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

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

CASE NOS. 23614-23617

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

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

CASE NOS. 24018-24020, 24025

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

DIVISION CASE NO. 22626
ORDER NO. R-22869-A
COMMISSION CASE NO. 24123

NOTICE OF AMENDED EXHIBITS

Goodnight Midstream Permian, LLC applicant in the above-referenced cases, gives notice that it is filing the attached amended hearing exhibit packet to include Rebuttal Exhibits C-19 through C-27 which were inadvertently excluded from the original filing.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on February 13, 2025, I served a copy of the foregoing document to the following counsel of record via Electronic Mail to:

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SELF-AFFIRMED REBUTTAL STATEMENT OF THOMAS E. TOMASTIK

1. My name is Thomas E. Tomastik. I work for ALL Consulting, LLC as the Chief Geologist and Regulatory Specialist. In this role, I manage injection well projects throughout the United States, including New Mexico. I am familiar with the applications in the above-referenced cases.

BEFORE THE OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Rebuttal Exhibit No. C
Submitted by: Goodnight Midstream Permian, LLC
Hearing Date: February 24, 2025
Case Nos. 23614-23617, 23775,
24018 – 24020, 24025, 24123

2. I have been asked to prepare this rebuttal statement in response to statements and depositional transcripts by Empire's witnesses and the New Mexico Oil Conservation Division (NMOCD).

3. I have previously testified before the New Mexico Oil Conservation Division ("Division") as an expert witness in petroleum engineering, hydrogeology, and petroleum geology. My credentials as an expert have been accepted by the Division and made a matter of record. I have previously attached my current curriculum vitae as **Goodnight Exhibit C-1 to my Self-Affirmed Statement**. It outlines my education, training, and experience, as well as a list of my publications and presentations.

Rebuttal Summary

4. I have been asked to review the direct testimony, exhibits, and additional data and new information provided by the parties relating to the applications filed by Goodnight Midstream and Empire in these cases. I have been asked to review the additional new data and information relating to the applications filed by Goodnight Midstream and Empire in these cases. I have conducted further study on the additional information and this, along with my experience, forms the basis of my rebuttal opinions expressed herein. I have made a good faith effort to anticipate Empire and NMOCD testimony based on the information I have reviewed, but I reserve the right to revise or expand my testimony or to respond to new assertions, allegations, or testimony of Empire or NMOCD and their witnesses.

5. Specifically, I have been asked to evaluate and assess the new information from Empire and NMOCD and provide additional rebuttal testimony on: (1) William West's deposition and transcript; (2) Overview of primary and secondary (waterflood operations) of the EMSU; (3) Empire's claims regarding corrosion and scaling issues associated with the EMSU and Empire's allegations of chloride corrosion caused by Goodnight's San Andres SWD injection operations;

(4) Analysis of the testimony by Empire regarding their chemical/treating protocols and the general water chemistry of both the Grayburg and San Andres formations; (5) Assessment of Empire's agreed compliance order for inactive well status from January 2024 to July 2024; (6) Further discussion of the geologic seal and barrier between the Grayburg Formation and the top of the Goodnight San Andes injection zones in the San Andres; (7) Review and assessment of NMOCD self-affirmed statement regarding the Capitan Reef, Goat Seep Formation, and potential need for aquifer exemptions for Class II injection into the San Andres Formation.

6. I have thoroughly researched all the available documents, records, and publications including but not limited to:

- **William West's two transcripts;**
- **Dr. Robert Lindsay's transcript;**
- **W.L. Hiss (1975) PhD dissertation;**
- **NMOCD's self-affirmed statement and exhibits;**
- **Lewis Land New Mexico Open-File Report 583;**
- **Male and others (2024) presentation;**
- **Dr. Robert Lindsay's self-affirmed statement; and**
- **Further review of existing publications and other documents listed in my reference section.**

7. The following is a summary of rebuttal topics that are addressed in my rebuttal statements below.

- Overview of Production and Waterflood Operations;
- Chloride Corrosion Issues;
- Scaling and General Water Chemistry;
- Empire's Claimed ROZ;

- Empire's Agreed Compliance Order;
- San Andres Upward Migration Barrier and Claimed Fractures;
- Empire EMSU CO_2 Plans;
- Capitan Reef and Goat Seep Aquifer; and
- Underground Injection Control and USDWs.

OVERVIEW OF PRODUCTION AND WATERFLOOD OPERATIONS IN THE EMSU

8. A continued overview of the primary production and waterflood operations at the EMSU and publications demonstrate the following points which support my rebuttal statement:

- Water was first produced in the EMSU in the 1930s with water encroachment from the west, southwest, and southeast edges of the field, but the water drive appears to be most active in the southwestern portion of the field.
- By late 1941, water encroachment was uniform on the west and southern parts of the field, while the east edge, because of lower permeability, was less evenly encroached on. The central part of the pool had the largest percentage of oil wells still free from water.
- Water encroachment in the EMSU is further demonstrated by **Exhibit C-12** (Page 48 of the transcript for Case No. 12,320 on March 2, 2000, has testimony from Tracey Love of Chevron) states *"They show in some areas that we're producing more water than we've put in. And that comes from the edge water to the west, there's an edge water encroachment to the west, and the wells on the west side exhibit more water influx than we put in."*
- The Chevron 1991 SPE Paper documented that the **San Andres Formation was under low-pressure** during the drilling of the water supply wells and large horsepower submersible pumps were used to pump the make-up water for waterflooding operations.
- **Exhibit C-13** - William West's direct testimony claims there was oil produced from the San Andres Formation from three wells, the EMSU #660, EMSU #658, and EMSU #577 [William West transcript, December 3, 2024, Page 12 (Pages 42-45)].
- Empire's only documentation of alleged show of oil from the San Andres Formation is from a well test in the EMSU #660, which was drilled and completed by XTO in late 2005 that was never filed into the NMOCD's public well file records. The well test produced de minimis oil from the San Andres along with large volumes of water and the well was then plugged back to the Grayburg Formation. In the review of all of the NMOCD documents for this well on their website, there is no testing document or Sundry Notice indicating any oil

production from the San Andres. The Sundry Notice indicates after the San Andres was perforated it was swabbed on December 14, 2005, and a submersible pump was run on December 15, 2005. There is no Form C-104 for the San Andres testing and on March 2, 2006, a cast iron bridge plug (CIBP) was set at 4,000 feet to isolate the San Andres perforations. On March 10, 2006, a 24-hour production test was conducted on the perforations in the Grayburg Formation above the CIBP.

There are no C-104s from the commencement of waterflooding to present indicating any oil production from any of the EMSU water supply wells.

- On the EMSU #457 water supply well, after being perforated, the well was swabbed and recovered 8,636 barrels of water in 19 hours and no oil production reported.
- Completion of the EMSU #458 water supply well had a production test of 925 barrels of water and no oil production.
- On the EMSU #461 water supply well, after perforating it tested 750 barrels of water and no oil.
- The other three water supply wells (EMSU #462, EMSU #459, and EMSU #460) also reported no oil production.

- William West testified he heard from someone, but could not remember who, that the EMSU water supply wells tested oil in the San Andres, but no evidence has been presented to confirm this. In response to a request for documents, Empire confirmed that, after a diligent and thorough search, it has been unable to locate any documents showing any oil or skim oil was produced from any of the EMSU water supply wells **(Exhibit C-14**).
- **Exhibit C-15** is from Page 3 from Exhibit No. B-14 – Case No. 23614-23617, November 2, 2023, and states *"For the proposed unit, saltwater from the **non-productive San Andres Formation**, supplemented by the reinjection of produced water, was recommended for pressurized injection into the oil producing portions of the Grayburg and Lower Penrose formations."*
- As can be seen, there are multiple documents from Gulf/Chevron regarding the ESMU waterflood that clearly defines the San Andres Formation as non-productive and only to be used for make-up water for the waterflood and disposal of produced water—both existing prior to formation of the EMSU and in support of EMSU operations.

CHLORIDE CORROSION ISSUES

9. In William West's deposition, he states that he does not rely on any scientific papers or studies for his assertion that chlorides cause corrosion in oil and gas wells because it is just a known fact that chlorides cause corrosion. As addressed in my self-affirmed statement, chloride corrosion is not a primary corrosive agent in the oil and gas industry. Hydrogen sulfide

(H_2S), oxygen, microbial-induced corrosion, and carbon dioxide (CO_2) are the prevalent corrosive agents in the oil and gas industry.

10. It is well documented in the EMSU that:

- Corrosion occurred well before commencement of waterflooding and continued after waterflooding operations commenced with the intermixing of make-up water from the San Andres (Chevron, 1991; 1996);
- Historical corrosion and scaling occurring in the Grayburg wells are not associated with injection operations from the Goodnight SWDs;
- Between 1989 and 1992—more than 25 years before Goodnight started its injection operations into the San Andres—Chevron (1996) sampled and analyzed produced waters from 153 EMSU producing wells and found the following:
  - Chloride concentrations from the 153 EMSU producing wells ranged from a low of 1,996 mg/L to a high of 55,453 mg/L.
  - Eighty-six of the wells were sampled and analyzed multiple times annually between 1989 to 1992 and chloride concentrations either increased or decreased over annual sampling periods, indicating that at different times there was either an influx of higher salinity or lower salinity waters into the Grayburg formation during the Chevron sampling period.
  - **Table 1** below shows examples of chloride levels decreasing and increasing over time in both the Grayburg and San Andres formations.

EMSU Well No.	Date Sampled	Chloride Concentration (mg/L)	Date Sampled	Chloride Concentration (mg/L)	Increase or Decrease in Chloride Concentration
214	11/01/1990	22,836	11/01/1991	6,762	Decrease
228	10/01/1989	2,972	10/01/1991	21,522	Increase
256	10/01/1989	3,789	10/01/1991	55,453	Increase
119	11/01/1990	32,300	11/01/1991	14,600	Decrease
457 WSW	10/01/1989	2,000	10/22/1992	8,280	Increase

- This documentation by Chevron (1996) clearly demonstrates that there have been substantial fluctuations (increases and decreases) in chloride concentrations for approximately 33 years prior to commencement of Goodnight injection operations and further demonstrates chlorides played a minor if any role in corrosion issues.
- Empire presented a total of 31 sampling and analysis events from 21 EMSU Grayburg producing wells between November of 2023 and November of 2024. The sampling

results show a range of TDS from a low of 17,971 mg/L to a high of 28,203 mg/L and a range of sulfates from a low of 12 mg/L to a high of 2,545 mg/L.

- **Exhibit C-16** shows the location of these Grayburg wells in relation to all of the San Andres SWDs in this area.
- There is no discussion from Empire as to why certain production wells were selected for sampling and analysis. Additionally, there is no technical interpretation of the analytical results nor is there any associated chemical treatment recommendation from Empire's chemical treating consultant or if treatment is even recommended for these wells. Additionally, the question arises as to why no fluids from Grayburg injection wells have been sampled and analyzed? Are the Grayburg injection fluids chemically treated at the surface facilities prior to injection?
- In William West's transcript, Mr. West testified that Empire's chemical treating company made recommendations for chemical treatment, but Empire made its own decisions on chemical treatment and Mr. West admitted that cost is a consideration. Goodnight requested copies of all chemical treatment recommendations made to Empire by its chemical treatment consultant for the EMSU, but none were provided.
- Mr. West testified that he did not know if Empire was following the chemical treatment programs that had been previously established by Chevron or XTO and was not aware of any historical record or protocol guidance or program from EMSU's prior operators.
- Additionally, Mr. West confirmed that Empire does not appear to have a comprehensive chemical treatment program other than an assortment of acid jobs.

- Empire has presented no technical evidence of chloride corrosion, or any other corrosion associated with Goodnight's injection operations, let alone any anecdotal evidence. In his deposition, Mr. West was unable to identify any specific wells or instances where he could identify impacts to Empire's wells from Goodnight's injection. See **Exhibit C-17**, Tr. 140:19-141:3. The only evidence he was able to cite in support of impacts is an alleged increase in salinity. See **Exhibit C-18**, Tr. 142:9-143:3. But as documented in the table above, the Grayburg Formation has historically experienced a wide swing in documented water quality concentrations that exceed/are in line with the more recent sampling events conducted by Empire.

SCALING AND GENERAL WATER CHEMISTRY

11. Empire fails to acknowledge that scaling and corrosion in the EMSU that existed prior to Goodnight's injection operations is well documented, and that scaling is the predominant corrosion issue associated with the EMSU even before commencement of waterflooding operations. Scaling and corrosion were further exacerbated by the use and incompatibility of San Andres make-up water for waterflooding operations and the age of the majority of the Grayburg

wells, which led to extensive workovers and deepening by Chevron during the initial preparation for the commencement of waterflooding in the early 1980s.

- Empire has provided zero written documented evidence or photographs of corrosion or scaling of surface equipment, pipelines, downhole tubulars, pumps, etc. No specific wells were identified, no scaling or corrosion reports, or any examples of impairment or impacts were provided.
- Empire has not provided any of the chemistry data from either Chevron or XTO's operations at the EMSU, which has been repeatedly requested, that might support or contradict Empire's arguments.
- An analysis of the sulfate chemistry data provided in the 1996 Chevron paper, 2000 Go Tech data, and Empire's late 2023 to November of 2024 chemistry data clearly shows the same chemistry fluctuations with sulfate concentrations on some wells increasing over time and some wells decreasing over time, just like the historic chloride chemistry data shows. These documented chemistry variations are not surprising, align with historic water chemistry fluctuations, and do not provide support for Empire's arguments.
- **Table 2** below shows examples of sulfate decreasing and increasing over time.

EMSU Well No.	Date Sampled	Sulfate Concentration (mg/L)	Date Sampled	Sulfate Concentration (mg/L)	Increase or Decrease in Sulfate Concentration
298	11/01/1991	763	10/01/2024	612	Decrease
441	10/01/1991	1,503	10/01/2024	125	Decrease
278	11/01/1990	204	11/08/2024	2,545	Increase
319	10/01/1989	209	10/01/2024	954	Increase
440	11/01/1990	2,500	10/01/2024	345	Decrease

12. As can be seen with the analysis of the documented chemistry data available for the EMSU, there is no geochemical fingerprinting that can be utilized to claim that the injection fluids at the Goodnight SWDs have allegedly altered the chemistry in the San Andres or Grayburg formations which is causing corrosion and scaling issues in the existing EMSU waterflooding operations. In short, there is simply no evidence to support the conclusion that Goodnight's

disposal water is affecting the EMSU water chemistry in the Grayburg or impacting any of Empire's EMSU wells.

EMPIRE'S CLAIMED ROZ

13. Additionally, the injection of the **fluids from the Goodnight SWDs is not impacting Empire's alleged potential CO_2 tertiary operations in the San Andres ROZ.** In all realty, Goodnight's injection operations are actually refilling the pore space from the huge volumes of water withdrawn from the San Andres for waterflooding operations, which overtime, would decrease the amount of CO_2 needed to repressurize the alleged San Andres ROZ if there is an effort by Empire to attempt a CO_2 tertiary recovery operation.

14. Even if the claimed San Andres ROZ exists, why has no oil been produced or reported since commencement of the waterflooding operations with the withdrawal of approximately 340 million barrels of water from the San Andres for make-up water for injection into the Grayburg for waterflooding operation?

EMPIRE'S AGREED COMPLIANCE ORDER

15. On November 7, 2023, Empire agreed to a compliance order with NMOCD for inactive wells, including wells in the EMSU. There was a total of 48 wells on the compliance order for EMSU and between November of 2023 and June of 2024, all 48 EMSU wells were returned to compliance. However, a number of wells were simply placed under temporary abandoned status. Out of the 48 EMSU wells returned to compliance, only two wells have been plugged and abandoned. The rest of the 48 wells returned to compliance were either temporarily abandoned or returned to production.

16. The only two EMSU wells that were plugged and abandoned by Empire from the agreed Compliance Order were plugged in 2024. These two Empire wells were at least 3.8 to 4

miles north of the closest Goodnight SWD (Sosa SA SWD) in the San Andres Formation. There have been no wells plugged and abandoned due to alleged impacts from the Goodnight SWDs.

SAN ANDRES UPWARD MIGRATION BARRIER AND CLAIMED FRACTURES

17. Based on the deposition testimony of Dr. Robert Lindsay in **Exhibit C-19**, the question was asked *"In your opinion is there a barrier to fluid flow at the top where you picked the San Andres, between the San Andres and the Grayburg?"* Dr. Lindsay responded *"There should be one, because normally at that, at the top of the San Andres, that's called a composite sequence boundary, and they tend to cement up a little bit. But what I've been able to see on well logs, it's not much of a barrier."* This statement is again supported by Dr. Lindsay's PhD from 2014 regarding the reservoir seal and that the pressure differential between the formations confirms the barrier.

18. However, despite his clear conclusion on the effectiveness of the barrier between the Grayburg and San Andres in his dissertation, Dr. Lindsay appears to now be taking a different position in these cases even though there is no new or additional information since his dissertation in 2014. He points to fractures that he contends extend into the San Andres and allow for communication.

19. The Chevron in-house fracture study referred to in Dr. Lindsay's self-affirmed statement is limited to fracture analysis from one well, EMSU #679. The fracture analysis referred to in Dr. Lindsay's self-affirmed statement is limited to the Grayburg and does not extend into the San Andres.

20. Dr. Lindsay's fracture analysis fails to discuss any drilling induced fractures, which are common in cores.

21. On Dr. Lindsay's Exhibit B-18 core photograph, there are two non-induced vertical fractures that dead end into a horizontal stylolite, which serves as a barrier to continued fracture extension (**Exhibit C-20**). This is an example of horizontal geologic barriers that exist that prevent continuation of natural vertical fracture extension in carbonate rocks. It also does not extend to Goodnight's pick for the top of the San Andres at -672 feet subsea depicted in Goodnight Exhibit B-32, where it has identified a geologic seal.

22. Dr. Lindsay's Exhibit B-23 clearly shows a low porosity confining zone directly below his Grayburg/San Andres Formation contact **(Exhibit C-21).** But as noted above, Goodnight's pick for the top of the San Andres and the confining layer for its disposal zone is deeper and clearly identified with low vertical permeability from the core analysis. See Goodnight Exhibit B-27.

23. Based on my extensive field experience with naturally fractured rocks and my publications regarding them, the fractures identified in Dr. Lindsay's self-affirmed statement and core photographs are discontinuous and some are sealed with secondary mineralization. My self-affirmed statement regarding naturally fractured rocks clearly shows how horizontal bedding planes tend to act as barriers to vertical fluid flow.

24. Additionally, as I stated in my direct written testimony and in my deposition, there are no continuous fractures extending downward from the Grayburg 285 to 463 feet into the San Andres injection zones utilized by the Goodnight SWDs.

EMPIRE EMSU CO_2 PLANS

25. William West testified extensively in his deposition regarding the San Andres ROZ and estimated oil recovery by CO_2 tertiary recovery. In **Exhibit C-22** [William West Transcript December 4, 2024, Page 38 (Pages 42-45)], Mr. West's response is as follows:

- **Question** – *"Okay. So, in the economic analysis that we just received, you told me that you use an 18 percent recovery factor, correct?"*
  - Mr. West responded, *"That is what it has on there."*
- **Question** – *"Okay, and in order to get – and that economic model gives us a recovery of approximately 140 million barrels of oil, correct?"*
  - Mr. West responded, *"That is correct."*
- **Question** – *"Okay. But in your testimony, you say that it's estimated that by flooding the ROZ, you can get 270 million barrels, correct?"*
  - Mr. West responded, *"That is an estimation."*

26. The question becomes if Chevron and XTO/ExxonMobil knew of the existence of the San Andres ROZ and the potential for the recovery of 140 to 270 million barrels of oil by CO_2 tertiary injection, why would a major oil company sell the EMSU? It is well documented that XTO attempted to produce the San Andres from three EMSU wells (EMSU #660, EMSU #658, and EMSU #577). They drilled, swabbed, and tested all three wells in 2006 with no commercial production of oil and the wells were plugged back to the Grayburg Formation.

27. Empire does not seem to understand that in order to even consider an attempt to inject CO_2 into the San Andres ROZ, you must refill the pore spaces that had been dewatered by almost 40 years of withdrawal of approximately 340 million barrels of water from the San Andres.

CAPITAN REEF AND THE GOAT SEEP AQUIFER

28. NMOCD filed its Exhibit List and Witness Testimony disclosure on August 26, 2024, with the concern that there may be a connection to the "Hobbs Channel" with the San Andres

injection wells, which in turn could potentially communicate with the Capitan Reef, which is an underground source of drinking water (USDW).

29. I have reviewed all of the publications submitted as exhibits by NMOCD, the research and work undertaken by Goodnight Midstream on the "Hobbs Channel", the Capitan Reef, and have reviewed more current geological presentations and publications regarding the Capitan Reef and facies changes in the Goat Seep aquifer.

30. Based on my review of all of these publications and presentations, there is no stratigraphic correlation or facies connection between the San Andres Formation and the Capitan Reef or the Goat Seep aquifer. A recent presentation by Male and others (2024) shows a geologic cross section that clearly shows the Goat Seep aquifer grading into the Queen and Grayburg formations and is not associated with the San Andres Formation (**Exhibit C-23**).

31. Additionally, Land (2016) makes the following statement regarding the Capitan Reef east of the Pecos River (**Exhibit C-24**).

- *"Because of the highly saline nature of groundwater in the Capitan Reef east of the Pecos River, very few water supply wells were completed in that portion of the aquifer. Until recently, the only water quality information available for the reef east of the Pecos River was from a network of monitoring wells installed by the U.S. Geological Survey in the mid-20th century (Hiss, 1975a; Hiss, 1975b). These records confirm the highly mineralized character of groundwater in the eastern segment of the Capitan Reef, resulting in a mean TDS concentration for the entire aquifer of > 54,000 mg/L."*
- Also, back in 2021, during Goodnight's hearing on the Andre Dawson and Ernie Banks SWD applications, NMOCD had requested ALL Consulting (ALL) to determine the proximity of the Capitan Reef to the proposed San Andres SWDs. ALL supplied this information to NMOCD, which showed these proposed SWDs were 2.8 to 3.2 miles from the reef (**Exhibit C-25**).
- In regard to the "Hobbs Channel", **there is no published reference to the "Hobbs Channel" as a geological feature** and supposedly Hiss (1975) based this groundwater flow channel not on geology but based it on chloride sampling results and his contouring of the chloride data. **Exhibit C-26** is a snip of the Hiss (1975) map which supposedly shows the "Hobbs Channel" off the San Simon Channel, which is a known geological feature. However, a scientific examination

> of the chloride data that was contoured by Hiss (1975) on this map clearly violated the widely accepted hand-contouring standards at that time and currently in use. This brings into question the scientific acceptance of the "Hobbs Channel" as a groundwater flow feature.

UNDERGROUND INJECTION CONTROL AND USDWS

32. On September 15, 1981, NMOCD submitted their Class II Underground Injection Control Class II Demonstration to U.S. EPA for primacy approval. On page 53 of this document (**Exhibit C-27**), NMOCD requested that the Tansil, Yates, Seven Rivers, Queen, Grayburg, and San Andres formations within Lea County, New Mexico be classified as exempted aquifers. Additional responses to U.S. EPA Region VI on October 24, 2016, and then again on May 28, 2020, reiterated NMOCD statements regarding the classification of the Artesia Group formations and the San Andres Formation in Lea County to be classified as exempted aquifers. The main concern in both 2016 and 2020 was injection into the Capitan Reef or directly above it, which is considered a USDW west of the Pecos River, but likely not a USDW east of the Pecos River. There was no referenced concern about injection into the San Andres.

33. I was employed by the Ohio Department of Natural Resources, Division of Oil and Gas Resources Management in the UIC Section from December of 1988 till mid-August of 2014. I was the senior geologist in Ohio's Class II UIC program for those 25-1/2 years and also served as a state representative to the U.S. EPA UIC National Technical Workgroup for over six years. I am very familiar with many of the U.S. EPA UIC staff in all of the U.S. EPA regional offices and the headquarters office in Washington D.C.

34. On March 28, 2024, I contacted U.S. EPA Region VI, as I know Mr. Ken Johnson, EPA's UIC Manager, very well. I was interested in seeing the list of exempt aquifers in New

Mexico. I received a response back from U.S. EPA Region VI with the list of the exempted aquifers and none were listed for Lea County, New Mexico.

35. The question becomes why U.S. EPA Region VI has not honored NMOCD's multiple requests since the initial primacy application in 1981 to classify the Artesia Group and the San Andres Formation as exempted aquifers for Lea County, New Mexico? NMOCD has provided detailed technical information multiple times to support this request. There are no documents available online from U.S. EPA Region VI denying the exempted aquifer request nor is there an explanation from U.S. EPA Region VI as to why these formations could not be exempted aquifers. Under Federal regulation 146.04 and 146.03 under 40 CFR 122.35, the criterion for an exempted aquifer clearly shows that the Artesia Group and the San Andres Formation east of the Pecos River meets the criteria for aquifer exemption.

36. I have advised and trained Class II regulators from across the U.S. on injection wells at national conferences and have published or presented numerous times on Class II injection wells. Additionally, as Chief Geologist with ALL Consulting, I have drilled, completed, tested, plugged, and performed workovers on over ten Class II SWDs in the last ten years.

37. Based on my review and experience with U.S. EPA as both a regulator and now as a consultant, Goodnight Midstream's current Class II SWD injection operations and their proposed new SWDs are protective of the USDWs in the Capitan Reef and Goat Seep as these wells are not in communication with the Capitan Reef or Goat Seep. Additionally, the sampling performed, and analysis conducted by Goodnight on the San Andres for each SWD prior to commencement of injection operations as required by Class II permit condition orders, **clearly demonstrated that the San Andres is not a USDW at the location of the Goodnight SWDs and is not in communication with one.**

CONCLUSIONS

38. Based on my technical assessment and analysis the following are my conclusions:

- It is well documented in historic publications and in Chevron published papers that corrosion and scaling occurred well before the commencement of waterflooding in the EMSU. Chevron experienced many issues with well workovers prior to commencement of waterflooding due to the age of the wells, corrosion and scaling, and junk and fish in the wells. Additionally, the use of the San Andres water for make-up water for waterflooding—despite known incompatibility issues—in all likelihood increased the scaling and corrosion problems that required Chevron's active chemical treatment program.
- There is no evidence of oil production from the San Andres Formation other than alleged shows in swabbing tests and no documentation, reporting, or filing of any C-104s from any of the San Andres water supply wells since commencement of withdrawing upwards of 340 million barrels of make-up water from the San Andres for water flooding.
- Mr. West claims that three EMSU wells drilled into the San Andres produced oil, but no oil was produced from any of the water supply wells and Empire has confirmed there is no documentation of oil production. How is it possible that no oil was produced after such a substantial depressurization in the San Andres if the alleged ROZ really exists?
- Water chemistry from both the Grayburg and San Andres formations are clearly variable and inconsistent, which leads to the fact that no one constituent or concentration of a constituent can be used for geochemical fingerprinting.
- Any fracturing identified in cores are discontinuous and highly variable which is typical for naturally fractured carbonate rocks. There is no evidence presented showing vertical fracture extension from the Grayburg into the existing injection zones which are from 285 to 463 feet below the top of Empire's pick or the San Andres Formation in the Goodnight SWDs.
- There is no geologic evidence showing that the Goat Seep aquifer grades into the San Andres, but it in fact grades into the Queen and Grayburg formations. Additionally, the San Andres is not connected or in hydraulic communication with the Capitan Reef. Most published literature shows the Capitan Reef as being saline east of the Pecos River.
- Hiss's 1975 chloride contour map, which is used to allegedly delineate the ground water flow into the "Hobbs Channel" completely violates the standardized methodology used for contouring of data and is not reliable to delineate the alleged ground water flow into the "Hobbs Channel."
- Sampling and TDS analysis of all of the Goodnight San Andres SWDs clearly shows the San Andres is not a USDW.

- NMOCD has since 1981 attempted to have all of the Artesia Group and the San Andres Formation in Lea County classified as exempt aquifers. There is no documentation found to determine why U.S. EPA Region VI has not honored this request.

39. 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.

Thomas E. Tomastik

Thomas E. Tomastik

February 7, 2025

Date

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EXHIBITS

34076762_v4

A. Yes.

Q. Okay, and what do those show you?

A. They show in some areas that we're producing more water than we've put in. And that comes from the edge water to the west, there's an edge water encroachment to the west, and the wells on the west side exhibit more water influx than we put in.

Q. Okay, what about the rest of the waterflood area?

A. No, we produce most everything we inject.

Q. Okay, and that's always --

A. Except for on the west side where you have the edge water encroachment.

Q. Okay, and that's always been the case?

A. Yes, sir.

Q. All right.

A. Except for the start of the flood before the water broke through in some of those high-permeability streaks. We have a real bad problem with cycling water through those high-permeability streaks. They're like pipelines, and until those broke through we were -- you know, water production was lower.

But once the injection broke through, you're almost at one with your water in, water out, till you squeeze out of those high-permeability streaks.

Q. Let me go back, if I could. Let me ask you this.

Mr. West, are you aware of any primary production occurring below this blue dolostone anywhere within the unit below that depth, anywhere -- correlative depth anywhere in that unit?

A. Can you tell me what subsea depth you have there?

Q. You don't have subsea depths on these exhibits, so I cannot give you a subsea depth.

A. I'll have to convert the depths. I can't really read the depths on this, these logs.

Q. Let me ask you this: Are you aware of any primary production within the San An- -- within the EMSU unit from within or below the interval that was completed by the water supply wells?

A. This is the 660; is that correct?

Q. The 460.

A. 460. There's -- there's been four wells in the EMSU that's, you know, tested oil in the San Andres.

Q. Which are those?

A. The 660, the 658, the 577.

Q. What's the fourth?

A. Sorry about that, I misstated. I had the wrong note on here.

Q. What notes are you reviewing?

A. Just notes in my deposition prep. This is going back through all the pieces. You can have them.

hydrocarbons that can be economically recovered through tertiary recovery?

A. In this cross section?

Q. Yep.

A. We believe down into the San Andres there. I don't know exactly which depth on those curves that there is, you know, a ROZ zone to be -- of oil to be recovered through tertiary production.

Q. Do you believe that it extends below this dolostone interval?

A. Yes.

Q. How far below the dolostone interval?

MS. HARDY: Form and foundation. Objection.

Q. (By Mr. Rankin) You can answer.

A. I can't tell from this cross section.

Q. Okay. All right. I will leave this cross section for now. I'm going to try another one. Let me stop sharing for a moment. Mr. West, have you reviewed Preston McGuire's testimony that was submitted in this case?

A. I've seen some of his testimony.

Q. I'm going to show you what's -- was marked as his Exhibit B9. Okay. This is a cross section that Mr. McGuire prepared that shows the EMSU 460 well, which we were looking at on Mr. McShane's Exhibit G7 (a) on the left-hand side, and it goes from left to right to the banks, Goodnight

Q. Thank you. So you're just telling me that they're actually -- you're saying that there were just -- there were three wells that you believe tested for oil in the San Andres?

A. Correct.

Q. If I were to look at the well completions and perforations for those wells, I would be able to discern the deepest interval from which they tested for oil?

A. It should be determined where the perf is on them; right, I suspect.

Q. Do you have that information in your notes there?

A. No, I don't.

Midstream's banks SWD well, to the Sosa SWD well, to the Dawson SWD, Ryno SWD and on the far right is the EMSU 462, which is another water supply well that was used to supply water for the water flood. Do you see that?

A. I see the cross section.

Q. Okay. Do you agree with that, the EMSU 462 was also a water supply well that was used to supply water for the water flood in the EMSU?

A. Yes, sir.

Q. Okay. Now, on this map, on this cross section, Mr. West, there are subsea depths on the right and left side. Do you see that?

REBUTTAL EXHIBIT C-14

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

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**
APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC TO AMEND ORDER NO. R-7767 TO EXCLUDE THE SAN ANDRES FORMATION FROM THE EUNICE MONUMENT OIL POOL WITHIN THE EUNICE MONUMENT SOUTH UNIT AREA, LEA COUNTY, NEW MEXICO.	**CASE NO. 24277**
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. 24018-24027**
APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC TO AMEND ORDER NO. R-22024/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.	**CASE NO. 24123** **ORDER NO. R-22869-A**

EMPIRE NEW MEXICO LLC'S RESPONSE TO GOODNIGHT MIDSTREAM PERMIAN LLC'S FOURTH SUBPOENA DATED JANUARY 3, 2025

Empire New Mexico, LLC ("Empire") submits the following responses to the Subpoena issued on January 10, 2025 at the request of Goodnight Midstream Permian, LLC ("Goodnight"). A link to responsive documents is provided in the email transmitting this response.

1. **Request No. 1:** All documents and data relating to corrosion encountered in each of Empire's EMSU wells that Empire contends is caused in whole or in part by Goodnight's saltwater disposal. If already produced, cite to the documents by bates

Response: Empire objects to Request No. 1 as duplicative of Request Nos. 3 and 4 in Goodnight's Third Subpoena Dated July 2, 2024, *inter alia*. See Empire's responses and documents produced in response thereto, including but not limited to Bates #s OCD 23614-17 03538-3557. In addition, Empire produces additional documents that can be found in the link provided concurrently in the subfolder entitled "Item 1 – Corrosion" under "4th Subpoena" and in the subfolder entitled "Chemicals" under "10_Item for Goodnight JAN 2025→West."

2. **Request No. 2:** All documents and data relating to premature and irregular encroachment of water or any other kind of water encroachment that Empire contends reduces or will tend to reduce the total ultimate recovery of crude petroleum oil or gas or both from the Grayburg or San Andres formations that Empire contends is caused in whole or in part by Goodnight's saltwater disposal. If already produced, cite to the documents by bates.

Response: Empire objects to this request as vague, ambiguous, and overly broad because, for example, responsive documents include documents that are responsive to Requests Nos. 1 and 3 herein. Moreover, this request is duplicative of numerous previous discovery requests and previously produced documents, including but not limited to Bates #s OCD 23614-17-04508 and -5439. In further response, Empire fully incorporates its responses to Request Nos. 1 & 3

herein and responses to Goodnight's previous subpoenas, including but not limited to Request No. 6 in its September 22, 2023 Subpoena and Request No. 14 in its March 5, 2024 Subpoena. In an effort to ensure that Goodnight has any document that it believes may be remotely related to this request, Empire produces one additional document, which can be found in the subfolder entitled Item 2 – Water Encroachment.

3. **Request No. 3:** All water analyses performed for the EMSU from 2020 to the present, including but not limited to (1) produced water from Grayburg producers; (2) water injected into Grayburg waterflood injectors; (3) water injected into the EMSU SWD #1; and (4) water produced from any of the EMSU water supply wells. If already produced, cite to the documents by bates for each forgoing category.

Response: Empire objects to this request as duplicative of previous Goodnight requests, which include but may not be limited to Request Nos. 5 and 6 in Goodnight's March 2, 2024 Subpoena. Empire fully incorporates its responses to Goodnight's previous discovery requests relating to the same subject matter, including but not limited to the Water Samples produced unnumbered on December 4, 2024. In an effort to ensure that Goodnight has any document that it believes may be remotely related to this request, Empire produces additional documents that may be found in the subfolder entitled Item 3 – Water Analyses at the link provided concurrently.

4. **Request No. 4:** Updated daily water injection volumes and wellhead pressures for Empire's EMSU waterflood injection wells.

Response: Responsive information was produced and filed as Notice of Filing Verified Accounting of Waterflood Injections on January 14, 2024.

5. Request No. 5: All documents and data, including communications or correspondence of any kind, relating to skim oil produced or collected from any of the EMSU water supply wells.

Response: Empire has conducted a diligent and thorough search of the records within its possession, custody, or control and discovered no responsive documents or data.

6. Request No. 6: Empire's EMSU evaluation file, including but not limited to all documents and communications relating to Empire's due diligence leading up to the purchase of the EMSU and all documents provided to Empire by XTO.

Response: Empire objects to this request, which has been repeated numerous times, including but not limited to Request No. 7 in Goodnight's Subpoena issued July 2, 2024. Empire incorporates its responses thereto, as well as its response to Goodnight's other related requests. In an effort to ensure that Goodnight has any document that it believes may be remotely related to this request, Empire produces additional documents that may be found in the subfolder entitled Item 6 – EMSU Evaluation File. *See* Index.

7. Request No. 7: All documents and data, including draft or final authorizations for expenditure, and communications or correspondence of any kind, including to/from EMSU working interest owners, relating to proposed new wells targeting the San Andres formation within the EMSU.

Response: Empire has conducted a reasonable search and determined that no responsive documents exist.

Respectfully submitted,

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Attorneys for Empire New Mexico, LLC

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing was served on the following by electronic mail on January 20, 2025.

/s/ Sharon T. Shaheen

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Attorneys for Intervenor Goodnight Midstream, LLC

Mr. West, are you aware of any primary production occurring below this blue dolostone anywhere within the unit below that depth, anywhere -- correlative depth anywhere in that unit?

A. Can you tell me what subsea depth you have there?

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hydrocarbons that can be economically recovered through tertiary recovery?

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A. We believe down into the San Andres there. I don't know exactly which depth on those curves that there is, you know, a ROZ zone to be -- of oil to be recovered through tertiary production.

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MS. HARDY: Form and foundation. Objection.

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Q. Okay. Do you agree with that, the EMSU 462 was also a water supply well that was used to supply water for the water flood in the EMSU?

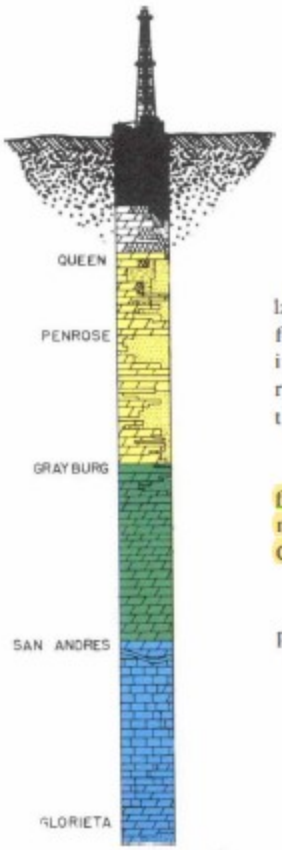
A. Yes, sir.

Q. Okay. Now, on this map, on this cross section, Mr. West, there are subsea depths on the right and left side. Do you see that?

HOW CAN WE EXTEND THE LIFE OF THIS FIELD — 1929 TO _____

As with all oil fields, production has declined with time. In 1979, the Working Interest Owners (companies operating the wells and paying the maintenance costs) began a series of meetings and engineering studies to attempt to extend the productive life of this field by recovering oil that can never be produced with the present method of operation and existing facilities.

REBUTTAL EXHIBIT C-15



WATER INJECTION

After the various company geologists and engineers completed their laboratory and reservoir studies, they concluded that a unit should be formed to inject water into the oil producing formations to force oil trapped in the rocks to the pumping units of the producing wells. This method of recovery is being successfully employed in many of the older oil fields in the area

For this proposed unit, salt water from the non-productive San Andres formation, supplemented by the reinjection of produced water, was recommended for pressurized injection into the oil producing portions of the Grayburg and Lower Penrose formations.

To understand the benefits of water injection, a brief discussion of primary and secondary recovery is helpful.

REBUTTAL EXHIBIT C-16

EMSU #171
06296

EME SWD #033M
12786

Empire EMSU
#001 SWD
04484

Oil Center

EMSU #284
04561

EMSU #278
20133

EMSU #294
04562

EMSU #296
04566

EMSU #298
04575

EMSU #325
04556

EMSU #323
04555

EMSU
#321
04570

EMSU
#713
37321

EMSU
#319
04584

N11 SWD #001
46577

Ernie
Banks SWD
50633

EMSU #369
04676

Ryno SWD
43901

EMSU #277
04689

EMSU #407
24588

EMSU #401
04667

Andre
Dawson SWD
50634

Sosa SA
17 SWD
47947

EMSU #440
04735

EMSU #441
04737

P-15 001 SWD
46579

EMSU #449
25351

EME SWD #021
21852

Yaz 28 SWD
46382

Ted 28 SWD
44386

Pedro SWD
50079

Nolan
Ryan SWD
45349

Penroc
State SWD
26491

State
E 27
SWD
26317

Parker
Energy SWD
38789

Scully
State SWD
46398

0 0.25 0.5 1 1.5 2 Miles

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ENGINEERING · ENVIRONMENTAL

REBUTTAL EXHIBIT C-17

Is it your testimony that chemicals from Delaware Basin fracture treatments are causing corrosion in your wells?

A. So chemicals from fracture treatments are, again, unknown chemicals that are coming into the mix, and they can cause -- there can be gels and if they react with iron, they can crosslink and cause gumming and gelling that could happen.

There's also, you know, fluids that could be put in there, acids or different things that are, you know, corrosive, more corrosive.

You -- they change the pH on frac jobs a lot. You tweak it up, you tweak it down. So you change the pH of the water, you greatly change the chemistry, which, you know, will lead to either corrosion or scaling or different things. It depends on the exact makeup.

Q. Okay. You mentioned -- have you identified any specific instances where you've had issues with EMSU wells that you attribute to any of those potential symptoms that you just referenced?

A. Any failures of potential symptom, right? It'd be potential. It's a creep over

time on it, but no one would ever say, hey, I'll go take a bunch of frac water to go do a waterflood with.

Q. Have you been tracking well failures in the EMSU?

A. Yes. We have well failures tracking with AFEs, and then we've got -- when we repair them, we had the documentation and, you know, what was failing. And always working on improving that program.

Q. You said -- I may have missed what you said. When we have repairs, we have documentation, and then you said something that dropped off, I couldn't quite pick it up.

A. You have documentation of the well work that was done. Hey, this part failed, this is what happened. You know?

Q. So Empire has documentation of all that, correct?

A. You have documentation of the well work that was done.

Q. Right. And the costs associated with them?

A. And the cost that is associated with them.

Is it your testimony that chemicals from Delaware Basin fracture treatments are causing corrosion in your wells?

A. So chemicals from fracture treatments are, again, unknown chemicals that are coming into the mix, and they can cause -- there can be gels and if they react with iron, they can crosslink and cause gumming and gelling that could happen.

There's also, you know, fluids that could be put in there, acids or different things that are, you know, corrosive, more corrosive.

You -- they change the pH on frac jobs a lot. You tweak it up, you tweak it down. So you change the pH of the water, you greatly change the chemistry, which, you know, will lead to either corrosion or scaling or different things. It depends on the exact makeup.

Q. Okay. You mentioned -- have you identified any specific instances where you've had issues with EMSU wells that you attribute to any of those potential symptoms that you just referenced?

A. Any failures of potential symptom, right? It'd be potential. It's a creep over

time on it, but no one would ever say, hey, I'll go take a bunch of frac water to go do a waterflood with.

Q. Have you been tracking well failures in the EMSU?

A. Yes. We have well failures tracking with AFEs, and then we've got -- when we repair them, we had the documentation and, you know, what was failing. And always working on improving that program.

Q. You said -- I may have missed what you said. When we have repairs, we have documentation, and then you said something that dropped off, I couldn't quite pick it up.

A. You have documentation of the well work that was done. Hey, this part failed, this is what happened. You know?

Q. So Empire has documentation of all that, correct?

A. You have documentation of the well work that was done.

Q. Right. And the costs associated with them?

A. And the cost that is associated with them.

Q. Okay. All right. I will come back to that.

We talked -- I think the next bullet point we kind of touched on already, some of the increased failure rates, is something that Empire is tracking, right?

A. We're tracking, yes, of all the well work and failures that happen.

Q. Is there any specific evidence that you cite to or point to in your testimony that supports or links any well failures to the disposal from Goodnight Midstream in your testimony or exhibits?

A. You could -- just the increase in salinity and, you know, this causing -- increases the cause of those problems.

Q. So in your evidence, testimony and evidence that -- where you present evidence where there's -- showing an increase in salinity in the Grayburg formation; is that right?

A. Other produced fluid?

Q. Okay. That's the indication that you're relying on to show that there's a -- Empire -- Goodnight's contributing to increased well failures?

A. Yes. You know, increased salinity will increase corrosion, which will increase well failures.

Q. We move to the next bullet here.

"By CO2 flooding the San Andres ROZ interval, it is estimated that 270 million barrels of this residual oil can be recovered."

I'll stop there. Did I read that portion of the sentence correctly?

A. Yes, sir.

Q. Now, I just want to get down to a couple things on this point.

The 270 million barrels, where does that number come from?

A. That comes from estimates like on the economic page of the different floods in the -- taken the, you know, the gross interval of the 400 and the dimensional curves and things that we went over.

Q. Okay. So when I pull up -- I think I'll pull it up, okay? Let me stop sharing so I don't have to -- I'll use the 250 pattern analysis that you prepared.

And tell me if I should use the 75 pattern analysis. It's taking a little while

REBUTTAL EXHIBIT C-19

A. No.

Q. Okay. Have you looked at all the different picks that Empire has picked for the San Andres top across all its wells in its structure maps?

A. No.

Q. Just the saltwater disposal wells?

A. Yes, just those.

Q. In your opinion is there a barrier to fluid flow at the top where you picked the San Andres, between the San Andres and the Grayburg? 11:24

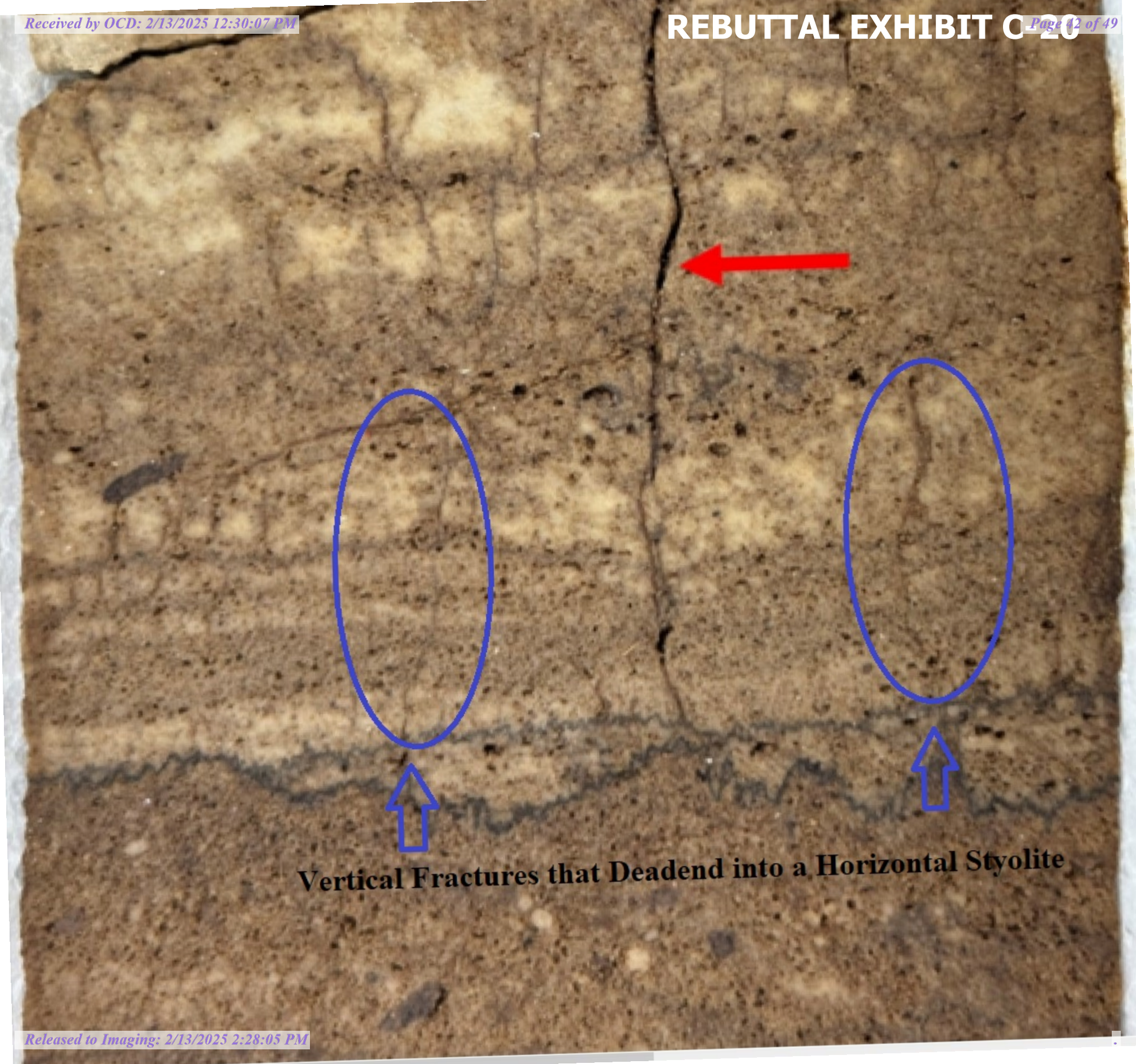
A. There should be one, because normally at that -- at the top of the San Andres, that's called a composite sequence boundary, and they tend to cement up a little bit. But what I've been able to see on well logs, it's not much of a barrier.

Q. But you haven't looked at where Goodnight has picked its top, right? 11:25

A. Uh, no.

Q. Okay. You don't know -- you don't know where

REBUTTAL EXHIBIT C-20



REBUTTAL EXHIBIT C-21

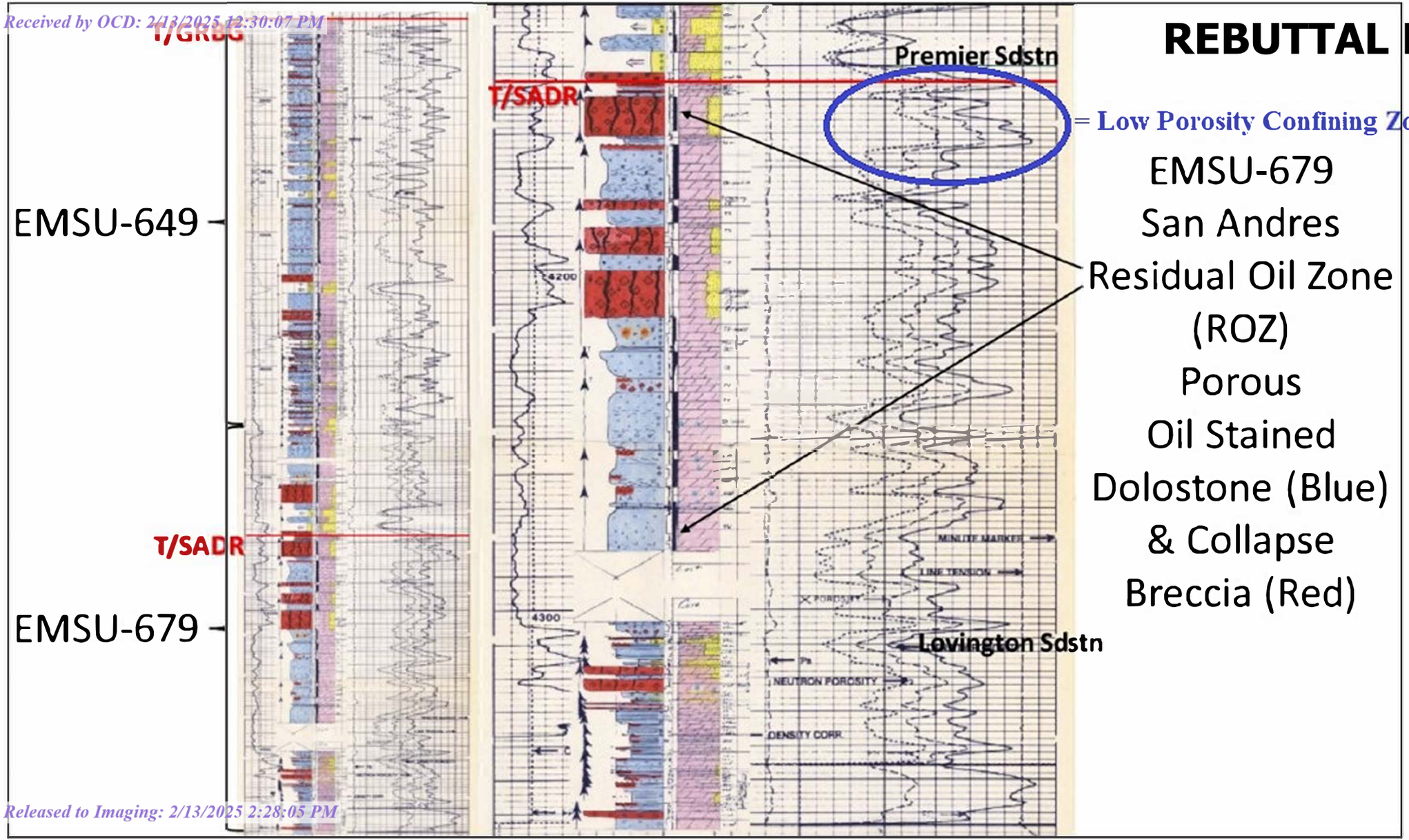


Exhibit B-23

up to 30 or 40 percent?
A. I refer to other documentations. You could refer to the seminal field or you could look at some other, you know, publicly available papers that are out there of, you know, CO2 floods.

A. There has not been a CO2 flood done in the ROZ of the San Andres in this scenario.
Q. That's not my question.
I'm asking you, is that -- it's not -- it's not based on any reservoir characteristics that you have measured or calculated in the --

(Talking over each other.)
Q. Sorry to interrupt, I did not mean to interrupt.
I guess my question, though, is based -- I'm asking you, not based on literature, but based on actual reservoir parameters, reservoir measurements, can you point to anything that would recommend to you an increase in the recovery factor in the EMSU to double the recovery factor in the EMSU from 18 percent to 30 or 40 percent?
A. Both of those are in the realm of the, you know, literature from other fields around the area to predict what you would get out. There's a range always.
Q. Okay. So as you sit here today, you're relying on literature or a higher-end recovery factor?
A. That's not necessarily a higher -- if I want higher end, I would say 50, right? So I'm not going higher in. I mean, I'm kind of in the middle of those two.
Q. Okay. So for purposes of arriving at a 270 million barrel recovery, you're relying on literature to justify a higher recovery

for the EMSU, correct?
MS. HARDY: Object -- object to the form.
BY MR. RANKIN:
Q. You can answer if you understand.
A. I'm having a hard time understanding how you're stating your question.
Q. Okay. So in the economic analysis that we just reviewed, you told me that you use an 18 percent recovery factor, correct?
A. That is what it has on there.
Q. Okay. And in order to get -- and that economic model gives us a recovery of approximately 140 million barrels of oil, correct?
A. That is correct.
Q. Okay. But in your testimony, you say that it's estimated that by flooding the ROZ, you can get 270 million barrels, correct?
A. That is an estimation.
Q. And my question to you is: What is that estimation based on?
A. It's based on doing the, you know, the simple modeling and then other literature of, you know, what's reasonable to get out of the

REBUTTAL EXHIBIT C-22

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Geology

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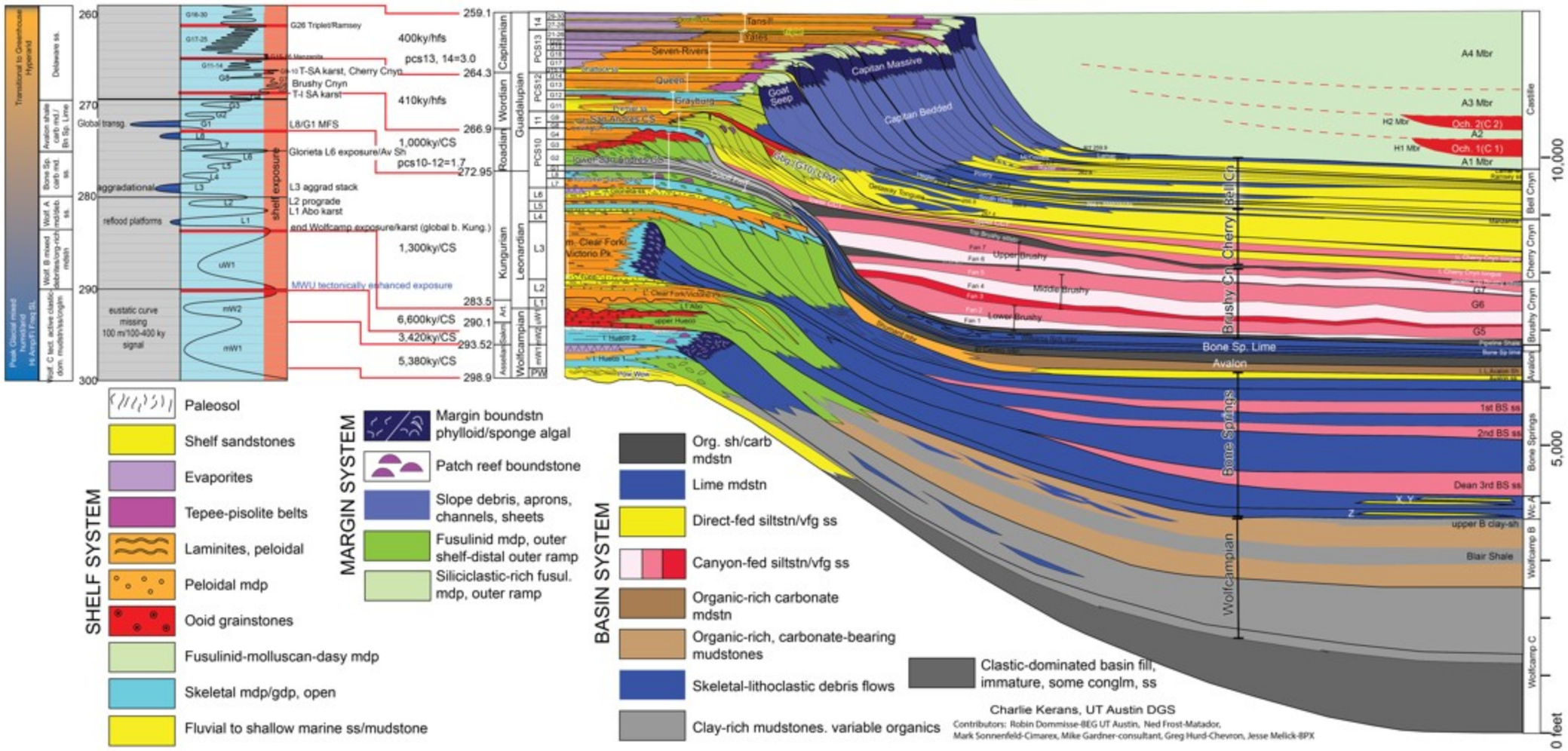

Fresh water is present in the aquifer only in the immediate vicinity of its recharge area in the Guadalupe Mountains. Mineral content rapidly increases east of the Pecos River, and throughout most of its extent the Capitan Reef is a brine reservoir, with TDS concentrations >100,000 mg/l in some of the deep monitoring wells in Lea County (Hiss, 1975a; 1975b).

The data set for the Capitan Reef aquifer is very limited, consisting of only 13 wells, most of which were last sampled almost half a century ago. The small data set is primarily due to the extremely limited amount of fresh water available in the reef aquifer. The city of Carlsbad, because of its proximity to recharge areas in the Guadalupe Mountains, is the only community in the region that is favorably positioned to exploit the fresh-water segment of the reef. Because of the highly saline nature of groundwater in the Capitan Reef east of the Pecos River, very few water supply wells are completed in that portion of the aquifer. Until recently, the only water quality information available for the reef east of the Pecos River was from a network of monitoring wells installed by the U.S. Geological Survey in the mid-20th century (Hiss, 1975a; 1975b). These records confirm the highly mineralized character of groundwater in the eastern segment of the Capitan Reef, resulting in a mean TDS concentration for the entire aquifer of >54,000 mg/l. We have chosen not to plot TDS and specific conductance vs. depth for the Capitan Reef because the lateral distribution of dissolved solids most accurately characterizes the distribution of salinity within this aquifer.

Brackish water resources are clearly available in the Capitan Reef aquifer, although for the most part that water is more accurately described as a brine, and would thus not be suitable for conventional desalination technologies. However, this highly saline water is a valuable resource for industrial applications in southeastern New Mexico and west Texas. Both the petroleum and potash mining industries have recently expressed interest in exploiting brackish water in the reef aquifer for water flooding of mature oil fields in the Permian Basin region and for processing of potash ore.

Capitan Reef aquifer, summary of water chemistry, based in part on preliminary analysis of samples collected by Sandia National Labs.

	Specific Cond. (µS/cm)	TDS (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	HCO_3 (mg/l)	SO_4 (mg/l)	Cl (mg/l)	F (mg/l)	As (mg/l)	U (mg/l)	Well depth
Maximum	196,078	184,227	5,902	2,046	46,700	784	4,970	107,949	1.9	0.001	0.001	5,713
Minimum	602	364	48.9	32.6	5.1	56	14.3	10	0.1	0.001	0.001	327
Mean	64,412.8	54,046.5	1,555.6	737.5	15,021.1	338.7	2,204	29,959.8	0.69	0.001	0.001	3,285
Median	39,000	26,900	1,240	463.4	2,357.5	271	1,862.9	13,800	0.5	0.001	0.001	3,250

Please cite this information as: Land, Lewis, 2016, Overview of fresh and brackish water quality in New Mexico, Open-file Report 583, 49 p.

REBUTTAL EXHIBIT C-24

REBUTTAL EXHIBIT C-25

From: Nathan Alleman <nalleman@all-llc.com>
Sent: Sunday, January 24, 2021 11:07 PM
To: Coss, Dylan
Cc: Grant Adams; Steve Drake - Retired; KALuck@hollandhart.com
Subject: Goodnight - Andre Dawson and Ernie Banks Capitan Reef Proximity

Dylan,

Goodnight's attorney, Ms. Kaitlyn Luck, mentioned that at last week's hearings for Goodnight's Andre Dawson SWD #1 (Case No. 21569) and Ernie Banks SWD #1 (Case No. 21570) OCD asked about the proximity of the proposed SWD locations to the Capitan Reef. OCD did not specifically request that Goodnight follow up with information related to this request, but as a means of resolving this concern, we have provided the distance from each proposed SWD location to the nearest point of the Capitan Reef.

- **Andre Dawson SWD #1:** 3.2 miles to the closest point of the Capitan Reef
- **Ernie Banks SWD #1:** 2.8 miles to the closest point of the Capitan Reef

Additionally, the Capitan Reef is shallower than the proposed injection formation (San Andres) and there is stratigraphic separation between the San Andres and Capitan Reef formations. Based on both the geographic distance and stratigraphic separation, these wells pose no threat of adverse impact to the water quality in the Capitan Reef.

Please let us know if you have any further questions on this.

Regards,

Nate Alleman
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Office: 918-382-7581
Cell: 918-237-0559

REBUTTAL EXHIBIT C-26

Program Description

REBUTTAL EXHIBIT C-27

6-- Approval Process - Liquid Hydrocarbon Storage

Liquid hydrocarbon storage wells will be approved in the same manner as produced fluid disposal wells.

7 - Aquifer Exemption - Lea County

The Lea County study contained in Appendix A-2 contains extensive data on Permian age aquifers, their water quality, the potential for their use, alternative water sources, cost analyses, and the value of such aquifers for disposal purposes.

Based upon this study the Division proposes that the Tansil, Yates, Seven Rivers, Queen, Grayburg, and San Andres formations of Lea County be classified as exempt aquifers.

Please refer to Figures 8 and 9 of the Lea County Report, Appendix A-2 and Resource Map No. 6 from "Stratigraphy and Ground-Water Hydrology of the Capitan Aquifer, Southeastern New Mexico and Western Texas". by William L. Hiss (PHD Thesis, University of Colorado 1975) for the vertical and horizontal sections to be exempted. (See following). Because of the gradational nature of the back reef facies a more precise description is not proposed.