lands and interests as recorded in the records of Lea County and from a review of NMOCD and BLM operator records as of the time the application was filed. *See* **Goodnight Exhibit A**, pages 14, 41. **Goodnight Exhibit A** pages 15, and 19-21, include maps that depict all lease tracts within the half-mile area of review. A complete list of the parties entitled to notice is included at page 41.

21. **Goodnight Exhibit A** pages 42-44 are copies of the green cards as proof that notice was sent by certified mail to all parties entitled to notice of the C-108 administrative application within the half-mile area of review. Constructive notice was also provided by publication in a newspaper of general circulation in Lea County, New Mexico, where the proposed injection well will be located. A copy of the affidavit of publication is included at page 40.

22. It is my opinion that Goodnight Midstream undertook a good faith effort to locate and identify the correct parties and valid addresses required for notice within the half-mile area of review. To the best of my knowledge the addresses used for notice purposes are valid and correct. There were no unlocatable parties for whom we were unable to locate a valid address.

23. In my opinion, granting this application will help conserve resources, and will avoid waste and protect correlative rights.

24. I affirm under penalty of perjury under the laws of the State of New Mexico that the foregoing statements are true and correct. I understand that this self-affirmed statement will be used as written testimony in this case. This statement is made on the date next to my signature below.

Nathan Alleman

09/16/2022
Date

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

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY, NEW MEXICO.

CASE NO. 22626

SELF-AFFIRMED STATEMENT OF STEVE ALLEN DRAKE

1. My name is Steve Allen Drake. I work for Goodnight Midstream Permian, LLC ("Goodnight Midstream") as Vice President of Geology and Reservoir Engineering.

2. I am familiar with the application filed by Goodnight Midstream in this case, and I am familiar with the status of the lands and geology in the subject area. I have conducted a study and review of the geology in the area of the proposed injection well and of the San Andres formation, which is the saline aquifer that is the intended disposal zone for Goodnight Midstream's proposed injection.

3. I have previously testified before the New Mexico Oil Conservation Division as an expert witness in petroleum geology. My credentials as an expert in petroleum geology have been accepted by the Division and made a matter of record. I have attached my curriculum vitae as **Goodnight Exhibit C-1**. I believe these credentials qualify me to testify as an expert in petroleum geology and petroleum engineering.

4. In summary, I have a bachelor's degree and master's degree in geology from Texas Christian University and more than 40 years' experience working in the oil and gas industry as a geologist and reservoir engineer. Most of my professional career has been spent working for reservoir engineering and consulting firms, including Netherland Sewell &

BEFORE THE OIL CONSERVATION DIVISION
Santa Fe, New Mexico
Revised Exhibit No. C
Submitted by: Goodnight Midstream, LLC
Hearing Date: September 15, 2022
Case No. 22626

Associates in Dallas. While there, I worked on gas storage geology, monitoring, and modeling gas storage, waterfloods, and water disposal. I have been with Goodnight Midstream for about 10 years. As Vice President of Geology and Reservoir Engineering with Goodnight Midstream my responsibilities include permitting, geologic support for drilling, technical advisor for completion design, testing and performance analysis, remediation, and service life projection. I have been working in the Permian Basin for more than 10 years, primarily on produced water disposal projects. I have overseen and managed the reservoir performance of 30 saltwater disposal wells in North Dakota, where we manage the movement and disposal of more than 250,000 barrels of produced water a day. We have drilled and operate 25 saltwater disposal wells in Texas. And have 9 saltwater disposal wells drilled and 12 permitted in New Mexico, as well.

Goodnight Midstream Permian, LLC Company Overview

5. Goodnight Midstream was founded in 2011. The company is based in Dallas, but our initial operations were in North Dakota. We have grown to be the largest third-party disposal company in North Dakota. In 2016, we commenced operations in Texas, and then started in New Mexico in early 2018. In New Mexico, we operate one large high-pressure pipeline system in Lea County called the Llano system.

6. **Goodnight Exhibit C-2** is a map depicting the current status of the Llano system along with its active and proposed saltwater injection wells. Currently the Llano system is comprised of 80 miles of pipeline with an ultimate projected capacity of 400,000 barrels of water per day, with 6 water recycling and re-use facilities and 9 approved saltwater disposal wells. The system currently serves 12 dedicated operators with 312 producing wells connected at 19 different receipt points, which are denoted as green dots on the map. Active production and drilling is located in the vicinity of the receipt points. Pipelines carry the produced water to the

disposal field where we have 9 approved saltwater disposal wells represented by the orange triangles. Our pending application, the Piazza SWD #1, is depicted with a purple triangle.

7. As reflected in this exhibit, our approach is to move produced water away from areas with the most intense production, where there is high competition for injection permits and reservoir capacity in the Devonian formation is relatively limited, to areas where we have identified depleted reservoirs on the Central Basin Platform that can sustainably accept large volumes of produced water for disposal. By targeting these depleted reservoirs, we avoid adding to the risk of induced seismicity through deep injection into the Devonian and instead target zones, such as the San Andres, where there has been substantial depletion through decades of water production to supply water for the waterfloods.

8. Access to the San Andres formation is of critical importance to these operators as a sustainable and long-term option to dispose of this produced water. The wells connected to the Llano system produced a combined 2.0 MM barrels of oil, 3.8 BCF of gas, and 4.5 MM barrels of water in March 2022 alone. About 1.9 MM barrels of produced water was reclaimed for re-use and about 2.6 MM barrels of produced water was delivered into the Llano system for disposal. The San Andres is also an important source of revenue for the State of New Mexico and Goodnight Midstream's landowners and royalty owners, including the State Land Office, who receive revenue from the transportation and disposal of produced water.

Piazza SWD C-108 Application: Geologic Overview

9. The injection disposal interval for the proposed Piazza SWD #1 will be within the San Andres formation [SWD; San Andres (Pool Code 96121)] between approximately 4,125 feet and 5,400 feet below the ground through a perforated completion. The top of the injection interval will not extend above the top of the San Andres.

10. In **Goodnight Exhibit A**, which is the C-108 administrative application, the geologic description under Item VIII at page 4 contains an overview of the geology and lithology of the target formation within the area of the proposed well.

11. The Piazza SWD #1 will penetrate the following geologic tops at the following approximate depths:

Formation	Top
Tansil	2,660 feet
Yates	2,810 feet
Seven Rivers	3,012 feet
Queen	3,424 feet
Penrose	3,568 feet
Grayburg	3,733 feet
San Andres	4,125 feet
Glorieta	5,410 feet
Total Depth	5,450 feet

12. **Goodnight Exhibit C-3** is a cross-section I prepared that shows the relative position of the proposed Piazza SWD #1 along with four well logs that span a two-mile distance from the southwest of Section 17 to the northeast of Section 9 all in Township 21 South, Range 36 East. The construction of the exhibit uses color to indicate impermeable, tight rock within each formation that will function as a barrier to vertical transmission of injection fluids. The lithology of these impermeable rocks are anhydrites, low porosity dolomites, and limestones. The color fill is color coded by formation: Grayburg is green and San Andres is Purple-Gray. White space is porous rock that contains either hydrocarbon or saltwater. Saltwater-filled porosity is a saline aquifer. The lithology of these porous intervals are dolomitic siltstones and porous dolomites. The gas/water contact ("GWC") for the Eumont Field is shown at -100 feet subsea. The GWC is marked by a red-green dashed horizontal line that cuts across all formations indicating a common gas oil contact. The oil/water contact for the Eunice EMSU oil pool is

shown as a green-blue horizontal line at -325 feet below sea level. At the proposed location, the Piazza well will be drilled through both the Eumont and the Eunice pools.

13. On the left side of the exhibit is the well log for the Sosa SWD #1. It was drilled in 2021 within the boundaries of the Eunice Monument South Unit ("EMSU") and is operated by Goodnight Midstream. It has hundreds of feet of porous dolomite in the upper and middle San Andres interval. The well injects 31,000 BWPD on vacuum due to the substantial depletion of fluids from the San Andres zone. Produced water feeds to the well by gravity feed. We can turn the charge pump on and increase the rate up to 40,000 BWPD at a tubing pressure of 60 psi. The well shuts in on instantaneous vacuum. The maximum operating pressure allowed for the well is 900 psi. The pressure rarely exceeds 140 psi.

14. The next well log to the right on the cross section is the Snyder (Ryno) SWD #1 well. It was also drilled within the boundaries of the EMSU and is operated by Goodnight Midstream. It is an open-hole log and gives us the best definition of rock type and porosity in this area. An excellent barrier at the top of the San Andres functions as the seal between the San Andres and the Grayburg formations consisting of approximately 200 feet of tight dolomite and anhydrite. An interval of tight rock in the center of the San Andres breaks the porosity interval into an upper- and lower-porosity member but there are still hundreds of feet of porous rock. The well injects between 28,000 BWPD - 35,0000 BWPD on vacuum with gravity feed. The well shuts in on instantaneous vacuum. The maximum operating pressure allowed for the well is 1,050 psi. The well rarely operates above 35 psi.

15. Moving along the cross section to the right, the third well log is from one of the Chevron EMSU water supply wells ("WSW"). The EMSU #461 WSW also has an open hole density neutron log. The proposed Piazza SWD #1 well will be located between the Snyder (Ryno) SWD #1 well and the EMSU #461 WSW, so we believe we have good well control. The

Chevron EMSU #461 WSW has withdrawn about 19 million barrels of water from the San Andres used for the Grayburg EMSU waterflood. It was plugged and abandoned in 2002. With this depletion from the San Andres, we anticipate that a disposal well near the former water supply well will have very low operating pressures and is an ideal location for injection.

16. The last well log on the right-hand side of the cross section is the log for the EMSU #278 well. This well originally produced oil from the Blinebry at a drilled depth of 5,950 feet. The well was plugged back and produced oil from the Grayburg starting in 1974. In 2017 the upper Grayburg perforations were squeezed off, the lower Grayburg was left open, and perforations in the San Andres were added. The well was occasionally flowed and tested for two years. A request was filed to convert the EMSU #278 to a water supply well, as noted on page 73 of the Division's well file, but the Division's well summary page still lists the well as a Grayburg producer. The EMSU #278 has produced about 1.0 million barrels of water from the commingled Grayburg – San Andres zones from 2018 to 2021. It has been inactive and shut in for most of 2022. Cumulative volumes for 2022 are 6 barrels of oil and 1 barrel of water over two days of production.

17. Turning to an overview of the San Andres formation itself, the proposed injection zone consists of interbedded carbonate rocks including dolomites and limestones. The upper San Andres is capped by 180 – 220 feet of tight dolomite and anhydrite. This serves as the upper geologic seal to prevent migration to the formations above. Several thick intervals of porous and permeable carbonate rock capable of accepting water are present within the subject formation in the area. The injection interval has a net thickness of 660 feet out of a gross thickness of approximately 1300 feet based on modern open-hole logs at the Snyder (Ryno) location in section 17.

18. The lower San Andres lithologic unit consists of approximately 200 feet of limestone with porosity values of 3%-6%, which creates an effective basal seal and barrier between the San Andres and Glorieta reservoirs against downward fluid migration. In addition, below the underlying Paddock interval, the Blinebry interval consists of approximately 580 feet of tight dolomite, which functions as an excellent and exceptionally thick barrier to downward migration. Based on my examination and study of the geology in the area, it is my opinion that these geologic seals above and below the target injection interval will effectively contain injected fluids within the injection zone.

Geologic Barriers Effectively Isolate the San Andres Formation

19. **Goodnight Exhibit C-4** provides direct evidence of a substantial barrier and seal above San Andres formation against vertical fluid migration. This exhibit shows three well logs. From left to right the wells are the Chevron EMSU #460 WSW, the Penroc (Chevron) Arnott Ramsay (NCT-C) #17, and the Rice Engineering EME SWD L-21. The Arnott Ramsay #17 produces from the shallower Eumont Y-7R-Q gas pool in the Yates, Seven Rivers, and Queen formations and is a depletion gas production well. It is 350 feet from the EME SWD L-21 disposal well. EME SWD L-21 has an estimated cumulative disposal volume of 37.6 million barrels of saltwater: 21.0 million barrels pre-OCD records [estimated 1966-1993] plus 16.6 million recorded in OCD records. The Arnott Ramsey (NCT-C) #17 has produced 2 BCF of gas from the Eumont Y-7R-Q pool. Despite its proximity to the EME SWD L-21 well, it has produced no water in the last 23 years, demonstrating that there is an effective barrier and seal between the San Andres and Y-7R-Q reservoirs.

20. The presence of an effective barrier between the San Andres and overlying Grayburg formation is proven by the presence of a regional pressure differential. The Grayburg has been pressured up due to being under water flood and the San Andres is depleted due to

water being extracted in great quantities. All producing Grayburg wells in the EMSU showed a gradual increase in water cut until they reached more than 98% water. All producing wells have built pressure from the injection of San Andres water into the Grayburg. The presence of water in the Grayburg, however, is not diagnostic of unwanted water encroachment. We must look instead to pressure differential to demonstrate that an effective barrier and seal exists between the two formations.

21. At the time the EMSU was created, the San Andres was identified as the source of water for the water flood operation. Water withdrawal began in 1987. Since that time the San Andres has supplied approximately 348 million barrels of water for field operations. **Goodnight Exhibit C-5** is a table I created using OCD records of production volumes for the 6 EMSU water supply wells. The history is incomplete. Data from hearing case records, and reconstructed volumes from tests and modeled averages were used to supplement the table. A few of the water supply wells are still active today. No oil production was ever reported for any of these wells.

22. As a result of this substantial fluid withdrawal, the San Andres was de-pressured while the Grayburg was re-pressured by waterflood injection. A large pressure differential was established between these two contiguous formations. An effective geologic barrier and seal exists between the Grayburg and San Andres formations. This seal must exist or we would not see the effects of the differential persist until the present day. The pressure differential is having an impact on drilling operations in the area and on injection into the San Andres.

23. Goodnight drilled its Snyder (Ryno) SWD #1 in the northwest quarter of Section 17 inside the EMSU in June 2018. Goodnight had no difficulty drilling through the normally pressured Grayburg reservoir. However, once the drill bit passed out of the base of the Upper San Andres anhydrites, which serves as the seal between the Grayburg and San Andres, the well lost circulation in the San Andres. All fluid was lost into the hole. This continued for the next

700 vertical feet as we drilled through the upper and middle San Andres zones. Water was continuously added to the hole to continue drilling. In contrast, the Grayburg held a column of fluid. This confirms that the Grayburg is pressure isolated from the San Andres. The condition repeated when we drilled each of our subsequent wells. All 8 have held a column of drilling fluid in the Grayburg but experienced a complete loss of fluid when we pass below the anhydrite boundary layer. The pressure differential between the Grayburg and San Andres is substantial, extends over a large area, and has not equilibrated over time. This strongly establishes that there are effective geologic barriers to flow between the two reservoirs across a substantial area.

24. Persistent low pressure in the San Andres is also demonstrated by the fact that Goodnight Midstream's Sosa SWD #1 and Snyder (Ryno) SWD #1 wells can inject into the San Andres on vacuum by gravity feed. This would not be possible if there was not an effective seal and barrier to maintain that dis-equilibrium between the two formations. This pressure differential has been maintained for more than 30 years confirming that the geologic barrier and seal between the two formations is effective and prevents water in the Grayburg from migrating to the San Andres, or the inverse. It will prevent water in the San Andres from migrating to the Grayburg.

Injection Will Not Affect Underground Sources of Drinking Water or Freshwater

25. The deepest underground source of groundwater is the Rustler formation at a depth of approximately 1,345 feet. Water well depths in the area range from approximately 195 feet to 213 feet below ground surface. No underground sources of drinking water exist below the injection interval in this area.

26. Based on this review and analysis of freshwater, the geologic seals above and below the injection interval, and the significant vertical offset between the injection zone and

shallow zones containing freshwater, it is my opinion that the proposed injection will not threaten drinking water sources or zones containing freshwater.

27. **Goodnight Exhibit C-6** is a geology and engineering statement that I prepared. It states that I have reviewed the available geologic and engineering data and have found no evidence of a hydrological connection between the proposed injection interval and any underground sources of drinking water. In addition, the casing string has been designed to ensure that there will be no hydrologic connection between the injection interval and overlying underground sources of drinking water.

Injection will not Result in Waste, Impair Correlative Rights, or Interfere with EMSU Operations

28. **Goodnight Exhibit B-2** is a copy of the email notification from the Division that Empire Petroleum Corporation ("Empire") protested this application. According to the protest, Empire objects to the proposed injection because the San Andres was included in the unitized formation for secondary recovery when the EMSU was created in 1985. Empire's objection states that the Grayburg and San Andres formations have "continued to produce hydrocarbons from same since the unit was formed." The objection contends that the EMSU "waterflood project . . . will be adversely affected by the proposed injection operation."

29. The San Andres has been confirmed to be a non-hydrocarbon bearing zone and has been permitted for saltwater disposal for 62 years, including within the EMSU boundary. **Goodnight Exhibit C-7** is a copy of Gulf Oil Corporation's Exhibit 5 from Division Case No. 8397, which originally sought approval of the EMSU as a statutory waterflood unit. It is a letter that Gulf sent to royalty and working interest owners explaining the benefits of their proposed waterflood. Page 3 of the exhibit makes clear that even at the time EMSU was proposed, the San Andres was determined to be non-productive and would serve only as a source of water for the

waterflood operation. That remains true to this day. Injection will not cause waste, impair correlative rights, and will not adversely affect the production of hydrocarbons from the EMSU or unit operations.

30. As demonstrated above, the proposed injection fluids will not migrate to vertically offsetting hydrocarbon intervals and will remain contained within the target injection zone, which is neither productive nor prospective for hydrocarbons in the area of the proposed injection well. The geologic seals above and below the injection interval, addressed in my testimony above, will isolate the disposal fluids from offsetting zones capable of producing hydrocarbons.

31. **Goodnight Exhibit C-8** shows a table I prepared tabulating the total volume of produced water injected into the San Andres within and immediately adjacent to the EMSU area. Included in the table is the operator for each injection well, the well's location, date of first injection, volumes injected, days in operation, average barrels of water injected per day, and a notation on whether the well is located within the boundaries of the EMSU. A total of 187 million barrels of produced water has been injected into these 14 saltwater disposal wells without any indication of communication with the overlying Grayburg formation in available production records. Active injection into the San Andres occurred before, during, and after the EMSU Grayburg waterflood commenced operations. There is a 62-year track record of no impact to Grayburg production and subsequent EMSU operations from concurrent and continuous produced water injection into the San Andres.

32. As reflected on the tables in the exhibit, Goodnight Midstream is not the only operator with active SWDs inside the EMSU. Rice Engineering, OWL, and Empire operate SWDs inside the EMSU that currently dispose water into the San Andres and do no harm to the Grayburg reservoir or to EMSU operations. **Goodnight Exhibit C-9** is a map I prepared locating

each of the SWDs included in the previous exhibit. Included on the map are Goodnight Midstream's Llano pipeline system and its nearby connected SWDs indicated with blue circles. The proposed Piazza SWD #1is marked with a yellow circle. Also included are the locations of EMSU water supply wells with the approximate volume of water produced from the San Andres by each supply well. Of note, Empire operates the Empire EMSU #001 SWD, which actively injects produced water into the San Andres and is located less than a mile to the north of the proposed Piazza SWD #1.

33. The EMSU #461 and #462 water supply wells are approximately 1,360 feet and 2,730 feet from the proposed Piazza SWD #1, respectively. As shown in **Goodnight Exhibit C-5**, these water supply wells have produced a combined total of approximately 90 million barrels of water from the San Andres over more than 30 years with no show of oil. Ninety-million barrels over three decades with no oil production is a sufficient test to confirm that the San Andres is devoid of hydrocarbons here.

34. In summary, millions of barrels of water have been taken out of the San Andres and millions of barrels of water have been put back in. The reservoir has been disturbed by these two types of water operations on a vast scale. Original conditions no longer exist. The third test of reservoir conditions is, did the San Andres reservoir reach the bubble point? As pressures were dropping did the San Andres ever produce gas?

35. Once the bubble-point pressure is reached in a reservoir it is no longer a candidate for a ROZ play because the reservoir energy needed to drive a residual oil zone play has been lost through depletion. The bubble point is the pressure at which the first bubble of gas appears from a fluid at a specific temperature or pressure. When a reservoir is depleted and its pressure falls below the bubble-point pressure, free gas starts to form in the reservoir.

36. In the San Andres, the bubble point was reached some time ago and no oil was produced. In 2013, XTO filed an application to allow for flaring a small volume of gas from the EMSU #458 and #459 water supply wells, which were completed and producing water from the San Andres. That means the San Andres was drawn down sufficiently to reach the bubble point and to release dissolved gas. **Goodnight Exhibit C-10** is a copy of the sundry notice filed with OCD showing that on page 4 XTO requested authority to flare these wells in 2013. No oil was produced with the gas, confirming that the San Andres is not an oil reservoir and is not a suitable candidate for a future ROZ play.

37. It is doubtful that an ROZ play that recovers commercial amounts of oil from the San Andres can exist in this space. Water has been extracted from what Goodnight refers to as the San Andres until the bubble point was reached and no oil was recovered. An adequate amount of water over an adequate amount of time has been extracted to prove that the San Andres zones being used for water supply are not oil productive. Goodnight has chosen a deeper top as our pick for the San Andres, which is our operational ceiling for injection. Goodnight does not propose to inject above it. Goodnight's pick for the San Andres top is functional as it is at the boundary of the mappable barrier to flow that exists between the Grayburg and San Andres. Goodnight has presented data to demonstrate that this barrier is real and effective. It appears that Empire wants to pursue the interval immediately below the Eunice Pool oil column as having economic potential. Goodnight's geologic model does not include this interval as part of the San Andres. It is part of the Grayburg by the top we have chosen. Goodnight believes that the ROZ that Empire appears interested in developing is actually the transition zone below and contiguous with the Grayburg oil column and is of the same natural origin and directly associated thereto. Salt water has been disposed into the same San Andres zones accessed by the water supply wells without doing harm to the Grayburg water flood above. Multiple operators have saltwater

disposal wells inside and near the EMSU actively injecting water while doing no harm to the unit or its operations. Goodnight believes that both Empire and Goodnight can pursue their separate goals without interfering with or harming the other. It is compatible for Empire to investigate the viability of producing oil from the Grayburg ROZ while Goodnight continues to dispose of water into the San Andres through its existing and proposed wells.

38. In addition to SWD operations within the EMSU, there are 14 different operators with 393 active producing wells inside the EMSU boundary. Of those, Empire operates 286 active wells. The other 13 operators have 107 active wells inside the unit boundary. **Goodnight Exhibit C-11** is a map of oil and gas wells located within the EMSU boundary that identifies each active oil and gas well within the EMSU by operator. The proposed Piazza SWD #1is marked with a yellow triangle. Goodnight Midstream's proposed injection well would be part of an active oil field where many companies use the same space to their advantage.

Empire's Documents Confirm that EMSU Production is Limited to the Grayburg and that San Andres Injection will not Cause Waste, Impair Correlative Rights, or Interfere with EMSU Operations

39. In response to a subpoena for all documents, communications, data, analyses, reports and summaries that address whether the San Andres contains hydrocarbons, Empire produced seven documents, none of which support the position that the San Andres in this area contains hydrocarbons capable of being produced or that it is a candidate for ROZ development.

EMSU #200H Well

40. **Goodnight Exhibit C-12** is an excerpt of portions of a 14-page well file on the EMSU #200H well from Enverus data service. It contains identifying information on the well, the deviation survey program, and the production history from January 1985 through July 2022. It does not provide support that oil has been produced from the San Andres. It shows that the well was completed in the Grayburg-San Andres pool, which was designated by the Division as

the Eunice Monument; Grayburg-San Andres Pool (Pool Code 23000) at the time the unit was approved by the Division. It does not show that the well actually produces from the San Andres; in fact, the document shows on Page 3 that the formation this well tests is the Grayburg formation. That is confirmed by the deviation survey in the Division's well file which shows that this well kicked off its horizontal interval at a depth of approximately 3,780 feet. The well's surface elevation is 3,555 feet, giving the well's lateral a subsea depth of approximately 225 feet, which is well within the Grayburg formation. This well does not penetrate San Andres and produces only from the Grayburg, as the document itself states.

41. **Goodnight Exhibit C-13** is a structure map that I prepared on the top of the San Andres showing the location of the completed interval for the EMSU #200H as a yellow line. Nearby wells that penetrate the San Andres are depicted as red circles. The last five digits of each offsetting well's API are included, posted above the well symbol. The TD of the well is posted below the well symbol. As well as the subsea depth for the top of the San Andres formation, as identified on each well log, is posted in a red-brown color. This exhibit shows that the shallowest depth for the top of the San Andres in this area is found near the midpoint of the EMSU #200H lateral and is located at about -540 feet subsea depth, or approximately 4,095 feet vertical depth. The EMSU #200H lateral is drilled at a subsea depth of only about -225 feet, or 3,780 feet vertical depth. That means the lateral for the EMSU #200H does not penetrate below the top of the San Andres in this area. It does not produce oil from the San Andres.

42. **Goodnight Exhibit C-14** is a copy of the well deviation survey for the EMSU #200H from the Division's well file showing the vertical depth of the EMSU #200H lateral along the entire length of the well path.

43. **Goodnight Exhibit C-15** is a portion of the well log for the Meyer B 4 #21 (API No. 30-025-04482). It is located about 100 feet northeast of the EMSU #200H lateral and, as

seen in the well log, penetrates the San Andres. It is depicted on the map in **Goodnight Exhibit C-13** and is near the midpoint of the EMSU #200H lateral where the San Andres formation is at its shallowest in this area. The exhibit also shows the approximate depth of the EMSU #200H lateral at approximately 3,780 feet. The EMSU #200H lateral is clearly within the Grayburg formation at that depth and does not penetrate the lower permeability barrier, depicted with purple shading on the well log, that separates the Grayburg from the San Andres. This permeability barrier is a proven barrier to flow between the Grayburg and San Andres and separates the zones of porosity in the Grayburg from those in the San Andres.

44. Of particular note, the EMSU #001 SWD (API No. 30-025-04484) is located about a quarter of a mile southwest from the EMSU #200H lateral in the center of Lot O in Section 4, Township 21 South, Range 36 East. It is depicted on the structure map in **Goodnight Exhibit C-13**. It is operated by Empire as a produced water injection well. As reflected in **Goodnight Exhibit C-8**, the EMSU #001 SWD has injected more than 4 million barrels of produced water into the San Andres since it commenced injection in 1987 without adversely affecting offsetting production in the Grayburg.

45. **Goodnight Exhibit C-16** is a proximity map prepared by Empire and provided in response to our subpoena for documents. It shows the approximate location of the EMSU #200H lateral in relation to the proposed Piazza SWD #1 about 1.37 miles to the south. In a call-out bubble, the exhibit also provides details about the EMSU #200H well, including TVD, lateral length, cumulative oil and gas production, and daily oil and gas production. I have included text on the left side of the exhibit in response to Empire's claims. The cumulative oil and gas provided on the exhibit is for the life of the well. It was originally a vertical well that was completed in the Grayburg formation and recompleted as a Grayburg horizontal well in 2011. As

addressed above, the EMSU #200H is not deep enough to have been completed in the San Andres.

46. The second page of the exhibit shows the same map prepared by Empire but with an additional reference point that I have added—the Rice Engineering SWD EME #33M well. It is located about 0.82 miles to the northeast of EMSU #200H lateral and has been injecting produced water into the San Andres since 1960. I have also included text on the left side of the page responding to Empire's claims. As reflected in **Goodnight Exhibit C-8**, this well has injected more than 58 million barrels of water into the San Andres since commencing injection and has averaged more than 2,500 barrels of water injected per day without impairing EMSU operations.

47. **Goodnight Exhibit C-17** shows a portion of the well log for the EME #33M. It shows that the same permeability barrier preventing flow between the Grayburg and San Andres reservoirs can be found in this well log, as well. It is indicated with a red line across the well log and with light purple shading where the top of the San Andres located. Also included on the exhibit is an overview of the well's injection history. As with Empire's own EMSU #001 SWD, this well has been injecting into the San Andres without adversely affecting offsetting EMSU production in the Grayburg.

48. Empire's suggestion that EMSU #200H produces in the San Andres and will be adversely impacted by Goodnight Midstream's proposed injection is not supported by the facts or data.

EMSU #462 Well

49. **Goodnight Exhibit C-18** is a copy of the well log for the EMSU #462 well prepared by Empire and provided in response to our subpoena for documents. Empire, or its geologic consultant, located geologic tops across the well log. Empire located the top of the San

Andres shallower than 4,000 feet deep on this log. That places the top of the San Andres significantly above the permeability barrier that Goodnight Midstream has been using as its pick for the San Andres.

50. In my opinion, and consistent with ConocoPhillips' San Andres picks in the area, the top of San Andres is located at approximately 4,168 feet in this well log. That aligns the San Andres with the low-permeability barrier separating the reservoirs and indicated by the higher gamma ray interval on the well log. Empire's pick also means the Grayburg would be only about 250 feet thick at this location. The approximate gross thickness of the Grayburg across the EMSU is recognized to be about 490 feet. **Goodnight Exhibit C-19** is a is a copy of Gulf Oil Corporation's Exhibit 34a from Division Case No. 8397, which is the geologic overview from the C-108, stating that the gross thickness for the Grayburg is about 490 feet and the approximate depth of the formation varies depending on the structural position of the well.

51. Empire also asserts in the comments included with the well log in this **Goodnight Exhibit C-18** that the EMSU #462 "was perforated and completed within the depths of the proposed injection disposal interval" of the Piazza SWD #1, and that it has produced 22,115 barrels of oil. Empire either misunderstands or misinterprets the historical record for the EMSU #462 well.

52. **Goodnight Exhibit C-20** is a is an excerpt from the well file for the EMSU #462 that I prepared. The excerpt provides an overview of the well's initial drilling and completion history. It was drilled down to 5,000 feet in the San Andres in February 1987 and completed as an open-hole water supply well.

53. The next page of the exhibit includes a table on the right that I prepared compiling the water production history for the EMSU #462 well starting in 1987. It was one of six Chevron water supply wells supporting the EMSU. In total, these six water supply wells produced more

than 348 million barrels of water. Water production data for the EMSU #462 well is not available for the years 1990-1993 from OCD's records but resumes from 1994 through the last injection in 2004. Where injection volume data is missing for 1990-1993, I used average injection volumes for 1987-1989 and 1994 to reconstruct the production records for those years. Division records reflect the well has produced more than 45 million barrels of water. Including reconstructed volumes for 1990-1993, the well likely produced more than 70 million barrels of water. The well never reported oil production through 2004 while it was completed and producing water from the San Andres.

54. The third page of the exhibit continues a review of the well's history based on a review of the Division's well file. In 2003, the well was shut in. Two years later in 2005, the operator at the time submitted a C-103 reflecting plans to perforate the upper San Andres and test the well. However, this work was never done. In May 2012, the operator set a cast-iron bridge plug at 4,260 feet to shut off the water supply zone in the San Andres. The well was then perforated in the Grayburg from 3,794 feet to 3,900 feet. It began producing from the Grayburg in 2014 and has cumulatively produced 22,115 barrels of oil—all of which has been produced after the well was recompleted in the Grayburg formation. Contrary to Empire's assertion, this well has not produced oil from the San Andres; the San Andres produced only water. All oil production was from the Grayburg after the well was recompleted.

CONCLUSION

55. In my opinion, granting this application will help conserve resources, avoid waste, and protect correlative rights. As demonstrated by existing and long-term injection into the San Andres formation adjacent to and inside the EMSU boundaries, the proposed injection through the Piazza SWD #1 will not cause waste or impair correlative rights in offsetting Grayburg production, and will not interfere with EMSU operations.

56. **Goodnight Exhibits C-1 through C-20** were prepared by me or compiled under my direction from company business records or from the public records of the OCD.

57. I affirm under penalty of perjury under the laws of the State of New Mexico that the foregoing statements are true and correct. I understand that this self-affirmed statement will be used as written testimony in this case. This statement is made on the date next to my signature below.

Steve Drake
Steve Allen Drake

9/15/2022
Date

Goodnight Midstream

API	Well / Formation	PLLS Location	Date Of First Injection	Volume of Water Injected	Days in Operation	Average BWPD	Inside EMSU Boundary	
30-025-43901	Ryno San Andres	H-17-21S-36E	3/14/2019	9,416,545	1,235	7,625	Yes	
30-025-47947	Sosa San Andres	N-17-21S-36E	4/18/2021	7,415,572	469	15,811	Yes	
30-025-44386	Ted San Andres/Glorieta	F-28-21S-36E	3/31/2019	6,946,567	1,218	5,703	No	
30-025-46382	Yaz San Andres	A-28-21S-36E	10/8/2019	10,203,387	1,027	9,935	No	
30-025-26491	Piper* San Andres	M-18-21S-37E	1/1/2012	22,520,722	3,864	5,828	No	
30-025-45349	Nolan Ryan San Andres	O-13-21S-36E	10/31/2019	7,567,841	1,004	7,538	No	
30-025-46398	Scully San Andres	F-4-22S-36E	3/12/2020	4,681,457	871	5,375	No	

* *Piper AKA Penroc State E 27 #2*

San Andres Operated by Others

30-025-21852	Rice EME SWD #021	L-21-21S-36E	9/22/1966	37,811,918	20,401	1,853	Yes	w/ volume before records
30-025-04484	Empire E M S U #001	W-4-21S-36E	3/2/1987	4,152,776	12,935	321	Yes	w/ volume before records
30-025-12786	Rice EME SWD #033M	M-33-20S-36E	4/14/1960	58,817,513	22,753	2,585	No	w/ volume before records
30-025-46579	Owl P15 #001	P-15-21S-36E	11/1/2020	1,920	637	3	Yes	
30-025-46577	Rice N11 #001	N-11-21s-36E	11/1/2020	2,640	637	4	Yes	
30-025-38789	Parker Parker SWD #005	A-24-21S-36E	3/15/2015	7,101,120	2,695	2,635	No	
30-025-26317	Rice State E 27 #1	N-18-21S-37E	10/15/2008	34,735,401	5,037	6,896	No	
				211,375,379				

BEFORE THE OIL CONSERVATION DIVISION Santa Fe, New Mexico
***Revised* Exhibit No. C-8**
Submitted by: Goodnight Midstream, LLC Hearing Date: September 15, 2022
Case No. 22626

Document: Goodnight SWD Application_EP Exhibit.PDF

Discussion: Empire Petroleum has picked the top of the San Andres too shallow in this well.

They have the San Andres top above 4000 feet. The top should be at 4168.

On average the Grayburg is greater than 400 feet thick across the EMSU.

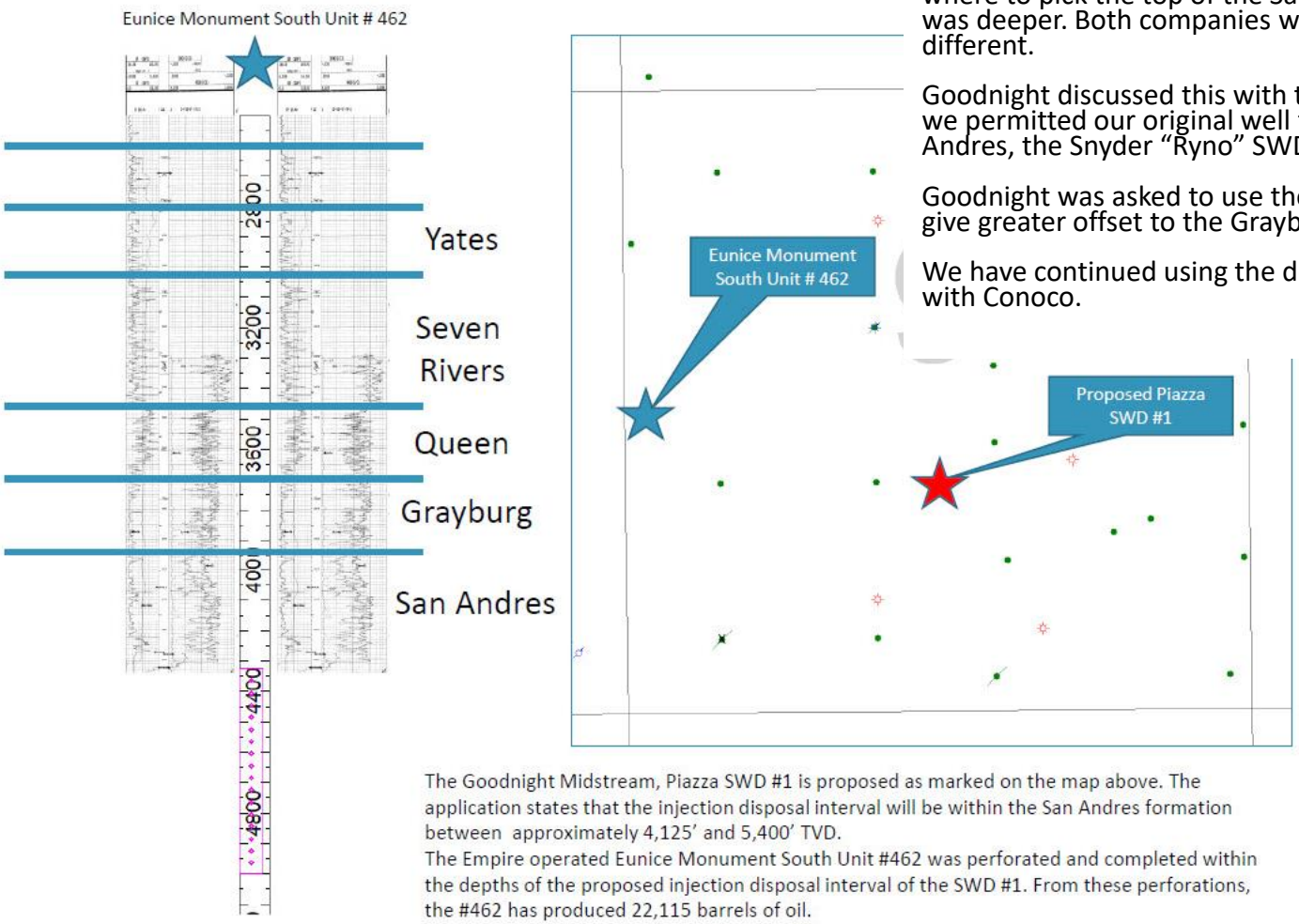
Historical Context: Gulf Oil and Conoco disagreed on where to pick the top of the San Andres. The Conoco pick was deeper. Both companies were consistent but different.

Goodnight discussed this with the OCD, Phil Goetze, when we permitted our original well for disposal in the San Andres, the Snyder "Ryno" SWD.

Goodnight was asked to use the deeper pick as it would give greater offset to the Grayburg production above.

We have continued using the deeper pick; compatible with Conoco.

Goodnight SWD Application



The Goodnight Midstream, Piazza SWD #1 is proposed as marked on the map above. The application states that the injection disposal interval will be within the San Andres formation between approximately 4,125' and 5,400' TVD.
The Empire operated Eunice Monument South Unit #462 was perforated and completed within the depths of the proposed injection disposal interval of the SWD #1. From these perforations, the #462 has produced 22,115 barrels of oil.

Geologic Consultants

BEFORE THE OIL CONSERVATION DIVISION
Santa Fe, New Mexico
***Revised* Exhibit No. C-18**
Submitted by: Goodnight Midstream, LLC
Hearing Date: September 15, 2022
Case No. 22626