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

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY, NEW MEXICO. **COMM. CASE NO. 24123**

APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS, LEA COUNTY, NEW MEXICO. **DIV. 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. **DIV. CASE NO. 23775**

APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO. **DIV. CASE NOS. 24018-24020, 24025**

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Direct Testimony and Exhibits

August 26, 2024

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APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO. **DIV. CASE NOS. 24018-24020**

SELF-AFFIRMED STATEMENT OF LAURENCE STEPHEN MELZER

1. My name is Laurence Stephen Melzer. I am working as a consulting engineer (Texas Professional Engineer #46859) with Melzer CO_2 Consulting. I have been recognized as an expert geological engineer. I was awarded a Bachelor of Science degree in Geological Engineering from Texas A&M University in May of 1968, a Masters of Engineering Degree from Purdue University in 1969 and served as a research engineer in the US Air Force for 4 years. I have conducted research in nuclear weapons effects both in the Air Force and as a civilian GS-12 for nine total years at Kirtland AFB in Albuquerque. Since June 1978 I have operated wells and conducted research into tertiary oil recovery and have had have a private consulting practice in Midland, Texas for 28 years.

2. I have not testified before as an expert witness for the Energy, Minerals and Natural Resources Department, Oil Conservation Division.

3. During the last 22 years I have directed much of my research into zones below the producing oil/water contacts (OWCs), now commonly understood to be residual oil zones or ROZs[1,2].

[1] L.S. Melzer, G.J. Koperna and V.A. Kuuskraa (2006), "The Origin and Resource Potential of Residual Oil Zones,"

EXHIBIT C

Many San Andres formation fields display a characteristic oil and water saturation profile much like the widely studied Seminole field shown in EXHIBIT C-1. My work originated in 2001 just after a four- year assignment chartered by the University of Texas System as a cooperative program between the University of Texas of the Permian Basin and the State of Texas' University Lands. The work has led to several key landmark ROZ reports published in 2006, 2012 and 2015.

4. In recent years the definition of an ROZ has become known as that interval beneath a conventionally productive oil zone, also known as a Main Pay Zone (MPZ), where the water production exceeds 85% or more (see EXHIBIT C-2). Although "shows" of oil remained present when drilling deeper, most oil companies avoided drilling too deep into the zone below the producing oil/water contact (POWC) in order to minimize the issues with produced water disposal. Later, when companies drilled deeper to find other producing intervals, they found that the deep San Andres intervals with excellent oil shows were commonly several hundreds of feet thick. The characteristics of the ROZ intervals display many of the features of the MPZs (EXHIBIT C-3).

5. Residual oil zones were formed in a number of depth horizons in the Permian Basin but are especially thick and laden with residual oil in the San Andres formation. The carbonate shelves of the Permian were areally extensive during a quiet geologic age that allowed >1000 feet of calcium carbonate buildup. These Paleozoic sediments were buried deeply in the Mesozoic age to become limestone rocks and surrounded by the two basins (Delaware and Midland). The basin sediments were so very rich in hydrocarbons that led to migration of oil and gas into the more porous carbonate rocks to form massive entrapments of oil. What would later be named the Eumont area is a classic example.

   The thick shelf entrapments were compressed in what is known as the Laramide orogeny and the compressive forces led to central New Mexico rocks being uplifted to great height. The crustal plates of the region were slowly colliding. Outcrops of San Andres formation were exposed in central NM allowing meteoric water influx which would sweep down into the oil entrapped intervals in the shelf rocks creating what we like to call "Mother Nature's water floods." Much like man's water floods, Mother Nature would leave behind much oil since water and oil do not mix. The oil left behind was effectively immobile to water hence the term residual (to water flood) oil applied to the swept zones (ROZs).

   The next geological phase, a few tens of million years later, saw the crustal plates diverging wherein the intense compressive forces were relieved. The Rio Grande and White Sand rift zones were part of a series of grabens cutting off much of the flow of water eastward to the

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SPE paper 102964, presented at the SPE Annual Technical Conference and Exhibition, San Antonio, Tx Sept 24-27, 2006.

[2] M. M. Honarpour, N. R. Nagarajan, A. Grijalba M. Valle, and K. Adesoye, (2010), Rock - Fluid Characterization for Miscible CO_2 Injection: ROZ, Seminole Field, Permian Basin, SPE Paper 133089 presented at the SPE Conference, Milan, Italy

shelfal rocks. The lower water gradients allowed renewed oil and gas migration back into the carbonates and formed what we now call the MPZs of the fields. These are the MPZs that have been produced under primary and waterflood conditions for almost 100 years. The graben displacements were vertical of course, occurring east into SE NM, and stretched out over geological time. The vertical interval below the re-entrapped oil zones have the remnant residual oil of the earlier stage of geologic entrapment and lateral water sweep.[3]

6. When enhanced oil recovery (EOR) techniques were developed to exploit mature water floods in the MPZs, several companies began to realize that the ROZ intervals had the same oil saturation levels as did the water flooded zones of the MPZs. And, starting at the turn of the century, several of the CO_2 flooded fields began to deepen wells into the ROZ to extend the depth intervals of EOR flooding. The success of the deepened wells has led the large integrated oil companies to extend their MPZ CO_2 floods into the ROZ. Over 20 CO_2 floods have been deepened (see EXHIBIT C-4) into what industry was previously calling transition zones where oil saturation levels diminished to zero in a few to tens of feet. Most professionals, especially with experience in the thick San Andres formation, have now acknowledged the intervals were naturally water swept paleo oil entrapments and are residual oil zones, some of which extend over 300 feet below the POWCs.

   A prime example of a CO_2 flood extended deeper into the ROZ is the Seminole San Andres Unit (SSAU) just across the state line from the Eumont area in Gaines County, Texas. The commercial experiment started in 1997 with a pilot and now a large portion of the field has undergone deepening into the ROZ. A careful analysis of the results from the project is shown in table form on EXHIBIT C-5 and graphically in EXHIBIT C-6. One notes that the original oil in place (OOIP) in the MPZ is 1.115 million barrels (MMBbls) with 121 MMBbls attributable to primary recovery, 338 MMBbls to water flooding, and 311 MMBbls to CO_2 Enhanced Oil Recovery (CO_2 EOR). Note too from the EXHIBIT C-6 that the primary and water flood recoveries would be essentially zero by 2010 meaning that the field would have been plugged out without advancing to an EOR phase and the 311 million cumulative CO_2 produced barrels left in the field. Further careful analysis breaks out what is believed to be the recovery of oil from CO_2 flooding the ROZ (68 MMBbls). The addition of the ROZ added oil in place which the operator deemed another 1 billion barrels.

   The Seminole field is not alone is proving the value of the ROZ recovery of oil. The Denver Unit within the Wasson field complex to the north of the Seminole field is yet another example. EXHIBIT C-7 (Table form) and EXHIBIT C-8 repeat the careful analysis done for the Seminole field. Note here that the MPZ OOIP is 2,223 MMBbls with a total recovery now at 1,204 MMBbls. The CO_2 flood recovery from both the MPZ and the ROZ is 351 MMBbls with estimates from the ROZ being 50 MMBbls.

[3] Lindsay, R.F., (2014), Grayburg Formation reservoir-scale architecture and sequence stratigraphy, Permian Basin USA: Volumes I-VI, 1348 pages, 76 large folded illustrations, University of Aberdeen, Scotland.

7. With the demonstrated success of extending CO_2 flood recovery below existing fields, an effort to map the areal extent of the ROZ was next. This was conducted under the guidance of major oil companies, the Research Partnership to Secure Energy for America, and in conjunction with the US Department of Energy. The research was led by a group headed by Melzer and Trentham (ROZ research group) identified that the ROZ intervals lie below the MPZs in oil fields ("brownfields" where the wells just need to be deepened) but also existed aside and away from the fields in what are now termed ROZ 'greenfields', The concept was pretty straightforward: if the modern-day oil entrapment was less than an original regional oil trap, areas should exist where mobile oil had not re-accumulated. The swept oil zone from the first and larger regional entrapment would leave a ROZ without an overlying MPZ. A proof test of the ROZ greenfields called the Tall Cotton project (see map on EXHIBIT C-9) was initiated in 2014 and peaked at 3000 BOPD using 40 production wells, and has accumulated over 5 million barrels to date (EXHIBIT C-10) in an area just less than a square mile.

   The above ROZ research and industry's commercial exploitation, together with the depth extensions below the producing oil/water contacts in the 20+ projects, has confirmed that the ROZ concept is different and broader than the transition zone notion. The findings now have shown commercial targets with huge oil-in-place (OIP) resources that are currently being developed.

8. The commercial discovery and development of the ROZ CO_2 EOR play in the last twenty years has not yet extended to the Eunice Monument South and South B Units. But the evidence for the presence of the significant oil saturations below the POWC and deep into the San Andres formation is clearly present there. Two conventional whole cores taken in the units demonstrate that fact. EXHIBITS C-11 and C-12 illustrate the conventional whole core analyses of the oil saturations measured in the lab. The two wells, the RR Bell #4 and EMSU 679, are located in the map in EXHIBIT C-13. Note that both illustrate that the saturations are over 200 feet into the San Andres and well below the POWCs. Note also on the EXHIBIT C-13 map that other core exists in the region with ROZ oil saturations well below the producing intervals illustrating the regional nature of the ROZ in this area of the New Mexico shelfal rocks. The NMSAU #522 well, located 10 miles to the north of the Bell and EMSU cored wells) was cored deeper into the San Andres formation and notes oil saturations down to 4399' depth (-900' subsea), the bottom of the core

   Whole core oil saturations have been analyzed for many tens of years. The science of core values from conventional core would demand that the oil remaining in the depressured cores is not representative of oil saturations at depth. The cores were taken at depth, brought out of the borehole to surface pressures, and then transported to the lab and would be considerably less than oil saturations representative of in-situ values. The best data evidencing this fact came from the Seminole San Andres field where Hess Corporation management wanted proof of in-situ ROZ saturation values to justify their extension of the CO_2 flood deep into the ROZ interval. The Company commissioned both pressure core and sponge core[4] to obtain more representative samples of in-situ oil saturations where their conventional core results showed value in the 10-15% levels. The idealized graphic in EXHIBIT C-1 displays the corrected values from conventional core to those more representative of the true in-situ values and very close to values in the MPZ post-water flooding. Correcting the conventional core values in EXHIBITS C-11 and 12 yields very similar values to the Seminole field and brownfield ROZ success as observed there in the production chart in EXHIBIT C-6.

9. New Mexico San Andres and Grayburg fields have not been exploited in EOR like the fields east across the State line. The fact that the same formations, Grayburg and San Andres in particular, are shallower in elevation reflects upon the NM uplifted and prolonged Tertiary-aged tectonics mentioned earlier. The uplift would be of no consequence were it not responsible for an overlay of porosity development and collapse breccia formation. The presence of the breccias creates excellent primary production but promotes vertical permeability challenges in laterally directed[5] flooding. In general, the Texas fields are missing that extra stage of uplift and graben development creating more predictable lateral continuity and better lateral sweep efficiency.

10. EXHIBIT C-14 uses the same set of conventional core analyses shown for oil saturations in EXHIBIT C-12 to examine the levels of vertical permeability for the EMSU 679 core. Note in the inserts that 20% of the Kv/Kh ratio reveal larger vertical than horizontal permeabilities in both the Grayburg and San Andres cored intervals. We should, however, recognize that core samples are on a much localized scale in contrast to an area scale which would otherwise better address the regional vertical movement of injected fluids. The greater presence of the natural fracturing in NM is the third issue that can cause vertical fluid movement and exacerbate lateral sweep in floods. If the fractures are vertical and allow vertical fluid movement, the success of a conventional flood can be challenging. Flexural vertical fractures are very often related to those same later stage uplift mechanisms mentioned before and present in the New Mexico oil producing units. EXHIBIT C-15 is a cross sectional depiction of the flexural fractures which can cause vertical movement of fluids and complicate effective lateral sweep during flooding.

11. The age of horizontal drilling has changed the oil and gas business. To date, however, the horizontal drilling age emphasis has been on primary production, i.e., depressuring the formation to allow the gas to expand and push liquids to the laterals (wellbores). But formation pressure loss eventually leads to wells going uneconomic. Many oil producing companies recognize that a second stage of production will require injection of a substance to push the large volume of the remaining (residual) oil to producing wells. The flooding engineers believe this will be challenging in shales due to their extremely low permeabilities but could work very well in more conventional porosity and permeability formations like the shelfal carbonates.

[4] https://wiki.aapg.org/Conventional_coring
[5] Conventional flood geometries, i.e., vertical injector wells pushing injectant toward vertical producing wells

CO_2 injection is especially preferred in the Permian Basin due to its long history of success and the CO_2 pipeline infrastructure. Adding to the preference to CO_2 EOR is the expectation of large supplies of surface captured (anthropogenic) CO_2 that may soon to come onto the market accompanied by the likelihood of decreased CO_2 prices. With lower cost CO_2, the efficiency and economic challenges of CO_2 EOR are diminished. Less efficient CO_2 floods can lead to greater CO_2 retention and permanent storage and producing low or even carbon negative oil[6].

EXHIBIT C-16 provides a flood geometry under development in a greenfield in Texas. The concept is to drill horizontal injectors near the base of the ROZ interval and utilize the buoyancy of CO_2 and the vertical permeability in the ROZ to produce from horizontal wells near the top of the ROZ or MPZ. The concept is dependent on the vertical permeability of the flooded section. It is a bit more challenged in the Texas fields than in the NM fields where the extra prolonged stage of tectonics in NM leading to better Kv/Kh ratios will prove an advantage. In an existing field with vertical MPZ producing wells, the need for the new horizontal wells in the MPZ can be eliminated as in the EMSU unit areas.

The above flood design is imperiled by waste water injection. The ROZ oil is residual to water flood will not move with the water. A compound is needed to change the oil properties to swell and change the surface tension of the oil to the rock. CO_2 is ideal and will fully clean the oil from the rock and allow movement to the pressure sinks. Enhanced reservoir pressure from waste water injection not only wastes pore space but it precludes effectiveness of the CO_2 process.

12. Available pore space for both waste water and carbon dioxide has reached alarming levels in recent years. Injection of waste water, by definition, creates over-pressured formations. Disposal formations are being carefully monitored for unwelcomed migration, levels of formation overpressure, and worries about exceeding formation parting pressures. Regional models are being developed for monitoring waste plumes and provide critical input and guidance for important decisions for the oil and gas regulators in many States. In the past ages when disposal volumes were limited, the problems were few but, in current times, the millions of barrels of mass that are being disposed, and often in local areas, are creating problems. Examples of the problems are induced earthquakes, well blowouts, and excessive drilling mud weights for drilling through over-pressured formations. The mineral rights involved have always had dominance over surface rights but this subject of large volume disposal into pore space is beginning to rewrite the legal landscape. I have termed this the emerging mineral and storage rights "skirmish" where disposal volume trespass is being claimed by minerals owners with nearby waste injections and, correspondingly, surface owners are beginning to demand compensation for injected and sequestered volumes.

CO_2 EOR occupies a very interesting space in this changing world of pore space and mineral

[6] Where the total CO_2 emissions from producing the oil are less than the CO2 released from the combusted barrel

development. The incidental storage of CO_2 during CO_2 EOR projects has long been recognized and is now treated as one of the solutions for sequestration of industrially emitted and captured CO_2 emissions. The Infrastructure Investment and Jobs Act (2021) along with the Inflation Reduction Act (2022) were passed and made law in the last few years to include generous Federal Tax Credits (the so-called 45Q tax credits). These incentives were designed to encourage continued industrial development but with the growing public concerns of greenhouse gas (GhG) emission reductions. The incentives have led to carbon capture project planning throughout the U.S. The captured CO_2 will necessarily be in large volumes and can be either be disposed of in a fashion similar to waste water disposal or utilized to make low carbon oil in CO_2 EOR projects[7]. The 45Q credits recognize both methods and the projects are being planned. A growing number are being implemented in many States. Most of the capture projects are in a confidential planning stage but New Mexico is likely to see several CO_2 capture projects commissioned in the very near future. The State has some advantages over other regions. It has a network of CO_2 pipelines to help move the CO_2 from capture facilities to injection sites. The subject Eumont Units lie less than 20 miles from two of the CO_2 pipelines; one of which lies only eight miles to the east.

The waste injection of CO_2 has all of the issues that large volume waste water injection wells have. The Class VI Underground Injection Council rules developed by the EPA (Class VI) are more stringent than current rules for waste water Class II wells and were very carefully vetted 10 years ago. But both waste water and CO_2 disposal require large areas of leased or owned pore space. State regulators must be involved there since EPA does not have a mission to demand rights amalgamation or unitization.

Business-as-usual CO_2 EOR has been underway for many decades and includes large injection volumes but has not worried with pore space ownership. The CO_2 retained in the projects 1) occupies the produced oil space, 2) has been carefully surveilled since CO_2 is the largest cost to an EOR project, and 3) pressures are controlled. And under State guidance, CO_2 EOR has an exemplary safety record over four decades. If the coming CO_2 EOR projects take their CO_2 from surface capture sources, the projects can now have two more value propositions than just the oil produced: a) producing low carbon oil for meeting continuing energy demands and b) the formation retention of the captured CO_2 that is good for the emission reductions and environment. Those future projects need large reservoir volumes, much like possessed in the Eunice Monument South and South B units[8]. Adding the San Andres interval ROZ of >300 feet thickness within the unitized depth and area makes the target reservoirs for low carbon oil production and CO_2 storage two of the finest and world class reservoir targets.

This brings this testimony to consideration of best future use of the San Andres reservoir:

[7] Oil that is produced while CO_2 is stored making the net GhG emission lower than a conventionally produced one

[8] OOIP for Eunice Monument South and South B Units are 141 and 115 MMBbls respectively which can conceivably allow 50% of the oil pore space to accommodate the stored CO_2 (roughly 140 and 115 billion ft^3) or 2.7 & 2.2 Billion metric tons)

CO_2 EOR or condemnation of mineral value by excessive disposal of waste water in zones with producible oil. As discussed above, the areas and formations with thick oil accumulations, whether depleted MPZs or ROZs, will be highly desired, good for energy supply, reduced emissions from industrial plants, and the NM environment.

13. Work subcontracted to Advanced Resources International (ARI) by the aforementioned ROZ research group at the University System contracted ARI to estimate the ROZ OIP targets. They assessed the total oil resource in 3 billion acres of greenfield ROZ resource. The 1) OIP resource and the 2) technically recoverable resource in only the greenfield ROZs in five selected Texas counties was estimated to be in excess of 150 and 16 billion barrels of oil, respectively (EXHIBIT C-17). The ROZ OIP resource in Lea County in New Mexico has recently been estimated to be well in excess of the largest Texas County in Texas (Gaines) at 45 billion barrels[9]. Facilitating CO_2 EOR in the New Mexico San Andres units could be a huge opportunity for severance taxes and CO_2 capture modification of critical industrial plants for low carbon emissions. The new age of carbon capture from industrial sites, as facilitated by the Federal tax credit is just part of the exciting opportunities. Availability of large volumes of CO_2 will allow low or carbon negative oil via a new threshold of economics for less efficient EOR projects, i.e., lower produced oil volumes per mcf of CO_2 injected.

14. CO_2 has been readily available in the Permian Basin region and operators have led the world in 1) developing CO_2 EOR recovery technologies, 2) the actual numbers of CO_2 floods, and 3) exploiting the ROZs. A new fourth consideration of CO_2 capture and storage has become another consideration and CO_2 EOR with its large areal footprint and associated and incidental CO_2 storage. This consideration of CO_2 storage is elevating the importance of both the brownfield and greenfield ROZ resources, first here in the Permian basin but also around the world.

Testimonial Conclusions

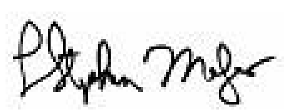
15. One of the emerging modern tragedies in our oilfields today is the condemnation of the MPZ and, especially, ROZ oil recovery potential via waste water disposal. This is especially true today with the recent passage of the Inflation Reduction Act's 45Q tax credit enhancements. The lost oil is bad enough but the enormous potential for large volume CO_2 storage that would otherwise occur while producing the oil makes it even more heart-rending. CO_2 EOR is now well established as a proven large and permanent storage process for emission captured CO_2. Large reservoirs are needed for the storage and the unitized, thick and laterally continuous ROZs are ideally suited for the storage. Disposal water injected into the ROZ reservoirs is effectively condemning them for oil exploitation and CO_2 storage.

[9] Personal communication – V. Kuuskraa, Advanced Resources International Corp

16. The public data and referenced EXHIBITS illustrate that the concept of producing ROZs beneath existing oil fields is a demonstrated, proven process and proven in over 20 different San Andres oilfields in the Permian Basin. This testimony and others amply demonstrate the existence of a thick oil-bearing zone below the MPZ identified as the EMSU San Andres ROZ.

17. I understand that this Self-Affirmed Statement will be used as written testimony in this case. I affirm that my testimony above is true and correct and is made under penalty of perjury under the laws of the State of New Mexico. My testimony is made as of the date identified next to my signature below.

18. **The evidence from the cores taken at depth in the San Andres clearly demonstrates a residual oil zone of at least 250’ beneath the two EMSU units**. I believe the continued large volume water disposal within the unitized San Andres formation at the EMSU has seriously damaged the ROZ and MPZ oil recovery there. The vertical permeability profile due to the Grayburg and San Andres Kv/Kh ratios, presence of collapse breccias and vertical conductive fractures causes vertical migration. The CO_2 storage potential is being eliminated for a huge portion of the Unit. Any further injection will extend the affected area to the entire Unit and even into the Grayburg MPZ and possibly the adjoining ROZ greenfields. The broader issue of allowing water disposal into San Andres greenfield ROZ regions should be re-considered as well.



Laurence Stephen Melzer, July 31, 2024

I understand this Self-Affirmed Statement will be used as written testimony in this case. I affirm that my testimony above is true and correct and is made under penalty of perjury under the laws of the State of New Mexico. My testimony is made as of the date next to my signature below.

Laurence Stephen Melzer

Date: August 21, 2024

RESUME FOR L. STEPHEN MELZER

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WORK EXPERIENCE SUMMARY

Mr. Melzer combines his forty years of technical oil and gas industry experience with extensive familiarity with the design, project evaluation, regulatory environment, and business of waterfloods and enhanced oil recovery projects. This background involves advising U.S. and International organizations on enhanced oil recovery, carbon capture and storage, and private clients on business strategies. He assists clients and regulators with evolving policy involving CO_2 Enhanced Oil Recovery and utilization of CO_2 for geologic storage. He also conducts reservoir characterization, engineering, and project planning studies on oil and gas projects and has served on the Texas Governor's Panel for the FutureGen project. His very recent work has been focused on advancing the understanding of residual oil zones, their origins, properties and amenability to EOR recovery with its associated CO_2 storage. For the past five years he has taught courses with several large independent oil companies and coauthored key reports for the National Petroleum Council and National Coal Council. He has consulted on a variety of projects and initiatives which include the following sponsors: Shell International Exploration and Production, Inc., Pioneer Natural Resources, Exxon/Mobil, Denbury Resources, Kinder Morgan Energy Partners, L.P., Great Plains Institute, Linde/Praxair Corporation, Citation Oil and Gas, numerous independent oil and gas companies, the Interstate Oil and Gas Compact Commission, The Plains CO_2 Reduction Partnership, The Midwest Geological Sequestration Consortium, The University of Texas System, The University of Wyoming's Enhanced Oil Recovery Institute, the National Research Center for Coal and Energy, US Army, US Air Force, U.S. Dept. of Energy, and the Defense Advanced Research Projects Agency. Noteworthy recent projects include:

- Teaching multi-day short courses on CO_2 EOR for Denbury Resources, Occidental and the CO_2 Conference in Midland, TX
- Acting as Principal Investigator for three large publicly sponsored research projects investigating the origins, distribution, and flood response of residual oil zones (ROZs) and recruiting a multidisciplinary team for the effort.
- Directing the 28 long-running series of annual CO_2 Flooding Conferences in Midland, Texas attended by all of the leading CO_2 flooding professionals (www.CO2Conference.net),
- Research on the newly understood issues of large volume water injection and its analog to deep saline formation, large volume CO_2 injection (CCS) projects.
- Planning and directing the 18 CO_2 Shortcourses (the most recently held in December 2022 and entitled "Carbon Capture and Geological Storage; Preserving Sound Practices in the Field),
- Organizing and teaching a CO_2 School, a four-day immersion in all aspects of CO_2 flooding with modules related to CO_2 storage.
- Contributing Author to the National Petroleum Council's 2018 report on Petroleum, the Dual Challenge and the Interstate Oil and Gas Compact Commission's 2010 report entitled "A Policy, Legal, and Regulatory Evaluation of the Feasibility of a National Pipeline Infrastructure for the Transport and Storage of Carbon Dioxide,"

ATTACHMENT

- Co-Chairing the University of Texas School of Law's Continuing Education Conference on "Carbon and Climate Change" in Austin, Texas (February 3-4, 2009),
- Chairing the Carbon Sequestration Development and Finance Summit in Houston, Texas (July 11-13, 2007),
- Keynote Speaker for Enhanced Oil Recovery Institute's (Wyoming) CO_2 related events (May 2009, July 2012, and July 2022).
- Directing the full-day pre-conference seminar and coauthoring three papers at the 2009 SPE International Conference on CO_2 Capture, Storage, & Utilization, San Diego, CA, Nov 2-4, 2009
- Conducting the short course entitled "EOR and the Expanding Field of CO_2 Flooding" in Association with the 2006 AAPG National Convention, April 8, 2006, Houston, Texas,
- Contributing Author to the Interstate Oil and Gas Compact Commission 2005 report entitled "A Regulatory Framework for Carbon Capture and Storage (CCS),"
- Authoring the CO_2 EOR portions of the Clean and Diversified Energy Advisory Committee of the Western Governors Association 2006 report on Clean Energy, A Strong Economy and a Healthy Environment,
- Chairing the International Conference on Carbon Sequestration for the Oil, Gas and Power Industry – London, England, June 2001,
- Conduct of numerous oil and gas field resource evaluations including CO_2 flooding resource estimations, waterflood unitization studies, CO_2 and waterflood design reports, drill site recommendations, oil and gas leasing, and oil field operations;
- Participation in the design, conduct, and surveillance of the Pioneer Natural Resources Spraberry CO_2 Pilot Program at the E. T. O'Daniel Lease in Midland County, Texas,
- Planning and directing a Department of Energy Workshop on Carbonate Reservoirs and Pioneer Natural Resource Corporation's Spraberry Symposium,
- Formulating the strategic plans and economic modeling for a $800 million helium and CO_2 field project with Ridgeway Petroleum of Calgary, Alberta Canada,
- Planning and directing a shallow offshore drilling, logging, and seismic project to develop insights on the nuclear craters at the Enewetak Atoll in the Marshall Islands of the Pacific Ocean, and
- Conducting a detailed hydrologic modeling study of a carbonate aquifer in Kentucky for the U.S. Army Waterways Experiment Station, Vicksburg, MS.

For the past ten years, Mr. Melzer has provided enhanced oil recovery consulting services for the oil and gas industry. From his extensive familiarity with a large percentage of waterfloods and a majority of the CO_2 floods in the Permian Basin, he has helped companies redefine their EOR targets to include vertical expansions to transition and residual oil zones and evaluate and select analogs for forecasting oil response. Prior to forming his consulting practice, he was the initial Director of the Petroleum Industry Alliance, a part of the University of Texas System and located at the Center for Energy and Economic Diversification between Midland and Odessa, Texas. His responsibilities included defining and directing all oil and gas research efforts, defining and directing area wide technology transfer activities, and assisting with economic development in the Permian Basin area. His organization also represented and assisted the oil and gas professionals and their companies within the Permian Basin in their dealings with Federal and State research and regulatory agencies.

Mr. Melzer was formerly a Department Manager and Senior Geotechnical Engineer for Science Applications International Corporation, a large consulting firm headquartered in San Diego, California. He headed the Midland, Texas office for SAIC from 1978 until October 1992.

Mr. Melzer has been actively engaged in oil and gas exploration and development through a family-owned business, Melzer Exploration Company. The partnership, formed with his father in l978, has invested in more than 85 successful oil and gas wells. Prior to accepting the post at the Center for Energy and Economic Diversification, he supervised drilling and production operations in over twenty-five company-operated wells.

SPECIFIC PROFESSIONAL EXPERIENCE

Melzer Consulting (May 1997 to Present)

Consultant, Midland, Tx. Mr. Melzer performs consulting services for a variety of commercial energy companies, non-governmental organizations and associations. His clients have included Shell International Exploration and Production Inc., Eastman Chemical Company, KinderMorgan CO_2 Company, Praxair, Inc., Plains CO_2 Reduction Partnership, Mobil Exploration and Producing, U.S., Inc., PetroSource Carbon Company, Pioneer Natural Resources, Colorado Interstate Gas (El Paso Corporation), The University of Texas of the Permian Basin, Permian Basin Petroleum Association, Illinois Geological Survey, and others. The work includes providing background materials and advising clients of business strategies related to CO_2 EOR and CCS, conducting economic evaluations of State and Federal policy matters, CO_2 market reports, water and CO_2 flood project economic projections, and conduct of shortcourses and seminars on CO_2 flooding.

Center for Energy and Economic Diversification (Oct 1992 - May 1997)

Director, Petroleum Industry Alliance - Midland, Texas. In October of 1992, Mr. Melzer was named to be the initial Director of the Center for Energy & Economic Diversification/Petroleum Industry Alliance. The organization is a part of the University of Texas System and represents a cooperative government/industry alliance with startup funding from the University of Texas Lands and the University of Texas of the Permian Basin. Mr. Melzer was instrumental in identifying the need and formulating the concept of the Petroleum Industry Alliance. Mr. Melzer is the director of the annual CO_2 Flooding Conference in Midland and continues to perform those duties for the Petroleum Industry Alliance.

Melzer Exploration Company (l978 to Present)

Partner and Co-owner. Mr. Melzer formed a family partnership with his father, Mr. Larry S. Melzer, in May of l978 for the purpose of exploring for and developing oil and gas properties. He oversaw the generation of prospects for in-house drilling and reviewed other prospects for participation recommendation to an investor group. The Company does not currently generate prospects nor operate wells but remains active in investing in new prospects for drilling.

Science Applications International Corporation (l978 to Oct 1992)

Department Manager and Senior Geotechnical Engineer - Midland, TX. Managed four-person office in southwest Texas performing geotechnical studies and analyses. Provided site characterization capabilities to the DOD for the execution of field tests including a multi-million dollar field test program in a very specific geological environment at Ft. Knox, KY. Also planned and provided cost estimates for two oil industry/Department of Energy cost share programs for enhanced oil recovery field projects, and performed drilling and completion of wells at the ASARCO and US Bureau of Mines in-situ copper leaching pilot cost share project near Casa Grande, Az.

Air Force Weapons Laboratory, Kirtland AFB (Albuquerque), NM (l969-l978)

Active Duty Air Force Project Officer and Civil Service Research Engineer (GS-13). Developed airblast and ground shock weapon effects test requirements, formulated test site selection criteria, performed test site selection, and was program manager for material property determination for use in theoretical calculations of conventional and nuclear weapon effects. Conducted studies of soil and rock response to blast loadings in a wide variety of soil and rock types. Was test director for large, multimillion dollar high explosive test program code-named MIDDLE GUST located in southeastern Colorado.

CURRENT AFFILIATIONS

Mr. Melzer is the past president of the Texas Carbon and Capture and Storage Association based out of Austin, Texas. He is the immediate past president of the Applied Petroleum Technology Academy, a Midland based technology training non-profit corporation, and a member of the City of Midland's Convention Center Advisory Board. He is an active member in the Society of Petroleum Engineers, American Association of Petroleum Geologists, West Texas Geological Society, and the Society for Independent Professional Earth Scientists.

RECENT AWARDS

Mr. Melzer was recently honored with 2023 Midland College Buno Hanson Environmental Excellence award and the Plains CO_2 Reduction Partnership Pioneer Award recognizing efforts in CO_2 Sequestration. He was also recognized and received the 2007 Hearst Energy Award for Technology in the Oil & Gas Industry. In 2004 he was given the Regional Service Award in the Southwestern North America Region of the Society of Petroleum Engineering in recognition of his significant industry publications, his time and effort in developing, directing and continuing to improve the Permian Basin CO_2 Conference and being instrumental in its success.

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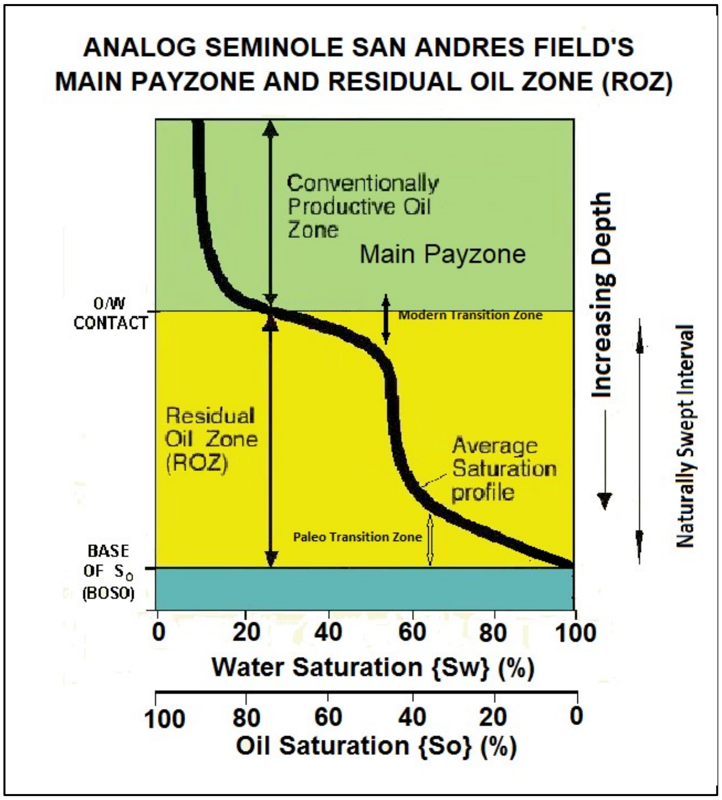
EXHIBIT C-1


ANALOG SEMINOLE SAN ANDRES FIELD'S
MAIN PAYZONE AND RESIDUAL OIL ZONE (ROZ)
Conventionally Productive Oil Zone
Main Payzone
O/W CONTACT
Modern Transition Zone
Increasing Depth
Naturally Swept Interval
Residual Oil Zone (ROZ)
Average Saturation profile
Paleo Transition Zone
BASE OF S_o (BOSO)
0 20 40 60 80 100
Water Saturation {Sw} (%)
100 80 60 40 20 0
Oil Saturation {So} (%)

1

EXHIBIT C-2

How is a Residual Oil Zone Defined?

A ROZ is often defined as that interval beneath the main pay interval (MPZ) within an oil field where water production exceeds 85%* during the primary phase of production

That depth where the ROZ begins is now defined to be equal to the historically defined producing oil/water contact (POWC)

Almost always in the Permian Basin's San Andres formation, the ROZ extends several hundreds of feet below the POWC and contains a huge oil resource that is immobile under primary or secondary (water flood) recovery

* *Might also be 100% or a lower percentage – is dependent on the unit's defined operating plan*

EXHIBIT C-3

Log Evidence of ROZs and Other Diagnostic Tools for Discriminating MNWs* of San Andres ROZs* from MPZs* and Non Oil Bearing Intervals

	PROCESS/TOOLS	DIAGNOSTIC	SPECIFIC EVIDENCE	CLASSIC INTERPRETATION	ROZ INTERPRETATION	FURTHER EXPLANATION
1	ROZ Specific Diagenesis as opposed to Burial Stage Diagenetic Processes and due to MNW's* pore volume sweep in the presence of oil**					
1A	Log Manifestations	Logging - 1	Bow Shape Porosity Character	Normal Depositional Explanation	Porosity enhancement due to pervasive dolomitization diagenesis	Peak Porosity represents best original porosity zone and maximum pore volume sweep; diagenesis spreads vertically up & down from there
		Logging - 2	Separation of Sonic Porosity & Density Porosity Logs	Secondary Porosity	Secondary Porosity due to Pervasive Dolomitization in ROZ interval	The late stage dolomitization process redistributes the rock matrix into vug porosity types
		Logging - 3	3-3.2 PE Log values for thick depth intervals	Depositional or burial stage Reflux Dolomitization	Late Stage Dolomitization due to microbial alternation of disseminated anhydrite to calcite to dolomite	San Andres is a three mineral formation - the anhydrite and calcite are converted into dolomite by microbial processes - anhydrite nodules may remain
		Logging - 4	Rw values different than MPZ	Not unusual / No significance	ROZ water chemistry less saline & sulfate rich than MPZ	Rw is different because the meteoric derived sweep is composed of lower salinity water
		Logging - 5	So > 30% in calculations	Possibly productive	ROZs are oil wet and values are residual to MNW*	Rw is different because the meteoric water derived sweep is composed of lower salinity water (mixed water zones)
		Logging - 5	Different M an N than MP needed	Not unusual / No significance	Rock fabric destructive dolomitization in ROZ only	Rocks have undergone a second (late stage) diagenetic event
		Logging - 6	Excellent and Laterally Correlatable Porosity	Not unusual / No significance	Shallow Shelf (Good Reservoir) Cycles + Sweep associated dolomitization	Thicker, laterally correlatable shallow water cycles usually capped by sabkha anhydrites, often bottomed by deeper marine wackestones (source rocks?)
		Logging - 7	Feaux Mobile Oil	set casing	Oil wet ROZs can have appearance of producible, mobile oil	Pervasive dolomitization, 30-40% residual oil, variable Rws make Archies calculations difficult
1B	Core Observation & Testing Clues	Core Examination 1	Leached/recrystallized molds	Not unusual / No significance	Recrystallization and Leaching during MNW*	Recrystallization of fossil structure into casts
		Core Examination 2	Sulfur Crystals	Diagenesis - no interpretation	Free sulfur presence likely due to conversion of anhydrite to calcite (anaerobic SRBs)	Conversion by Sulfate reducing bacteria resulting in free sulfur
		Core Testing 3	So Values Ranging from 5%-20%	Loss of mobile oil due from in-situ pressure to lab	Flushed mobile oil - all MNW* residual oil	Mixed wet MPZs altered to oil wet ROZs and preserved Sorw saturations of 30-40% then degassed when brought to the surface and lab yielding 5-30% So values
		Core Testing 4	Matrix Densities of 2.8 gpcc	Early stage & burial stage diagenesis to dolomite	Early and burial diagenesis to dolomite with a significant overprint of late stage diagenesis	Microbial converted anhydrite (2.97 gpcc) and Mg-rich water sweep calcite (2.71) to dolomite (2.81) dominated matrix
1C	Mud Logging Clues	Mud Logging - 1	Cut in samples	Transition Zone / MPZ Remnant	Oil saturation present	Residual Oil Saturation is present
		Mud Logging - 2	Dull gold fluorescence in samples	Transition Zone / MPZ Remnant	"Water washed" oil	Indicative of Mother Nature's Waterflood. Removal of mobile oil
		Mud Logging - 3	Odor in samples	Transition Zone / MPZ Remnant	Oil saturation present	Indicative of residual oil remaining from Mother Nature's Waterflood
		Mud Logging - 4	Vertically decaying gas show	Transition Zone / MPZ Remnant	ROZ interval with less Pore Volume Sweep	Significant Lateral Sweep of MNWs* removes light ends and fluorescing components in the residual oils
		Mud Logging - 5	"Free" Sulfur crystals	No significance	Suggests MNW* flushing at top or base of ROZ	Result of activity of Sulfate Reducing Bacteria. Indicates Meteoric Derived Flushing.

* MNW = Mother Nature's Waterflood, ROZs = Residual Oil Zones, MPZs = Main Payzones

** All sediments and rocks undergo diagenetic changes when subject to burial. The ROZ diagenesis covered here is consists of an "overlay "and furtherance to those rock changing processes. The overlaid diagenesis requires the nutrients (oil) for the microbial induced changes to the rock and indirectly demonstrates the presence of residual oil

EXHIBIT C-4

ON-GOING ROZ CO_2 EOR PROJECTS
IN THE PERMIAN BASIN REGION OF THE U.S.

Melzer CO2nsulting
as of Jan 2022

	Type and operator	Field	State	County	Top MPZ Depth, (ft)	Pay zone	Lith-ology	MPZ Start date	MPZ Start Date	ROZ Start Date	ROZ Well Spacing (acres)	Strategy
1	CapturePoint	East Seminole	Tex	Gaines	5,400	San Andres	Dolo.		1/13	1/13		Commingle
2	CapturePoint	George Allen (BF&GF)	Tex	Yoakum	4,900	San Andres	Dolo.	12/12	12/12	2012		Deepen&Drill
3	Fasken	Hanford	Tex.	Gaines	5,500	San Andres	Dolo.	7/86	7/86	8/09		Commingle
4	Kinder Morgan CO2 Co	Goldsmith-Landreth Unit	Tex.	Ector	4,200	San Andres	Dolo.	8/09	8/09	8/09	40	Commingle
5	Kinder Morgan CO2 Co	Tall Cotton Phase I	Tex.	Gaines	n/a	San Andres	Dolo.		n/a	11/14		Green Field ROZ
6	Kinder Morgan CO2 Co	Tall Cotton Phase II	Tex.	Gaines	n/a	San Andres	Dolo.		n/a	11/16		Green Field ROZ
7	Maverick Permian LLC	East Vacuum GSA Unit	NM	Lea Co.	4,500	San Andres	Dolo.		1994	2015		Commingle
8	Morningstar Operating LLC	Central Vacuum Unit	NM	Lea Co.	4,550	San Andres	Dolo.	2007	20015	2015		Commingle
9	Morningstar Operating LLC	Vacuum Grayburg San Andres Unit	NM	Lea Co.	4,550	San Andres	Dolo.	2007	2007	2007		Commingle
10	Occidental Petroleum	North Hobbs	NM	Lea Co.	4,200	San Andres	Dolo.		3/03	2016		Commingle
11	Occidental Petroleum	Salt Creek	Tex.	Kent	6,300	Canyon Reef	LS		Jun-05	1996		Commingle
12	Occidental Petroleum	South Hobbs	NM	Lea Co.	4,200	San Andres	Dolo.		7/15	2018?		Commingle
13	Occidental Petroleum	Sundown Slaughter	Tex.	Hockley	4,950	San Andres	Dolo.		2018?	2018?		Deepen (Dedicated*)
14	Occidental Petroleum	Wasson Bennett Ranch Unit	Tex.	Yoakum	5,250	San Andres	Dolo.	6/95	6/95	2000		Commingle
15	Occidental Petroleum	Wasson Denver Unit	Tex.	Yoakum	5,200	San Andres	Dolo.	4/83	4/83	1995**		Commingle
16	Occidental Petroleum	Wasson ODC	Tex.	Yoakum	5,200	San Andres	Dolo.		Nov-84	2005?		Commingle
17	Occidental Petroleum	Seminole Unit-ROZ Phase 1	Tex.	Gaines	5,500	San Andres	Dolo.	7/83	7/83	7/96	80	Commingle
18	Occidental Petroleum	Seminole Unit-ROZ Phase 2	Tex.	Gaines	5,500	San Andres	Dolo.	7/83	7/83	4/04	40	Deepen (Dedicated*)
19	Occidental Petroleum	Seminole Unit-ROZ Stage 1 Full Field Dev	Tex.	Gaines	5,500	San Andres	Dolo.	7/83	7/83	10/07	80	Commingle
20	Occidental Petroleum	Seminole Unit-ROZ Stage 2 Full Field Dev	Tex.	Gaines	5,500	San Andres	Dolo.		7/83	5/11	80	Commingle
21	Occidental Petroleum	Seminole Unit-ROZ Stage 3 Full Field Dev	Tex.	Gaines	5,500	San Andres	Dolo.		7/83	7/13		Commingle
22	Occidental Petroleum	Seminole Unit-ROZ Stage 4 Full Field Dev	Tex.	Gaines	5,500	San Andres	Dolo.		7/83	7/13		Commingle
23	ExxonMobil	Means San Andres Unit - Ph 1	Tex	Andrews	4,500	GrBrg/San Andr	Dolo.		Nov-83	1/12	40	Commingle
24	ExxonMobil	Means San Andres Unit - Ph 2	Tex	Andrews	4,500	GrBrg/San Andr	Dolo.		Nov-83	7/15		Commingle

EXHIBIT C-5

Seminole San Andres Unit Production Summary

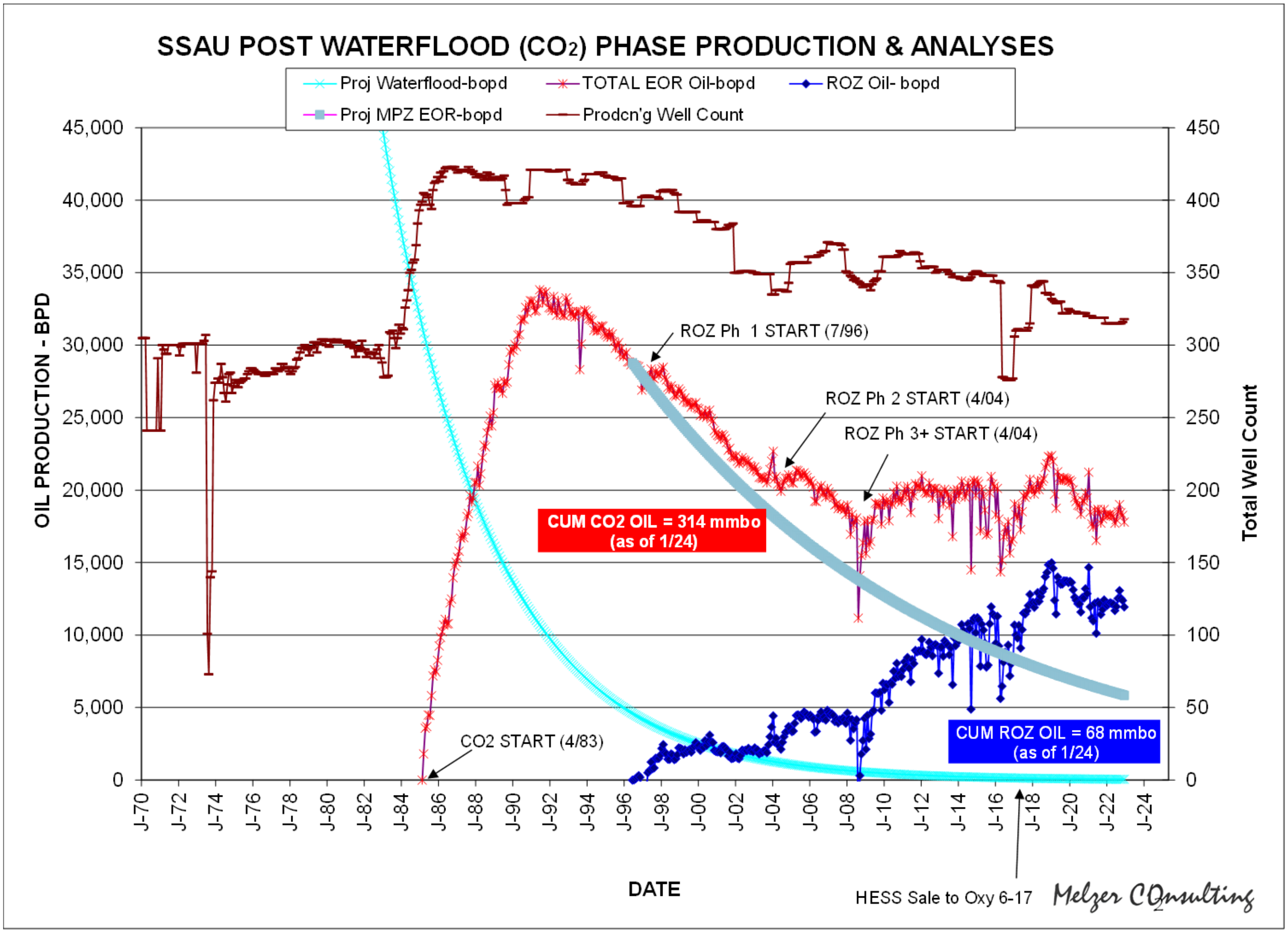
in Millions of Bbls

- MPZ OOIP………………………………………1,115
- Primary Recovery (P)………………………121 (11%)
- Water Flood Recovery (S)………………338 (30%)
- MPZ Recovery (P+S)………………………459 (41%)
- CO_2 Enhanced Oil Recovery……………311 (28%)[1]
- ROZ Portion of CO_2 EOR…………………68 [2]
- Total Recovery to Date……………………769 (69%)[3]

[1] Includes the ROZ Recoveries (w/added OIP)
[2] Included in the 311 CO_2 EOR
[3] Includes 68 million Bbls from the ROZ OIP

Melzer COnsulting

EXHIBIT C-6



SSAU POST WATERFLOOD (CO_2) PHASE PRODUCTION & ANALYSES
Proj Waterflood-bopd
TOTAL EOR Oil-bopd
ROZ Oil- bopd
Proj MPZ EOR-bopd
Prodcn'g Well Count
OIL PRODUCTION - BPD
Total Well Count
DATE
ROZ Ph 1 START (7/96)
ROZ Ph 2 START (4/04)
ROZ Ph 3+ START (4/04)
CUM CO2 OIL = 314 mmbo (as of 1/24)
CUM ROZ OIL = 68 mmbo (as of 1/24)
CO2 START (4/83)
HESS Sale to Oxy 6-17
Melzer CO2nsulting

EXHIBIT C-7

Denver Unit Oil Recoveries

Millions of Bbls

MPZ OOIP……………………….2,223

MPZ Recovery……………………851 (38%)

CO_2 EOR Recovery…………….351 (16%) [1]

ROZ Portion of CO_2 EOR……>50 [2]

Total Recovery to Date…….1,204 (54%) [3]

[1] Includes the ROZ Recoveries (w/added OIP)
[2] Included in the 351 CO_2 EOR
[3] Includes >50 million Bbls from the ROZ OIP

Melzer CO_2nsulting

EXHIBIT C-8

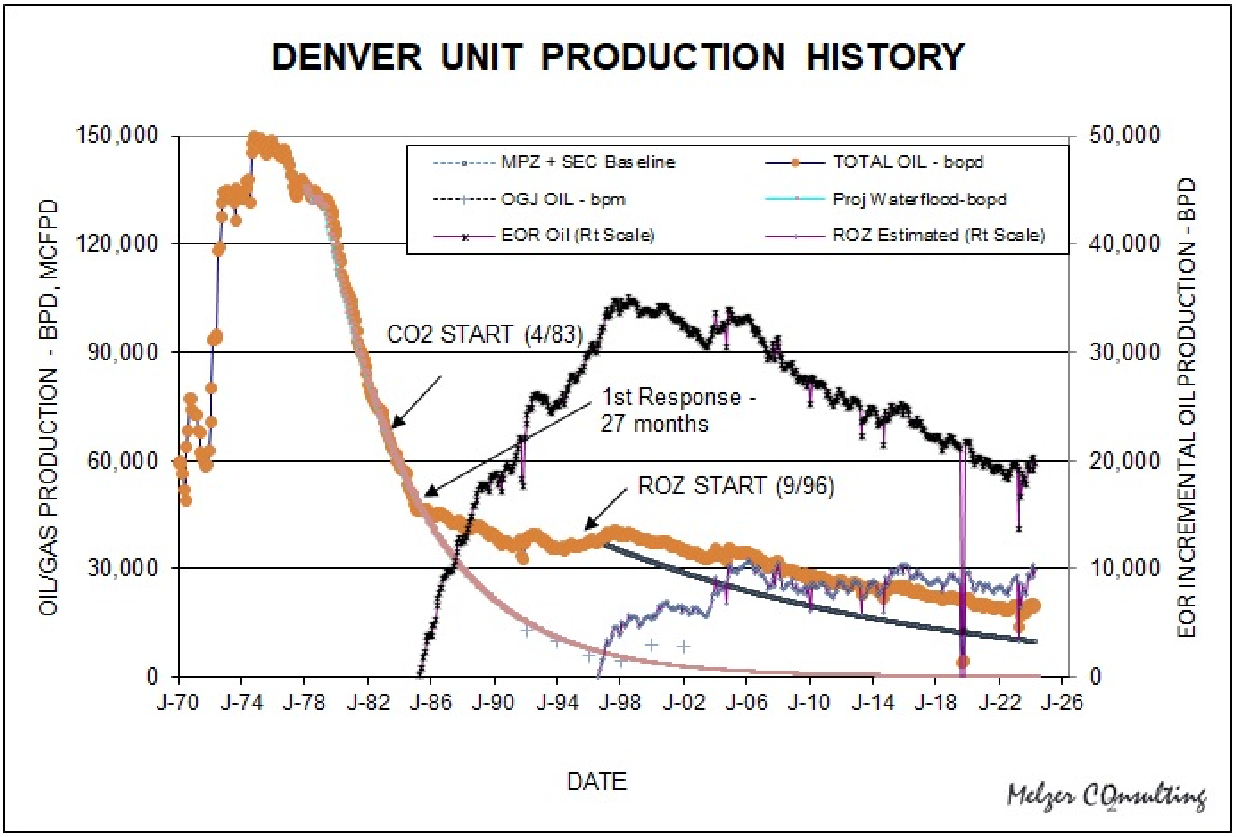
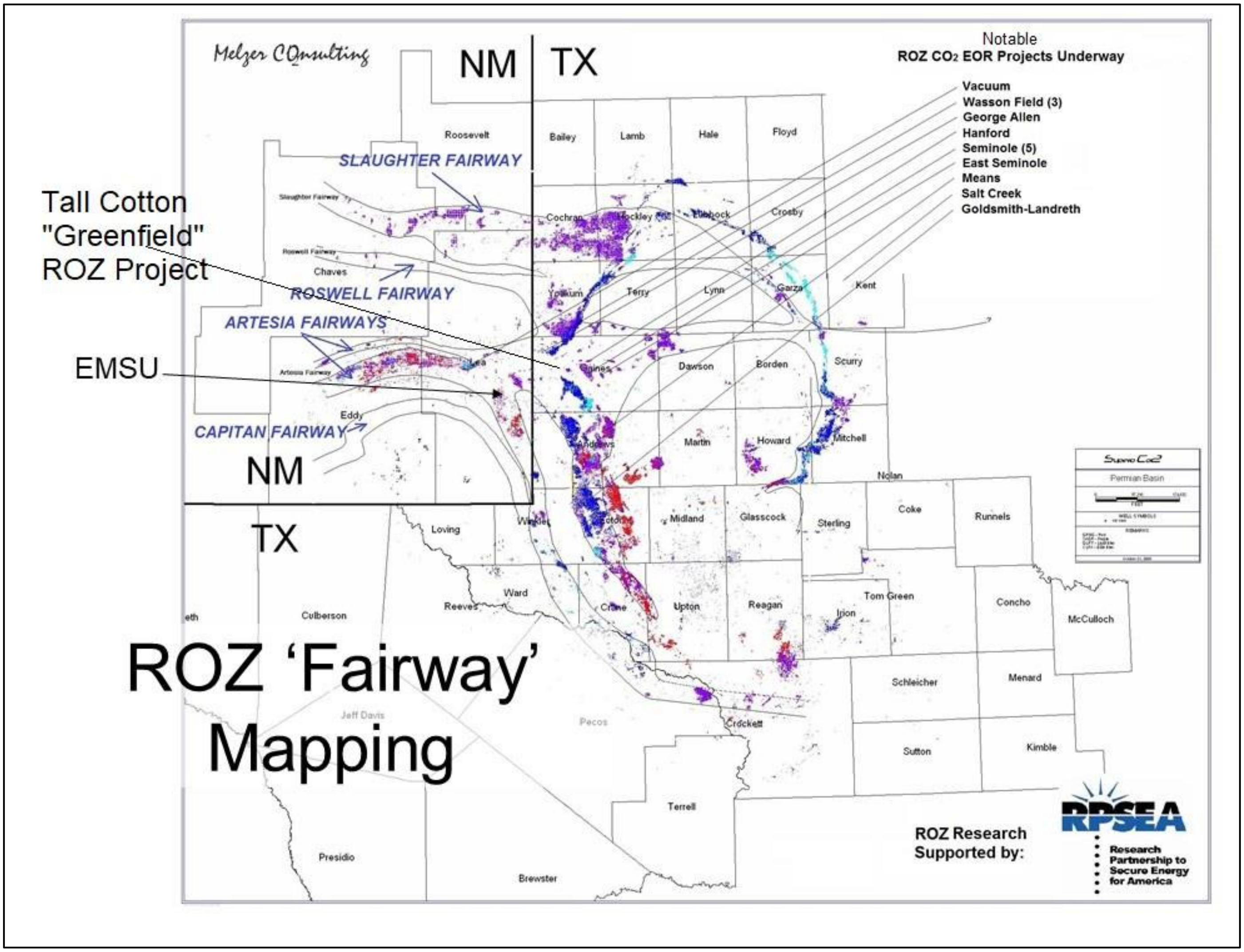
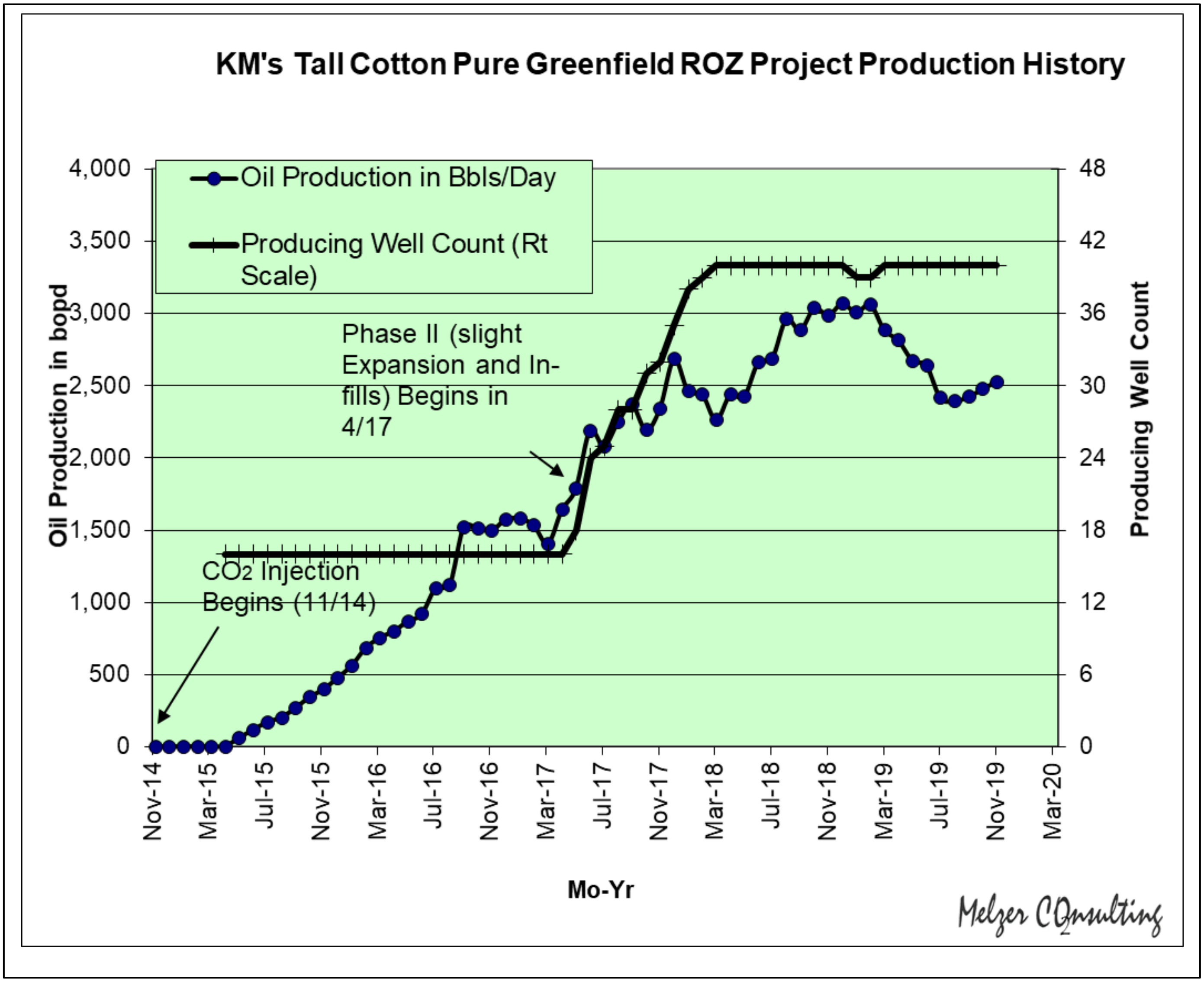

DENVER UNIT PRODUCTION HISTORY
MPZ + SEC Baseline
TOTAL OIL - bopd
OGJ OIL - bpm
Proj Waterflood-bopd
EOR Oil (Rt Scale)
ROZ Estimated (Rt Scale)
CO2 START (4/83)
1st Response - 27 months
ROZ START (9/96)
OIL/GAS PRODUCTION - BPD, MCFPD
EOR INCREMENTAL OIL PRODUCTION - BPD
150,000
120,000
90,000
60,000
30,000
0
50,000
40,000
30,000
20,000
10,000
0
J-70
J-74
J-78
J-82
J-86
J-90
J-94
J-98
J-02
J-06
J-10
J-14
J-18
J-22
J-26
DATE
Melzer COnsulting

EXHIBIT C-9


Melzer CQnsulting
NM
TX
Notable
ROZ CO2 EOR Projects Underway
Vacuum
Wasson Field (3)
George Allen
Hanford
Seminole (5)
East Seminole
Means
Salt Creek
Goldsmith-Landreth
Tall Cotton
"Greenfield"
ROZ Project
EMSU
SLAUGHTER FAIRWAY
ROSWELL FAIRWAY
ARTESIA FAIRWAYS
CAPITAN FAIRWAY
NM
TX
ROZ 'Fairway'
Mapping
ROZ Research
Supported by:
RPSEA
Research Partnership to Secure Energy for America

1

EXHIBIT C-10



8

EXHIBIT C-11

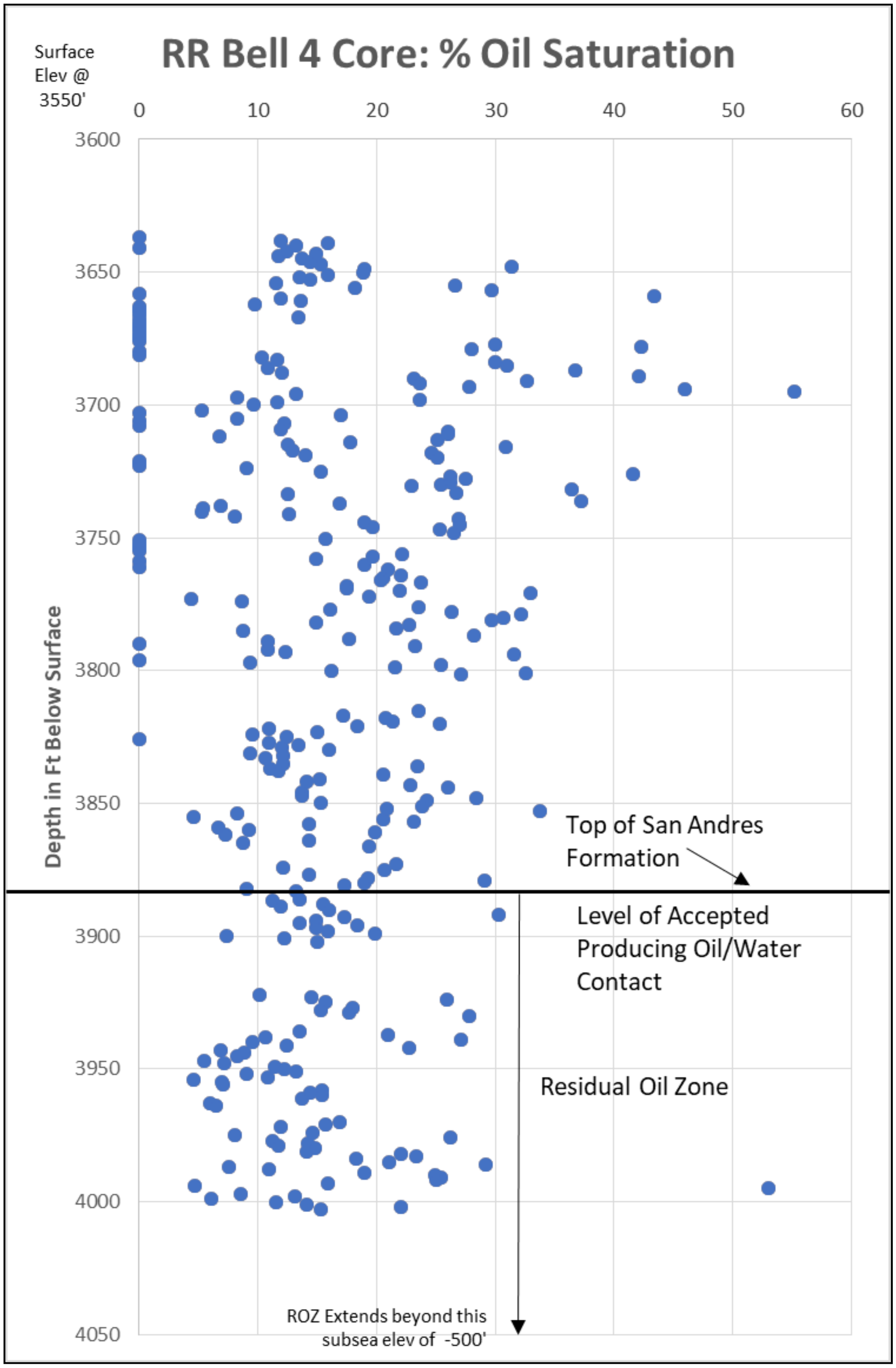

RR Bell 4 Core: % Oil Saturation
Surface Elev @ 3550'
0
10
20
30
40
50
60
3600
3650
3700
3750
3800
3850
3900
3950
4000
4050
Depth in Ft Below Surface
Top of San Andres Formation
Level of Accepted Producing Oil/Water Contact
Residual Oil Zone
ROZ Extends beyond this subsea elev of -500'

EXHIBIT C-12

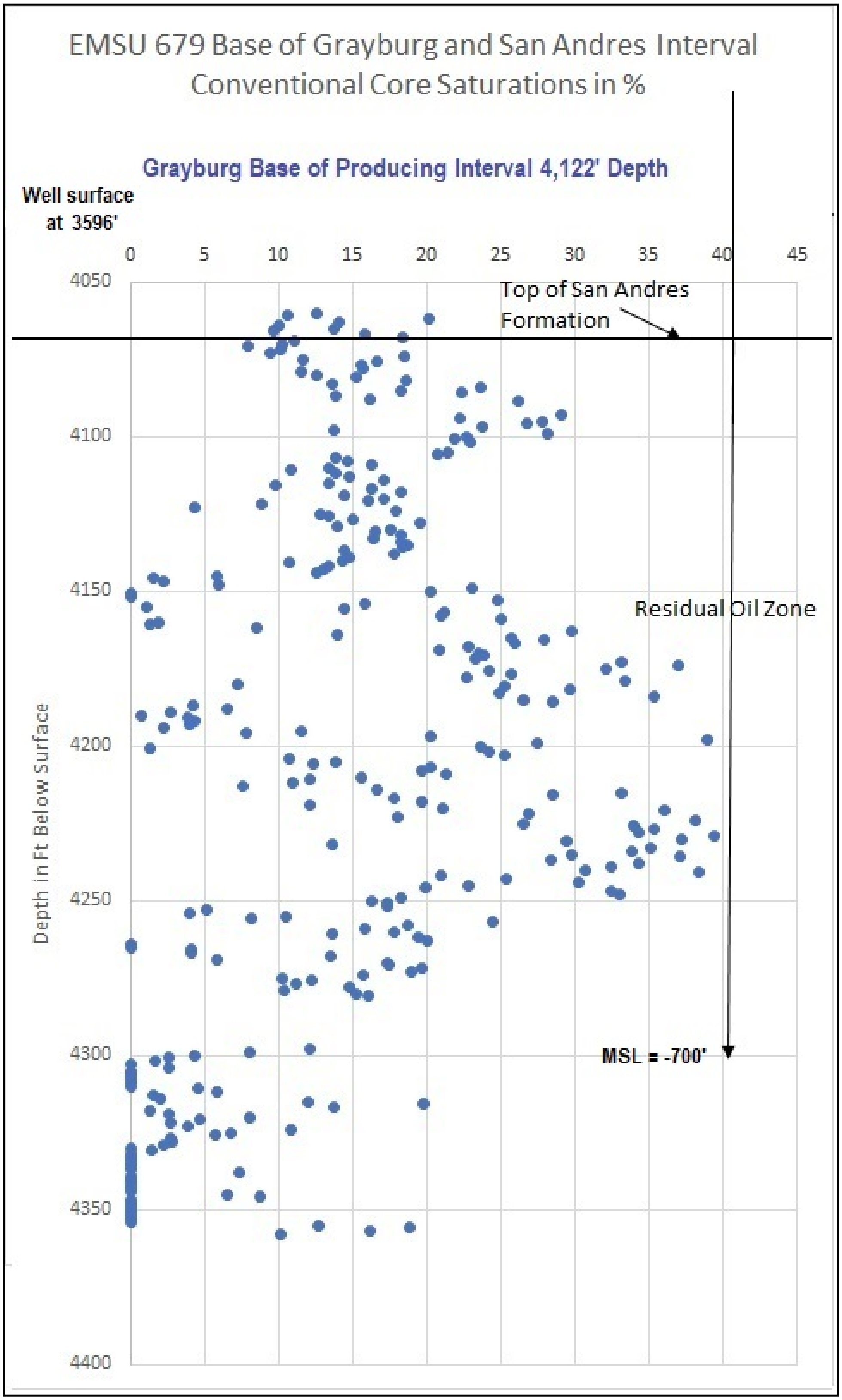

EMSU 679 Base of Grayburg and San Andres Interval
Conventional Core Saturations in %
Grayburg Base of Producing Interval 4,122' Depth
Well surface at 3596'
0
5
10
15
20
25
30
35
40
45
4050
4100
4150
4200
4250
4300
4350
4400
Depth in Ft Below Surface
Top of San Andres Formation
Residual Oil Zone
MSL = -700'

EXHIBIT C-13

Map of the Shelf Carbonate Area in the Eumont Field Region with Conventional Core Taken

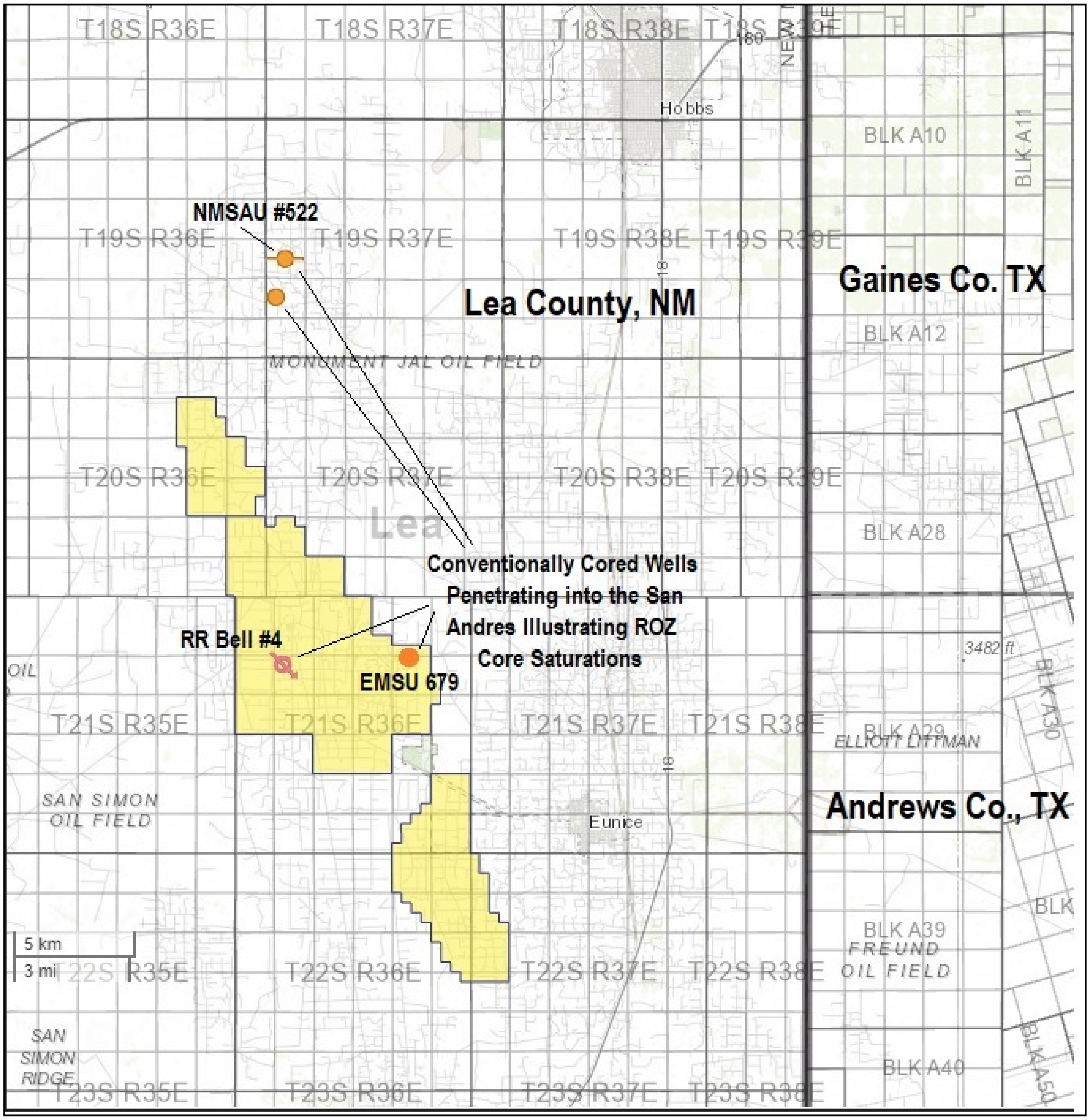


EXHIBIT C-14


Kv/Kh EMSU 679 Grayburg Interval
20% of Kv/Kh >100 md
Kv/Kh (%)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
4060
4080
4100
4120
4140
4160
Depth in Feet
Kv/Kh EMSU 679 San Andres Interval
20% of Kv/Kh >100 md
Kv/Kh (%)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
4140
4180
4220
4260
4300
4340
4380
Depth in Feet

EXHIBIT C-15

Vertical fractures

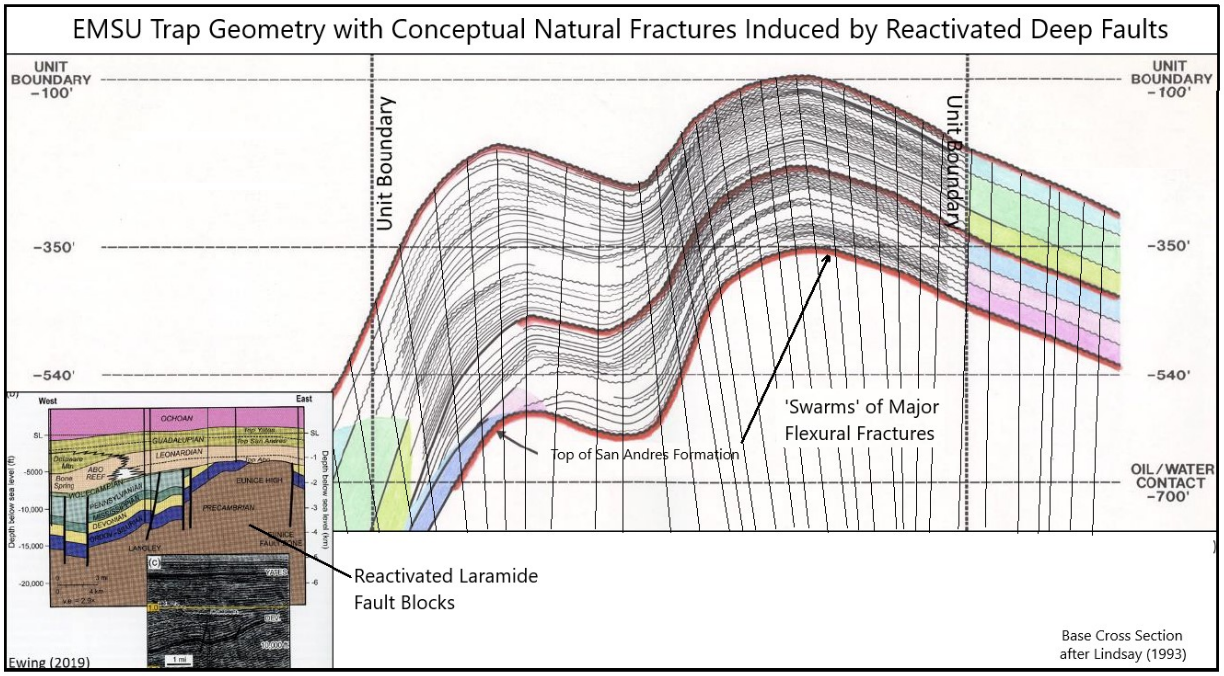


EXHIBIT C-16

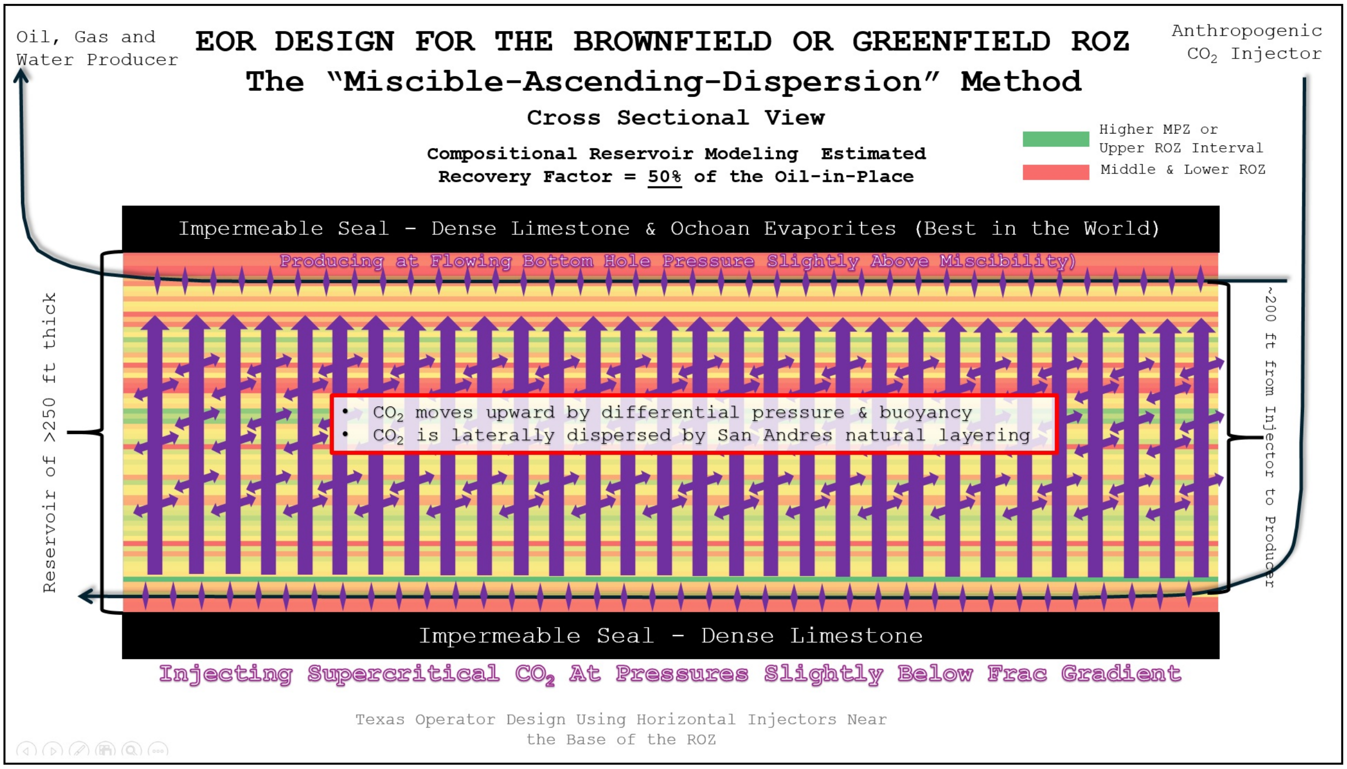

Oil, Gas and Water Producer
EOR DESIGN FOR THE BROWNFIELD OR GREENFIELD ROZ
The "Miscible-Ascending-Dispersion" Method
Cross Sectional View
Anthropogenic CO_2 Injector
Compositional Reservoir Modeling Estimated Recovery Factor = 50% of the Oil-in-Place
Higher MPZ or Upper ROZ Interval
Middle & Lower ROZ
Impermeable Seal - Dense Limestone & Ochoan Evaporites (Best in the World)
Producing at Flowing Bottom Hole Pressure Slightly Above Miscibility)
Reservoir of >250 ft thick
~200 ft from Injector to Producer
• CO_2 moves upward by differential pressure & buoyancy
• CO_2 is laterally dispersed by San Andres natural layering
Impermeable Seal - Dense Limestone
Injecting Supercritical CO_2 At Pressures Slightly Below Frac Gradient
Texas Operator Design Using Horizontal Injectors Near the Base of the ROZ

EXHIBIT C-17

County by County San Andres Greenfield ROZ Study (LSM, ARI, RPSEA II/DOE)

PB Texas	County mi^2	County Size (Acres)	ARI Est ROZ Acreage (Acres)	ARI TOTAL ROZ OIP Million bbls	ARI HIGHER QUAL ROZ OIP, Million bbls	15% OIL Recovery Factor Million bbls	20 Net Util Factor (mcf/Bbl) = Storage Vol (bcf)
Gaines	1,503	961,920	858,000	45,500	35,400	5,310	106,200
Yoakum	800	512,000	421,000	20,700	16,100	2,415	48,300
Terry	891	570,240	549,000	17,940	10,600	1,590	31,800
Dawson	902	577,280	562,000	27,770	14,610	2,192	43,830
Andrews	1501	960,640	657,600	37,130	31,230	4,685	93,690
	PB 5-County Area		3,047,600	149,040	107,940	16,191	323,820 or 323.8 tcf or 16.2 billion Metric Tons of CO_2