

**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 PERMIAN  
MIDSTREAM, 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**

**SELF-AFFIRMED STATEMENT OF DR. LARRY W. LAKE, P.E.**

1. My name is Larry W. Lake. I am a professor at The University of Texas at Austin where I have taught since 1978. I am engaged as a consulting petroleum engineer with Austin Consulting Petroleum Engineers Inc. for this case.

2. I have been asked to review the available data and information relating to the applications filed by Goodnight Midstream and Empire in these cases. In particular, I have been asked to (1) analyze Empire's proposal to develop the San Andres as a ROZ enhanced recovery project; (2) Empire's claims that Goodnight's disposal injection into the San Andres impairs

Empire's EMSU operations; and (3) my opinions regarding the suitability of the San Andres formation within the EMSU as a zone for produced water disposal. I have conducted a study of this information and this, along with my experience, forms the basis of my opinions expressed herein.

3. Attached as **Goodnight Exhibit G-1** is my curriculum vitae. I have authored or co-authored over 150 technical papers and 4 textbooks. One of the latter is *Fundamentals of Enhanced Oil Recovery* published in 1989 of which I was the sole author. This text was revised in 2004 with 3 co-authors. I have taught classes on enhanced oil recovery all over the world. I am a member of the US Academy of Engineers and a professional engineer registered in the State of Texas.

4. I have not previously testified before the New Mexico Oil Conservation Commission. I believe my credentials, my experience and my analyses and review of the information in this matter qualify me to testify as an expert in petroleum and reservoir engineering in these matters.

5. Data and information considered:

I have considered the following data and information in forming my opinions:

- a. Data and information produced by Goodnight Midstream ("GM") in this matter.
- b. Data and information produced by Empire in this matter.
- c. Well data obtained from subscription service IHS
- d. Discussions with GM personnel.
- e. Discussions with Netherland Sewell & Associates ("NSAI").
- f. Testimony of GM's witnesses.
- g. SPE papers SPE 129921

6. I understand that Empire's witnesses will file testimony concurrent with the filing of my testimony and the testimony of GM's other witnesses. I have made a good faith effort to anticipate Empire's testimony based on the information I have, but I reserve the right to revise or expand my testimony or to respond to new assertions, allegations, or testimony of Empire or its witnesses. I also reserve the right to amend or supplement this statement, if necessary, should additional information become available to me, and to rebut any related opinions reached by experts related to these cases.

### **Summary of Opinions**

- The Grayburg and San Andres formations show pressure differences between the producing reservoir and the disposal aquifer. Consistent and significant pressure differences like this are conclusive evidence of lack of communication.
- The San Andres aquifer used by GM is separated from the Grayburg productive formation by at least 200 feet, which includes impermeable zones and anhydrite layers. This separation means that the San Andres aquifer in the EMSU is not a ROZ according to the standard model of a residual oil zone underlying a main pay zone.
- Because of the large injection rate and small pressure increase, the San Andres aquifer is likely fractured and/or heavily karsted. Such reservoir properties imply that were CO<sub>2</sub> to be injected it is likely to have poor volumetric sweep in this interval.
- With a poor volumetric sweep and low concentration of oil, the San Andres aquifer is not reasonable target for any type of recovery.

- Without detailed reservoir engineering and economic analyses, Empire cannot plausibly claim that a viable ROZ project, which would require an investment of 100s of million dollars, can be justified and implemented.

### **Initial Response to Empire's Claimed San Andres Residual Oil Zone**

7. **Goodnight Exhibit G-2** is a base map of the Eunice Monument South Unit. Empire alleges that a large target of oil exists in the claimed residual oil zone "ROZ" in the San Andres aquifer below the historic producing zone in the Eunice Monument South Unit "EMSU." (There is a disagreement between the parties on the depth and definition of the interface between the Grayburg and the San Andres formations.) Since, the designations between Grayburg and the San Andres are not distinct, it would be better to designate the intervals by subsurface depths, as some have done and shown in **Goodnight Exhibit G-3**. Unless otherwise noted, I will continue to use the terms San Andres aquifer and Grayburg to be consistent with prior work. The GM disposal wells inject water into the San Andres aquifer at depths that Empire alleges contain the ROZ oil target, or that will impact the alleged ROZ. **Goodnight Exhibit G-3**.

8. The San Andres aquifer used by GM and the Grayburg hydrocarbon producing zone operated by Empire are very different. The Grayburg is a producing oil formation but the San Andres aquifer is a water disposal unit. The San Andres aquifer has had a large volume of water injected into it with little pressure rise: 4-10 psi/MMbbl of water. They do not appear to be in pressure communication with each other. **Goodnight Exhibit B-21, Goodnight Exhibit B-22 and Goodnight Exhibit B-23** show pressure differences between the producing reservoir and the disposal aquifer. **Consistent and significant pressure differences like this are conclusive evidence of lack of communication.**

9. In addition, the San Andres aquifer used by GM is separated from the Grayburg formation by at least 200 ft, (**Goodnight Exhibit B-9**), which includes impermeable zones and anhydrite layers. **This separation means that the San Andres aquifer in the EMSU is not a ROZ according to the standard model of a residual oil zone underlying a main pay zone. See Goodnight Exhibit G-4.**

10. There is no oil production from the San Andres aquifer in the EMSU. The San Andres formation is a historically productive formation on the eastern edge of the Central Basin Platform, but not on the western edge where EMSU is located. This distinction between east and west, and their different depths, agrees with the traditional model of oil migration by buoyancy forces and trapping from the Central Basin Platform. Because of the large injection rate and small pressure increase, the San Andres aquifer is likely fractured and/or heavily karsted. Such reservoir properties imply that were CO<sub>2</sub> to be injected it is likely to have poor volumetric sweep in this interval.

11. Based on NSAI's analysis Empire's target San Andres ROZ below -700 ft TVDSS is in an aquifer with only scattered So above 20 percent. NSAI identified this zone as having less than 20 percent So and as being best described as "oil-stained" and not a reasonable target for oil recovery by tertiary means. With a poor volumetric sweep and low concentration of oil the San Andres aquifer is not reasonable target for any type of recovery.

**Comments on the Report Entitled  
*Eunice Monument & Arrowhead Field CO<sub>2</sub> Development Plan, Dated January 15, 2024*  
(Empire's Memo to File/Report)**

12. Even if oil exists in a Grayburg or San Andres ROZ, its recovery will require an expensive and complicated project to inject CO<sub>2</sub> to mobilize any oil for production. **Without detailed reservoir engineering and economic analyses, Empire cannot plausibly claim that a viable ROZ project, which would require an investment of 100s of million dollars, can be**

**justified and implemented.** This is true whether the targeted ROZ is in the Grayburg or the San Andres. Empire's Memo to File/Report appears to be a preliminary report with very little of the expected detail and study needed for a project with this budget and scope. A typical study would include geology and petrophysics to define the volume and distribution of reservoir fluids, and physical characteristics, reservoir engineering studies, including laboratory tests and reservoir simulation, a plan for the project infrastructure, more miscibility tests, and detailed economics.

13. Other specific comments on Empire's CO2 plan include:

- The report contains no petrophysical information. "Nature's waterflood" appears to apply to the region underlying the Grayburg formation.
- At times it is not clear whether Empire's conclusions were based on Grayburg and the San Andres aquifer or Grayburg only.
- Except for Figure 7, there is no mention of pressures. The very large rates in the SWD injectors and the very small pressures in the San Andres aquifer, compared to the other zones, is another indication that they are separate reservoirs. **Goodnight Exhibit G-4.**

13. Empire's CO2 plan states:

*"To prevent CO2 cycling through the high permeability intervals in Zones 1 and 2 of the Grayburg, the CO2 flood will focus on Layers 3, 4, and 5 of the Grayburg and the entire ROZ interval of the San Andres."*

No clear definition is given on what is meant by the "entire ROZ interval" in the CO2 plan.

14. **Goodnight Exhibit G-3** shows the completed intervals of the Empire proposed CO2 plan wells (shown in Tables 2-5 of their plan), the existing water supply wells, and the salt water disposal wells "SWDs" operated by GM. No proposed injection or production wells are completed within the SWD completion interval zone of the San Andres aquifer. However, it is likely that new wells will be drilled or deepened and recompleted based on the statement below:

*“For the San Andres, CO2 injection rate should not be a major issue based on water disposal rates currently being achieved by Goodnight Midstream Permian, LLC., whereas for the Grayburg interval it will be a concern especially if we do not inject into the high permeability layers within zones 1 and 2.”*

If the wells are completed across both zones for the waterflood and CO2 flood, the pressure differential between both the Grayburg and San Andres aquifer fluids will cause injected fluid to migrate to the lower pressure zone in the wellbore if no mechanical separation is present. Separate wellbores or other separation would be needed to prevent fluid segregation.

15. From Empire’s CO2 plan they state:

*“Design of the CO2 flood will take into account learnings from the waterflood where two high permeability intervals caused poor vertical sweep, with water bypassing the oil.”*

The conformance issues are poorly understood despite nearly forty years of waterflooding. Undesired flow patterns could be lateral or vertical. Using the same pattern and well field design previously used as proposed by Empire likely will result in the same problems or worse with a CO2 flood (see CO2 plan Figs. 3, 9, 14, and 15).

16. Empire’s CO2 plan states:

*“New wells drilled will provide additional insight into San Andres oil volume.”*

Existing WSW wells already drilled and tested in the San Andres injection interval show miniscule, if any, oil production. **See Goodnight Exhibit G-5** showing production tests in this zone.

17. Figure 7 of the report shows relationships between the fracture pressure with depth and a minimum miscibility pressure “MMP” for CO2 in a 40° API gravity oil. However, Table 1 of the report describes at 32° higher pressures will be needed for this lower API miscibility, bringing the curve closer to the fracture pressure curve shown in Figure 7. Reservoir heterogeneity

also plays a factor in achieving miscibility during a CO<sub>2</sub> flood; as such, simple basin-wide correlations may not appropriate. More detailed laboratory testing is required for implementation.

15. Tables 2 and 3 of the report list proposed injectors and water injection rates. It is unclear when these rates were reported, or if these are predicted rates. The rates used for the CO<sub>2</sub> plan should be steady state rates. However, injection rates always fluctuate during field implementation. The report also notes that the proposed CO<sub>2</sub> injection rate depends on pipeline pressure, but the report gives no consideration to reservoir pressures that also effect CO<sub>2</sub> and water injection rates.

16. **The preliminary calculations done by Empire fall short of what is needed for a technical evaluation of CO<sub>2</sub> oil recovery.** From Empire's CO<sub>2</sub> plan they state:

*“Assuming 75% net-to-gross, 35% oil saturation, and 10% porosity, the OOIP over this 960 acres will be approximately 57 MMBO.”*

How these values are determined is not clear. There is no mention of measured oil saturations anywhere, or of logs. Also, these values are inconsistent with the reservoir characteristics described in Table 1 that lists an oil saturation of 30%, and porosity of 6%. Additionally, a fixed ratio of OIP and CO<sub>2</sub> recovery was used to estimate potential recovery. No consideration was given to the distribution of OIP and potential sweep efficiencies.

17. No information has been provided on any reservoir specific simulation or estimations necessary to determine the feasibility of Empire's CO<sub>2</sub> plan. From their CO<sub>2</sub> plan they state:

*“To calculate the amount of CO<sub>2</sub> produced over time, a dimensionless curve of Cumulative Gas Produced (% HCPV) versus HCPV's of CO<sub>2</sub> injected is developed using **reservoir simulation** or analogs to other CO<sub>2</sub> floods.”*



The simulation or analog referenced here has not been provided for review. No information has been provided with regards to the type of reservoir simulator or any input to this simulator. The curve provided in Figure 13 is represented as an “example.” An actual curve that is developed from known inputs and assumptions has not been provided. As such, I reserve the right to provide additional testimony on this topic when and if any information is provided.

### **Conclusion**

18. Without detailed reservoir engineering and economic analyses, Empire cannot plausibly claim that a viable ROZ project, which would require an investment of 100s of million dollars, can be justified and implemented. The preliminary calculations done by Empire fall short of what is needed for a technical evaluation of CO2 oil recovery.

19. The San Andres aquifer used by GM and the Grayburg hydrocarbon producing zone operated by Empire are very different. The Grayburg is a producing oil formation but the San Andres aquifer is a water disposal unit. Consistent and significant pressure differences like this are conclusive evidence of lack of communication.

20. The San Andres aquifer has been able to accept large volumes of water with little increase in pressure. Because of the large injection rate and small pressure increase, the San Andres aquifer is likely fractured and/or heavily karsted, making it a good disposal zone because of increased permeability.

21. 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.

*Larry W. Lake*

\_\_\_\_\_  
Date August 26, 2024

\_\_\_\_\_  
Dr. Larry W. Lake, P.E.

**Larry W. Lake**

**Professor in Petroleum and Geosystems Engineering  
Hildebrand Department of Petroleum and Geosystems Engineering  
200 E. Dean Keeton, C0300  
The University of Texas at Austin  
Austin, Texas 78712-1585**

**EDUCATION:**

B.S.E., Chemical Engineering, Arizona State University, 1967  
Ph.D., Chemical Engineering, Rice University, 1973

**PROFESSIONAL REGISTRATION:**

Registered Professional Engineer, State of Texas, #43660, November, 1978-present

**CURRENT AND PREVIOUS ACADEMIC POSITIONS:**

Penn State Energy and Earth Resources, advisory board, 2018-present.  
Shahid and Sharon Ullah Chair 2012- present.  
Interim Chair, Department of Petroleum and Geosystems Engineering, 2006-2008.  
W.A. (Monty) Moncrief Centennial Endowed Chair in Petroleum Engineering, 1998 - 2012  
Consultant, Intevep, Petroleos de Venezuela, Los Teques, Venezuela, January - June 2001  
Program Director, Reservoir Engineering Research Program, 1998 - 2002  
Chair, Department of Petroleum Engineering, 1989 - 1997  
W.A. (Tex) Moncrief, Jr. Centennial Endowed Chair in Petroleum Engineering, 1993 - 1998  
Shell Distinguished Chair, 1988 - 1993  
Program Director, Center for Enhanced Oil and Gas Recovery Research, 1985 - 1998  
Halliburton Annual Professor in Petroleum Engineering, 1985 - 1988  
Professor, Department of Petroleum and Geosystems Engineering, The University of Texas, 1985 - present  
Associate Professor, Department of Petroleum Engineering, The University of Texas, 1982 - 1985  
Assistant Professor, Department of Petroleum Engineering, The University of Texas, 1978 - 1982

**PROFESSIONAL EXPERIENCE:**

Shell Development Company, Houston, Texas, Research Engineer, August 1973 - June 1978  
Motorola, Inc., Phoenix, Arizona, Process Engineer, June 1968 - February 1970  
Platt, Sparks and Associates (now FTI), Austin, Texas, Engineering Advisor and Senior Consulting  
Engineer, September 1995 – 2018  
Intera Petroleum Consultants, May 2016-2021

**CONSULTING:**

Quantum Reservoir Inc., March 2019-present  
Intera Petroleum Consultants, May 2016-2021  
EXPEC ARC, Aramco Advisory Board, 2013-present; chairman 2017-2020  
Platt, Sparks and Associates (now FTI), Austin  
Petrobras, 1995  
Shell E and P, 1994  
Chevron, 1994  
Exxon, 1993  
Schlumberger, 1992  
Keystone Environmental, 1991, 1992  
Mobil, 1990 - 1998  
Statoil, 1990 - 1992  
P.T. Loka Datamas Indah, 1988 - 1996

**BEFORE THE OIL CONSERVATION COMMISSION  
Santa Fe, New Mexico  
Exhibit No. G-1**

**Submitted by: Goodnight Midstream Permian, LLC  
Hearing Date: September 23, 2024  
Case Nos. 23614-23617, 23775,  
24018 – 24020, 24025, 24123**

UNOCAL, 1986  
 Malapai Resources, 1985 - 1990  
 Amoco Oil and Gas Co., 1984 - 1992  
 Arco, 1986 - 1992

### **SHORT COURSES:**

Enhanced Oil Recovery, McCombs School of Business, January 2015.  
 Geochemistry and Fluid Flow, Rijswijk, Netherlands, November 2013  
 CO<sub>2</sub> for Oil Recovery, Petrobras, Rio de Janeiro, January 2010  
 Reservoir Characterization, Nautilus Inc., Houston Texas  
 November 2007  
 March 2008  
 March 2009  
 Fundamental of Enhanced Oil Recovery, Petroskills  
 London, UK, January 2013  
 Aberdeen, UK, September 2011, May 2012  
 Miri, Sarawak, July 2011  
 Rijswijk, Netherlands, March 2007, March 2008, July 2009  
 Houston, December 2007, March 2008, December 2018  
 Reservoir Simulation, Gulf Coast Section of the SPE, May 2005  
 Geostatistics Fundamentals, Idaho National Labs, NeXT, Summer 2003  
 Natural Gas Exploitation - Spring 2001, More than three times, Venezuela with Dr. Sonia Embid.  
 Enhanced Oil Recovery Fundamentals - More 30 times since 1981 in Norway, Venezuela, Mexico,  
 Malaysia, Argentina, UK, and the United States.  
 Enhanced Oil Recovery Techniques for Environmental Clean-up, Keystone Environmental, December  
 1991.  
 How Rock and Reservoir Properties Determine Oil Recovery, AAPG, Houston, June 1990.  
 Micellar-Polymer and Miscible Flooding, DGMK, German Oil and Gas Society, June 1984.  
 Micellar-Polymer Flooding, Core Laboratories, Trans Ocean, and SOHIO with G. A. Pope, 1981.  
 Miscible Flooding, ARCO Research and Japanese National Oil Company.  
 Petrophysics - Amoco Exploration and Production Co., Tulsa, annually from 1997 - 2000.  
 Properties of Reservoir Rocks, Tenneco, December 1987.  
 Reservoir Characterization – More than 30 times since 1987 in Norway, Scotland, Venezuela, Japan,  
 Indonesia, Egypt and the United States.  
 Statistics in Reservoir Description, Intevep, Caracas, Venezuela, February 1987.

### **HONORS AND AWARDS:**

Legion of Honor, SPE, 2023  
 Hildebrand Departmental Distinguished Alumni Award, 2022  
 IEA EOR TCP Lifetime Achievement Award, 2021  
 Veteran Contribution Award, Texas Health and Human Services, 2018  
 Shahid and Sharon Ullah Chair in Petroleum Engineering, 2014-present  
 SPE Honorary Member, 2006-present  
 Russian Academy of Natural Sciences, US Section, 2006-present  
 International Association of Mathematical Geologists Distinguished Lecturer, 2006  
 University of Texas Joe J. King Award for professional service, 2004  
 SPE DeGoyer Award for distinguished service, 2003  
 SPE Distinguished Lecturer, 1994, 2003.  
 Texas Society of Professional Engineers Dream Team, 2001  
 SPE Distinguished Member, 1996, 2000  
 SPE Distinguished Service Award, 2000  
 Society of Petroleum Engineering/Department of Energy Improved Oil Recovery Symposium,  
 IOR Pioneer, 2000  
 Claude and Billie Hocott Award, College of Engineering, 1999  
 The University of Texas at Austin, Departmental Teaching Award, 1998 - 1999

Lockheed Martin Departmental Engineering Teaching Award, 1998 - 1999  
 Dad's Association Centennial Teaching Fellowship, 1998 - 1999  
 W.A. (Monty) Moncrief Centennial Chair in Petroleum Engineering, 1997 - 2014  
 National Academy of Engineering, 1997-present  
 Departmental Leadership Award, Engineering, 1997  
 American Institute of Mining, Metallurgical, and Petroleum Engineers 1996 Anthony F. Lucas Gold Medal,  
 February 5, 1996, Anaheim, CA.  
 SPE Award of Appreciation for Outstanding Technical Editor, September 1994  
 W.A. (Tex) Moncrief, Jr. Centennial Endowed Chair in Petroleum Engineering, 1993 – 1997  
 Halliburton Education Foundation Award of Excellence, 1990  
 Engineering Foundation Faculty Award, The University of Texas, 1979 and 1990  
 SPE Reservoir Engineering Award, 1990  
 Shell Distinguished Chair, 1988 - 1993  
 Graduate Engineering Council Faculty Award for Meritorious Service, 1987  
 Halliburton Annual Professor, 1985 - 1988  
 Petroleum Engineering Distinguished Achievement Award, 1981  
 SPE Distinguished Achievement Award for Petroleum Engineering Faculty, 1981

### **MEMBERSHIP IN PROFESSIONAL AND HONORARY SOCIETIES:**

National Academy of Engineers, 1997 - present  
 Society of Petroleum Engineers, 1975- present  
 SPE Board of Directors, 1993 - 1997

### **UNIVERSITY COMMITTEE ASSIGNMENTS:**

Cockrel School promotion and Tenure Committee, 2015-2017  
 Energy and Earth Resources, Graduate Studies and Admission Committees, 2013- present  
 Graduate Council, 2010-2013  
 Department of Petroleum and Geosystems Engineering, Interim Chairman, 2006- 2008  
 PGE Undergraduate Advisor, 2001- 2006  
 Remote Teaching Committee, Chairman, 2001 - 2004  
*Ad Hoc* Search Committee for Director of the Bureau of Economic Geology, Member, 1999  
 College of Engineering Faculty Salary Review Committee, Member, 1998 - 1999  
 College of Engineering Review of the Ferguson Engineering Laboratory Committee Chairman, 1998  
 PGE Graduate Admissions Committee Chairman, 1997 - 2000  
 PGE Graduate Studies Committee Chairman, 1985 - 1987, 1997 - 2000  
 Provost's Task Force on Distance Learning, 1996 - 1998  
 Provost Search Committee, 1995  
 Department of Petroleum and Geosystems Engineering, Chairman, 1989 - 1997  
 College of Engineering *ad hoc* promotions committee, 1987; Chairman 1988  
 College of Engineering Scholastic Appeals Committee 1983 - 1985  
 Faculty Senate 1981 - 1983  
 University Council 1981 - 1983

### **PROFESSIONAL SOCIETY AND MAJOR GOVERNMENTAL COMMITTEES:**

External Advisory Board, Energy and Minerals Engineering department, Penn State University, 2018-present.  
 Director, Center for Subsurface Energy Security, DOE Basic Energy Studies, August 2015-July 2018.  
 External Advisory Board, Earth and Energy Resources, Stanford University, Feb. 2012  
 Board Member, PetroJava, 2011- present  
 EXPEC ARC Advisory Committee, Saudi Aramco, 2010-2014; 2016-2022  
 National Academy of Science Committee to review groundwater protection plan at Los Alamos National Laboratory, Feb. 2006 - May 2007. Committee co-chair.

Advisory Committee Norwegian Research Council, Feb. 2004.  
 Committee of Geotechnical and Geological Engineering, National Research Council, 2003 - 2004  
 Associateship Advisory Program, National Research Council, 1998 - 2002  
 Stanford Earth Sciences Advisory Board Member, 2002 - 2007  
 Chemical Engineering Advisory Committee, Arizona State University, 2000 - 2001  
 SPE, Distinguished Lecturer, 1993 - 1994; 2002 - 2003  
 Petroleum Recovery Fund Advisory Committee, American Chemical Society, 1999-2006  
 Chairman, SPE Petroleum Engineering Handbook Revision Committee, 1998 - 1999  
 Member, SPE CO<sub>2</sub> Flooding Reprint Committee, 1997 - 1998  
 Texas A&M University, Board Member, Offshore Technology Conference Research, 1997  
 SPE, Board of Directors, 1993 - 1996  
 SPE, Professional Development & Academic Affairs Committee 1993 - 1996; Chairman 1995 - 1996  
 SPE, Continuing Education Committee, 1992 - 1994; 1986 - 1988; Chairman 1988 - 1989  
 SPE, Education & Professionalism Committee, 1992 - 1994  
 SPE, Education & Accreditation Committee 1993 - 1996; 1982 - 1985, Chairman 1985  
*In Situ*, editorial review committee member, 1992 - 1993  
 SPE editorial review committee member, 1992 - 1993, 1978 - 1979  
 Reservoir Characterization Co-Chairman of conference organized by National Institute for  
 Petroleum and Energy Research, June 1989, May 1985  
 University of Wyoming Technical Advisory Committee, 1988 - 1992  
 University of Southern California Advisory Panel, 1988 - 1992  
 SPE, Chairman, Oil Field Chemistry Symposium, 1987  
 SPE Forum Series Chairman, 1985, 2008  
 ABET accreditation visit, Mississippi State University, 1984

## PUBLICATIONS:

### A. Refereed Archival Journal Publications

175. Ruiz Maraggi, L., Walsh, M.P., and Lake, L.W., "A New Approach to Apply Decline-Curve Analysis for Tight-Oil Reservoirs Producing Under Variable Pressure Conditions," SPE-218016-PA, SPE Journal, 29 (03), pp 1655-1671, March 2024. <https://doi.org/10.2118/218016-PA>.
174. Parra, J.E., Samaniego-V.,F., Lake, L.W., "CRM-Aquifer-Fractional Flow Model to Characterize Oil Reservoirs with Natural Water Influx," SPE-217973-PA, SPE Journal, 29 (01), pp538-553, January 2024, <https://doi.org/10.2118/217973-PA>
173. Roustazadeh, A., Ghanbarian, B., Shadmand, M.B., Taslimitehrani, V., and Lake, L.W., "Estimating hydrocarbon recovery factor at reservoir scale via machine learning: Database-dependent accuracy and reliability," Engineering Applications of Artificial Intelligence Journal, November 11, 2023, pp.0952-1976. <https://doi.org/10.1016/j.engappai.2023.107500>
172. Parra, J.E., Samaniego-V.,F., Lake, L.W., "Application of the Producer-Based Capacitance Resistance Model to Undersaturated Oil Reservoirs in Primary Recovery," SPE-214678-PA, *SPE Journal*, 28(05), pp2256-2273, October 2023, <https://doi.org/10.2118/214678-PA>
171. Para, J.E., Samaniego-V, F., and Lake, L.W., "CRM-Aquifer-Fractional Flow Model to Characterize Oil Reservoirs with Natural Water Influx," SPE-217973-PA, *SPE Journal*, September 2023.
170. Male, F., Marder, M. P., Ruiz-Maraggi, L. M., & Lake, L. W. "Bluebonnet Scaling solutions for production analysis from unconventional oil and gas wells," *Journal of Open Source Software*, 8(88), 5255. August 2023, <https://doi.org/10.21105/joss.05255>
169. Para, Jose E., Samaniego-V. Fernando, and Lake, Larry W., "Application of the Producer-Based Capacitance Resistance Model to Understaturated Oil Reservoirs in Primary Recovery," *SPE Journal*, Feb. 2023, pp. 1-12.
168. Lara Orzco, R.A., Okuno, R., Lake, L.W., Analytical Solutions for the Injection of Wettability Modifier in Carbonate Reservoirs Based on Resurface Complexation Model, *Geoenergy Science and Engineering*, 227 (2023) 211825.

167. Arouri, Yazan, Lake, Larry W., and Sayyafzaseh, Mohammad “Bilevel Optimization of Well Placement and Control Settings Assisted by Capacitance-Resistance Models, *SPE Journal*, December 2022, pp. 3829-3848.
166. Shakiba, Mahmood, Lake L. W., Gale J. F. W. and Laubach, S. E. “Multiscale Spatial Analysis of Fracture Nodes in Two Dimensions,” *Marine and Petroleum Geology*, .Jan. 2023, doi.org/ 10.1016/j.marpetgeo, 2022, 106093
165. Lan Yuzheng, DiCarlo, D., and Lake L. W, “Interface Stability of Compressible Fluid Displacements,” *Transport in Porous Media*, August 2022, pp. 699-713, <https://doi.org.10.1067/s11242-022-01831-2>
164. Ruiz Maraggi, L. M., Lake, L. W., and Walsh, M. P., “Rate-Pseudopressure Deconvolution Enhances Rate-Time Models Production History-Matches and Forecasts of Shale Gas Wells,” *SPE Res. Eval.& Eng*, June 2022, pp. 1-20, <https://doi.org/10.2118/208967-PA>
163. Lara Orozco, Ricardo A., Gayan A. Abeykoon, Ryosuke Okuno and Larry W. Lake , “An Electrokinetic Study of Amino Acid and Potential-Determining Ions for Enhanced Waterflooding in Carbonate Reservoirs,” *SPE Reservoir Engineering and Evaluation*, 2022.
162. Shakiba, Mahmood, Larry W. Lake, Julia F. W. Gale and Pyrcz, Michael, “Multiscale Spatial Analysis of Fracture Arrangement and Patter Reconstruction Using Ripley’s K-Function,” *J. of Structural Geology*, vol. 155, doi.org/10.1016/j.jsg.2022.10453, 2022
161. Ruiz Maraggi, L. M., Lake, L. W., and Walsh, M. P. 2020. A Bayesian Framework for Addressing the Uncertainty in Production Forecasts of Tight Oil Reservoirs Using a Physics-Based Two-Phase Flow Model. Presented at the Latin America URTEC, Virtual, 16-18 November, 2020. <https://doi.org/10.15530/urtec-2020-10480>.
160. Ren, B, Jensen Jerry, Lake Larry, and Male, Frank, “Analysis and Importance of Vertical Permeability in a Carbonate3 Reservoir Undergoing CO2-EOR, presented at the 2021 SPE Annual Technical Conference and Exhibition, 2022 SPE Reservoir Evaluation and Engineering, March 2022, <https://doi/10.2118/205995-PA/482788>.
159. Lara Orozco, Ricardo A., Gayan A. Abeykoon, Ryosuke Okuno and Larry W. Lake, “The Impact of Glycine on the Zeta Potential of Calcite at Different Temperatures and Brine Compositions,” *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, May 16, 2021, <https://doi.org/10.1016/j.colsurfa.2021.126851>.
158. Araque-Martinez, A. N. and Lake, L. W. 2021. The Effect of Compressibility and Outer Boundaries on Incipient Viscous Fingering. *SPE Res Eval & Eng*. SPE-201310-PA (7 April 2021). <https://doi.org/10.2118/201310-PA>.
157. Salazar, J. Jose, and Larry W. Lake, “The Physical Meaning of the Koval Factor,” *Mathematical Geoscientists*,”<https://doi.org/10.1007/s111004-0200-9883-O>, 19 July 2020.154, Springer.
156. Male, Frank, Jerry L. Jensen, and Larry W. Lake, “Comparisons of Permeability Predictions on Cemented Sandstones with Physics-Based and Machine Learning Approaches,” *J. of Natural Gas Science and Engineering*, <https://doi.org/10.1016/j.jngse.2020.103244> , March 2020.
155. Farazdeh, R., Eftekhari, A. A., Dafnomilis, G., Larry W. Lake and Bruining, J., “On the Sustainability of CO<sub>2</sub> Storage Through CO<sub>2</sub>-Enhanced Oil Recovery,” *Applied Energy*, 261 (2020), 114467.
154. Bakhshian, Sahar, Seyyed A. Hosseini, Larry W. Lake, “Estimating CO<sub>2</sub>-Brine Relative Permeability and Capillary Pressure of Tuscaloosa Sandstone: Effect of Anisotropy., *Advances in Water Resources*, 135, 2020, 103464.
153. Ren, Bo, Steven L. Bryant, and Larry W. Lake, “Estimating Local Capillary Trap Volume Capacities Using a Geologic Criterion,” *International Journal of Greenhouse Gas Control*, Vol 85, June 2019, pp 46-57, <https://doi.org/10.1016/j.ijggc.2019.03.025>.
152. Nwachukwu, Azor, Jeong, Hoonyeong, Pyrcz, Michael, and Lake, Larry W. “Fast evaluation of well placements in heterogeneous reservoir models using machine learning,” *Journal of Petroleum Science and Engineering* 163, 463-475, April 2018, <https://doi.org/10.1016/j.petrol.2018.01.019>
151. de Holanda, Rafael W., Eduardo Gildin, Jerry L. Jensen, Larry W. Lake, and C. Shah Kabir, “A State-of-the-Art Literature Review of Capacitance Resistance Models for Reservoir Characterization and Performance Forecasting,” *Energies* 11 (12), 1-46, 2018; doi: 10.3390/en11010001.
150. Ghanbarian, Behzad, Torres-Verdin, Carlos, Larry W. Lake, and Michael Marder, “Gas Permeability in



- Unconventional Tight Sandstones: Scaling up From Pore to Core”, *J. Pet. Sci and Eng.*, vol. 173, February 2019, pp. 1163-1172, <https://doi.org/10.1016/j.petrol.2018.10.057>
149. Behzad Ghanbarian, Larry W. Lake, and Muhammad Sahimi, “Insights into Rock Typing: A Critical Study,” *SPE Journal*, Vol. 24, Issue 01, February 2019, pp 230-242, <https://doi.org/10.2118/191366-PA>.
148. Naudomsup, Nuntha and Larry W. Lake, “Extension of Capacitance/Resistance Model to Tracer Flow for Determining Reservoir Properties,” *SPE Reservoir Evaluation & Engineering*, Vol. 22, Issue 01, February 2019, pp 266-281, <https://doi.org/10.2118/187410-PA>.
147. Lashgari, Hamid R., Sun, Alexander, Zhang, Tongwei, Pope, Gary A., and Lake, Larry W. “Evaluation of Carbon Dioxide Storage and Miscible Gas EOR in Shale Oil Reservoirs”, *Fuel*, Online December 2018, <https://doi.org/10.1016/j.fuel.2018.11.076>.
146. Hong, Aojie, Reidar B. Bratvold, and Larry W. Lake, “Fast Analysis of Optimal Improved-Oil-Recovery Switch Time Using a Two-Factor Production Model and Least-Squares Monte Carlo Algorithm,” SPE 191327-PA, *SPE Reservoir Evaluation and Engineering*, preprint, November 2018, <https://doi.org/10.2118/191327-PA>.
145. Walsh, Mark P. and Larry W. Lake, Oil Production Growth Forecast to Continue in Permian Basin, Oil and Gas Recorder, Nov. 2018, pp. 36-41.
144. Hosseininoosheri, Pooneh, S.A. Hosseini, V. Nunez-Lopez, and Larry W. Lake, “Impact of Field Development Strategies on CO2 Trapping Mechanisms in a CO2-EOR Field: A Case Study in the Permian Basin (SACROC Unit)”, *International Journal of Greenhouse Gas Control*, 72, 2018, pp. 92-104.
143. Ren, Bo, Jennifer M. Delaney, Larry W. Lake, and Steven L. Bryant, “Maximizing CO<sub>2</sub> Accumulation in Storage Reservoirs: Interplay Between Permeability Retardation and Capillary Trapping of Rising CO<sub>2</sub>,” *SPE Journal*, Oct. 2018, pp. 1866-1879
142. R.A. Lara Orozco, G.A. Abeykoon, M. Wang, F.J. Argüelles-Vivas, R. Okuno, L.W. Lake, S.C. Ayirala, A.M. AlSofi, Amino acid as a novel wettability modifier for enhanced waterflooding in carbonate reservoirs, *SPE Reserv. Eval. Eng.* 23 (2020) 741–757. <https://doi.org/10.2118/195907-PA>.
141. Wu, Yun, Bryant, Steven L., and Lake, Larry W., “Pressure Management of CO<sub>2</sub> Storage by Closed-loop Surface Dissolution”, *Energy Procedia* 114, 2017, pp. 4811-4821.
140. Ettehadtavakkol, A., Jablonowski, C., and Lake, Larry W. “Development Optimization and Uncertainty Analysis Methods for Oil and Gas Reservoirs”, *Natural Resources Research* vol.26, issue 02, pp.177-190, 2017.
139. Venkatraman, A., Dindoruk, B., Elshahawi, H., Lake, L. W., and Johns, R. T., “Modeling Effect of Geochemical Reactions on Real-Reservoir-Fluid Mixture During Carbon Dioxide Enhanced Oil Recovery.” *SPE 175030, Soc. Pet. Eng. J.*, Preprint, doi:10.2118/175030-PA, April 2017.
138. McGuire, P.L., Okuno, R., Gould, T.L., and Lake, L.W., “Ethane-Based Enhanced Oil Recovery: An Innovative and Profitable Enhanced-Oil-Recovery Opportunity for a Low-Price Environment,” *SPE Res. Eval. and Eng.*, 20(01) 42-58, <http://dx.doi.org/10.2118/179565-PA>, February 2017.
137. Farajzadeh, R., Bedrikovetshy, B., Lotfollahi, M. and Larry W. Lake, “Simultaneous Sorption and Mechanical Entrapment During Polymer Flow Through Porous Media,” *Water Resources Research*, 52, 2015, March 2016, pp. 2279-2298.
136. Yu, Wun, Bryant, Steven L., and Lake, Larry W., “Modeling of Gas Exsolution for CO<sub>2</sub>/brine Surface Dissolution Strategy,” *Energy Procedia*, CHCT-13, Nov. 14-16, 2016, Lausanne, Switzerland.
135. Ogunyomi, B.A., Patzek, T.W., Lake, L.W., and Shah Kabir, C., “History Matching and Rate Forecasting in Unconventional Oil Reservoirs with an Approximate Analytical Solution to the Double-Porosity Model,” *SPE 171031-PA, SPE Res. Eval. and Eng.*, 19(01) 70-82, <http://dx.doi.org/10.2118/171031-PA>, January, 2016.
134. Cao, F., Luo, H., and Lake, L.W., “Oil-Rate Forecast by Inferring Fractional-Flow Models From Field Data With Koval Method Combined With the Capacitance/Resistance Model,” *SPE 173315-PA, SPE Res. Eval. and Eng.*, 18(04) 534-553, <http://dx.doi.org/10.2118/173315-PA>, November, 2015.
133. Venkatraman, A., Lake, L.W., and Johns, R.T., “Modelling the impact of geochemical reactions on hydrocarbon phase behavior during CO<sub>2</sub> gas injection for enhanced oil recovery,” *Fluid Phase Equilibria*, 402 56-68, <http://dx.doi.org/10.1016/j.fluid.2015.05.028>, September 2015.
132. Ogunyomi, B.A., Larry W. Lake and C.S. Kabir, “New Analytical Functions for Skin and Storage Effect—An insight to decouple fracture half-length and square root of permeability,” *Journal of Natural Gas Science and Engineering*, June 2015, pp. 1-13.
131. Venkataram, Ashwin, Lake, Larry W., and Johns, Russell T., “Gibbs Free Energy Minimization for Prediction of Solubility of Acid Gases in Water,” *Industrial and Engineering Chemistry Research*, 53,



- 2014, pp. 6157-6968.
130. Rodriquez, H. Martin, S. Escobar, S. Embid, N. Rodriquez Marillas, M. Hegazy and Larry W. Lake, "A New Approach to Identify Analogous Reservoirs," *SPE Economics and Management*, Oct. 2014, pp. 173-184.
  129. Adepoju, Olaoluwa, Larry W. Lake, and Russell T. Johns. "Anisotropic Dispersion and Upscaling for Miscible Displacement," *Soc. Pet. Eng. J.*, 2014, pp. 1-12.
  127. Laochamroonvorapongse, R., C.S. Kabir and Larry W. Lake, "Performance Assessment of Miscible and Immiscible Water-Alternating Gas Floods with Simple Tools," *J. Pet. Sci. and Eng.*, 122, 2014, pp. 18-30.
  127. Etehadtavakkal, A., Lake, L.W., and Bryant, S.L., "CO<sub>2</sub>-EOR Storage Design and Optimization," *International J. of Greenhouse Gas Control*, 25 (2014), pp. 79-92.
  126. Moreno, G., and Lake, L.W., "On the uncertainty of interwell connectivity estimates from the capacitance resistance model," *Petroleum Science*, vol. 1, 2014, pp. 265-271.
  125. Moreno, G. A., and LW Lake, "Input signal design to estimate interwell connectivities in mature fields from the capacitance-resistance model", *Petroleum Science* 11 (4), 563-568, 2014
  124. Olson, Hilary Clement, Jon E. Olson, Steven L. Bryant, Larry W. Lake, Paul Bommer, Katherine Romanak, Susan C. Hovorka, Rebecca C. Smyth, and Iona Williams, "Meeting the Grand Challenges for Future Carbon Management Engineers and Scientists: Stimulating Workforce Capacity Through Teacher Professional Development," *Energy Procedia*, vol. 37, 2013, pp. 7265-7272.
  123. Venkataram, A., Hesse, M., Lake, LW, and Johns, R.T., "Analytical Solutions for Flow in Porous Media with Multicomponent Cation Exchange Reactions," *Water Resources Research*, June 10, 2013, pp. 3-17.
  122. Lake, L. W. J. Martin, J.D Ramsey, S. Titman, "A primer on the economics of shale gas production just how cheap is shale gas?", *Journal of Applied Corporate Finance* 25 (4), 87-96, 2013
  121. Adepoju, O., Lake, L.W., and Johns, R.T., "Investigation of Anisotropic Mixing in Miscible Displacements," *SPE Res. Eval. and Eng.*, Feb. 2013, pp. 86-96.
  120. Ghanbarnezhad, R., and Lake, Larry W., "Applying Fractional Flow Theory Under the Loss of Miscibility," *Soc. Pet. Eng. J.*, June 2012, 10 p.
  119. Metin, C.O., Bonnacaze, R.T., Lake, L.W., Miranda, C.R., and Nguyen, Q.P., "Aggregation kinetics and shear rheology of aqueous silica suspensions," *Applied Nanoscience*, published online Dec. 21, 2012. DOI: 10.1007/s13204-012-0185-6.
  118. Rai, K., Johns, R.T., Delshad, M., Lake, L.W., Goudarzi, A., "Oil Recovery Predictions for Surfactant Polymer flooding", *J. Pet. Sci. and Eng.*, 112, (2013), 341-350.
  117. R Ghanbarnezhad, LW Lake, "Applying fractional-flow theory under the loss of miscibility", *SPE Journal* 17 (03), 661-670, September 2012
  116. Kaviani, D., Jensen, J.L., and Lake, L.W., "Estimation of Interwell Connectivity in the Case of Fluctuating Bottomhole Pressures," *J. Pet. Sci. and Engr.*, Vol. 90-91, July 2012, pp. 79-95.
  115. Balhoff, M., Lake, L.W., Bommer, P., Lewis, R., Weber, M., and Calderin, J., "Rheological and Yield Stress Measurements of Non-Newtonian Fluids using a Marsh Funnel," *J. Pet. Sci. and Engr.*, vol. 77, no. 3-4, June 2011, pp. 393-402.
  114. Jha, R.K., Lake, L.W., and Bryant, S.L., "The Effect of Diffusion on Dispersion," *Soc. Pet. Eng. J.*, March 2011, vol. 16, no. 1, pp. 65-77.
  113. Bickel, J.E., Lake, L.W., and Lehman, J., "Discretization, Simulation and Swanson's (Inaccurate) Mean," *SPE Economics and Management*, July 2011, pp. 128-140.
  112. Metin, C.O., Lake, L.W., Miranda, C.R., and Nguyen, Q.P., "Stability of Aqueous Silica Nanoparticle Dispersions," *J. of Nanoparticle Research*, DOI: 10.1007.
  111. Ettahadtavakkoi, A., Jablonowski, C., and Lake, L.W., "Gas Storage Facility Design Under Uncertainty," *SPE Management and Resources*, 5.02, 2010, pp. 155-165.
  110. Jeong, C., Kallivokas, L.F., Huh, C., and Lake, L.W., "Optimization of Sources for Focusing Wave Energy in Targeted Formations," *J. of Geophysics and Engineering*, 7, (2010), pp. 242-256. doi: 10.1088/1742-2131/7/3/003
  109. John, A.K., Lake, L.W., Bryant, S.L., and Jennings, J.W. "Investigation of Mixing in Field-Scale Miscible Displacements Using Particle-Tracking Simulations of Tracer Floods with Flow Reversal," *Soc. Pet. Eng. J.*, Sept. 2010, pp. 598-609.
  108. Sayarpour, M., Kabir, C.S., and Lake, L.W., "Field Applications of Capacitance-Resistance Models in Waterfloods." *SPE Res Eval and Engr.*, 12 (6), 2010, pp. 853-864. doi: 10.2118/114983-PA.

107. Garmeh, G., Johns, R.T., and Lake, L.W., "Pore Scale Simulation of Dispersion," *Soc. Pet. Eng. J.*, vol. 14, no. 4, December 2009.
106. Sayapour, M., Zuluaga, E., Kabir, C.S., and Lake, L.W., "The Use of Capacitance-Resistance Models for Rapid Estimation of Waterflood Performance and Optimization," *J. Pet. Sci. and Eng.*, 2009, doi: 10.1016/j.petrol.2009.09.008, 12 p.
105. Gilbert, R., Lake, L.W., Jablonowski, C., Jennings, J., and Nunez, E., "A Procedure for Assessing the Value of Oilfield Sensors," *SPE Res. Eng. and Eval.*, August 2009, pp. 618-619.
104. Jha, R.K., John, A., Bryant, S.L., and Lake, L.W., "Flow Reversal and Mixing," *Soc. Pet. Eng. J.*, March 2009, vol. 14, no. 1, pp. 41-49.
103. Al-Yousif, A., Lake, L.W., and Jensen, J.L., "Integrated Interpretation of Interwell Connectivity Using Injection and Production Fluctuations," *Mathematical Geology*, 2009, vol. 41, issue 1.
102. John, A.K., Lake, L.W., Torres-Verdin, C., and Srinivasan, S., "Seismic Facies Identification and Classification Using Simple Statistics," *SPE Res. Eng. and Eval.*, December 2008, pp. 984-990.
101. Hultsch, P., Lake, L., Gilbert, R., "Uncertainty Estimation Through the Life of the Field," *Energy Exploration and Exploitation*, 26 (2):<sup>SEP</sup>175-195.
100. Wood, D.J., Lake, L.W., Johns, R.T., and Nunez, V., "A Screening Model for CO<sub>2</sub> Flooding and Storage in Gulf Coast Reservoirs Based on Dimensionless Groups," *SPE Res. Eval. and Eng.*, vol. 11, no. 3, June 2008, pp. 513-520.
99. Zuluaga, E. and Lake, L.W., "Modeling Experiments on Water Vaporization in Gas Injection Using Traveling Waves," *Soc. Pet. Eng. J.*, June 2008, vol. 13, no. 2.
98. Yoshioka, K., Zhu, D., Hill, A.D., Dawkrajai, K., and Lake, L.W., "Prediction of Temperature Changes Caused by Water or Gas Entry into a Horizontal Well," *SPE Production and Operations*, vol. 22, no. 4, pp. 425-433.
97. Noh, M., Lake, L.W., Bryant, S.L., and Araque-Martinez, A., "Implications of Coupling Fractional Flow and Geochemistry for CO<sub>2</sub> Injection in Aquifers," *SPE Res. Eval. and Eng.*, August 2007, pp. 406-414.
96. Hazlett, R.D., Babu, D.K., and Lake, L.W., "Semi-analytical Streamfunction Solutions on Unstructured Grids for Flow Permeable Media," *SPE Reservoir Engineering*, July 2007.
95. Yousef, A.A., Gentil, P., Jensen, J.L., and Lake, L.W., "A Capacitance Model to Infer Interwell Connectivity from Production- and Injection-Rate Fluctuations," *SPE Reservoir Engineering*, Dec. 2006, pp. 630-646.
94. Lake, L.W. and Bryant, S.L., "The Scientific Method and Earth Sciences." Guest editorial, *J. of Energy Resources Technology*, vol. 128, Dec. 2006, p. 245-246.
93. Varela, O.J., Torres-Verdin, C., and Lake, L.W., "On the Value of 3D Seismic Amplitude Data to Reduce Uncertainty in the Forecast of Reservoir Production," *J. Pet. Sci. and Eng.*, vol. 20, pp. 269-284, 2006.
92. Ewing, R.C., Kocurek, G., and Lake, L.W., "Pattern Analysis of Dune-Field Parameters," *Earth Surf. Process. Landforms*, vol. 31, 2006.
91. Johns, R.T., Lake, L.W., and Delliste, A.M., "Prediction of Capillary Fluid Interfaces During Gas or Water Coning in Vertical Wells," *Soc. Pet. Eng. J.*, 10(4), December 2005, pp. 440-448.
90. Kumar, A., Ozah, R., Noh, M., Pope, G.A., Sepehrnoori, K., Bryant, S., and Lake, L.W., "Reservoir Simulation of CO<sub>2</sub> Storage in Deep Saline Aquifers," *Soc. Pet. Eng. J.*, Sept. 2005.
89. Srinivatsan, L., Lake, L.W. and Bonnecaze, R.T., "Scaling Analysis of Deposition from Turbidity Currents," *Geomarine Letters*, vol. 24, 2004, pp. 63-74.
88. Lake, L.W., and Srinivasan, S., "Statistical Scale-up of Reservoir Properties: Concepts and Applications," *J. Pet. Sci. and Eng.*, vol. 44, 2004, pp. 27-39.
87. Mahadevan, J., Lake, L.W., and Johns, R.T., "Estimation of True Dispersivity in Field Scale Permeable Media," *Soc. Pet. Eng. J.*, September 2003.
86. Albertoni, A. and Lake, L.W., "Inferring Interwell Connectivity from Well-Rate Fluctuations in Waterfloods," *SPE Reservoir Engineering*, February 2003, p. 6 - 16.
85. Solano, R., Johns, R.T., and Lake, L.W., "Impact of Reservoir Mixing on Recovery in Enriched-Gas Drives Above the Minimum Miscibility Enrichment," *SPE Reservoir and Engineering J.*, October 2001, Issue 23.
84. Deng, Y. and Lake, L.W., "A Thermodynamic Study of Capillary Pressure Curves Based on Free Energy Minimization," *Geofluids*, Summer 2001.

83. Engblom, W.A., Lake L.W., and Bonnacaze, R.T., "A Front-Capture Scheme for the Simulation of Homogeneous and Particle-Laden Gravity Currents," *International Journal for Numerical Methods in Fluids*, Vol. 35, Issue 8, April 4, 2001, pp. 961-982.
82. Pizarro, J.O.S. and Lake, L.W., "Dominant Communication Reservoir Trends Determined by Nonparametric Statistics," *J. of Canadian Pet. Tech.*, Vol. 40, No. 4, April 2001, pp. 61-67.
81. Araque-Martinez, A., and Lake, L.W. "A Simplified Approach to Geochemical Modeling and Its Effect on Well Impairment," *Soc. Pet. Eng. J.*, March 2001.
80. Charbeneau, R.J., Johns, R.T., Lake, L.W., and McAdams, M.J. III, "Free Product Recovery of Petroleum Hydrocarbon Liquids," *Ground Water Monitoring and Remediation*, Vol. 20, No. 3, Summer 2000, pp. 147-158.
79. Araque-Martinez, A. and Lake, L.W., "Some Frequently Overlooked Aspects of Reactive Flow Through Permeable Media," *Industrial & Engineering Chemistry Research*, R.S. Schechter Special Issue, Vol. 39, Issue 8, August 7, 2000, pp. 2717-2724.
78. Kapur, L., Lake, L.W., and Sepehrnoori, K., "Probability Logs for Facies Classification," *In\_Situ*, Vol. 24, No. 1, 2000, pp. 57-58.
77. Quinn, M.A., Lake, L.W., and Schechter, R.S., "Designing Effective Sandstone Acidizing Treatments Through Geochemical Modeling *SPE Production and Facilities*," Vol. 15, No. 1, February 2000.
76. Refunjol, B.T. and Lake, L.W., "Reservoir Characterization Based on Tracer Response and Rank Analysis of Production and Injection Rates," 1999, in *Reservoir Characterization-Recent Advances*, R. Schatzinger and J. Jordan, eds., *AAPG Memoir 71*, pp. 209-217.
75. Campozana, F.P., Lake, L.W., and Sepehrnoori, K., "How Incorporating More Data Reduces Uncertainty in Recovery Predictions," 1999, in *Reservoir Characterization-Recent Advances*, R. Schatzinger and J. Jordan, eds., *AAPG Memoir 71*, pp. 259-367.
74. Pizarro, J.O.S. and Lake, L.W., "A Simple Method to Estimate Interwell Autocorrelation," 1999, in *Reservoir Characterization-Recent Advances*, R. Schatzinger and J. Jordan, eds., *AAPG Memoir 71*, pp. 269-380.
73. Lake, L.W., "Oilfield Modeling," *Discovery*, Vol. 15, No. 1, 1998, pp. 36-39.
72. Helset, H.M. and Lake, L.W., "Three-Phase Secondary Migration of Hydrocarbon," *J. of Mathematical Geology*, Vol. 30, No. 6, 1998, pp. 637-660.
71. Savioli, G.B., Bidner, M.S., Jacovkis, P.M., and Lake, L.W., "Influencia de la Permeabilidad Vertical en el Flujo de Petróleo Hacia un Pozo Productor," *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*, Vol. 13, No. 4, 1997, pp. 573-586.
70. Bruining, J., van Batenburg, D., Lake, L.W., and Yang, A.P., "Flexible Spectral Methods for the Generation of Random Fields with Power-Law Semivariograms," *Mathematical Geology*, Vol. 29, No. 6, 1997, p. 823.
69. Li, D., Cullick, A.S., and Lake, L.W., "Scale-Up of Reservoir Model Relative Permeability Using A Global Method," *SPE Reservoir Engineering*, Vol. 11, No. 3, August 1996, pp. 149-157.
68. Li, D., Cullick, A.S., and Lake, L.W., "Global Scale-up of Reservoir Model Permeability with Local Grid Refinement," *J. of Pet. Sci. and Tech.*, Vol. 14, August 1995, pp. 1-13.
67. Dria, M.A., Schechter, R.S., and Lake, L.W., "The Behavior of Thermochemical Waves During Reactive Flow through Permeable Media," *Industrial and Engineering Chemistry Research*, Vol. 34, No. 8, August 1995, pp. 1889-2897.
66. Li, D. and Lake, L.W., "A Type Curve Approach to Estimating p for a p-Normal Transformation," *J. of Mathematical Geology*, Vol. 27, No. 3, 1995, pp. 359-371.
65. Datta-Gupta, A., Pope, G.A., and Lake, L.W., "A Combinatorial Optimization Based Inverse Approach for Characterizing Heterogeneous Permeable Media Using Spatial Statistics and Tracer Data," *J. of Mathematical Geology*, March 1995.
64. Li, D. and Lake, L.W., "Scaling Fluid Flow Through Heterogeneous Permeable Media," *SPE Advanced Technology Series*, March 1995.
63. Sen, M.K., Datta-Gupta, A., Stoffa, P.L., Pope, G.A., and Lake, L.W., "Stochastic Reservoir Modeling Using Simulated Annealing and Genetic Algorithm," *SPE Formation Evaluation*, Vol. 10, No. 1, March 1995, pp. 40-48.
62. Datta-Gupta, A., Lake, L.W., Pope, G.A., and King, M.J., "A Type Curve Approach to Analyzing Two-Well Tracer Tests," *SPE Formation Evaluation*, Vol. 10, No. 1, March 1995, pp. 49-55.
61. Panda, M. N. and Lake, L.W., "A Physical Model of Cementation and its Effects on Single-Phase Permeability," *AAPG Bulletin*, Vol. 79, No. 3, March 1995, pp. 431-443.

60. Sevougian, S.D., Schechter, R.S., and Lake, L.W., "A New Geochemical Simulator to Design More Effective Sandstone Acidizing Treatments," *SPE Production & Facilities*, February 1995.
59. Li, D. and Lake, L.W., "A Moving Window Semivariance Estimator," *Water Resources Research*, Vol. 30, No. 5, 1994, pp. 1479-1489.
58. Ingsøy, P., Gauchet, R., and Lake, L.W., "Pseudofunctions and Extended Dietz Theory for Gravity-Segregated Displacement in Stratified Reservoirs," *SPE Reservoir Engineering*, Vol. 9, No. 1, February 1994, pp. 67-72.
57. Panda, M.N. and Lake, L.W., "Estimation of Single-Phase Permeability from Parameters of Particle Size Distribution," *AAPG Bulletin*, Vol. 78, No. 7, July 1994, pp. 1028-1039.
56. Kasap, E. and Lake, L.W., "Effective Relative Permeabilities for Viscously-Dominated Flow Through Cross-Bedded Units," *SPE Advanced Technology Series*, Vol. 1, No. 2, 1993.
55. Sevougian, S.D., Schechter, R.S., and Lake, L.W., "Effect of Partial Local Equilibrium on the Propagation of Precipitation/Dissolution Waves," *Industrial and Engineering Chemistry Research*, Vol. 32, No. 10, August 1993, pp. 2281-2304.
54. Shook, M., Li, D., and Lake, L.W., "Scaling Immiscible Flow Through Permeable Media by Inspectional Analysis," *In Situ*, Vol. 16, No. 4, 1992, pp. 311-349.
53. Waggoner, J.R., Castillo, J.L., and Lake, L.W., "Simulation of EOR Processes in Stochastically Generated Permeable Media," *SPE Formation Evaluation*, Vol. 7, No. 2, June, 1992.
52. Siddiqui, F.I. and Lake, L.W., "A Dynamic Theory of Hydrocarbon Migration," *Journal of the International Association for Mathematical Geology*, Vol. 24, No. 3, 1992.
51. Aliaga, D.A., Wu, G., Sharma, M., and Lake, L.W., "Barium and Calcium Sulfate Precipitation, Dissolution and Migration Inside Sandpacks," *SPE Formation Evaluation*, Vol. 7, No. 1, March 1992, pp. 79-86.
50. Goggin, D.J., Chandler, M.A., Kocurek, G., and Lake, L.W., "Permeability Transects in Eolian Sands and Their Use in Generating Random Permeability Fields," *SPE Formation Evaluation*, Vol. 7, No. 1, March 1992, pp. 7-16.
49. Schmidt, R.L., Venuto, P.B., and Lake, L.W., "A Niche for Enhanced Oil Recovery in the 1990's," *Oilfield Review*, January 1992.
48. Jensen, J.L. and Lake, L.W., "A Review of Heterogeneity Measures Used in Reservoir Characterization," *In Situ*, Vol. 15, No. 4, 1991, pp. 409-439.
47. Mueller, T. and Lake, L.W., "A Theoretical Study of Water-blocking in Miscible Flooding," *SPE Reservoir Engineering*, Vol. 6, No. 4, November 1991, pp. 445-451.
46. Novak, C.F., Schechter, R.S., and Lake, L.W., "Geochemical Modeling of Two-Phase Flow with Interphase Mass Transfer," *AIChE Journal*, Vol. 37, No. 11, November 1991, pp. 1625-1633.
45. Datta Gupta, A., Pope, G.A., Sepehrnoori, K., King, M.J., and Lake, L.W., "High-Resolution Monotonic Schemes for Reservoir Fluid Flow Simulation," *In Situ*, V. 15, No. 3, 1991, pp. 289-317.
44. Wolff, M., Oney, B., Miller, M., and Lake, L.W., "On the Imbibition of Oil from Fractured Reservoir Matrix Blocks," *In Situ*, Vol. 15, No. 1, 1991, pp. 1-33.
43. Kittridge, M.G., Lucia, F.J., Fogg and, G.E., and Lake, L.W., "Outcrop-Subsurface Comparisons of Heterogeneity in the San Andres Formation," *SPE Formation Evaluation*, September 1990, pp. 233-240.
42. Wolff, M., Miller, M.A., and Lake, L.W., "Oil Recovery from Geologically-Based Fracture Networks," *In Situ*, Vol. 14, No. 4, 1990, pp. 407-427.
41. Kasap, E. and Lake, L.W., "Calculating the Effective Permeability Tensor of a Grid Block," *SPE Formation Evaluation*, Vol. 5, No. 2, June 1990, pp. 192-200.
40. Bhuyan, D., Pope, G.A., and Lake, L.W., "Mathematical Modeling of High-pH Chemical Flooding," *SPE Reservoir Engineering*, Vol. 2, May 1990, pp. 213-220.
39. Walsh, M.P. and Lake, L.W., "Applying Fractional Flow Theory to Solvent Flooding," *J. Pet. Sci. and Eng.*, Vol. 2, 1989, pp. 281-303.
38. Schechter, R.S., Vinot, B. and Lake, L.W., "Formation of Water - Soluble Silicate Gels by the Hydrolysis of a Diester of Dicarboxylic Acid Solubilized as Microemulsions," *SPE Reservoir Engineering*, Vol. 4, No. 3, August 1989, pp. 391-397.
37. Chandler, M.A., Kocurek, G., Goggin, D.J., and Lake, L.W., "The Effects of Stratigraphic Heterogeneity on Permeability in an Eolian Sandstone Sequence, Page Sandstone, Northern Arizona," *AAPG Bulletin*, Vol. 73, No. 5, May 1989, pp. 658-668.
36. Goggin, D.J., Chandler, M.A., and Lake, L.W., "A Mechanical Field Permeameter for Making Rapid,



- Non-Destructive, Permeability Measurements," *J. of Sedimentary Petrology*, Vol. 59, No. 4, July 1989, pp. 613-615.
35. Yang, A.P. and Lake, L.W., "The Accuracy of Autocorrelation Estimates," *In Situ*, Vol. 12, No. 4, 1988-89, pp. 275-317.
  34. Novak, C.F., Schechter, R.S., and Lake, L.W., "Diffusion and Solid Dissolution/Precipitation in Permeable Media," *AICHE Journal*, Vol. 5, No. 7, July 1989, pp. 1057-1072.
  33. Novak, C. F., Schechter, R.S., and Lake, L.W., "Rule-Based Mineral Sequences in Geochemical Flow Processes," *AICHE Journal*, Vol. 34, No. 10, October 1988, pp. 1607-1614.
  32. Goggin, D.J., Thrasher, R.L., and Lake, L.W., "A Theoretical and Experimental Analysis of Minipermeameter Response Including Gas Slippage and High Velocity Flow Effects," *In Situ*, Vol. 12, Nos. 1 and 2, Spring 1988, pp. 79-116.
  31. Goggin, D.J., Chandler, M.A., Kocurek, G.A., and Lake, L.W., "Patterns of Permeability in Eolian Deposits," *SPE Formation Evaluation*, Vol. 3, No. 2, June 1988, 297-306.
  30. Jensen, J.L. and Lake, L.W., "The Influence of Sample Size and Permeability Distribution Heterogeneity Measures," *SPE Reservoir Engineering*, Vol. 3, No. 2, May 1988, pp. 629-637.
  29. Lake, L.W., "The Origins of Anisotropy," *J. Petroleum Technology*, April 1988, pp. 395-396; discussion *J. of Pet. Tech.*, July 1988, p. 905.
  28. Bryant, S.L., Schechter, R.S., and Lake, L.W., "Isotherm-free Chromatography: Propagation of Precipitation/Dissolution Waves," *Chemical Engineering Communications*, V. 58, 1987, pp. 53-376.
  27. Dria, M.A., Bryant, S.L., Schechter, R.S., and Lake, L.W., "Interacting Precipitation/Dissolution Waves: The Movement of Inorganic Contaminants in Groundwater," *Water Resources Research*, Vol. 23, No. 11, November 1987, pp. 2076-2090.
  26. Arya, A., Hewett, T.A., Larson, R.G., and Lake, L.W., "Dispersion and Reservoir Heterogeneity," *SPE Reservoir Engineering*, Vol. 1, No. 1, February 1988, pp. 139-148.
  25. Dria, M.A., Schechter, R.S., and Lake, L.W., "An Analysis of Reservoir Chemical Treatments," *SPE Production Engineering*, February 1988, pp. 52-62.
  24. Jensen, J.L., Hinkley, D.V., and Lake, L.W., "A Statistical Study of Reservoir Permeability: Distributions, Correlations, and Averages," *SPE Formation Evaluation* Vol. 2, December 1987, pp. 461-468.
  23. Camilleri, D., Engelsens, S., Lin, E.C., Ohno, T., Pope, G.A., Sepehrnoori, K., and Lake, L.W., "Description of an Improved Compositional Micellar/Polymer Simulator," *SPE Reservoir Engineering*, November 1987, pp. 427-432.
  22. Delshad, M., Pope, G.A. and Lake, L.W., "Two and Three-Phase Relative Permeabilities of Micellar Fluids," *SPE Formation Evaluation*, Vol. 2, No. 3, September 1987, pp. 327-337.
  21. Bryant, S.L., Schechter, R.S., and Lake, L.W., "Mineral Sequences in Precipitation/Dissolution Waves," *AICHE Journal*, Vol. 33, No. 8, 1987, pp. 1271-1287.
  20. Guilinger, T.R., Schechter, R.S., and Lake, L.W., "A Kinetic Study of Pyrite Oxidation in Basic Carbonate Solution," *Industrial and Engineering Chemistry Fundamentals*, Vol. 26, No. 4, 1987, pp. 824-830.
  19. Zapata, V.J. and Lake, L.W., "Estimating the Vertical Flaring In Situ Leaching," *In Situ*, Vol. 11, No. 1, Spring 1987, pp. 39-62.
  18. Tweeton, D.R. and Lake, L.W., "Mining Push-Pull Field Test for Evaluating Cation Exchange Parameters," with *Trans. AIME/SME*, Vol. 280, Spring 1987.
  17. Jones, Jr., J.R., Scott, A.J., and Lake, L.W., "Reservoir Characterization for Numerical Simulation of Mesaverde Meanderbelt Sandstones, Northwestern Colorado," *SPE Formation Evaluation*, Vol. 2, No. 1, March 1987, pp. 97-107.
  16. Bryant, S.L., Schechter, R.S., and Lake, L.W., "Interactions of Precipitation/Dissolution Waves and Cation Exchange in Flow Through Permeable Media," *AICHE Journal*, Vol. 32, No. 5, May 1986, pp. 751-764.
  15. Kabir, M.I., Schechter, R.S., and Lake, L.W., "Novel Scaling Methods for Modeling In Situ Leaching," *Minerals and Metallurgical Processing*, May 1985, pp. 127-136.
  14. Guilinger, T.R., Schechter, R.S., Price, J.G., Bobeck, P., and Lake, L.W., "Factors Influencing Production Rates in Solution Mining of Uranium Using Basic Lixiviants," *Minerals and Metallurgical Processing*, February 1985, pp. 60-67.
  13. Haldorsen, H.H. and Lake, L.W., "A New Approach to Shale Management in Field Scale Simulation Models," *Soc. Pet. Eng. J.*, Vol. 24, August 1984, pp. 447-457.

12. Pope, G.A., Carey, G.F., Sepehrnoori, K., and Lake, L.W., "Isothermal, Multiphase, Multicomponent Fluid Flow in Permeable Media, Part I: Description and Mathematical Formulation," *In Situ*, Vol. 8, No. 1, March 1984, pp. 1-40.
11. Walsh, M.P., Bryant, S.L., Schechter, R. S., and Lake, L.W., "Precipitation and Dissolution of Solids Attending Flow Through Porous Media", *AIChE Journal*, Vol. 30, No. 2, March 1984, pp. 317-327.
10. Price, J.G., Bobeck, P., Guilinger, T.R., Schechter, R.S., Stover, D.E., Mays, W., and Lake, L.W., "Case History of an In-Situ Uranium Leaching Project," *Uranium*, January 1984, pp. 335-361.
9. Walsh, M.P., Schechter, R.S., and Lake, L.W., "A Description of Chemical Precipitation Mechanisms and Their Role in Formation Damage During Stimulation by Hydrofluoric Acid," *J. of Pet. Tech.*, September 1982, pp. 2097-2112.
8. Kabir, M.I., Lake, L.W., and Schechter, R.S., "A Minitest of In Situ Uranium Leaching: Practical Problems in the Interpretation of Test Data," *In Situ*, Vol. 6, No. 4, 1982, pp. 281-327.
7. Kabir, M.I., Schechter, R.S., and Lake, L.W., "Evaluation of the One Well Uranium Leaching Test: Restoration," *Soc. Pet. Eng. J.*, Vol. 22, February 1982, pp. 141-150.
6. Hirasaki, G.J. and Lake, L.W., "Taylor's Dispersion in Stratified Porous Media," *Soc. Pet. Eng. J.*, Vol. 21, August 1981, pp. 459-468.
5. Stegemeier, G.L., Johnston, J.R., and Lake, L.W., "Simulation and Performance Prediction of Large-Scale Surfactant/Polymer Project," *Soc. Pet. Eng. J.*, Vol. 18, 1978, p. 12.
4. Hill, H.J. and Lake, L.W., "Cation Exchange in Chemical Flooding - Part 3, Chemical Flood Experiments," *Soc. Pet. Eng. J.*, Vol. 18, No. 6, December 1978, pp. 445-456.
3. Helfferich, F. and Lake, L.W., "Cation Exchange in Chemical Flooding - Part 2, The Effect of Dispersion, Cation Exchange, and Polymer/Surfactant Absorption on Chemical Flood Environment," *Soc. Pet. Eng. J.*, Vol. 18, No. 6, December 1978, pp. 435-444.
2. Pope, G.A., Helfferich, F., and Lake, L.W., "Cation Exchange in Chemical Flooding - Part 1, Basic Theory Without Dispersion," *Soc. Pet. Eng. J.*, Vol. 18, No. 6, December 1978, pp. 418-434.
1. Hill, H.J., Helfferich, F.G., Reisberg, J., Pope, G.A., and Lake, L.W., "Cation Exchange and Chemical Flooding," *J. Pet. Tech.*, October 1977, pp. 1336-1338.

## B. Other Publications

149. Fast Optimization of the Net Present Value of Unconventional Wells Using Rapid RTA” URTEC-4043501-MS, presented at 2024 SPE/AAPG/SEG Unconventional Resources Technology Conference, Houston, Texas USA, June 17–19, 2024, <https://doi.org/10.15530/urtec-2024-4043501>
148. Lan, Yuzheng and Lake, L.W., “Flow Reversibility in Hydrogen Storage in Subsurface Aquifers,” presented at 2024 SPE Improved Oil Recovery Conference, Tulsa, Oklahoma, USA, April 2024.
147. Ruiz Maraggi, L.M., Tuero, F., Walsh, M.P., and Lake, L.W., “The Application of a New Variable Pressure Decline-Curve Analysis Technique to Unconventional Reservoirs in Argentina,” URTEC-3968926-MS, presented at 2023 Latin America Unconventional Resources Technology Conference (LA URTEC), Buenos Aires, Argentina, Dec, 2023.
146. Villareal, Julio C., Larry W. Lake, and David DiCarlo, "Accounting for Exterior Flow Using the Modified Logistic Growth Model for Unconventional Geopressured Shale Gas Reservoir, SPE 214872MS, presented at the 2023 Annual Technical Conference and Exhibition of the SPE, San Antonio, TX, Oct. 2023.
145. Ruiz Maraggi, Leopoldo M., Mark P. Walsh and Larry W. Lake, " Bayesian Variable Pressure Decline-Curve Analysis for Shale Gas Wells," Presented at the Unconventional Resources Technology Conference, Denver, Colorado, USA, URTEC:3856826.
144. Ruiz Maraggi, Leopoldo M., Mark P. Walsh and Larry W. Lake, " A New Approach to Apply Decline-Curve Analysis for Tight-Oil Reservoirs Producing Under Variable Pressure Conditions," Presented at the Unconventional Resources Technology Conference, Denver, Colorado, USA, URTEC:3848106.
143. Bo, Ren, Jensen, Jerry, Duncan, Ian, Lake, Larry W. “Buoyant Flow of H2 Versus CO2, presented at the 2022 SPE Annual Technical Conference and Exhibition, SPE-210327-MS, Houston Oct..
142. What CO<sub>2</sub>-EOR Has Already Taught Us About Upscaling Permanent Carbon Sequestration, J. Pet. Tech. invited lecture, May 2022.
141. Lara Orozco, Ricard A., Ryosuke Okuno, and Larry W. Lake, “Analytical Solutions for the Injection of Wettability Modifiers in Carbonate Reservoirs Based on a Reduced Surface Complexation Model, presented at the 2021 SPE Annual Technical Conference and Exhibition, SPE-206088-MS, Dubai.
140. Ren, B, Jensen Jerry, Lake Larry, and Male, Frank, “Analysis and Importance of Vertical Permeability in a Carbonate Reservoir Undergoing CO<sub>2</sub>-EOR, presented at the 2021 SPE Annual Technical Conference and Exhibition, SPE205995MS.
139. Ruiz Maraggi, L. M., Lake, L.W. and Walsh, M.P., 2021 “Deconvolution of Time-Varying Bottomhole Pressure Improves Rate-Time Models History Matches and Forecasts of Tight Oil Production, URTEC 5279, presented at the Unconventional Resources Technology Conference held in Houston, Texas, USA, July 26-28
138. Ruiz Maraggi, L. M., Lake, L.W. and Walsh, M.P., 2021 “Using Bayesian Leave-One-Out and Leave-Future-Out Cross-Validation to Evaluate the Performance of Bayesian Rate-Time Models to Forecast Production of Tight Oil Wells.” URTEC 5020, presented at the Unconventional Resources Technology Conference held in Houston, Texas, USA, July 26-28
137. Ruiz Maraggi, L. M., Lake, L. W., and Walsh, M. P. 2021. Bayesian Predictive Performance Assessment of Rate-Time Models for Unconventional Production Forecasting, presented at SPE Europec featured at 82nd EAGE Conference and Exhibition, 14-17 June 2021 Amsterdam, the Netherlands, SPE-205151-MS.
136. Araque Martinez, Aura and Larry W, Lake, “Effect of Compressibility and Outer Boundaries on the Onset of Viscous Fingering, SPE201310, presented at the 2020 Annual Technical Conference and Exhibition, Houston, doi: <https://doi.org/10.2118/201310-MS>
135. Ruiz Maraggi, L. M., Lake, L. W., and Walsh, M. P. 2020. A Bayesian Framework for Addressing the Uncertainty in Production Forecasts of Tight Oil Reservoirs Using a Physics-Based Two-Phase Flow Model. Presented at the Latin America URTEC, Virtual, 16-18 November. <https://doi.org/10.15530/urtec-2020-10480>
134. Ruiz Maraggi, L. M., Lake, L. W., and Walsh, M. P. 2020. A Two-Phase Non-Linear One-Dimensional Flow Model for Reserves Estimation in Tight Oil and Gas Condensate Reservoirs Using Scaling Principles. Presented at the SPE Latin American and Caribbean Petroleum Engineering Conference, Virtual, 27–31 July. SPE-199032-MS. <https://doi.org/10.2118/199032-MS>
133. Ren, Bo, Duncan, Ian, Male, Frank, Vinyet, Baques and Lake, Larry W., “Economic Assessment of Strategic for CO<sub>2</sub>-EOR and Storage in Brownfield Residual Oil Zones: A Case Study from the Seminole San Andres Unit, SPE 200363 MS, presented at the SPE Improves Oil Recovery Conference IOR 2020,

- Tulsa, Oklahoma.
132. Maraggi Ruiz, Leopoldo, Lake, Larry W., and Walsh, Mark P., "A Two-Phase Non-Linear One-Dimensional Flow Model for Reserves Estimation in Tight Oil and Gas Condensate Reservoirs Using Scaling Principles," SPE199032, presented at the Latin America and Caribbean Petroleum Engineering Conference (LACPEC), Bogota, Colombia, 2020.
  131. Lara Orozco, Ricardo A., Gayan A. Abeykoon, Mingyan Wang, Francisco Arguelles Vivas, Ryosuke Okuno, Larry W. Lake, Subhash C. Ayirala, and Abdulkareem M. Alsofi, "Amino Acid as a Novel Wettability Modifier for Enhanced Waterflooding in Carbonate Reservoirs," presented at the 2019 SPE Annual Technical Conference and Exhibition, Calgary, Alberta, Canada, Sept. 30-Oct. 3.
  130. Hosseinshori, Pooneh, Mehrab Mehrabi, Seyyed Abolfazl Hosseini, Vanessa Nunez-Lopez, and Larry W. Lake, "Impact of Relative Permeability Uncertainty on CO<sub>2</sub> Trapping Mechanisms in a CO<sub>2</sub>-EOR Process: A Case Study in the U.S. Gulf Coast (Cranfield), SPE-195351-MS, presented at the SPE Western Regional Meeting, April 24-25, San Jose, California, 2019.
  129. Lake, Larry W., Andrew Yang, and Zhong Pan, "Listening to the Data: An Analysis of the Oil and Gas Journal Database," SPE169056, presented at the 2014 SPE Improved Oil Recovery Symposium, Tulsa, Oklahoma, USA, April 12-15.
  128. Yun, Wu, Lake, Larry W., and Bryant, Steven L., "Optimization of Utilization Efficiency of CO<sub>2</sub>/brine Surface Dissolution Strategy" 14<sup>th</sup> International Conferences on Greenhouse Gas Control Technologies, Oct. 21-25, 2018, Melbourne, Australia.
  127. Larry W. Lake, Larry W., Lotfollahi, Mohammad, and Bryant, Steven L., "Fifty Years of Field Observations: Lessons for CO<sub>2</sub> storage from CO<sub>2</sub> Enhanced Oil Recovery" 14<sup>th</sup> International Conferences on Greenhouse Gas Control Technologies, Oct. 21-25, 2018, Melbourne, Australia.
  126. Ren, Bo, Larry W. Lake, Steven L. Bryant, "Countercurrent Flow Enhances CO<sub>2</sub> Accumulation During Upward Migration in Storage Aquifers," 14<sup>th</sup> International Conferences on Greenhouse Gas Control Technologies, Oct. 21-25, 2018, Melbourne, Australia.
  125. Hong, Aojie, Reidar B. Bratvold, Larry W. Lake and Leopoldo M. Ruiz Maraggi, "Integrating Model Uncertainty in Probabilistic Decline Curve Analysis for Unconventional Oil Production Forecasting," URTEC 29000625, presented at the Unconventional Resource Technology Conference, Houston, TX July 23-25, 2018.
  124. Hong, Aojie, Reidar B. Bratvold, and Larry W. Lake, "Fast Analysis of Optimal IOR Switch Time Using a Two-Factor Production Model and Least-Square Monte Carlo Algorithm," SPE-191327-MS, presented at the SPE Norway One Day Seminar, April 18, 2018, Bergen, Norway.
  123. Nwachukwu, Azor, Hoongyoung Jeong, Alexander Sun, Michael Pyrcz, and Larry W. Lake, "Machine Learning-Based Optimization of Well Locations and WAG Parameters under Geologic Uncertainty," SPE-190239-MS, presented at the SPE Improved Oil Recovery Conference, Tulsa, Oklahoma, 14-18 April 2018.
  122. Bin, Liang, Jiang, Junjian, R.S. Seright and Larry W. Lake, "Further Insights into the Mechanism of Disproportionate Permeability Reduction. SPE 187364-MS, presented at the 2017 SPE Annual Technical Conference and Exhibition, San Antonio, Texas, Oct. 9-11.
  121. Wu, Yun, Bryant, Steven L. and Lake, Larry W. "Modeling of Gas Exsolution for CO<sub>2</sub>/brine Surface Dissolution Strategy, 13th International Conference on Greenhouse Gas Control Technologies, GHGT-13, 14-18 November 2016, Lausanne, Switzerland
  120. Wu, Yun, Bryant, Steven L. and Lake, Larry W. "Pressure Management of CO<sub>2</sub> Storage by Closed-loop Surface Dissolution," 13th International Conference on Greenhouse Gas Control Technologies, GHGT-13, 14-18 November 2016, Lausanne, Switzerland
  119. Venkatraman, A., Arguilles-Vivas, F.J., Okuno, R., Singh, G., Lake, L.W., and Wheeler, M.F., "Modeling Impact of Aqueous Ions on Solubility of CO<sub>2</sub> and its Implication for Sequestration," SPE181634MS, presented at the 2016 SPE Annual Technical Conference and Exhibition, Dubai, UAE, Sept. 26-28.
  118. Yeganeh, M., Hegner, J., Lewandowski, E., Mohan, A., Lake, L.W., Cherney, D., Jusufi, A., and Jaishankar, A. "Capillary Desaturation Curve Fundamentals," SPE-179574-MS presented at the 2016 SPE Improved Oil Recovery Conference, Tulsa, OK, April 11-13.
  117. Ren, B., Bryant, S.L., and Lake, L.W., "Fast Modeling of Local Capillary Trapping during CO<sub>2</sub> Injection into a Saline Aquifer," CMTC-439486-MS presented at the 2015 Carbon Management Technology Conference, Sugar Land, TX, Nov. 17-19.



116. Ren, B., Bryant, S.L., and Lake, L.W., "Quantifying Local Capillary Trapping Storage Capacity Using Geologic Criteria," CMTC-439489-MS presented at the 2015 Carbon Management Technology Conference, Sugar Land, TX, November 17-19.
115. Lee, B.H. and Lake, L.W., "Using Data Analytics to Analyze Reservoir Databases," SPE174900, presented at the 2015 SPE Annual Technical Conference and Exhibition, Houston, TX, Sept. 28-30.
114. Venkatraman, A., Dindoruk, B., Eishahwi, H., Lake, L.W., and Johns, R.T., "Modeling Impact of Geochemical Reactions on a Real Reservoir Fluid Mixture during CO<sub>2</sub> EOR" SPE175030, presented at the 2015 SPE Annual Technical Conference and Exhibition, Houston, TX, Sept. 28-30.
113. Lake, L.W., "Enhanced Oil Recovery: Progress and Processes," Rocky Mountain Law Foundation, May 2015, San Antonio, TX.
112. Ogunyomi, B.A., Dong, S., La, N., Lake, L.W. and Kabir, C.S., "Method, Models, Decline Curves and EURS," *American Oil and Gas Reporter*, Jan. 2015, pp. 166-171.
111. Ogunyomi, B.A., Dong, S., La, N., Lake, L.W. and Kabir, C.S., "A New Approach to Modeling Production Decline in Unconventional Formations," SPE170889, presented at the 2014 SPE Annual Technical Conference and Exhibition, Amsterdam, Netherlands, Oct. 27-29.
110. Ogunyomi, B.A., Patzek, T., Lake, L.W., and Kabir, C.S., "History Matching and Rate Forecasting in Unconventional Oil Producing Reservoirs Using an Approximate Analytical Solution to the Double Porosity Model," SPE 171031, presented at the 2014 SPE Eastern Regional Meeting, Charleston, WV, Oct. 21-23.
109. Ettehadtavakkal, A., Lake, L.W., and Bryant, S.L., "Impact of Storage Tax Credit on Economic Viability of CO<sub>2</sub> Storage with EOR," SPE 169837, presented at the 2014 SPE Hydrocarbon Economics and Evaluation Symposium, Houston, TX, May 19-20.
108. Habibi, M., Gilbert, R.B., Lake, L.W., and McIntosh, P., "Assessing Value of Test Wells in Developing an Unconventional Play--Decision Entropy Theory," SPE169847, presented at the 2014 SPE Hydrocarbon Economics and Evaluation Symposium, Houston, TX, May 19-20.
107. Cao, F. and Lake, L.W., "Development of a Fully Coupled Capacitance Resistance Model," SPE169485-MS, presented at the 2014 SPE Improved Oil Recovery Symposium, Tulsa, OK, April 12-16.
106. Jeong, C., Kallivokas, L.F., Huh, C., and Lake, L.W., "Estimation of Oil Production Rates in Reservoirs Exposed to Focused Vibration Energy," SPE169079-MS, presented at the 2014 SPE Improved Oil Recovery Symposium, Tulsa, OK, April 12-16.
105. Zhong, P., Yang, A., and Lake, L.W., "Listening to the Data: An Analysis of the Oil and Gas Journal Database," SPE169056, presented at the 2014 SPE Improved Oil Recovery Symposium, Tulsa, OK, April 12-16.
104. Jain, L. and Lake, L.W., "Surveillance of Second and Tertiary Recovery Projects: Application of Koval's Theory to Enhanced Oil Recovery Displacements," SPE169055, presented at the 2014 SPE Improved Oil Recovery Symposium, Tulsa, OK, April 12-16.
103. Lake, L.W., Martin, J., Ramsey, J. D., and Titman, S., "A Primer on the Economics of Shale Gas Production: Just how Cheap is Shale Gas?," *Journal of Applied Corporate Finance*, vol. 25, no. 4, Fall 2013, pp. 87-96.
102. Venkataram, A., Lake, L.W., and Johns, R.T., "Gibbs Free Energy Minimization for Reactive Flow in Porous Media," SPE-166448-MS, presented at the 2013 SPE Annual Technical Conference and Exhibition, New Orleans, LA, Sept. 30- Oct. 2.
101. Jain, L. and Lake, L.W., "Upscaling of Miscible Floods: An Extension to Koval's Theory," SPE 166400, presented at the 2013 SPE Annual Technical Conference and Exhibition, New Orleans, LA, Sept. 30- Oct. 2.
100. Adepoju, O., Lake, L.W., and Johns, R.T., "Anisotropic Dispersion and Upscaling for Miscible Displacement," SPE 166390-MS, presented at the 2013 SPE Annual Technical Conference and Exhibition, New Orleans, LA, Sept. 30- Oct. 2.
99. Arscott, R.L., Fairhurst, C., and Lake, L.W., "Grand Challenges for Earth Resources Engineering," *J. Pet. Tech.*, June 2012, pp. 66- 71.
98. Kim, J.S., Lake, L.W., and Edgar, T.F. "Integrated Capacitance Resistive Model for Characterizing Waterflooded Reservoirs." *International Federation of Automatic Control in Offshore Oil and Gas Production*, Trondheim, Norway, 31 May-1 June 2012.
97. Ogunyomi, B.A., Jablonowski, C.J., and Lake, L.W., "Field Development Optimization Under

- Uncertainty: Screening-Models for Decision Making,” SPE146788, presented at the 2011 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 30- Nov. 2.
96. Kim, J.S., Lake, L.W., and Edgar, T.F., “Integrated Capacitance Resistance Model for Characterizing Waterflooded Reservoirs,” IFAC Workshop on Automatic Control in Offshore Oil and Gas Production, November 2011.
  95. Jeong, C., Kallivokas, L.F., Huh, C., and Lake, L.W., “Maximum of Oil Mobility within a Reservoir for Elastic Wave-based Enhanced Oil Recovery,” SPE 17150-PP, presented at the 2011 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 30- Nov. 2.
  94. Wang, W. Patzek, T.W., and Lake, L.W., “A Capacitance-Resistive Model and InSAR Imagery of Surface Subsidence Explain Performance of Waterflood Project at Lost Hills,” SPE 146366-PP, presented at the 2011 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 30- Nov. 2.
  93. Nguyen, A.P., Kim, J.S., Lake, L.W., Edgar, T.F., and Haynes, B., “Integrated Capacitance Resistive Model for Reservoir Characterization in Primary and Secondary Recovery,” SPE 147344, presented at the 2011 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 30- Nov. 2.
  92. Nguyen, A.P., Lasdon, L.S., Lake, L.W., and Edgar, T.F., “Capacitance Resistive Model Application to optimize water in a West Texas Field, SPE 146984, presented at the 2011 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 30- Nov. 2.
  91. Clark, A. J., Lake, L.W. and Patzek, T.W., “Production Forecasting with Logistic Growth Models,” SPE 144790, presented at the 2011 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 30- Nov. 2.
  90. Gharbarnezhedeh, R., and Lake, L.W., “Applying Fractional Flow Theory to Determine CO<sub>2</sub> Storage in a Deep Saline Aquifer,” SPE 14493, presented at the 2011 Western North American Regional Meeting, Anchorage, AK, May 7-11.
  89. Rivet, S.M., Lake, L.W. and Pope, G.A., "A Coreflood Investigation of Low-Salinity Enhanced Oil Recovery," SPE-134297-PP, presented at the 2010 SPE Annual Technical Conference and Exhibition, Florence, Italy, Sept. 19-22.
  88. Betacourt, S., Dussan, E.B., and Lake, L.W., "Inducing Spherical Flow Conditions with Formation Testers," SPE 133523, presented at the 2010 SPE Annual Technical Conference and Exhibition, Florence, Italy, Sept. 19-22.
  87. Sharma, A., Srinivasan, S., and Lake, L.W., "Classification of Oil and Gas Reservoirs Based on Recovery Factor: A Data-Mining Approach," SPE 130257, presented at the 2010 SPE Annual Technical Conference and Exhibition, Florence, Italy, Sept. 19-22.
  86. Rouzbeh, G., and Lake, L.W., "Simultaneous Water-Gas-Injection Performance under Loss of Miscibility," SPE 129966, presented at the 2010 SPE Improved Oil Recovery Conference, Tulsa, OK, April 24-28.
  85. Carrizales, M, Lake, L.W., and Johns, R.T., "Multiphase Simulation of Heavy Oil by Electromagnetic Heating, SPE 129730, presented at the 2010 SPE Improved Oil Recovery Conference, Tulsa, OK, April 24-28.
  84. Sayarpour, M, Kabir, C.S., Sepehrnoori, K., and Lake, L.W., "Probabilistic History Matching with the Capacitance-Resistance Model in Waterfloods: A Precursor to Numerical Modeling," SPE 129604, presented at the 2010 SPE Improved Oil Recovery Conference, Tulsa, OK, April 24-28.
  83. Carrizales, M. and Lake, L.W., "Two-Dimensional COMSOL Simulation of Heavy-Oil Recovery by Electromagnetic Heating," presented at the 2009 COMSOL user's conference, Boston, MA, Oct.
  82. Weber, D., Edgar, T.F., Lake, L.W., Lasdon, L., Kawas, S., and Sayapour, M., "Improvements in Capacitance-Resistive Modeling and Optimization of Large Scale Reservoirs," SPE 121299, presented at the 2009 SPE Western Regional Meeting, San Jose, CA, March 24-26.
  81. Etehdavakkol, A., Jablonowski, C., and Lake, L.W., "Gas Storage Facility Design Under Uncertainty," SPE 123987, presented at the 2009 SPE Annual Technical Conference and Exhibition, New Orleans, LA, Oct. 4-6.
  80. Rai, K., Johns, R.T., Lake, L.W., and Delshad, M., "Oil Recovery Predictions for Surfactant Polymer Flooding," SPE124001, presented at the 2009 SPE Annual Tech. Conf. and Exhibition, New Orleans La., Oct. 4-6.
  79. Lake, L.W., "Cycling Through a Career" Society of Petroleum Engineers Young Professional, vol. 5, no. 1, Feb. 2009, pp. 12-13. Invited.
  78. Carrizales, M.A., Lake, L.W., and Johns, R.T., "Production Improvement of Heavy-Oil Recovery by Using Electromagnetic Heating," SPE 115723, presented at the 2008 SPE Annual Technical

- Conference and Exhibition, Denver, CO, Sept. 21-24.
77. Jha, R.K., Bryant, S.L., and Lake, L.W., "Investigation of Dispersion in Physically Realistic Network Model," SPE 116961, presented at the 2008 SPE Annual Technical Conference and Exhibition, Denver, CO, Sept. 21-24.
  76. John, A.K., Lake, L.W., Bryant, S.L., and Jennings, J.W., "Investigation of Field Scale Dispersion," SPE113429, presented at the 2008 SPE Improved Oil Recovery Symposium, Tulsa, OK, April 19-23.
  75. Lawal, A.A., Lake, L.W., and Srinivasan, S., "Sensitivity Analysis of Production Forecasts Using Variance Based Methods," SPE 110846, presented at the 2008 SPE Western Regional and Pacific Section AAPG Joint Meeting, Bakersfield, CA, March 31- April 2.
  74. Liang, X, Weber, D.B., Edgar, T.F., Lake, L.W., Sayarpour, M., and Yousef, A.A., "Optimization of Oil Production in a Reservoir Based on Capacitance Model of Production and Injection Rates", *SPE 107713*, presented at the 2007 SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, April 1-3.
  73. Faya, L.C., Lake, L.W. and Lasdon, L.S., "Beyond Portfolio Optimization," SPE 107709, presented at the 2007 SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, April 1-3.
  72. Lasdon, L., Faya, L.C., Lake, L.W., Dyer, J.S. and Chen. W., "Constructing Oil Exploration and Development Project Portfolios Using Several Risk Measures - A Realistic Example," SPE 107708, presented at the 2007 SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, April 1-3.
  71. Hultsch, P., Lake, L.W. and Gilbert, R.B., "Decision and Risk Analysis through the Life of the Field," SPE 107704, presented at the 2007 SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, April 1-3.
  70. Jha, R.K., John, A.K., Bryant, S.L., and Lake, L.W., "Flow Reversal and Mixing," SPE 10305, presented at the 2006 SPE Annual Conference and Exhibition, Sept. 24- 27, San Antonio, TX.
  69. Huh, C. and Lake, L.W., "Enhanced Oil Recovery in Africa," *The Africa Journal*, Nov. - Dec. 2005.
  68. Dawkrajai, P., Lake, L.W., Yoshioka, K., Zhu, D., and Hill A.D., "Detection of Water or Gas Entries in Horizontal Wells from Temperature Profiles," presented at the 2006 SPE/DOE Symposium on Improved Oil Recovery, Tulsa, OK, April 22-26.
  67. Al Yousef, A., Lake, L.W., and Jensen, J.L., "Analysis and Interpretation of Interwell Connectivity from Production and Injection Rate Fluctuations Using a Capacitance Model," SPE99998, presented at the 2006 SPE/DOE Symposium on Improved Oil Recovery, Tulsa, OK, April 22-26.
  66. Jha, R.K., Bryant, S.L., Lake, L.W., and John, A., "Investigation of Pore-Scale (Local) Mixing," SPE 88982, presented at the 2006 SPE/DOE Symposium on Improved Oil Recovery, Tulsa, OK, April 22-26.
  65. Hazlett, R.D., Babu, D.K., and Lake, L.W., "Semi-analytical Streamfunction Solutions on Unstructured Grids for Flow Permeable Media," SPE 95913, presented at the 2005 SPE Annual Technical Conference and Exhibition, Dallas, Texas, Oct. 9-12.
  64. John, A., Torres-Verdin, C., Srinivasan, S., and Lake, L.W., "Seismic Facies Identification Using Simple Statistics, SPE 96577, presented at the 2005 SPE Annual Technical Conference and Exhibition, Dallas, T, Oct. 9-12.
  63. Yoshioka, K., Zhu, D., Hill, A.D., and Lake, L.W., "A Comprehensive Model of Temperature Behavior in Horizontal Wells," SPE 95656, presented at the 2005 SPE Annual Technical Conference and Exhibition, Dallas, TX, Oct. 9-12.
  62. Al-Yousef, A., Gentil, P., Jensen, J.L., and Lake, L.W., "A Capacitance Model to Infer Interwell Connectivity from Production and Injection Rate Fluctuations," SPE 95322, presented at the 2005 SPE Annual Technical Conference and Exhibition, Dallas, TX, Oct. 9-12.
  61. Noh, M.H., Lake, L.W., Bryant, S.L., and Araque-Martinez, A., "Implications of Coupling Fractional Flow and Geochemistry for Injection of CO<sub>2</sub> into Aquifers," SPE 89341, presented at the 2004 SPE/DOE Fourteenth Symposium on Improved Oil Recovery, Tulsa, OK, April 17-21.
  60. Varela, O.J., Torres-Verdin, C., and Lake, L.W., "Assessing the Value of 3D Seismic Data in Reducing Uncertainty in Reservoir Production Forecasts," SPE 77359, presented at the 2002 SPE Annual Technical Conference and Exhibition, San Antonio, TX, Sept. 29 - October 2.
  59. Noh, M.H. and Lake, L.W., "Geochemical Modeling of Fracture Filling," SPE 75245, presented at the 2002 SPE/DOE Thirteenth Symposium on Improved Oil Recovery, Tulsa, OK, April 13-17.
  58. Mahadevan, J., Lake, L.W., and Johns, R.T., "Estimation of True Dispersivity in Field Scale Permeable Media," SPE 75247, presented at the 2002 SPE/DOE Thirteenth Symposium on Improved Oil Recovery, Tulsa, OK, April 13-17.

57. Delliste, A.M., Johns, R.T., Lake, L.W., and Charbeneau, R.J., "Effect of capillary pressure on fluid interfaces," presented at the 1998 ENVIROMeet, Symposium on Environmental Models and Experiments Envisioning Tomorrow, Irvine, CA, July 20-23.
56. Albertoni, A. and Lake, L.W., "Inferring Interwell Connectivity from Well-Rate Fluctuations in Waterfloods," SPE 75225, presented at the 2002 SPE/DOE Thirteenth Symposium on Improved Oil Recovery, Tulsa, OK, April 13-17.
55. "Advancing Our Understanding of Permeability," *Oilfield Review*, Autumn 2001.
54. Solano, R., Johns, R.T., and Lake, L.W., "The Impact of Reservoir Mixing on Recovery in Enriched-Gas Drives Above the Minimum Miscibility Enrichment," SPE 59339, presented at the 2000 SPE/DOE Improved Oil Recovery Conference, Tulsa, OK, April 2 - 5.
53. Obigbesan, A.B., Johns, R.T., Lake, L.W., Bermudez, L., Hassan, M.R., and Charbeneau, R.J., "Analytical Solutions for Free-Hydrocarbon Recovery Using Skimmer and Dual-Pump Wells," SPE 66756, presented at the 2001 SPE/EPA. DOE Exploration and Production Environmental Conference, San Antonio, TX, Feb. 26-28.
52. Chewaroungroaj, J., Varela, O.J., and Lake, L.W., "An Evaluation of Procedures to Estimate Uncertainty in Hydrocarbon Recovery Predictions," SPE 59449, Proceedings of the 2000 SPE Asia Pacific Conference on Integrated Modeling for Asset Management, Yokohama, Japan, April 25-26.
51. Prasad, R.K., Lake, L.W. Jennings, J.W., and Lucia, F.J., "Improving Economics of Production in Heterogeneous Reservoirs by Redirecting Water Injection Patterns," SPE 59692, Proceedings of the 2000 SPE Permian Basin Oil and Gas Recovery Conference, Midland, TX, March 21-23.
50. Alpak, F.O., Lake, L.W. and Embid, S., "Validation of a Modified Carman-Kozeny Equation To Model Two-Phase Relative Permeabilities," SPE 56479, Proceedings of the 1999 SPE Annual Technical Conference and Exhibition, Houston, TX, Oct. 3-6.
49. Araque-Martinez, A., and Lake, L.W. "A Simplified Approach to Geochemical Modeling and Its Effect on Well Impairment," SPE 56678, Proceedings of the 1999 SPE Annual Technical Conference and Exhibition, Houston, TX, Oct. 3-6.
48. Li, H., Zhu, D., Lake, L.W., and Hill, A.D., "A New Method to Interpret Two-Phase Profiles from Temperature and Flowmeter Logs," SPE 56793, Proceedings of the 1999 SPE Annual Technical Conference and Exhibition, Houston, TX, Oct. 3-6.
47. Narayanan, K., White, C.D., Lake, L.W., and Willis, B.J., "Response Surface Methods for Upscaling Heterogeneous Geologic Models," SPE 51923, Proceedings of the 1999 SPE Reservoir Simulation Symposium, Houston, T, Feb. 14-17.
46. Delliste, A.M., Johns, R.T., Lake, L.W., and Charbeneau, R.J., "Effect of Capillary Pressure on Fluid Interfaces," Proceedings of the 1998 EnviroMeet, University of California, Irvine, CA, July.
45. Kapur, L., Lake, L.W., Sepehrnoori, K., Herrick, D.C., Kalkomey, C.T., "Facies Prediction From Core and Log Data Using Artificial Neural Network Technology," Proceedings of the 39th Annual Society of Professional Well Log Analysts, Keystone, CO, May 26-29, 1998.
44. Pizarro, J.O.S. and Lake, L.W., "Understanding Injectivity in Herterogeneous Reservoirs," SPE, Proceedings of the 1998 SPE/DOE Symposium on Improved Oil Recovery, Tulsa, OK, April 19-22.
43. Kapur, L., Lake, L.W., and Sepehrnoori, K., "Modeling Nonlinear Phenomena," SPE 39805, Proceedings of the 1998 SPE Permian Basin Oil and Gas Recovery Conference, Midland, TX, March 25-27.
42. Lake, L.W., "Oilfield Modeling," *Discovery*, 1998, Vol. 15, No. 1, pp. 36-39.
41. Siddiqui, F. and Lake, L.W., "A Comprehensive Dynamic Theory of Hydrocarbon Migration and Trapping," SPE 38682, Proceedings of the 72nd SPE Annual Technical Conference and Exhibition, San Antonio, TX, Oct. 5-6, 1997.
40. Becker, M.R., Lake, L.W., and Tyler, N. "Fractal Properties of Braided Fluvial Deposits for Characterization and Simulation of Reservoir Heterogeneity," SPE 38951, Proceedings of the Fifth Latin American and Caribbean Petroleum Engineering Conference and Exhibition, Rio de Janeiro, Brazil, Aug. 30 – Sept. 3, 1997.
39. Malik, M. A. and Lake, L.W., "A Practical Approach to Scaling-Up Permeability and Relative Permeabilities in Heterogeneous Permeable Media," SPE 38310, Proceedings of the 1997 SPE Western Regional Meeting, Long Beach, CA, June 25-27.
38. Quinn, M.A. Lake, L.W., and Schechter, R.S., "Designing Effective Sandstone Acidizing Treatments Through Geochemical Modeling," SPE 38173, Proceedings of the 1997 SPE European Formation Damage Conference, The Hague, The Netherlands, June 2-3.



37. Campozaña, F.P., Lake, L.W., and Sepehrnoori, K. "How Incorporating More Data Reduces Uncertainty in Recovery Predictions," Proceedings of the 1997 DOE-BDM Oklahoma, Inc.-AAPG sponsored 4th International Reservoir Characterization Conference, Houston, TX, March 2-4.
36. Pizarro, J.S.A. and Lake, L.W., "A Simple Way to Estimate Interwell Autocorrelation," Proceedings of the 1997 DOE-BDM Oklahoma, Inc.-AAPG sponsored 4th International Reservoir Characterization Conference, Houston, TX, March 2-4.
35. Refunjol, B.T. and Lake, L.W., "Reservoir Characterization Based on Tracer Response and Rank Analysis of Production and Injection Rates," Proceedings of the 1997 DOE-BDM Oklahoma, Inc.-AAPG sponsored 4th International Reservoir Characterization Conference, Houston, TX, March 2-4.
34. Rivera, N., Lake, L.W., and Wang, F.P., "Estimating Effective Permeability of Porous Media with Stochastic Permeability Distributions," Proceedings of the 1996 Petroperu Internacional Practicas de Explotacion de Petroleo y Gas Seminar, Lima, Peru, Oct. 28 - 31.
33. Campozaña, F.P., Lake, L.W., and Sepehrnoori, K., "Reservoir Modeling Constrained to Multiple Well-Test Permeabilities," SPE 36569, Proceedings of the 1996 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 6-9.
32. Embid, Sonia M. and Lake, L.W., "Extension of the Carman-Kozeny Equation to Model Relative Two-Phase Permeabilities," SPE 36519, Proceedings of the 1996 SPE Annual Technical Conference and Exhibition, Denver, CO, Oct. 6-9.
31. Savioli, G.B., Falsigno, E.D., Bidner, M.S., and Lake, L.W., "Influencia de la distribución y autocorrelación de permeabilidades en el modelado estocástico de reservorios," Anales del 2o Simposio de Produccion de Hidrocarburos, Instituto Argentino del Petróleo, Mendoza, 12/16 de Junio de 1995, Tomo 2, p. 181-204.
30. Lake, L.W., "Applying Reservoir Characterization Technology," SPE 27967, Proceedings of the 1994 University of Tulsa/SPE Centennial Petroleum Engineering Symposium, Tulsa, OK, Aug. 29-31.
29. Araque, A. and Lake, L.W., "Sweep Efficiency Estimates for Reservoirs with Nonuniform Layers," SPE 26793, Proceedings of the III LACPEC (Third Latin American and Caribbean Petroleum Engineering Conference), Buenos Aires, Argentina, April 26-29, 1994.
28. Kumar, V. and Lake, L.W., "Transverse Dispersion in Uncorrelated Heterogeneous Media," SPE 27052, Proceedings of the III LACPEC (Third Latin American and Caribbean Petroleum Engineering Conference), Buenos Aires, Argentina, April 26-29, 1994.
27. Panda, N. and Lake, L.W., "Parallel Simulated Annealing for Stochastic Reservoir Modeling," SPE 26418, Proceedings of the 1993 SPE Annual Technical Conference and Exhibition, Houston, TX, Oct. 3-6.
26. Rouse, B., Hiebert, F., and Lake, L.W., "Laboratory Testing of a Microbial Enhanced Oil Recovery Process," SPE 24819, Proceedings of the 1992 SPE Annual Technical Conference and Exhibition, Washington, DC, Oct. 4-7.
25. Ravnaas, R.D., Strickland, R.F., Yang, A.P., Malik, M.A., Prezbindowski, D.R., Mairs, T., and Lake, L.W., "Three-Dimensional Conditional Simulation of Schneider (Buda) Field, Wood County, Texas," SPE 23970, Proceedings of the 1992 SPE Permian Basin Oil and Gas Recovery Conference, Midland, TX, March 18-20.
24. Schmidt, R.L., Venuto, P.B., and Lake, L.W., "A Niche for Enhanced Oil Recovery in the 1990s," *Oilfield Review*, January 1992.
23. Ingsøy, P., Gauchet, R., and Lake, L.W., "A New Approach to Pseudo-functions for Multiphase Flow in Stratified Porous Media," Proceedings of the 1991 European Conference on Improved Oil Recovery, Stavanger, Norway, May 21-23.
22. Johansen, T., Tveito, A., Winther, R., and Lake, L.W., "A Theory of Multicomponent Chromatography with Application to Polymer Flooding," Proceedings of the 1991 European Conference on Improved Oil Recovery, Stavanger, Norway, May 21-23.
21. Kasap, E., Shook, G.M., and Lake, L.W., "Pseudofunctions - The Key to Practical Use of Reservoir Description," with *North Sea Oil & Gas Reservoirs - II*, Proceedings of the 2nd North Sea Oil and Gas Reservoirs Conference organized and hosted by the Norwegian Institute of Technology, A.T. Buller, E. Berg, O. Hjelmeland, J. Kleppe, O. Torsæter, and J.O. Aasen, eds., Graham & Trotman, London, 1990.
20. Bhuyan, D., Pope, G. A., and Lake, L.W., "Simulation of High-pH Coreflood Experiments Using a Compositional Chemical Flood Simulator," SPE 21029, Proceedings of the 11th SPE International Symposium on Oil Field Chemistry, Anaheim, CA, Feb. 20-22, 1991.
19. Lake, L.W., "Marriage of Geology and Reservoir Engineering," *Numerical Simulation in Oil Recovery*,

- Vol. 11, Institute for Mathematics and Applications, Springer-Verlag, 1988.
18. Jensen, J.L. and Lake, L.W., "Optimization of Regression Based Permeability Predictions," Proceedings of the 10th Formation Evaluation Symposium of the Canadian Well Logging Society, Calgary, Alberta, Canada, Sept. 29 – Oct. 2, 1985.
  17. Paul, G.W., Gould, T.W., and Lake, L.W., "Simplified Predictive Model for CO<sub>2</sub> Miscible Flooding," SPE 13238, Proceedings of the 1984 SPE Annual Technical Fall Conference and Exhibition, Houston, TX, Sept. 16-19.
  16. Jones, Jr., R.S., Pope, G.A., and Lake, L.W., "A Predictive Model for Water and Polymer Flooding," SPE 12653, Proceedings of the 1984 SPE/Department of Energy Fourth Joint Symposium on Improved Oil Recovery, Tulsa, OK, April 16-18.
  15. Guilinger, T.R., Schechter, R.S., Price, J.G., Bobeck, P., Tweeton, D., and Lake, L.W., "Minitest of an *In Situ* Uranium Leach Solution," preprint 84-80, Proceedings of the 1984 Annual Society of Mining Engineers Meeting, Los Angeles, CA, Feb. 26 - March 1.
  14. Thele, K.J., Sephehrnoori, K., and Lake, L.W., "A Comparison of Three Equation of State Compositional Simulators," SPE 12245, Proceedings of the Seventh SPE Symposium on Reservoir Simulation, San Francisco, CA, Nov. 16-18, 1983.
  13. Lake, L.W., "A Technical Survey of Micellar-Polymer Flooding," presented at EOR--Enhanced Oil Recovery, A Symposium for the Independent Producer, Institute for the Study of Earth and Man, Dallas, TX, Nov. 9-10, 1983.
  12. Walsh, M.P., Rouse, B.A., Senol, N., Pope, G.A., and Lake, L.W., "Chemical Interactions of Aluminum-Citrate Solutions with Formation Minerals," SPE 11799, Proceedings of the 1983 SPE International Symposium on Oil Field and Geothermal Chemistry meeting, Denver, CO, June 1-3.
  11. Paul, G.W., Lake, L.W., and Pope, G.A., "Simplified Predictive Model for Micellar-Polymer Flooding," SPE 10733, Proceedings of the 1982 SPE California Regional Meeting, San Francisco, CA, March 24-26.
  10. Yokoyama, Y., and Lake, L.W., "The Effects of Capillary Pressure on Immiscible Displacements in Stratified Porous Media," SPE 1012, Proceedings of the 1981 SPE/American Institute of Mechanical Engineers (AIME) Fall Technical Conference and Exhibition, San Antonio, TX.
  9. Zapata, V.J. and Lake, L.W., "A Theoretical Analysis of Viscous Crossflow," SPE 1011, Proceedings of the 1981 SPE/American Institute of Mechanical Engineers (AIME) Fall Technical Conference and Exhibition, San Antonio, TX.
  8. Kabir, M.I., Schechter, R.S., and Lake, L.W., "A Mini Field Test of *In Situ* Uranium Leaching: Interpretation of Results," Proceedings of the 2nd Society of Mining Engineers/SPE PE International Solution Mining Symposium, Denver, CO, Nov. 1981.
  7. Tatom, A., Schechter, R.S., and Lake, L.W., "Factors Influencing the In Situ Acid Leaching Rate of Uranium Ores," Proceedings of the 2nd Society of Mining Engineers/SPE International Solution Mining Symposium, Denver, CO, Nov. 1981.
  6. Wang, B., Pope, G.A., and Lake, L.W., "The Development and Application of a Streamline Micellar/Polymer Simulator," SPE 10290, Proceedings of the 56th Annual Fall Technical Conference and Exhibition of the SPE/AIME, San Antonio, TX, Oct. 5-7, 1981.
  5. Pope, G.A. and Lake, L.W., "Status of Micellar Polymer Field Tests," *Petroleum Engineer International*, November 1979, pp. 38-60.
  4. Lake, L.W., "Enhanced Oil Recovery," *Texas Business Review*, The Bureau of Business Research, The University of Texas at Austin, September-October 1979, p. 159.
  3. Stock, L.G., Lawson, J.B., and Lake, L.W., "A Screening Estimation of Chemical Flood Recovery Efficiency and Chemical Requirements," SPE-7069, Proceedings of the 1978 SPE Improved Oil Recovery Symposium, Tulsa, OK, April 16 - 19.
  2. Armeniades, C.D. and Lake, L.W., "Structure-Property Relations for Aortic Tissue," *Transactions of the American Society for Artificial Internal Organs*, No. 18, 1973, pp. 202-208.
  1. Armeniades, C.D., Missirles, Y.F., Kennedy, J.H., and Lake, L.W., "Histologic Origin of Aortic Tissue Mechanics: The Role of Collagenous and Elastic Structures," *Transactions of the American Society for Artificial Internal Organs*, No. 22, 1973, pp. 319-339.

### C. Books, Chapters of Books, Editor of Books

**Authored or Co-Authored:**

Fundamentals of Enhanced Oil Recovery with Russell T. Johns, Gary A. Pope and William R. Rossen, SPE textbooks. 2014 (revision of Enhanced Oil Recovery listed below).  
Primary Hydrocarbon Recovery, with Mark P. Walsh, Elsevier, 2004.  
Geochemistry and Fluid Flow, with S.L. Bryant and A.N. Araque-Martinez; Elsevier, 2002.  
Statistics for Petroleum Engineers and Geoscientists, with J.L. Jensen, P.M.W. Corbett and D.J. Goggin; Prentice-Hall, Inc., 1997; 2nd edition by Elsevier, 2001, reprinted 2002  
Enhanced Oil Recovery, Prentice-Hall, Inc., 1989.

**Edited:**

Petroleum Engineering Handbook, Editor in Chief  
 Vol. I. General Engineering, John R. Fanchi, Editor, 2006  
 Vol. II. Drilling Engineering, Robert F. Mitchell, Editor, 2006  
 Vol. III. Facilities and Construction Engineering, Kenneth E. Arnold, Editor, 2007  
 Vol. IV. Production Operations Engineering, Joe Dunn Clegg, Editor, 2007  
 Vol. V. Reservoir Engineering and Petrophysics, Edward D. Holstein, Editor, 2007  
 Vol. VI. Emerging and Peripheral Technologies, H.R. Warner, Jr., Editor, 2007  
Reservoir Characterization II, edited with H.B. Carroll and T.C. Wesson, Academic Press, 1991.  
Reservoir Characterization, chaired SPE editorial committee, 1989.  
Reservoir Characterization, edited with H. B. Carroll, Academic Press, 1986.

**Chapters:**

Lake, Larry W., Mohamad Lotfollahi, and Steve L. Bryant, "CO<sub>2</sub> Enhanced Oil Recovery Experience and its Messages for CO<sub>2</sub> Storage," In Panewell, Pania and Anastasia G. Ilgen (eds.), *Science of Carbon Storage in Deep Saline Formations*. Chennai: Elsevier, 2019, p. 11

Kumar, A., Noh, M., Pope, G., Seperhnoori, K., Bryant, S. and Lake, L., "Simulating CO<sub>2</sub> Storage in Deep Saline Aquifers", *Carbon Dioxide Capture for Storage in Deep Geologic Formations - Results from the CO<sub>2</sub> Capture Project*, Chapter 13, Vol. 2, Thomas, D., Ed., Elsevier, 2005.

Bryant, S. and Lake, L., "Effect of Impurities on Subsurface CO<sub>2</sub> Storage Processes", *Carbon Dioxide Capture for Storage in Deep Geologic Formations - Results from the CO<sub>2</sub> Capture Project*, Ch. 18, Vol. 2, Thomas, D., ed., Elsevier, 2005.

Jaramillo-Mendez, N., Embid-Droz, S., and Lake, L.W., "Estimation of Capillary Pressure and Relative Permeability Using Artificial Neural Networks," *Proceedings of the Artificial Neural Networks in Engineering Conference (ANNIE '98)*, Vol. 8: *Smart Engineering Systems: Neural Networks, Fuzzy Logic, Evolutionary Programming, Data Mining, and Rough Sets*, C.H. Dagli, M. Akey, A.L. Buczak, O. Ersoy, and B.R. Fernandez, eds., ASME Press, 1998.

Malik, M. and Lake, L.W., "Modeling Fluid Flow Through Geologically Realistic Media," in *Geological Society Special Publication: Characterisation of Fluvial and Aeolian Reservoirs*, C.P. North and D.J. Prosser, eds., The University of Aberdeen, 1993.

Datta Gupta, A., Pope, G.A., and Lake, L.W., "Heterogeneity and Mixing in Flow Through Porous Media," with *Proceedings, Computational Methods in Water Resources IX*, Vol. 2: *Mathematical Modeling in Water Resources*, T.F. Russell, R.E. Ewing, C.A. Brebbia, W.G. Gray, G.F. Pinder, eds., Computational Mechanics Publications and Elsevier Science Publishers, June 1992.

Lake, L.W., "Chemical Flooding," Chapter 47 in *Petroleum Engineers Handbook*, September 1987, 47-1 – 47-26.

Lasseter, T.J., Lake, L.W., and Waggoner, J.R., "Reservoir Heterogeneities and Their Influence on Ultimate Recovery," *Reservoir Characterization*, L.W. Lake and H. B. Carroll, Jr., eds., 1986, pp. 545-559.

## D. Technical Reports

- Lake, Larry W. (director) and several others, Center for Subsurface Energy Security, Final Report, March 2019.
- Cooper, Scott P., Gregory J. Elbring, Larry W. Lake, Mary F. Wheeler, Rafael Banchs, Bob Gilbert, Blake E. Jakaboski, Jim Jennings, Chris Jablonowski, Hector Klie, John C. Lorenz, Seethambal S. Mani, Randy A. Normann, Emilo J. Nunez, Michael Rightley, Adolfo Rodriques, Snul G. Thomas, Bart G. van Beoeman Waanders and Chester J. Weiss, "Analysis of Real-Time Reservoir Monitoring: Reservoirs, Strategies, and Modeling." Sandia Report, SAND2006-7503, Oct. 2007.
- Charbeneau, R.J., Johns, R.T., Lake, L.W., McAdams, M.J., III, "Free-Product Recovery of Petroleum Hydrocarbon Liquids," Report for the American Petroleum Institute (June 1999).
- Lake, L.W. and Kapur, L., "A Systematic Procedure for Reservoir Characterization," Category A Research, Sixteenth Annual Report, Enhanced Oil and Gas Recovery Research Program, Center for Petroleum and Geosystems Engineering, The U. of Texas, Austin (March 1999).
- Pizarro, J., Kapur, L., Embid, S., and Lake, L.W., "A Systematic Procedure for Reservoir Characterization," Category A Research, Fifteenth Annual Report, Enhanced Oil and Gas Recovery Research Program, Center for Petroleum and Geosystems Engineering, The U. of Texas, Austin (March 1998).
- Campozana, F., Embid, S., Pizarro, J., Refunjol, B., and Lake L.W., "A Systematic Procedure for Reservoir Characterization," Category A Research, Fourteenth Annual Report, Enhanced Oil and Gas Recovery Research Program, Center for Petroleum and Geosystems Engineering, The U. of Texas, Austin (March 1997).
- Lake, L. "Application of Geochemical Modeling to Well Treatments," Stimulation, Logging, and Formation Damage 1996 Research Program, The U. of Texas, Austin (January 1997).
- Campozana, F., Embid, S., Kawahara, H., Malik, M., Pizarro, J., Rivera, N., and Lake L.W., "A Systematic Procedure for Reservoir Characterization," Category A Research, Thirteenth Annual Report, Enhanced Oil and Gas Recovery Research Program, Center for Petroleum and Geosystems Engineering, The U. of Texas, Austin (March, 1996) 220-408.
- Campozana, F., Li, D., Malik, M., Panda, M., and Lake L.W., "A Systematic Procedure for Reservoir Characterization," Category A Research, Twelfth Annual Report, Enhanced Oil and Gas Recovery Research Program, Center for Petroleum and Geosystems Engineering, The U. of Texas, Austin (March, 1995) 1-166.
- Pope, G.A., Schechter, R.S., and Lake, L.W., U.S. "Reservoir Characterization and Enhanced Oil Recovery Research," Final Report for September 1989 to February 1991, Department of Energy/Bartlesville Project Office, DE-FG-89BC14251, March 1993.
- Pope, G.A. Schechter, R.S. and Lake, L.W., "Reservoir Characterization and Enhanced Oil Recovery Research," Annual Report for September 1988 to August 1989, U.S. Department of Energy/Bartlesville Project Office, DE-FG-89BC14251, March 1992.
- Lake, L.W., Short Course Manual, *Reservoir Characterization*, SPE, 1996.
- Kocurek, G.A. Miller, M.A. and Lake, L.W., "A Systematic Procedure for Reservoir Characterization," Annual Report for October 1, 1986 to September 30, 1987, U.S. Department of Energy/Bartlesville Project Office, AC19-85BC10849, November 1988.
- Kocurek, G.A. Miller, M.A. and Lake, L.W., "A Systematic Procedure for Reservoir Characterization," Annual Report for October 1, 1985 to September 30, 1986, U.S. Department of Energy/Bartlesville Project Office, AC19-85BC10849, December 1987.
- Scott, A.J. Kocurek, G.A. and Lake, L.W., "Reservoir Characterization for Numerical Simulation," Final Report, U. S. Department of Energy/Bartlesville Project Office, DOE/BC/10744-8, June 1986.
- Schechter, R.S. Guilinger, T.R. Price, J.G. Bobeck, P. and Lake, L.W., "Development of Environmentally Attractive Leachants. Volume IV, A Minitest of an *In-Situ* Uranium Leach Solution," Bureau of Mines, U.S. Department of the Interior, July 1985.
- Manning, R.K. Pope, G.A. and Lake, L.W., "A Technical Survey of Polymer Flooding Projects," sponsored by the Department of Energy/Bartlesville Technical Center, January 1985.
- Sepehrnoori, K. Schneider, R.R. Lau, K. and Lake, L.W., "Geopressured-Geothermal Information System Well and Reservoir Database," published as a Center for Energy Studies Report, Summer 1984.
- Schechter, R.S. Guilinger, T.R. and Lake, L.W., "Development of Environmentally Attractive Leachants. An Experimental and Theoretical Study of Uranium and Pyrite Dissolution Kinetics, Volume II"



- Bureau of Mines, U.S. Department of the Interior, February 1984.
- Lake, L.W., "Selection of Reservoirs Amenable to Micellar Flooding," Final Report, October 1978-December 1982, sponsored by the U.S. Department of Energy, August 1983.
- Schechter, R.S. Kabir, M.I. and Lake, L.W., "Development of Environmentally Attractive Leachants. Volume I, A Minitest for *In Situ* Uranium Leaching," sponsored by the U.S. Bureau of Mines, HO282016, January 1983.
- Schechter, R.S., Lake L. W. and Walsh, M. P., "Development of Environmental Attractive Leachants, Volume III, sponsored by the U.S. Bureau of Mines, 1985.
- Pope, G.A. Carey, G.F. Sepehrnoori, K. and Lake, L.W., "Isothermal, Multiphase, Multicomponent Fluid-Flow in Permeable Media. Part I: Description and Mathematical Formulation," Center for Enhanced Oil and Gas Recovery Research, 1981.

## ORAL PRESENTATIONS:

### A. Professional Society Presentations

- Pan, Zhou, Andrew Yang and Larry W. Lake, "Listening to the Data: An Analysis of the Oil and Gas Journal Database, presented at the 2014 Improved Oil Recovery Symposium, April, Tulsa, OK.
- Lake, Larry W., and Robert Gilbert, "Estimating Extreme Events," presented at the 2010 INFORMS Annual Meeting, Austin, TX, September.
- Rivet, S.M., L.W. Lake and G.A. Pope. "A Coreflood Investigation of Low-Salinity Enhanced Oil Recovery," SPE-134297-PP, presented at the 2010 Annual Technical Conference and Exhibition of the SPE, Florence, Italy, Sept. 19-22.
- Li, H., D. Zhu, L.W. Lake, and A.D. Hill, "A New Statistical Method for Interpreting Production Logs," paper SPE 71729, presented at the 2001 SPE Technical Conference and Exhibition, New Orleans, LA, Sept. 30 - Oct. 3.
- Chewaroungroj, J., Varela, O.J., and Lake, L.W., "An Evaluation of Procedures to Estimate Uncertainty in Hydrocarbon Recovery Predictions," paper SPE 59449 presented at the 2000 SPE Asia Pacific Conference on Integrated Modeling for Asset Management, Yokohama, Japan, April 25-26.
- Lake, L.W., "What We've Learned from All Those Outcrop Studies," presented at the Paris 1992 Reservoir Characterization Workshop of the European Association of Petroleum Geoscientists and Engineers, May 30.
- Lake, L.W., "Characterization and Modeling of Lateral Heterogeneity in Reservoirs," presented at the Paris 1992 Reservoir Characterization Workshop of the European Association of Petroleum Geoscientists and Engineers, May 30,.
- Waggoner, J. and Lake, L.W., "A Detailed Look at Simple Viscous Fingering," presented at the II Simposio Internacional Sobre Recuperacion Mejorada de Crudo Trabajos Tecnicos, Maracaibo, Venezuela, February 24-27, 1987.

### B. Invited Lectures

2023

Interpore Time Capsule, January,  
<https://www.interpore.org/new-interpore-time-capsule-prof-larry-lake/>

2022

EOR to CCS: the Maturation and Migration of a Technology, SPE Gulf Coast Section, online January  
 EOR to CCS: the Maturation and Migration of a Technology, University of Oklahoma, April  
 EOR to CCS: the Maturation and Migration of a Technology, Energy and Earth Resources Lecture, April  
 EOR to CCS: the Maturation and Migration of a Technology, Energy and Earth Resources Lecture, CSEE Webinar, May  
 EOR Modeling, IEA EOR TCP, Bogota, Columbia, September

- Low Order Models, SPE Webinar, September
- 2021  
Geology and Geoscience Webinar, Delft, May  
EOR to CCS: the Maturation and Migration of a Technology, SPE Gulf Coast Section' KAUST, Saudi Arabia, November
- 2020  
Energy Institute Panel Discussion, February  
ATCE SPE, Houston, November
- 2019  
SPE Advanced Technology Workshop, San Antonio, TX, November.  
SIPES luncheon presentation, Ft. Worth, TX, December
- 2018  
Explore UT, March  
BASF Workshop, polymer flooding, Frankfurt, Germany, May  
Petroleum Engineering Education Forum, Katy, TX, August
- 2017  
Departmental seminar, University of Houston, January  
Petroleum Engineering Club of Dallas, February  
PES Conference, Dubrovnic, Croatia, May  
DHRTC Technology Conference 2017, Coldover, Denmark
- 2016  
Mechanical engineering seminar, Arizona State University, September.  
TOPCORP, August, Bakersfield  
Explore UT, March  
The Future of Energy in Trinidad and Tobago, Pt. Lisas, Trinidad, March  
ARMA/AAPG SedHeat Workshop, Houston  
Maurice Bourrel retirement party, Houston  
Delft Summer School, lecturer and participant, Delft, the Netherlands
- 2015  
General Electric, Oklahoma City, August  
Sandia National Laboratories, June  
Rocky Mountain Mineral Legal Forum, San Antonio, May  
Arizona State University (2 presentations), March  
Repsol EOR Workshop, Madrid, March.  
Explore UT, March  
Departmental Seminar, Brigham Young University, January  
Departmental Seminar, University of Tulsa, January
- 2014  
Explore UT, March  
Departmental Seminar, Texas Tech University, April  
SPE/SPWLA, AAPG, EAPG Summer Research Program, San Diego, August  
Shell Production Technology Team Building Session, Houston, September  
100<sup>th</sup> Anniversary of Shell Research, September, Amsterdam
- 2013  
QRI, Houston, January  
Edmonton SPE section lunch talk, March  
CCUS Symposium, US Department of Energy, Midland, March

SPE Gulf Coast Section, Houston, April  
Departmental Seminar, U. of Houston, April

2012

Saudi Arabian Section of SPE, January  
Explore UT, March  
Improved Oil Recovery Symposium, Tulsa, April  
Graduate Student Research Presentation, UT, April  
Uncertainty and Geosciences, 3 times, UT, August  
Enhanced Oil Recovery Institute, Jackson Hole, Wyoming, September  
Praxis Global, Cancun, Mexico, September  
    Simple Models for EOR  
    Retrospective of the Oil Business  
UT Graduate Engineering Council, October

2011

Saudi Aramco, January  
Advanced Energy Consortium, Austin, February  
Texas Energy Forum, March  
Colorado School of Mines, April  
Zander/ISEE Distinguished Lecture, University of Calgary, April  
    Scales, Scaling and Scale up  
    What We Know About EOR Today  
Segundas Jornadas YPF de Ingenieria de Reservoiros y Petrofisica, Keynote address, May  
Enhanced Oil Recovery Institute, Jackson Hole, Wyoming, September  
Midwestern Governor's Conference, Houston, October  
UT American Society of Engineering Education, October  
UK Council Meeting, December

2010

UT American Society of Engineering Education, January  
Rice/UH Student SPE Chapter, February  
Explore UT, March  
Improved Oil Recovery Symposium, Jackson Hole, Wyoming, September  
Society of Independent Professional Earth Scientists, Corpus Christi, October  
Departmental Seminar, University of Kansas, Lawrence, Kansas, December  
Lunch Speaker, CO<sub>2</sub> Conference, Midland, Texas

2009

Explore UT, March  
Platt. Sparks and Associates, March 31  
Lyman Handy Seminar, University of Southern California, April 2  
TU Delft, July  
Chevron Lunch and Learn, August

2008

Presentations in Saudi Arabia  
Keynote talk at Oil and Gas Exploration and Production Conference, Riyadh, Jan. 5  
Panel discussion, OGEP, Riyadh, Jan. 6  
Presentation at Saudi Aramco, Dhahran, Jan. 7  
SPE Dinner Presentation, Dhahran, Jan. 7  
Distinguished Lecture Series, Texas A and M University, March  
Explore UT, March  
Keynote talk at Enhanced Oil Recovery Institute Conference, U. of Wyoming, September  
Keynote talk at Advanced Technology Workshop of SPE, Houston, November

2007

Explore UT, March  
Departmental seminar, Texas A and M University, April  
Graduate seminar Penn State University May  
Presentation at Ecuadorian Oil Conference, August  
Society of Exploration Geologists, September

2006:

Explore UT, March  
International Association of Mathematical Geologists Distinguished Lecturer  
Sandia National Labs, April 12  
New Mexico Tech, April 11, (2 presentations)  
Midland SPE Section, March 15  
Florida State University, Feb. 23  
Florida International University Feb. 24  
Memorial University, St. John, Newfoundland, May 29  
Geological Survey of Canada, Ottawa, May 30  
Geological Survey of Canada, Calgary, Alberta, May 31  
Alberta Research Council, Edmonton, Alberta, June 1  
University of British Columbia, Vancouver, British Columbia, June 2  
Texas A and M University, College Station, October 10  
Occidental Petroleum, Houston, November

2005:

SPE Advanced Technology Workshop (2 presentations), Veracruz, June  
Improved Oil Recovery Meeting, Budapest, April  
University of Miskoltz, Hungary, April  
Stanford University seminar, February

2002:

Graduate seminar series, University of Tulsa, March  
Petroleum Engineering Department seminar, University of Oklahoma, February

2001:

Departmental seminar, Texas A and M, September  
Jornada de Enhanced Oil Recovery, Puerto la Cruz, Venezuela, May  
V Congress of Venezuelan Chemical Society, April  
SPWLA monthly meeting, Caracas, March

2000:

Schlumberger Stochastic Modeling Workshop, December  
University of Southern California, November  
University of Houston, October  
INTEVEP tracer conference, Los Teques, October  
Sun City (Arizona) Engineers Club, January  
British Petroleum, Houston, TX, January

1999:

UT Interactive, February

1998:

Marathon Oil Company, Littleton, CO, July  
ARCO, Plano, TX, July and April

1997:

Rice University, Dean's Distinguished Lecture Series, Houston, TX, November

SPE Improved Recovery Forum, Houston, TX, November  
 Oil & Gas Decision and Risk Analysis Symposium, Austin, TX, November  
 Petroleum Technology Transfer Council, Focused Technology Workshop, Hobbs, NM,  
 September  
 Conoco, Houston, TX, August  
 Amoco, Houston, TX, August  
 Shell, Houston, TX, August  
 Exxon, Houston, TX, July  
 BP Exploration, Houston, TX, July  
 Chevron, La Habra CA, July  
 Texaco, Houston, TX, July  
 Marathon Oil Company, Littleton, CO, June  
 Burlington Resources, San Antonio, TX, May  
 ARCO, Dallas, TX, May  
 BDM-Oklahoma, Houston, TX, March  
 Mobil, Dallas, TX, January

1996:

Exxon, Montgomery, TX, November  
 Texas A&M University, College Station, TX, March  
 Stanford University, Palo Alto, CA, February  
 ARCO, Plano, Texas, TX, February

1995:

Shell, Houston, Texas, October  
 University of Michigan, Ann Arbor, MI  
 Anadarko, Houston, TX, June

1994:

YPF S.A., Buenos Aires, December  
 Geoscience Institute, UT, November  
 Tulsa Centennial Celebration, August  
 Gordon Research Conference, August  
 SPE Distinguished Lectures: Europe, North Africa, January; South America, March

1993:

University of Arizona, November

1992:

Gordon Research Conference, August  
 EAPG Meeting, Paris, June  
 Heriot-Watt University, Edinburgh, May  
 Schlumberger, Ridgefield CT, January 1991  
 Austin Section Meeting of the SPE, October 15  
 ARCO, Matrix Stimulation Seminar, Dallas, TX, September  
 The Society of Core Analysts' Fifth Annual Technical Conference, San Antonio, TX,  
 August 20  
 Chevron Overseas Petroleum Inc., Eolian Workshop, Vernal, UT, August  
 Dynamic Geologic Modeling Conference, Texaco, Houston, TX, April  
 Annual Convention of the American Association of Petroleum Geologists, Dallas, TX, April  
 Department of Applied Mathematics, Rice University, Houston, TX, March  
 Conference on Characterization of Fluvial and Aeolian Reservoirs, University of  
 Aberdeen, UK, March

1990:

Sandia National Laboratory Colloquium, Albuquerque, NM, October

- Archie Conference on Petrophysics, Houston, TX, October  
Fifth Joint Canadian/American Conference on Hydrogeology, Calgary, September  
American Geophysical Union, Baltimore, MD, May  
SPE Study Group, College Station, TX, March  
American Association for the Advancement of Science Annual Conference, New Orleans, LA, February  
Borehole Geophysics Conference, Society of Exploration Geophysicists and the University of Arizona, Tucson, AZ February
- 1989:  
New Mexico Institute of Mining and Technology, Socorro, NM, October  
Banff Conferences on Earth Sciences (4 lectures), Banff, Alberta, September  
Zycor Corporation User's Group Conference, Austin, TX, May  
Rogaland University, Stavanger, Norway, May  
Norsk Hydro Oil Company, Bergen, Norway, May  
North Sea Oil and Gas Reservoirs, Trondheim, Norway, May  
Shell Development Co., Houston, TX, March
- 1988:  
Lawrence Livermore National Laboratory, Livermore, CA, September  
Amoco Production Research, Tulsa, OK, September  
Amoco Production Company, Denver, CO, July  
Mobil Oil Company, Dallas, TX, June  
Heriot-Watt University, Edinburgh, Scotland, May  
University of Wyoming, Laramie, WY, May  
Improved Oil Recovery Symposium, Tulsa, OK, February  
Schlumberger Research, Austin, TX, February  
Guest lecturer in geochemistry course, UT Geology Department, February  
SPE Local Section, Fort Worth, TX, February
- 1987:  
Engineering Foundation Conference, Santa Barbara, CA, October  
American Chemical Society, Ann Arbor, MI, June  
Energy Research Advisory Board, Dallas, June  
Mathematical Sciences Research Institute, Berkeley, CA, May  
American Geophysical Union, Baltimore, MD, May  
Intevep, Los Teques, Venezuela, February
- 1986:  
Institute for Mathematics and Applications, Minneapolis, MN, December  
DGMK, German Oil and Gas Society, September  
Institute for Energy Technology, Oslo, Norway, September  
SPE Local Section, Copenhagen, Denmark, August  
Norwegian Petroleum Directorate, Stavanger, Norway, August  
Energy Research Advisory Board, Bartlesville, OK, June  
Research presentations at Amoco, UNOCAL, Chevron, and Mobil Oil
- 1985:  
American Geophysical Union, May, Baltimore, MD
- 1984:  
SPE Forum Series, August
- 1981:  
Fossil Energy Research Working Group, La Jolla, CA, September  
Gordon Research Conference presentation, Summer

1980:

- University of Houston seminar, Summer
- Gordon Research Conference presentation, Summer

## GRANTS AND CONTRACTS:

- Center for Frontiers of Energy Safety and Security, co-director, 2015-2018
- Center for Petroleum Asset Risk Management, 2004- present
- American Chemical Society Grant, the Petroleum Research Fund, 1998 - 2000
- Research grant from BHP Petroleum Inc. (with Roger T. Bonnecaze), 1998 - 2001
- Texas Higher Education Coordinating Board, Texas Research and Technology Program grant, 1998 - 1999
- Industrial Consortium, Stimulation, Logging, and Formation Damage Research Program, 1996 - 1997
- Research grant from Intevep, 1996 - 1999
- Co-principal investigator (with Roger T. Bonnecaze), Mobil, 1996 - 1998
- Co-principal investigator (with W.R. Rossen), BDM-Oklahoma, Inc., 1996 - 1998
- Research grant from Amoco, 1993 - 1994, 1994 - 1995
- Research grant from R.W. Tillman, 1991 - 1993
- Research grant from the Office of the Governor, Annex II - Reservoir Characterization and Enhanced Oil Recovery, 1988 - 1989
- Research grant from Research and Engineering Consultants, Inc., 1989
- Texas Advanced Technology Program grant, 1988 - 1989
- Cray Computing Research Grant, 1988
- Co-principal investigator (with G.A. Kocurek), U.S. Department of Energy grant, 1985 - 1988
- Co-principal investigator (with G.A. Pope) of U.S. Department of Energy grant, 1985 - 1988
- Co-principal investigator (with A. Scott) of U.S. Department of Energy grant, 1982 - 1984
- Co-founding member (with five others) of Center for Enhanced Oil and Gas Recovery Research
- Co-founder (with R. S. Schechter) of the University of Texas In Situ Uranium Leaching Consortium (Petroleum Engineering)
- Co-principal investigator (with R.S. Schechter) on U.S. Bureau of Mines grant, 1980 - 1984
- Industrial research grants from Shell, Core Labs, Intercomp, Arco, Conoco, Mobil and Tenneco, 1978 - present

## ABSTRACTS:

- Ruiz, Maraggi Leo, Larry W. Lake, and Mark P. Walsh, "A Two-Phase Non-Linear One-Dimensional Flow Model for Reserves Estimation in Tight Oil Reservoirs Using Scaling Principles," Extended Abstract, International Association of Mathematical Geologists, Penn State, August, 2019.
- Salazar, Jose and Larry W. Lake, "Physical Meaning of the Koval Factor," Extended Abstract, International Association of Mathematical Geologists, Penn State, August, 2019.
- Sevougian, S.D., Schechter, R.S., and Lake, L.W., "The Effect of Partial Local Equilibrium on Mineral Zonation," EOS, Transactions, American Geophysical Union, Vol. 72, No. 17, April 23, 1991, Supplement, p. 111.
- Miller, C., Collins, R.E., Rouse, B.A., and Lake, L.W., "Molecular Diffusion Within Aquitard Rocks," EOS, Transactions, American Geophysical Union, Vol. 72, No. 17, April 23, 1991/Supplement, p. 109.
- Young, G.R., Panda, M. N., and Lake, L.W., "Analyzing Permeability Anisotropy with a Minipermeameter," EOS Transactions, American Geophysical Union, Vol. 71, No. 17, April 24, 1990, p. 520.
- Lake, L.W., "Simulating Fluid Flow Through a Geologically Realistic Permeable Medium," EOS, Transactions, American Geophysical Union, Vol. 71, No. 17, April 24, 1990, p. 508.
- Hiebert, F., Oppenheimer, C.H., and Lake, L.W., "Laboratory Investigation of Bacteria-Mineral Interactions in a Simulated Subsurface Environment," EOS Transactions, American Geophysical Union, Vol. 71, No. 17, April 24, 1990, p. 503.
- Lake, L.W., "How Fast Will Chemicals Move Through Rocks? A Study of Oil Reservoirs and Aquifers," Session 18-5, American Association for the Advancement of Science Annual Meeting, New Orleans, February 15 - 20, 1990.



**PATENTS:**

- Ogunyomi, Babafemi, and Lake, L. W., "Closed Loop Enhanced Oil Recovery, WO2018/071378 AI, April 2018..
- Kocurek, G.A. Goggin, D.J. Horne, P. Chandler, M.A., and Lake, L.W., "Electronic Field Permeameter," U.S. No. 4,864,845, September 12, 1989.
- Hill, H.J. Reisberg, Helfferich, F. G., Pope, G.A., and Lake, L.W., "Ion Exchange Controlled Chemically Aided Waterflood Process," U.S. No. 4,074,755, February 21, 1978.

**Ph.D. SUPERVISIONS COMPLETED:**

- Vinegar, Eva Gayle, "Petrophysical and Geophysical Study of a Dual-Porosity Chalk with Type-II Kerogen During Early-Stage Organic Maturation," May 2024
- Lara Orozco, Ricard Antonio, "Wettability Alteration. By Glycine and Seawater Injection in Carbonate Reservoirs," December 2022 (co-supervised by Ryoske Okuno)
- Ruiz Maraggi, Leopoldo Matias, "Production Analysis and Forecasting of Shale Reservoirs Using Simple Mechanistic and Statistical Modeling," May 2022.
- Shakiba, Mahmood, "Multiscale Spatial Analysis and Modeling of Fracture Arrangements," December 2021 (co-supervised with Michael Pycrz).
- Habibi, Mahdi, "Development of a Theory for the Assignment of Prior Probabilities in Decision. Making," August 2020 (co-supervised with Bob Gilbert).
- Lee, Brian, "Algorithm-Aided Decision Making in Reservoir Management," May 2019.
- Nwachukwu, Chiazor, "Machine Learning Solutions for Reservoir Characterization, Management, and Optimization," December 2018 (co-supervised with Michael Pycrz).
- Wu, Yun, "Strategies for Mitigating Risks or Scalability and Containment in Geological CO<sub>2</sub> Storage," December 2017 (co-supervised with Steve Bryant)
- Ren, Bo, "Local Capillary Trapping and Permeability-Retarded Accumulation During Geologic Carbon Sequestration," August 2017 (co-supervised with Steve Bryant)
- Ogunyoi, Babafemi Anthony, "Simple Mechanistic Modeling of Recovery from Unconventional Oil Reservoirs," May 2015.
- Cao, Fei, "Development of a Two-Phase Flow Capacitance Resistance Model," December 2014.
- Venkataran, Ashwin, "Gibbs Free Energy Minimization for Flow in Porous Media," May 2014 (co supervised with Russ Johns).
- Jain, Lokendra, "Global Upscaling of Secondary and Tertiary Displacements," May 2014.
- Ettehadtavakkol, Amin, "CO<sub>2</sub> EOR-Storage Design Optimization Under Uncertainty," Dec. 2012 (co-supervised with Chris Jablonowski).
- Nguyen Anh, "Capacitance Resistance Modeling for Primary Recovery, Waterflood and Water-CO<sub>2</sub> Flood," August 2012, (co-supervised with T.F. Edgar).
- Betancourt, Soraya Sonia, "Some Aspects of Deep Formation Testing, May 2012, (co-supervised with E.V. Dussan).
- Moghanloo, Rouzbeh Ghanbarnezhad, "Modeling the Flow of Carbon Dioxide Through Permeable Media," May 2012.
- Mollaei, Alireza, "Forecasting of Isothermal Enhanced Oil Recovery (EOR) and Waterflood Process," August 2011, (co-supervised with Mojdeh Delshad).
- Carrizales, Maylin Alejandra, "Recovery of Stranded Heavy Oil Using Electromagnetic Heating," December 2010.
- Weber, Daniel B., "The Use of Capacitance Resistance Models to Optimize Injection Allocation and Well Location in Waterfloods," August 2009, (co-supervised with T. F. Edgar).
- Sayapour, Morteza, "Development and Application of Capacitance-Resistive Models for Water/CO<sub>2</sub> Floods," August 2008 (co-supervised with K. Sepehrnoori).
- Min, Namhong, "A Method to Establish Non-Informative Prior Probabilities for Risk-Based decision Analysis," August 2008 (co-supervised with Dr. Robert A. Gilbert)
- John, Abraham K., "Dispersion in Large Scale Permeable Media," August 2008
- Jha, Raman, Investigation of Local Mixing and its Influence on Core Scale Mixing (Dispersion)," August 2008 (co-supervised with Dr. Steve Bryant)



- Dawkrajai, Pinan, "Temperature Prediction Model for a Producing Horizontal Well," August 2006.
- Al-Yousef, Ali, "Investigating Statistical Techniques to Infer Interwell Connectivity from Production and Injection Rate Fluctuations," May 2006
- Zuluaga, Elizabeth, "Geochemical Effects in Two-Phase Flow," May 2005
- Noh, Myeong Hwan, "Reactive Transport Modeling in Fractures and Two-phase Flow," December 2003.
- Araque-Martinez, Aura N., "Geochemical Effects on Well Impairment," May 2001.
- Chewaroungroaj, Jirawat, "Improved Procedures for Estimating Uncertainty in Hydrocarbon Recovery Predictions," August 2000.
- Kapur, Loveena, "Investigation of Artificial Neural Networks, Alternating Conditional Expectation, and Bayesian Methods for Reservoir Characterization," (co-supervised with K. Sepehrnoori) December 1998.
- Pizarro, Jorge Oscar de Sant'Anna, "Estimating Injectivity and Lateral Autocorrelation in Heterogeneous Media," May 1998.
- Embid Droz, Sonia Mariette, "Modeling Capillary Pressure and Relative Permeability for Systems with Heterogeneous Wettability," (co-supervised with Dr. K. Sepehrnoori), August 1997.
- Campozana, Fernando, "Incorporating Dynamic Data Into Geostatistical Reservoir Modeling," (co-supervised with Dr. K. Sepehrnoori), May 1997.
- Malik, Mohammad A., "A Study in Geostatistical Reservoir Characterization and Scale-Up of Permeability and Relative Permeabilities," December 1996.
- Siddiqui, Fared, "A Dynamic Theory of Hydrocarbon Migration and Entrapment," May 1996.
- Kurihara, Masanori, "Development of a Three-Dimensional Streamline Model (UTSTREAM) and Its Application," (co-supervised with Dr. G.A. Pope) December 1995.
- de Lima, Luis Cavalcante, "Large-Scale Conditional Simulation: Domain and Matrix Decomposition and the Moving Template Model", (co-supervised with Dr. K. Sepehrnoori) May 1995.
- Li, Dachang, "Scaling Fluid Flow Through Permeable Media", May 1995.
- Panda, Manmath, "A Forward Modeling of the Interwell Property Assignment in Eolian Depositions", August 1994.
- Wu, Gang, "Pore-Network Evolution Induced by Interaction Between Minerals and Migrating Fluids: Implications for Rock Diagenesis", (co-supervised with Dr. W.R. Rossen) December 1992.
- Datta Gupta, Akhil, "Stochastic Heterogeneity, Dispersion and Field Tracer Response", (co-supervised with G.A. Pope) December 1992.
- Sevougian, Stephen David, "Partial Local Equilibrium and the Propagation of Mineral Alteration Zones", (co-supervised with R.S. Schechter) December 1992.
- Yang, An-Ping, "Stochastic Heterogeneity and Dispersion," December 1990.
- Kasap, Ekrem, "Analytic Methods to Calculate an Effective Permeability Tensor and Effective Relative Permeabilities for Cross-Bedded Flow Units," May 1990.
- Waggoner, John R., "The Growth of Viscous Fingers," May 1990.
- Novak, Craig F., "Metasomatic Patterns Produced by Infiltration or Diffusion in Permeable Media," (co-supervised with Dr. R.S. Schechter) May 1990.
- Bhuyan, Debojit, "Development of an Alkaline/Surfactant/Polymer Compositional Reservoir Simulator," (co-supervised with Dr. G.A. Pope) August 1989.
- Goggin, David Jon, "Geologically-Sensible Modeling of the Spatial Distribution of Permeability in Eolian Deposits: Page Sandstone (Jurassic), Northern Arizona," December 1988.
- Dria, Myra Ann, "Chemical and Thermochemical Waves and Their Interactions," (co-supervised with Dr. R.S. Schechter) May 1988.
- Arya, Atul, "Dispersion and Reservoir Heterogeneity," August 1986.
- Bryant, Steven L., "Geochemical Modeling," (co-supervised with Dr. R.S. Schechter) August 1986.
- Jensen, Jerry L., "Reservoir Characterization," May 1986.
- Lawal, Akanni, "Physical Property Predictors for Reservoir Compositional Simulator," May 1986.
- Delshad, Mojdeh, "Transport of Micellar Fluids in Porous Media," (co-supervised with Dr. G.A. Pope) May 1986.
- Walsh, Mark, "Geochemical Flow Modeling," (co-supervised with Dr. R.S. Schechter) December 1983.
- Guilinger, Terry R., "An Experimental and Theoretical Study of Uranium and Pyrite Dissolution Kinetics," (co-supervised with Dr. R.S. Schechter) December 1983.
- Haldorsen, Helge, "Reservoir Characterization Procedures for Numerical Simulation," May 1983.

Kabir, Muhammad I., "In-Situ Uranium Mining," (co-supervised with Dr. R.S. Schechter) May 1982.  
 Wang, Ben, "Development and Application of a Large Scale Micellar-Polymer Simulator," (co-supervised with Dr. G.A. Pope) May 1982.  
 Zapata, Vito J., "A Theoretical Analysis of Viscous Crossflow," August 1981.

## **M.S. SUPERVISIONS COMPLETED:**

Wang, Ruoyu, "Neural Network-Based Production Forecasting: Dynamic Modeling of Reservoir Parameters using the Capacitance-Resistance Model" with John T. Foster, Michael J. Pyrcz, December 2023.  
 Villaroel, Caeser Julio Salvatierra, "Accounting for Exterior Flow using the Modified Logistic Growth Model of Unconventional Geopressed Shale Reservoirs" with David DiCarlo, May 2023.  
 Portia, Akhil, "Assessing the Predictability and Uncertainty of Capacitance Resistance Models," (co-supervised with John T. Foster, May 2022.  
 Ruiz Maraggi, Leopoldo Matias, "Mechanistic and Probabilistic Rate-Time Analysis of Unconventional Reservoirs," August 2018.  
 Salazar Neira, Jose Julian, "Heterogeneity Study of the Little Creek Field from Petrophysical Data," May 2018.  
 Naudomsup, Nuntha, "Estimation of Reservoir Properties Using an Integration of the Capacitance - Resistance Model and Tracer Testing," August 2017.  
 Pan, Zhou, "Revised Productivity Index Equation to Improve Transient History Match for the Capacitance Resistance Model," December 2016.  
 Raina, Arindam, "An Investigation of Properties of Geological Simulation Techniques Based on Orthogonal Decompositions, December 2016 (with Dr. Sanjay Srinivasan).  
 Chavez, Grecia, "Eagle Ford Shale: Evaluation of Companies and Well Productivity," Energy and Earth Resources Report, May 2016 (with Dr. Cary King)  
 Lee, Brian Boum Hee, "Analyzing Databases Using Data Analytics," December 2015.  
 Alsuaaimani, Thamer Abbas, "Ethane Miscibility Correlations and Their Application to Oil Shale Reservoirs, August 2015.  
 Chitsiripanish, Soros, Field Application of Capacitance-Resistance Models to Identify Potential Locations for Infill Drilling, May 2015.  
 Ojunuya, Sinem, Impacts of US LNG Exports on the Supply Security of the EU Natural Gas Market, May 2015. (with Dr. William L. Fisher)  
 Ogbuabuo, Prisca Chinwendu, CO<sub>2</sub> EOR Storage Potential and the Role of Methane in Limiting CO<sub>2</sub> EOR: Case study offshore Gulf of Mexico, May 2015. (with Rebecca Smith).  
 Nguyen-La, Natalie, "Production Analysis of Oil Production from Unconventional Reservoirs Using Bottom Hole Pressure Entirely in the Laplace Space, May, 2015  
 Apiwatcharoenkul, Woravut, "Uncertainty in Proved Reserves Estimation by Decline Curve Analysis," December 2014.  
 Altubayyed, Abdulaziz Samir, "A Numerical Study of the Impact of Pattern Size on Ultimate Recovery in Undersaturated Oil Reservoirs, August 2014.  
 Song, Dong Hee, "Using Simple Models to Describe Oil Production from Unconventional Reservoirs," March 2014.  
 Smith, Kyle Lane, "Methods for Economic Optimization of Reservoirs," August 2013.  
 Loacharamroonvorapongse, Rapheephan, "Advances in the Development of a Capacitance-Resistance Model," May 2013.  
 Allahverdiyev, Perviz, "Improved Sweep Efficiency Through Seismic Wave Stimulation," August 2012  
 Wang, Wenli, "Reservoir Characterization Using a Capacitance Resistance Model in Conjunction with Geomechanical Surface Subsidence Models, " August 2011 (with Tad Patzek)  
 Clark, Aaron James, "Decline Curve Analysis in Unconventional Resources Plays Using Logistic Growth Models," August 2011 (with Dr. Tad Patzek)  
 Cao, Fei, "A New Method of Data Quality Control in Production Data Using the Capacitance-Resistance Model," August 2011.  
 Para-Sanchez, Cristina, "A Life Cycle Optimization Approach to Hydrocarbon Recovery," December 2010.

- Rivet, Scott Michael, "Coreflooding Oil Displacements with Low Salinity Brine, December 2009 (with G.A. Pope).
- Andonyadis, Panos, "Decision Support for Enhanced Oil Recovery Projects," August 2010, (with Robert Gilbert).
- Mozano, Jennifer Maile, "Deciding Among Models: A Decision Theoretic Approach," M.S. report, May 2010 (with Dr. J. Eric Bickel).
- Madriz, Darrin, "Stochastic Characterization of Carbonate Buildup Architectures Using Two- and Multiple-Point Statistics, and Statistical Evaluation of These Methods, May 2009.
- Rai, Khyati, "Screening Model for Surfactant-Polymer Flooding Using Dimensionless Groups, December 2008 (with Dr. R. T. Johns)
- Sharma, Arival, "Classification of Hydrocarbon Recovery Factor Based on Reservoir Databases,' August 2008 (co-supervised with Dr. Sanjay Srinivasan)
- Krishnan, Rahul, "Modeling the Effect of Capillary Pressure and the Effects of Viscous to Capillary Forces to Recover Residual Saturation Using a Pore N-Let, "August 2008.
- Vrubel, Nathan Kyle, "Statistically Partitioning of Well Logs and Core Measurements to Detect and Quantify Petrophysical Properties, " (co-supervised with Dr. Carlos Torres-Verdin) August 2007
- Phillips, Temitope, "The Effect of Neutral Wettability on Trapped Phase Saturation," May 2007
- Wood, Derek James, " Creating a Quick Screening Model for CO<sub>2</sub> Flooding and Storage in Gulf Coast Reservoirs Using Dimensionless Groups," August 2006
- Faya, Luis C., "Real Asset Risk Management: An Integral Approach to Manage Uncertainty in the E&P Industry," Energy and Mineral Resources, May 2006.
- Hultsch, Paul Adolfo, "Decision and Risk Analysis Through the Life of the Field," Energy and Mineral Resources, 2005
- D'Addosio, Pierangela, "An Analysis of Projected and Actual Returns in E&P Projects," 2005.
- Gentil, Pablo Hugo, "The Use of Multilinear Regression Models in Patterned Waterfloods: Physical Meaning of the Regression Coefficients," 2005.
- Portillo, Maria, "Probabilistic Forecasting in Dry-Gas Reservoirs and Monte Carlo Simulation and Decision Tree Comparison," 2005.
- Holtz, Mark F., "Reservoir Characterization Applying Residual Gas Saturation Modeling, Example from the Starfak T1 Reservoir, Middle Miocene, Gulf of Mexico," 2005.
- Albertoni, Alejandro, "Inferring Interwell Connectivity from Well-Rate Fluctuations in Waterfloods," May, 2002.
- Mahadevan, Jagannathan, "Estimation of True Dispersivity," December 2000.
- Prasad, Rajan, "Improving Waterflood Techniques in Heterogeneous Reservoirs," December 2000.
- Wolter, Henrik, "Physical Chemistry Laboratory Experiments for Petroleum Engineers," December 2000.
- Guillot, Vincent P., "Analytical Solutions of a Production System," December 1999.
- Vásquez-Cruz, Mario Alberto, "Modeling Non-Darcy Parallel Linear Flow in Bounded Systems," December 1999.
- Alpak, F. Omer, "Validation of a Thermodynamically Based Relative Permeability Model," December 1999.
- Varela, Omar J., "Evaluating Uncertainties in Reservoir Simulation," August 1999.
- Gu, Yaguang, "Simulation Study of Aggregate Properties of Natural Fracture System," (co-supervised with Dr. W.R. Rossen) August 1998.
- Barros Griffiths, Isolda, "Further Aspects of Using the Rank Correlation Coefficient in Reservoir Characterization," May 1998.
- Harneshaug, Tom, "Permeability and Saturation Distributions from Tracer Data," (co-supervised with Dr. G.A. Pope) May 1997.
- Slagstad, Lise, "Coning Models for Dual-Pump Systems in Aquifers Contaminated with Non-Aqueous Phase Liquids," (co-supervised with Dr. R.T. Johns) May 1997.
- Refunjol, Belkis Teresa, "Reservoir Characterization of North Buck Draw Field Based on Tracer Response and Production/Injection Analysis", May 1996.
- Rivera Vega, Nestor Alirio, "Estimating Effective Permeability of Porous Media with Stochastic Permeability Distributions," December 1995.
- Folger, Lois Katharine, "Compositional Simulation Using Three-Dimensional Geologic Description in Slaughter Field - Hockley County, Texas," May 1995.
- Muneta, Yasuhiro, "Cluster Analysis in Reservoir Characterization," August 1994.

- Elneser, Milagro, "Flow Modeling through the Ferron Complex," August 1994.
- Sikandar, Ali, "A Study of Barrier Efficiency," August 1994.
- Murphy, Keith, "Analysis of Near Surface Velocity Gradients to Predict Sand Transport," August 1994.
- Quinn, Anthony, "Designing Effective Sandstone Acidizing Treatments through Geochemical Modeling," August 1994.
- Chapman, Michael, "Discounted Cashflow Analysis of the Alkaline Surfactant Polymer Process Enhanced Oil Recovery Technique," August 1994.
- Renyut, Fransiskus Xaverius Budianto, "Effect of Small-Scale Heterogeneity on Steamflood Simulation Results," May 1994.
- Araque-Martinez, Aura, "Estimation of Autocorrelation and Its Use in Sweep Efficiency Calculation," August 1993.
- Kumar, Vasant, "Transverse Dispersion in Uncorrelated Heterogeneous Media," August 1993.
- Mishra, Anil, "Numerical Simulation of Interwell Heterogeneity in Carbonate Reservoirs Based on an Outcrop Study," May 1993.
- Purandare, Kapil Y. "A Numerical Study of Transverse Dispersion Characteristics," August 1992.
- Bhosale, Jaideep V. "Generation and Analysis of Stochastic Fields by the Source Point Method," May 1992.
- Oney, Baris, "Scaling Water-Oil Imbibition in Fractured Reservoirs," 1989.
- Young, Gordon Robert, "Determining Permeability Anisotropy from a Core Plug Using a Minipermeameter," 1989.
- Thiele, Marco Roberto, "A Pseudofunction Approach to the Description of Viscous Crossflow in Multi-Layered Permeable Media," 1988.
- Simmons, David M., "A Study of the Reactive Flow of EDTA in Berea Sandstone," 1988.
- Kittridge, Mark Gerard, "Analysis of Areal Permeability Variations - San Andres Formation (Guadalupean): Algerita Escarpment, Otero County, New Mexico," 1988.
- Chieruzzi, Gianni, "Geochemical Flow Modeling of the Supergene Alteration of Porphyry Copper Deposits," (co-supervised with Dr. J.R. Kyle) 1988.
- Knight, Julia B., "Eolian Bedform Reconstruction - A Case Study from the Page Sandstone (Jurassic), Northern Arizona," (co-supervised with Dr. G.A. Kocurek) 1986.
- Chandler, Mark A., "Depositional Control on Permeability in an Eolian Sandstone Sequence, Page Sandstone, Northern Arizona," (co-supervised with Dr. G.A. Kocurek) 1986.
- Bhuyan, Debojit, "An Investigation of the Effect of Wettability on Phase Trapping," (co-supervised with Dr. G.A. Pope) 1986.
- Waggoner, John, "A Study of the Effects of Heterogeneities on Immiscible Displacement and Their Representation in Numerical Simulators," 1985.
- Takeda, Hideaki, "Modification of EOS Compositional Simulator," (co-supervised with Dr. K. Sepehrnoori) 1985.
- Stohs, Miriam, "Geochemical Modeling," (co-supervised with Dr. R.S. Schechter) 1986.
- Aldersley, Peter, "Phase Behavior," 1985.
- Thele, Kent J., "A Comparison of Three Equation of State Compositional Simulators," (co-supervised with K. Sepehrnoori) 1984.
- Quigley, Kathryn A., "A Technical Survey of Immiscible Gas Injection Projects," (report) 1984.
- Jones, R. Steven, "A Predictive Model for Water and Polymer Flooding," (co-supervised with G.A. Pope) 1984.
- Gros, Reinhard, "A Steam Soak Predictive Model," (co-supervised with G.A. Pope) 1984.
- Goggin, David, "Comparison of Moving Point Numerical Techniques for Enhanced Oil Recovery," (co-supervised with G.A. Pope) 1984.
- Nobuyuki, Samizo, "Numerical Simulation of Two Phase Compressible Flow by the Moving Point Method," 1983.
- Manning, Robert, "A Technical Survey of Polymer Flooding Projects," 1983.
- Welch, Brandon E., "A Numerical Investigation of the Effects of Various Parameters in CO<sub>2</sub> Flooding," 1982.
- Huhn, Sharon, "A Comparison of Several Techniques to Generate a Vertical Distribution of Permeabilities and Porosities for Reservoir Modeling," 1982.
- Ravnaas, Bob, "Determination of Field Scale Dispersivities by Mathematical Modeling," 1981.
- Lambert, Mary E., "A Statistical Study of Reservoir Heterogeneity," 1981.

Zapata, Vito J., "The Effects of Viscous Crossflow on Sharp Front Displacements in Two-Layered Porous Media," 1979.  
Yokoyama, Yoshio, "The Effects of Capillary Pressure on Displacements in Stratified Porous Media," 1979.

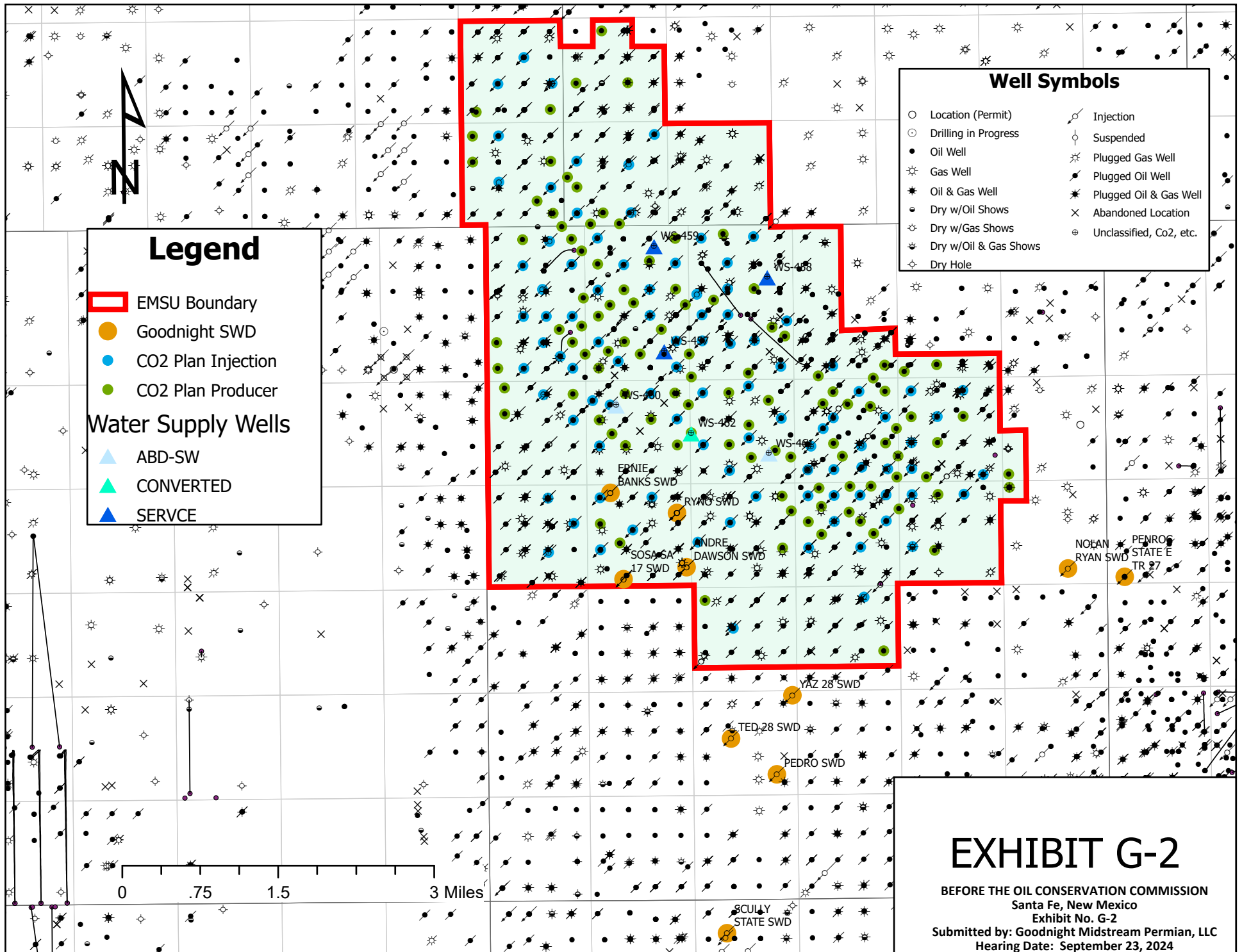
**VITA:**

Larry W. Lake is a professor in the Department of Petroleum and Geosystems Engineering at The University of Texas at Austin. He holds B.S.E and Ph.D. degrees in Chemical Engineering from Arizona State University and Rice University, respectively. Published widely, Dr. Lake is the author or co-author of more than 100 technical papers, four textbooks and the editor of three bound volumes. He was the General Editor of the Society of Petroleum Engineers Handbook. He has been teaching at UT since 1978 years prior to which he worked for Shell Development Company in Houston, Texas. He was chairman of the department from 1989 to 1997, and again from 2006-2008. He formerly held the Shell Distinguished Chair and the W.A. (Tex) Moncrief, Jr. Centennial Endowed Chair in Petroleum Engineering. He currently holds the W.A. (Monty) Moncrief Centennial Chair in Petroleum Engineering. He has served on the Board of Directors for the Society of Petroleum Engineers (SPE), as well as on several of its committees. He has twice been an SPE distinguished lecturer, won the 1996 Anthony F. Lucas Gold Medal of the AIME, the Degoyer Distinguished Service Award in 2002, and was named an SPE Honorary Member in 2006. He was also awarded the 1999-2000 Billy and Claude R. Hocott Distinguished Research Award and The University of Texas and the SPE/DOE Symposium IOR Pioneer Award in 2000. In 2000 he received the SPE Distinguished Service Award, and in 2001, was chosen as a member of the Texas Society of Professional Engineers Dream Team. Dr. Lake has been a member of the US National Academy of Engineers since 1989.

**SPOUSE'S NAME:** Carole

32682096\_v1



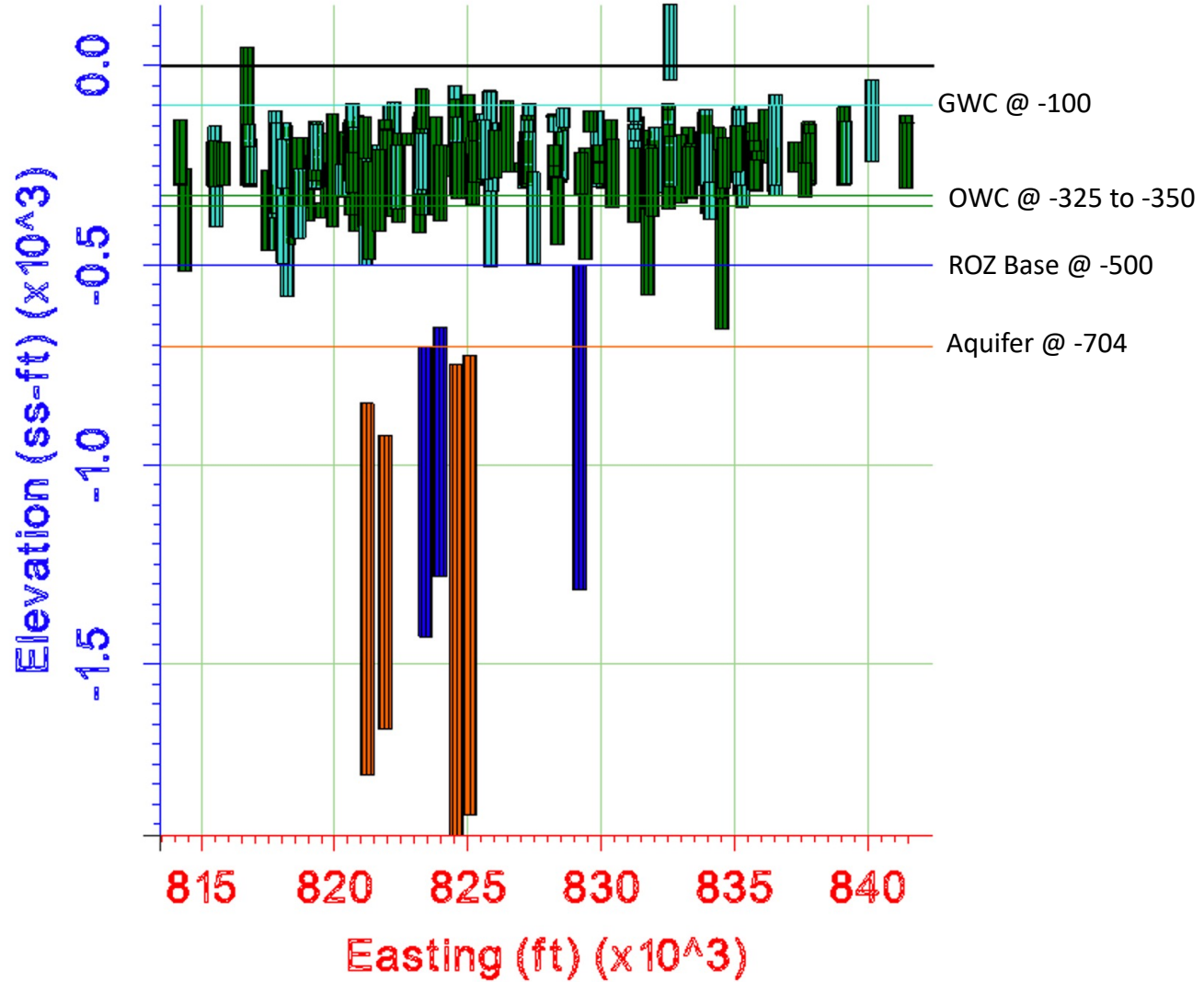
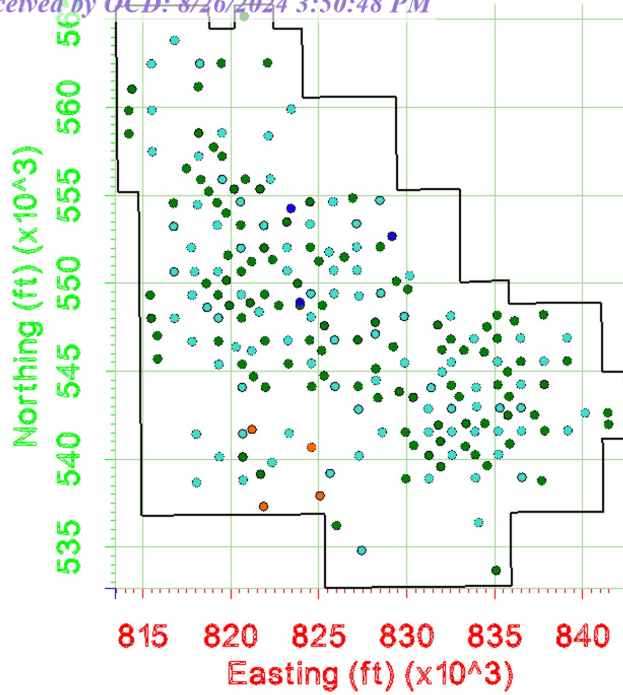


# EXHIBIT G-2

BEFORE THE OIL CONSERVATION COMMISSION  
 Santa Fe, New Mexico  
 Exhibit No. G-2  
 Submitted by: Goodnight Midstream Permian, LLC  
 Hearing Date: September 23, 2024

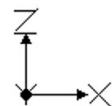
Case Nos. 23614-23617, 23775,  
 24018 - 24020, 24025, 24123

# LAKE EXHIBIT G-3

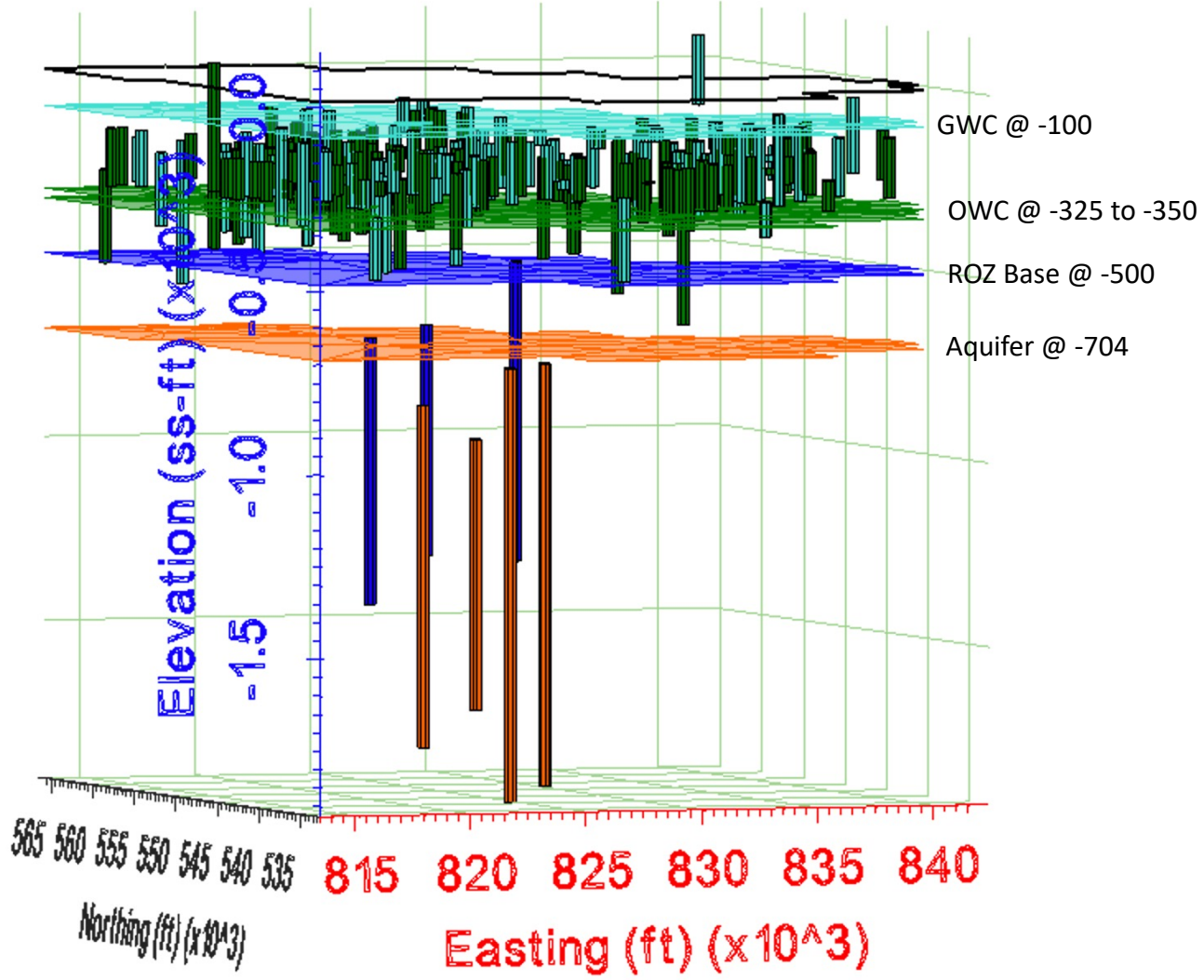
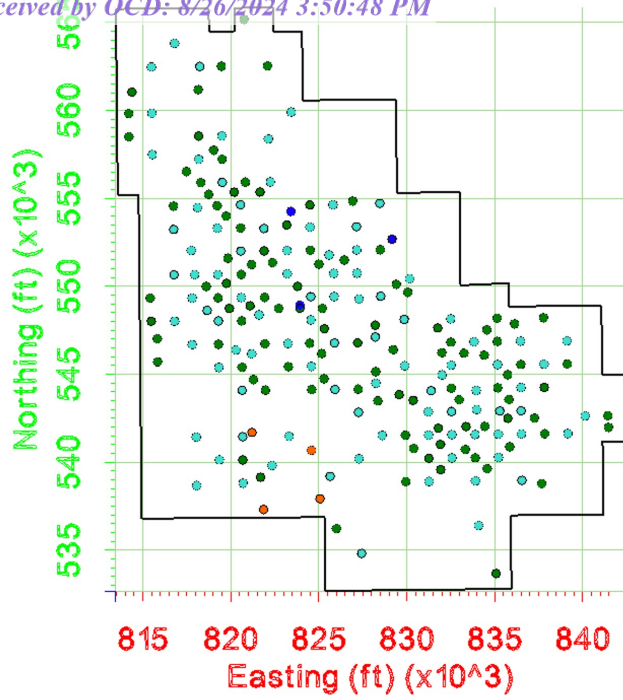


- Injectors and producers are listed in the CO2 plan
- WSWs are the currently active wells
- GM SWDs are the current wells

- EMSU Injection
- EMSU Producer
- EMSU WSW
- GM SWD

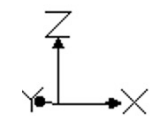


# LAKE EXHIBIT G-3



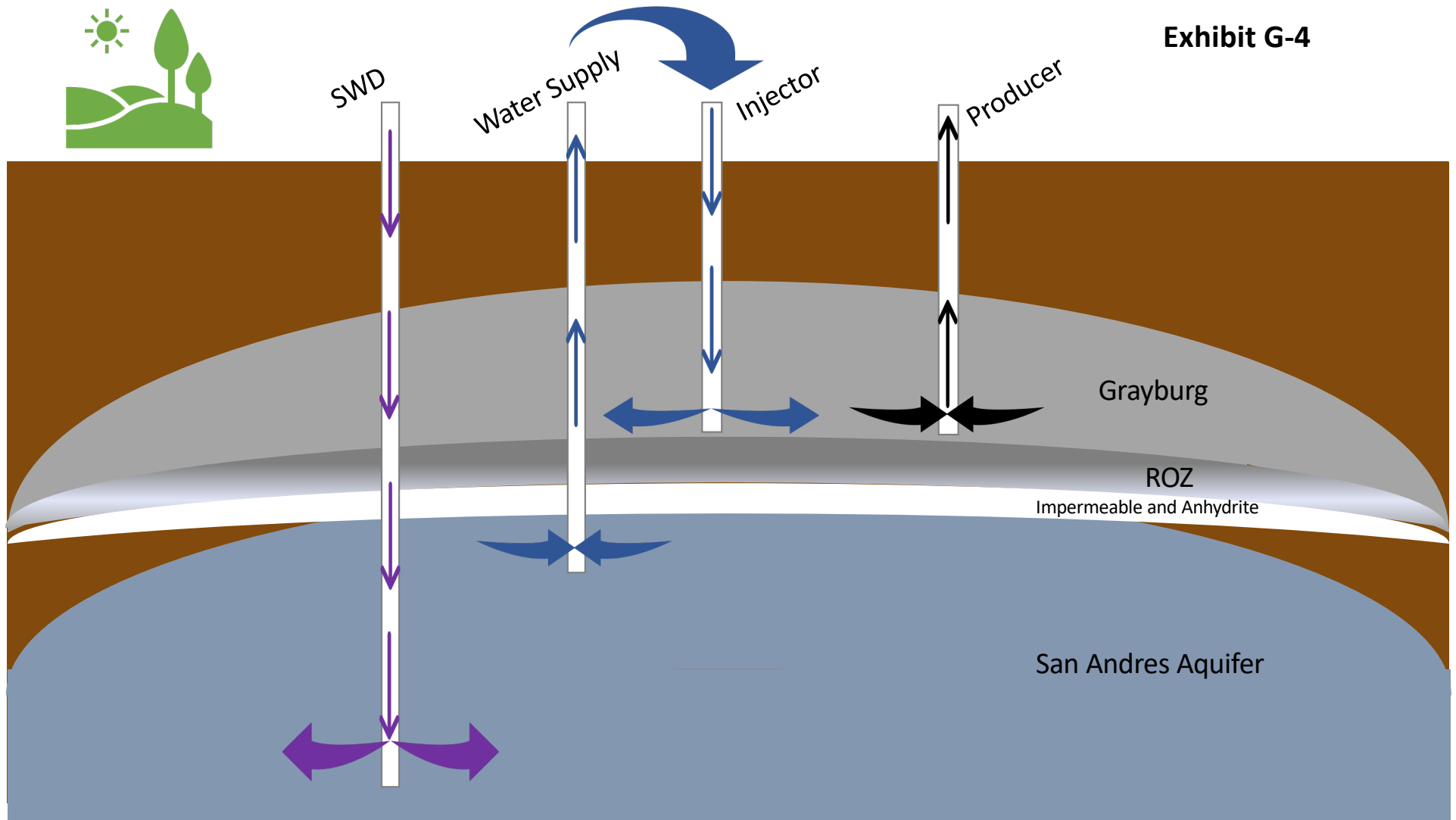
- Injectors and producers are listed in the CO2 plan
- WSWs are the currently active wells
- GM SWDs are the current wells

- EMSU Injection
- EMSU Producer
- EMSU WSW
- GM SWD





**Exhibit G-4**



BEFORE THE OIL CONSERVATION COMMISSION  
Santa Fe, New Mexico  
Exhibit No. G-4  
Submitted by: Goodnight Midstream Permian, LLC  
Hearing Date: September 23, 2024  
Case Nos. 23614-23617, 23775,  
24018 – 24020, 24025, 24123

STATE OF NEW MEXICO  
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION  
P. O. BOX 2088  
SANTA FE, NEW MEXICO 87501

Form C-103  
Revised 10-1-78

NO. OF COPIES RECEIVED	
DISTRIBUTION	
SANTA FE	
FILE	
U.S.O.B.	
LAND OFFICE	
OPERATOR	

5a. Indicate Type of Lease  
State  Fee

5. State Oil & Gas Lease No.

SUNDRY NOTICES AND REPORTS ON WELLS

(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT -" (FORM C-101) FOR SUCH PROPOSALS.)

1. OIL WELL <input type="checkbox"/> GAS WELL <input type="checkbox"/> OTHER- Water Supply	7. Unit Agreement Name Eunice Monument South Unit
2. Name of Operator Chevron U.S.A. Inc.	8. Farm or Lease Name
3. Address of Operator P.O. Box 670 Hobbs, NM 88240	9. Well No. 457
4. Location of Well UNIT LETTER 0 1500 FEET FROM THE South LINE AND 1280 FEET FROM THE East LINE, SECTION 5 TOWNSHIP 21S RANGE 36E NMPM.	10. Field and Pool, or Wildcat Eunice Monument
15. Elevation (Show whether DF, RT, GR, etc.) 3578.6 GL	12. County Lea

16. Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:		SUBSEQUENT REPORT OF:	
PERFORM REMEDIAL WORK <input type="checkbox"/>	PLUG AND ABANDON <input type="checkbox"/>	REMEDIAL WORK <input type="checkbox"/>	ALTERING CASING <input type="checkbox"/>
TEMPORARILY ABANDON <input type="checkbox"/>	CHANGE PLANS <input type="checkbox"/>	COMMENCE DRILLING OPNS. <input type="checkbox"/>	PLUG AND ABANDONMENT <input type="checkbox"/>
PULL OR ALTER CASING <input type="checkbox"/>	OTHER <input type="checkbox"/>	CASING TEST AND CEMENT JOB <input type="checkbox"/>	Completion <input checked="" type="checkbox"/>

17. Describe Proposed or Completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work) SEE RULE 1703.

Drilled out DV tool and float collar. Tested casing to 1000 psi. Ran CBL/CCL/GR from 4942'-3500'. Perforated from 4850'-4252' (160-.5" holes). Acidized with 16000 gallons 15% NEFE HCL. Swabbed well. Reacidized with 20000 gallons 15% NEFE HCL. GIH with 5½" tubing and electric pump. Recovered 8634 bbls water in 19 hours. Pumped inhibitor down backside. POH with 5½" tubing and pump. Installed 11" 900 series flange with 2" valve. Well closed in.

BEFORE THE OIL CONSERVATION COMMISSION  
Santa Fe, New Mexico  
Exhibit No. G-5  
Submitted by: Goodnight Midstream Permian, LLC  
Hearing Date: September 23, 2024  
Case Nos. 23614-23617, 23775,  
24018 - 24020, 24025, 24123

18. I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED P. H. Buley, Jr. TITLE Division Drilling Manager DATE 11-6-1985

ORIGINAL STORED BY JERRY SEXTON  
DISTRICT 1 SUPERVISOR

APPROVED BY \_\_\_\_\_ TITLE \_\_\_\_\_ DATE NOV 8 - 1985

CONDITIONS OF APPROVAL, IF ANY:



# Proposed WELBORE DIAGRAM

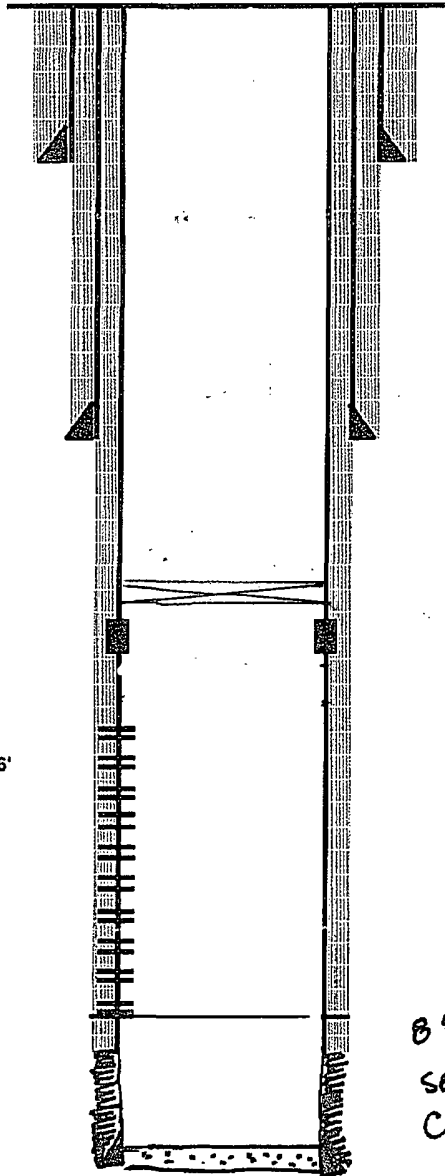
LEASE: EMSU	WELL: 458	FIELD: Eunice-Monument	API: 30-025-29618
LOC: 2640' FNL & 1305 FEL,	SEC: 4	BLK: T21S, R36E	
SVY: N.M.P.M.	GL: 3540	CTY/ST: Lea / NM	SPUD: 05/03/086
CURRENT STATUS: WS	KB: 17'	DF: 16'	

16", 65# H-40 csg  
set @ 332'  
600 sx cmt  
Cmt Circ? Yes  
TOC @ Surf by Circ  
250 sxs.

11-3/4", 47#, K-55 csg  
Set @ 2549'  
1050 sx cl "C" cmt.  
Cmt Circ? Yes 190 sx)  
TOC @ surf. by circ.

DV TOOL @ 4035'

Perfs: 4058-4866'



Date Completed: 05/23/86  
Initial Formation: San Andres From: 4056' To: 4866'

Completion Data:  
05/03/86 Drill to 3646'. Core 3630'-3918' w/ 5 core barrels. Ream 3500'-3918' & drill to 5000'. Log SCHL LDT-CNL-EPT, DLL MSFL & RFT ( log'r TD @ 4999') Ran 8 5/8" csg. DO cmt. & DV Tool. Tag FC @ 4956'.  
10/09/86 Perf (SA) 4056'-4866' w/ tll 155 holes. RBP @ 4933'. Acc'd 4416'-4871' w/ 9000 gals 15% neff. Good block action. Swb Ran Submersible pump & shoot FL. Put well on production.

Workover History:  
02/29/89 Repair sub pump & replace 30 jts 4 1/2" csg. Test pmp 14400 BWPD, RWTP.  
12/228/90 Repair motor & pmp and replace 55 joints 4 1/2" csg. Test pmp 13536 BWPD.  
02/26/08 POOH w/ ESP. Run new ESP, Motor & Cable. RWTP.  
06/03/2010: Pull Weatherford SD900 ESP. Replace with Weatherford SD5500 ESP. Intake @ 1968'.

CIBP @ 3940' w/ 20' cmt

FL @ 4956'

8 5/8", 32#, K-55 csg  
set @ 5000' w/ 1215 sx cl "C"  
CMT in 2 stages

PBD @ 4400' (FILL)  
TD @ 5000'





# WELLBORE DIAGRAM

LEASE: EMSU	WELL: 460	FIELD: Eunice-Monument	API: 30-025-29620
LOC: 1220 FNL & 1520 FWL, Unit	SEC: 8	BLK: T21S, R36E	REF NO: FW6271
SVY: N.M.P.M.	GL: 3586.7	CTY/ST: Lea / NM	SPUD: 1/7/1987
CURRENT STATUS: WS	KB: 3602.7	DF: 3601.7	TD DATE: 1/21/1987

16", 65# H-40 csg  
set @ 415'  
500 sx cl "C" 2% CaCl2 cmt  
Cmt Circ? Yes (42 SX)  
TOC @ surf. by circ.  
(20" hole)

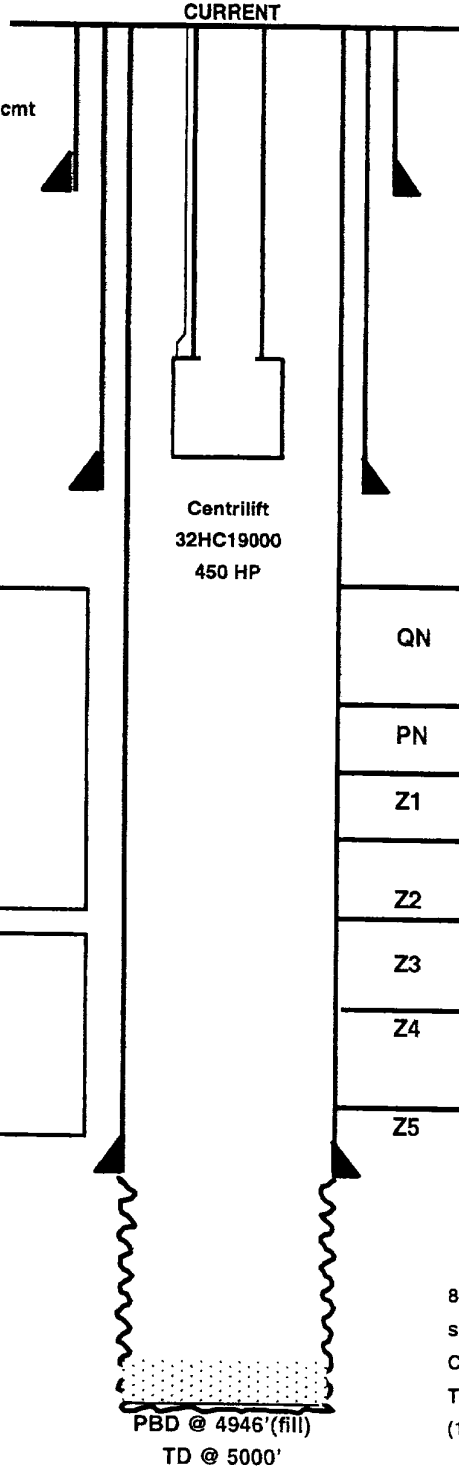
11-3/4", 47#, K-55 csg  
Set @ 2700'  
FC @ 2654'  
1050 sx cl "C" cmt.  
Cmt Circ? Yes (306 sx)  
TOC @ surf. by circ.  
(14-3/4" hole)

**Tubing Detail:**

**Rod Detail:**  
N/A

FC @ 4270'

FILE: EMSU460WB.xls  
DLMc: 10/11/2000



**Date Completed: 2-14-1987**  
Initial Prod: 15840 BWPD  
Initial Formation: San Andres From: 4350' To: 5000'

**Completion Data:**  
2-12-1987 POH w/ RBP @ 4200'. TIH w/ pkr and set @ 4215'. Swb tst 4 hrs. Made 16 runs. Rec'd 100 bbls wtr, 0 bbls oil, SFL=1200', EFL=1200', FER=25 bbl/hr. POH w/pkr. Run 14 jts 4-1/2" IPC csg w/ btm of Bakerlift 300 HP motor @ 2598'. Tst well, avg rate = 165 bbl/ 15 min. = 15840 bbl/ 24 hrs. FL 15 min after tst = 1000' FS. Panel kicked on automatically and overloaded system downhole. Cracked flat cable, broke seal on equalizer and burnt motor lead connectors  
No stimulation required due to air drlg open hole section.

**Workover History:**  
2-26-1987 Pull & rerun pmp. Empower motor guard did not work. Ran Baker-Lift 300 hp - 2360V - 80A monel coated motor equalizer. 46 stg pmp. Run on 4-1/2" 10.5# STC IPC csg for tbg. Ppg 16320 BWPD @ 75 amps.  
10-26-1988 SP grounded dn hole. POH. Btm 33 jts csg pitted, cable also bad (btm 33 jts). XO cable w/ poly cable, exchanged bad csg w/ Cl B. Ran new Trico motor, pmp, seal. Tst 12500 BWPD @ 88 amps.  
5-18-1989 POH. Fish motors @ 4946'. RIH w/ Trico sub pmp, 360 hp, 30 stg, 91 amp. Well pmp'g 12,600 BWPD.  
8-28-1989 Well dn during storm. POH. Bad motor. RIH w/ new motor, new seal, & old pmp. Pmp 17300 BWPD @ 75amp.  
9-22-1989 Well dn. Btm 30' of poly cable bad. Repl cable. RIH w/ old motor, new seal, old pmp, & 4-1/2" tbg. Land @ 2546'. Pmp 12,500 BWPD @ 73 amps.  
8-27-1990 POH. 4-1/2" csg very corroded w/ holes in 10 jts. RIH w/ Centrilift 450 hp tandem mtrs-seal-pmp & 49 jts of 4-1/2" 10.5# IPC csg. Prod 21350 BWPD @ 98 amps.  
9-1992 Replaced shorted motors w/ 450 hp Centrilift motors. XO shorted cable. Tst 20000 BWPD  
1-1995 POH. Motor burnt. Pmp tst bad. Run new pmp & mtr. Centrilift 32HC19000 - 450 hp 32 stg ESP. Run new round cable. Warehouse old flat cable Tst 22000 BWPD.  
6-16-1997 Acdz w/ 500 gals 15% NEFE.

8-5/8", 32#, K-55 csg  
set @ 4350' w/ 750 SX cl "C" cmt  
Cmt. Circ? NO  
TOC @ 700' ff surf.  
(10-5/8" hole)

**Additional Data:**  
T/Queen @ 3458'  
T/Penrose @ 3600'  
T/Grayburg Zone 1 @ 3765'  
T/Grayburg Zone 2 @ 3820'  
T/Grayburg Zone 2A @ '  
T/Grayburg Zone 3 @ 3947'  
T/Grayburg Zone 4 @ 4003'  
T/Grayburg Zone 5 @ 4071'



**WELL DATA SHEET**

LEASE: EMSU WELL: 461-WSW  
 LOC: 1640' F S L & 1305' F W L SEC: 9  
 TOWNSHIP: 21S CNTY: Lea  
 RANGE: 36E UNIT: \_\_\_\_\_ ST: N.M.

FORM: Grayburg / San Andres DATE: \_\_\_\_\_  
 GL: 3584' STATUS: Water Supply  
 KB: 3602' API NO: 30-025-29621  
 DF: 3601' CHEVNO: FW 6272

Date Completed: 6/8/1986  
 Initial Production: flwd 750 BW in 1-3/4 hrs.  
 Initial Formation: Grayburg  
 FROM: 4200 to 5000'

**Completion Data**

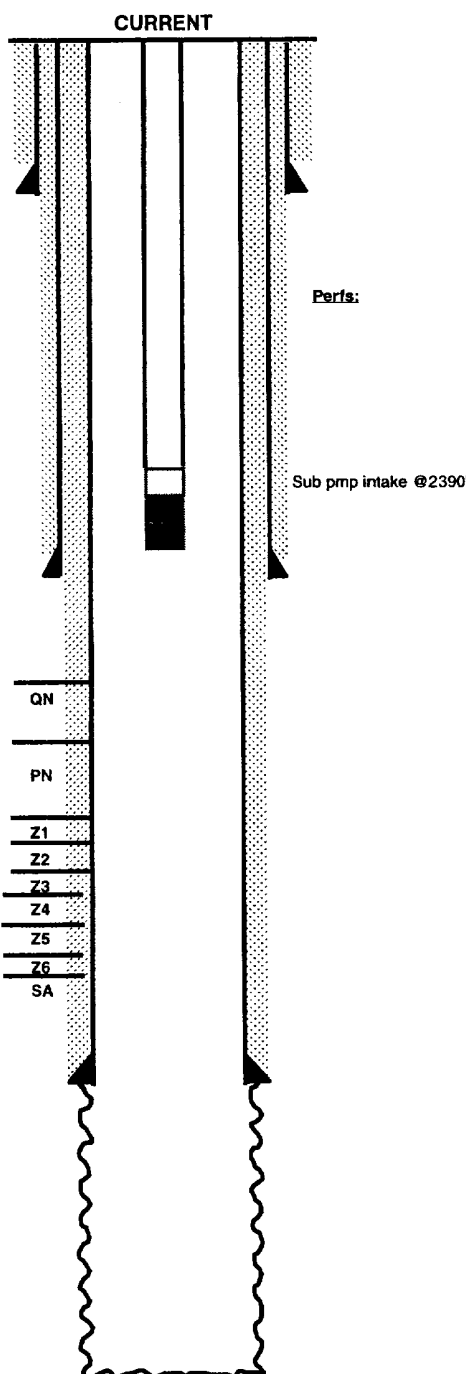
**5/24/1986** Drill to 3745'. Core 3745'-3926' w/ 6 core barrels. Drill 3926'-4200'. Log Schl. LDT-CNL-EPT, DLL-MSFL, & RFT (logger TD @ 4202'. Run 8-5/8" csg. DO cmt. Drill 4200'-5000'. Lost 800 bbls wtr 4610'-4643'. Well flowed approx 100 BW & died. RTBP set @ 4001' & circ 240 BW w/ corr inhib on top of plug.  
**10/13/1986** Rec RBP & set fullbore pkr @ 4035'. Swb Rec 95 BW in 12 runs in 3 hrs. SFL @ 1100', FER 31.6 BPH. Swb SION Rec 60 BW in 8 runs in 2.5 hrs; SFL & EFL @ 1200', FER 24 BPH. Rel pkr & RIH w/ submersible pmp. Well tubed to 2553'. pmp intake @ 2511'. Tst well Rec 750 BW in 1-3/4 hrs (12,000 BWPd). FL @ 1470' /10 min shut dn; @ 1344' / 20 min shut dn. Turn over to Prod.

**Subsequent Workover or Reconditioning:**

**2/18/1987** Pmp would not start. Run Gearhart logs FDC-CNL-GR 4000'-5011' (logr TD). Repair & RIH w/ pmp. SFL @ 1050', 10 min FL @ 1150' FS, 25 min FL @ 1200' FS, 45 min FL @ 1200' FS. Well flwg @ approx 16,000 bbl/ day.  
**7/12/1988** Bad seal, motor and bad spots on cable approx 800-1000' f/ pmp. TIH w/ new PE. Centralift 2200 v, 79 amp, KME 300 hp mtr, equalizer, 34 stg pmp, & drain vlv. Fluid to surf in 30 sec. Initial rate 23,700 BPD w/ 80 psi tbg press. Ck dn to 14,000 BPD w/ 220 psi tp. Amps:62 in bal, volts: 2250. 7/16 Pmp rate 13,400 BPD w/220 psi tp.  
**10/3/1988** Repair sub pmp. Hole in last jt 4-1/2" csg. "Corrosion" under mtr flat. Pmp stuck. XO pmp & seal. Ran same mtr. Pmp 68 amps. Rate 14,800 BWPd.  
**6/15/1989** Splice to mtr flat blown. Pmp & mtr OK. GIH w/ mtrs, new seal, & pmp. XO 30 jts 4-1/2" csg because of corrosion pits. Starting amps 66 @ 14,200 BWPd..  
**10/6/1989** Mini-mandrel burned along w/ lower pigtail. Replaced. Ppg 12,600 BPD @ 71 amps.

**Additional Data:**

T/Queen Formation @ 3427'  
 T/Penrose Formation @ 3558'  
 T/Grayburg Zone 1 @ 3749'  
 T/Grayburg Zone 2 @ 3783'  
 T/Grayburg Zone 3 @ 3844'  
 T/Grayburg Zone 4 @ 3882'  
 T/Grayburg Zone 5 @ 3936'  
 T/Grayburg Zone 6 @ 3992'  
 T/San Andres Formation @ 4002'  
 KB @ 3602'



16" OD  
 65# CSG H-40  
 Set @ 368' W/ 500 SX  
 Cmt circ.? Yes  
 TOC @ surf. by \_\_\_\_\_

11-3/4" OD  
 47# CSG K-55  
 Set @ 2668' W/ 1000 SX  
 Cmt circ.? Yes  
 TOC @ surf. by TS

**Tubing Detail: 6/14/1989**  
 Seaboard Mandrel Hanger 17.0'  
 4-1/2" x 10.5# K-55 IPC csg PinxPin 59.42'  
 4-1/2" x 10.5# k-55 IPC csg BoxxPin 1109.86'  
 30 jts 4-1/2" 10.5#K-55 IPC & Ex-PC Box x Pin 2372.5'  
 4-1/2" csg collar 2373.02'  
 X-O IPC 5-1/2" 8rd x 4-1/2" 8rd Pin K-55 2373.46'  
 Centrlift pmp 34R330 pmp w/ ck drain 2390.68'  
 Centrlift seal 2396.99'  
 Centrlift motor 300 hp 2429.16'  
 pmp intake @ 2390'

8-5/8" OD  
 32# CSG K-55  
 Set @ 4200' W/ 700 SX  
 Cmt circ.? Yes  
 TOC @ surf. by \_\_\_\_\_

PBD: \_\_\_\_\_  
 TD: 5000'

FILE: EMSU461WB.XLS

printed: 2/27/2001