

**An Update on Seismicity
and Other Health & Safety
Issues in Recent
Shale Oil & Gas Litigation
and Successful Daubert
Challenges of Experts
IPEC #26**

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Co-Authors and Acknowledgements

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Summary of Major Issues Raised and Daubert Expert Testimony Requirements

In *Daubert v Merrill Dow*, [509 U.S. 579, 113 S. Ct. 2786, 125 L. Ed. 2d 469, 1993 U.S.](#), Supreme Court ruled that, to be admissible, expert scientific conclusion from research for the purpose of litigation must be based on recognized scientific methods of research

- Compliance and Regulatory
- Royalties & Measures
- Transportation
- Air Emissions & Global Warming
- Seismicity
- Surface and Ground Water Contamination
- Produced Water/Water Rights
- Toxic Chemicals Management -Fingerprints

Typical Plaintiff Strategy

- ▶ Plaintiff sues making Claims
- ▶ Offer an Expert with Speculative Conclusions re Claims:
 - ▶ Based on Plausible Connection, only
 - ▶ Based on Limited Data
 - ▶ Based on False Interpretation of Data
- ▶ Force Defendants to Develop Hard and Sound Data and Seek to Prove Action Intentional via State Regulatory Involvement
- ▶ Defendants
 - ▶ Rely on Courts to throw out Plaintiff Expert Data or
 - ▶ Draw out Legal Process, or Settle or
 - ▶ Appeal adverse rulings
- ▶ Texas of 31 cases in 10 years: 4 pending, 5 decided (2 appealed, one settled), 11 dismissed and 11 additional cases settled.
- ▶ Oklahoma of 20 cases: 12 pending, 6 dismissed or closed, 1 settled, 1 decision on appeal

Case Studies: Integrity of Injection Zone, Fracturing and Seismicity

- Horizontal wells interfering with vertical wells, a focus inOklahoma
- AG releases in Louisiana
- AG releases at two locations in Texas
- Sneed Plant, Panhandle, Texas
- South Texas Releases
- Seismic Activity: Denton, West Texas, and inOklahoma
- *E.g. See Earthquakes in Oklahoma: Oklahoma Corporation Commission, OKLA. SEC'Y OF ENERGY & ENV'T, <https://earthquakes.ok.gov/what-we-are-doing/Oklahoma->*

FINDINGS OF EPA & USGS STUDIES

1. Blowouts in Louisiana are directly related to TX injection
2. Communication across formations and between wells can be demonstrated via practical field tests
3. Sneed Plant and South Texas releases illustrate challenge of injection in old fields with many old wells & complex geology for both Plaintiffs and Defendants
4. Some Earthquake activity is related to injection
 - But not necessarily to the Defendant's activities

Case History: Purging Wells Linked To A Disposal Well Through Interference Testing



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2016 One-Year Seismic Hazard Forecast for the Central and Eastern United States from Induced and Natural Earthquakes

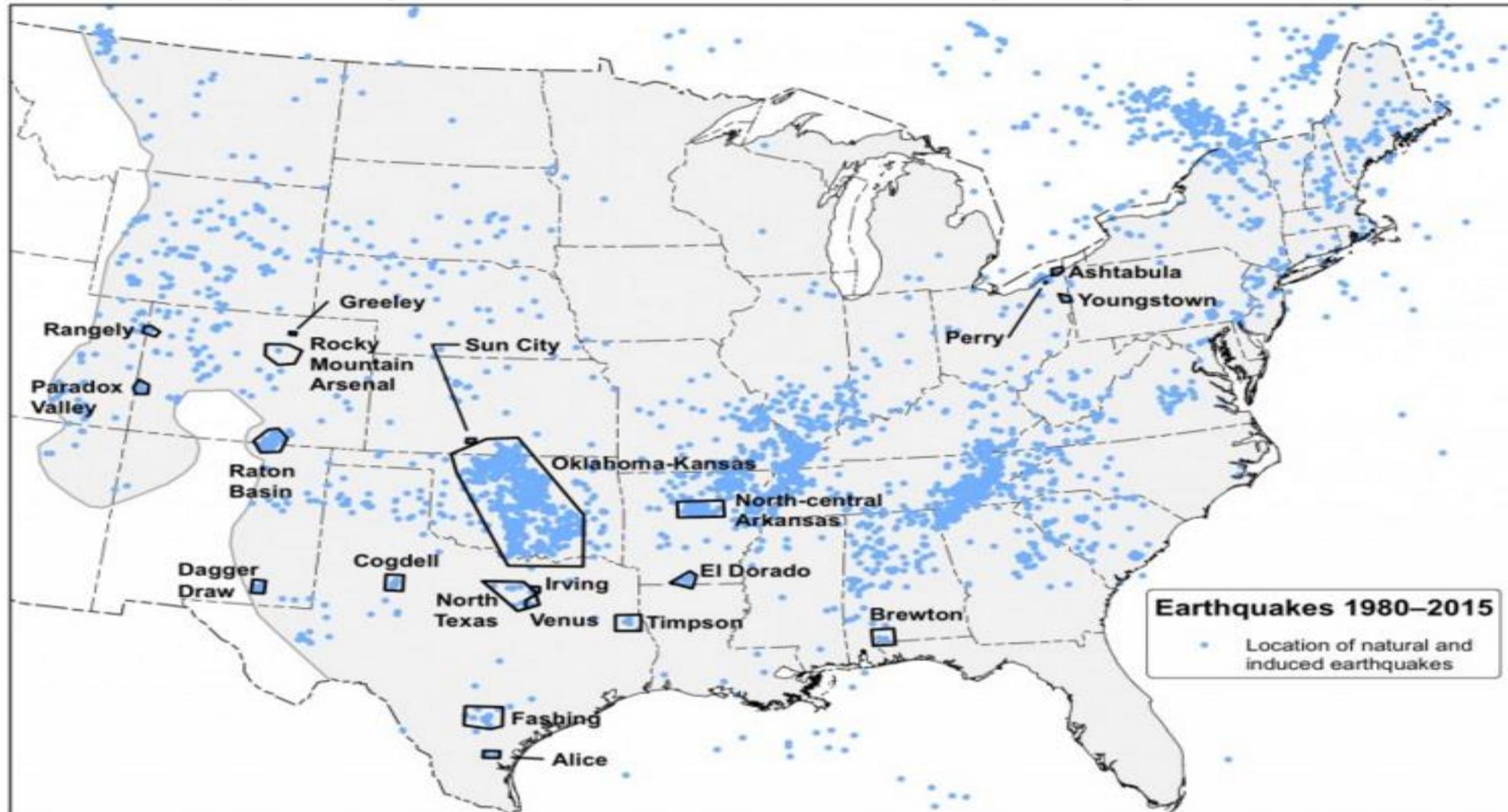
By Mark D. Petersen, Charles S. Mueller, Morgan P. Moschetti,
Susan M. Hoover, Andrea L. Llenos, William L. Ellsworth,
Andrew J. Michael, Justin L. Rubinstein, Arthur F. McGarr, and
Kenneth S. Rukstales

Open-File Report 2016–1035

Litigants in Texas & Oklahoma

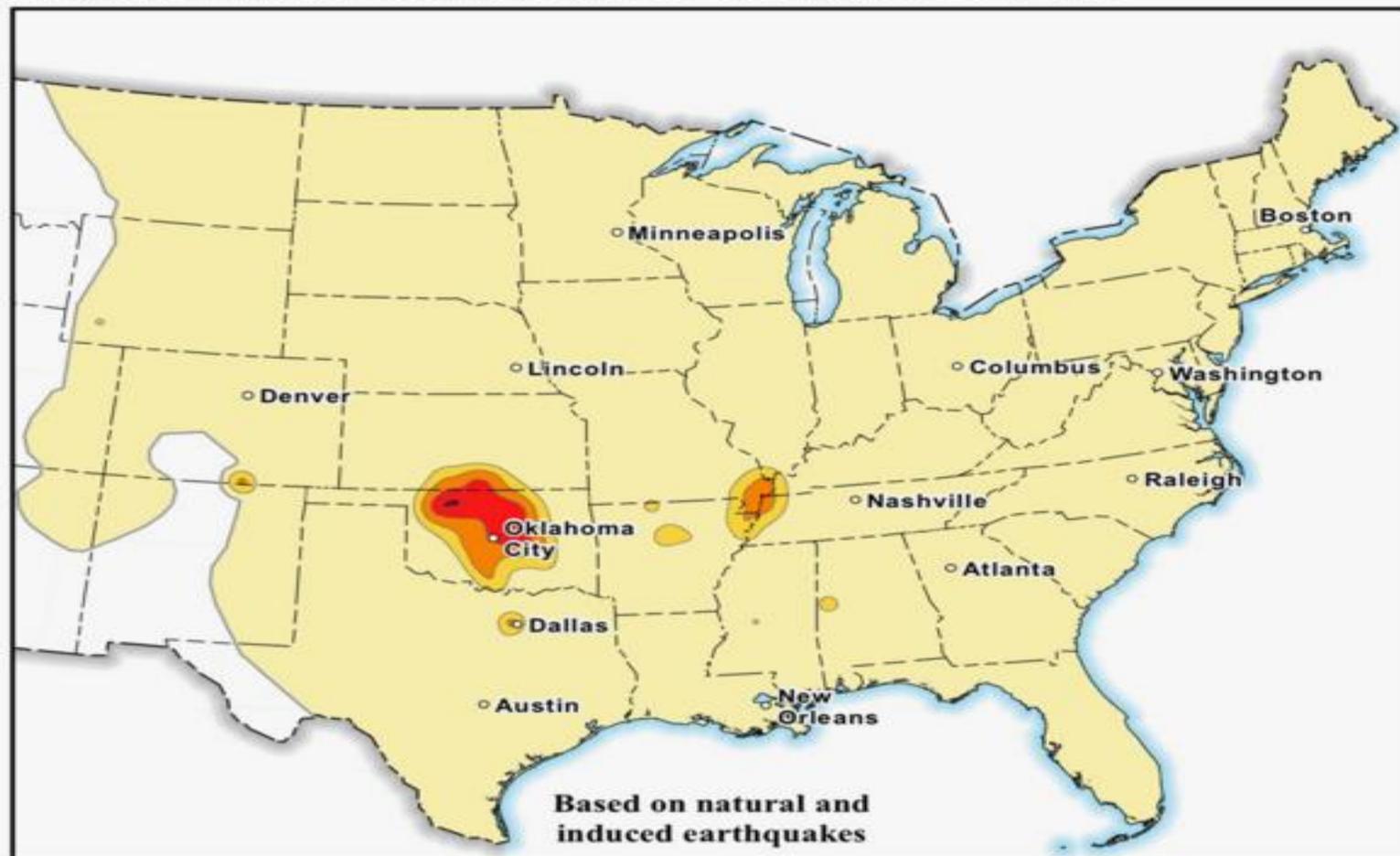
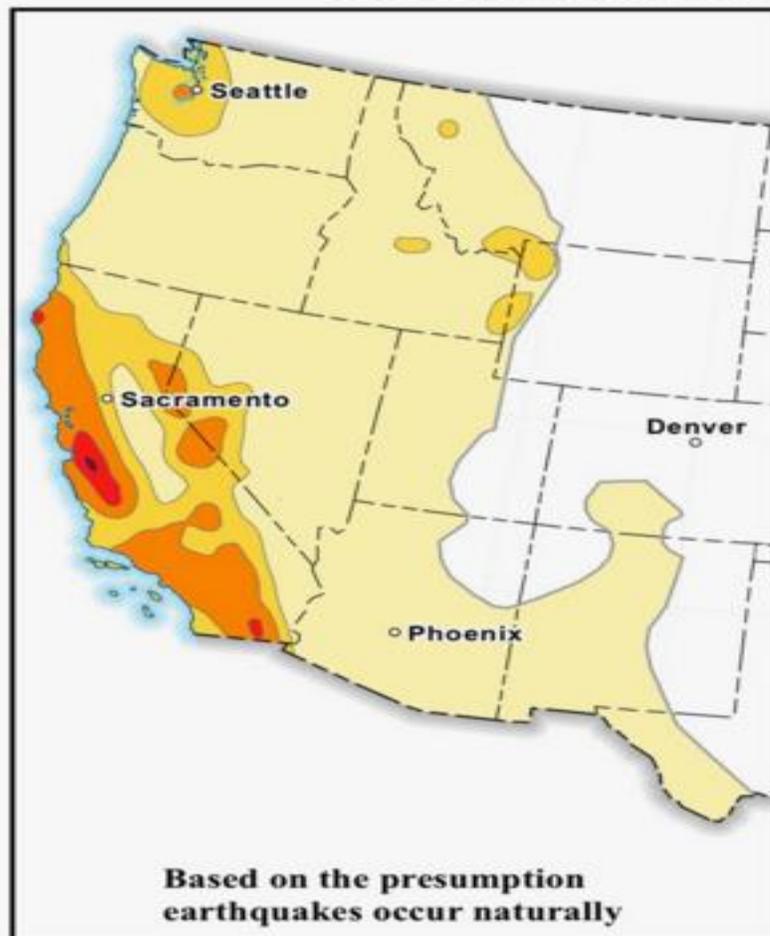
1. Contend Earthquake is related to Injection of Defendant(s)
2. Reference USGS or Oklahoma Studies
3. Offer no Definitive Studies of Their Own
4. New Seismic Monitoring Networks allow Defendants to Assess Relationship of Quakes to Defendant Activities
5. Cases dismissed, verdicts thrown out, or minimal settlements
6. Daubert Challenge: no case specific data analysis, plaintiff expert opinions are speculative

USGS Map of Earthquakes since 1980 and Recent Areas Impacted by Induced Seismicity

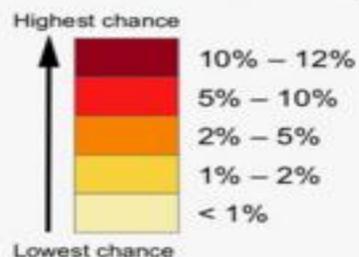


USGS map displaying 21 areas where scientists have observed rapid changes in seismicity that have been associated with wastewater injection. The map also shows earthquakes—both natural and induced—recorded from 1980 to 2015 in the central and eastern U.S. with a magnitude greater than or equal to 2.5.

USGS Forecast for Damage from Natural and Induced Earthquakes in 2016

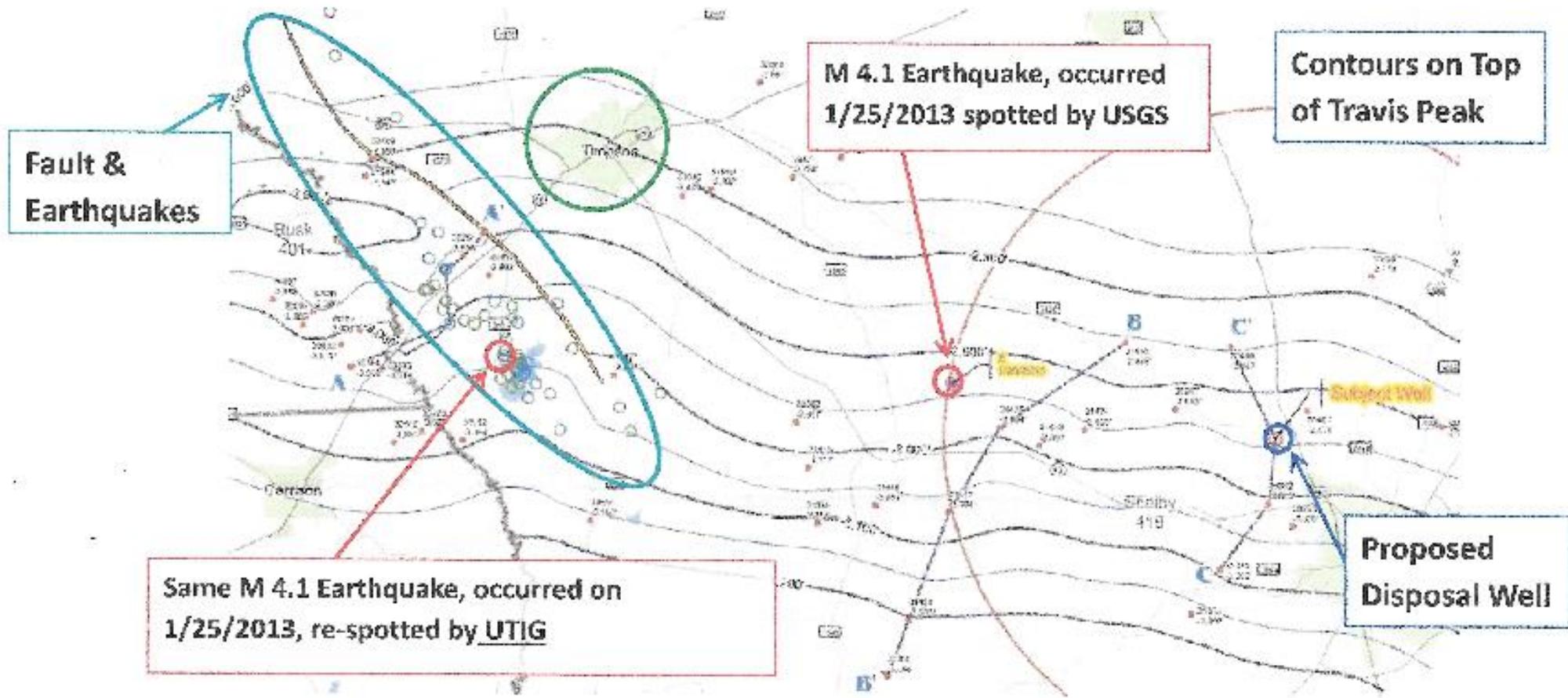


Chance of damage

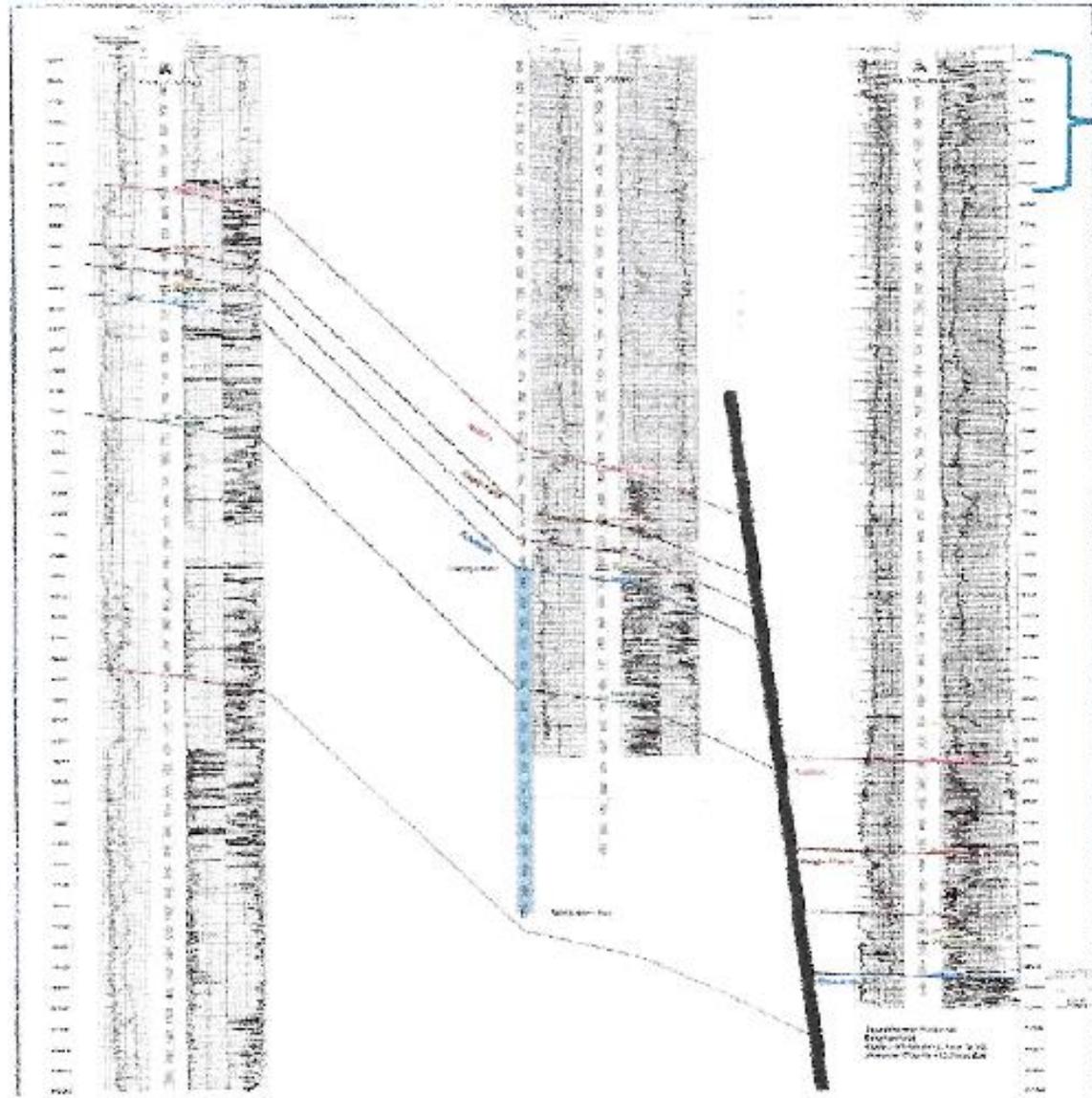


USGS map displaying potential to experience damage from natural or human-induced earthquakes in 2016. Chances range from less than 1 percent to 12 percent.

Structure Map with Epicenters



Geologic Cross Section



Disposal Interval

Unfaulted rock

faulted rock

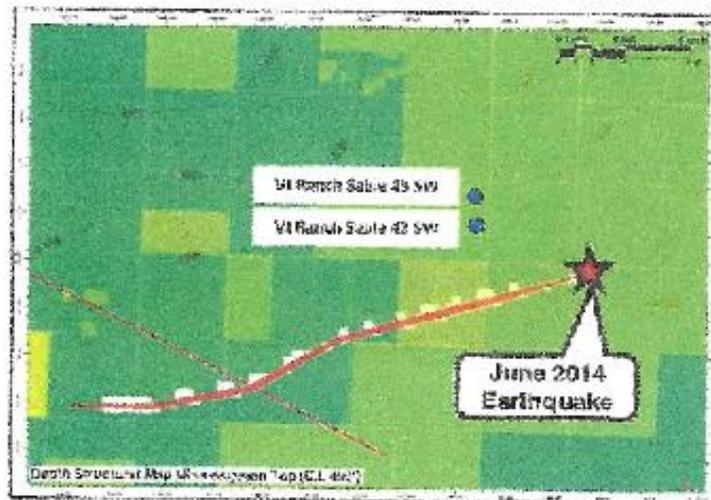
Seismic Cross Section



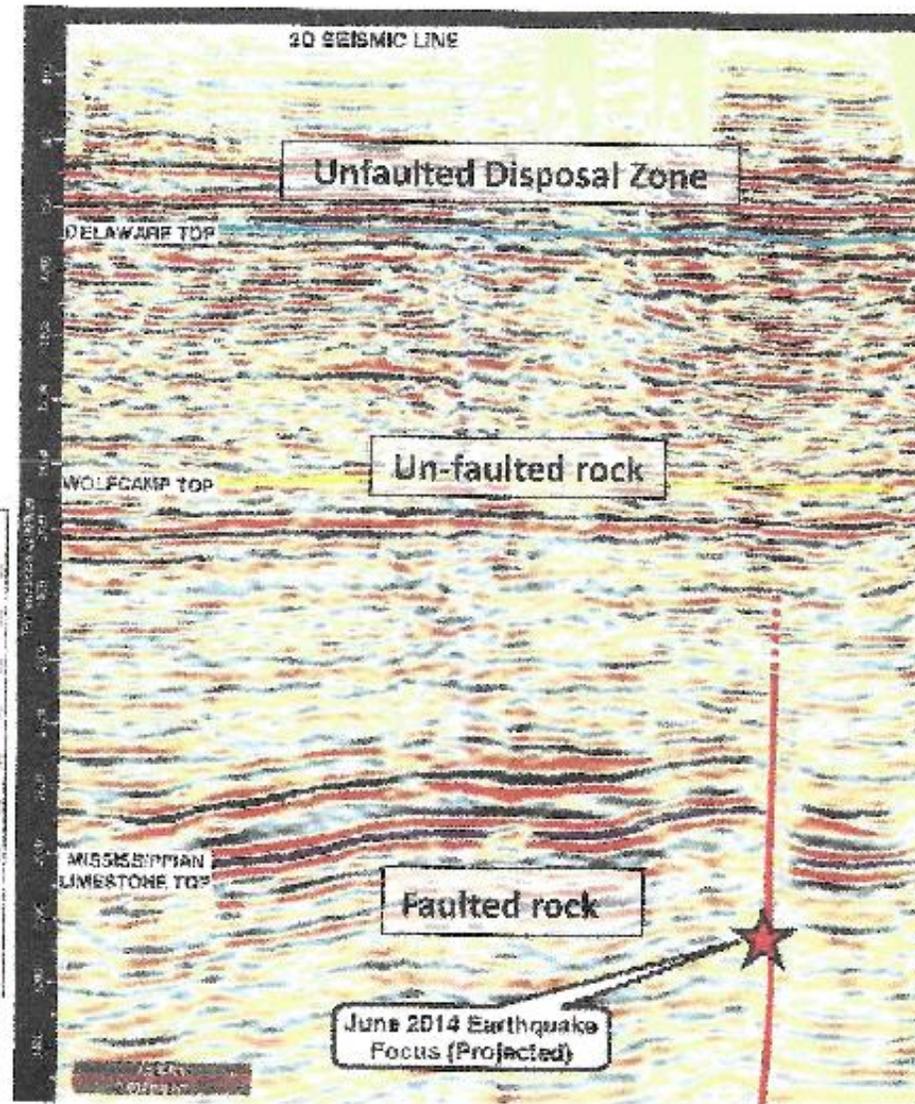
Seismic Survey near NW Red Bull, with proposed Delaware Mountain Group SWD locations and focus of the 28 June 2014 Magnitude 2.9 Earthquake

To accompany Form H-1 for VJ Ranch Sable #2 SW and VJ Ranch Sable #3 SW

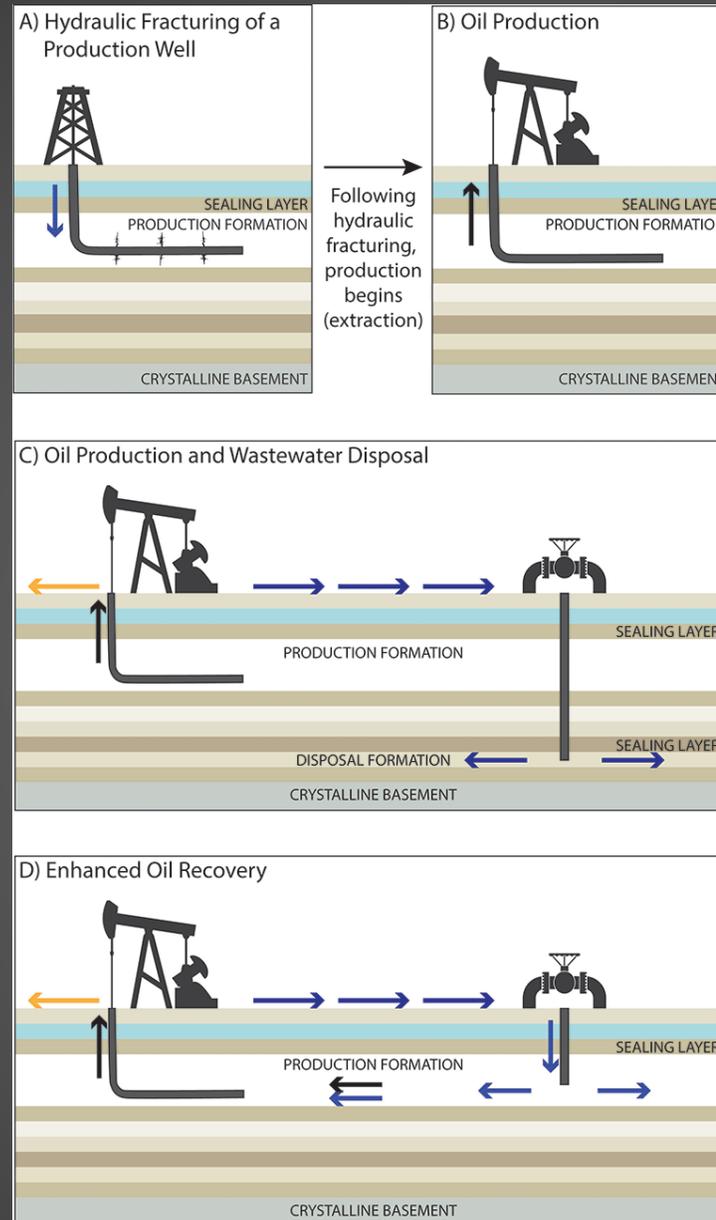
Balmorhea Ranch (Bell Canyon L. Field)
Huebner County, Texas (District 108)



*Geophysical Interpretation by Maria Cristina Bernal,
Geophysical Advisor, Occidental Worldwide Exploration*



Shale Oil & Gas Injection, and Enhanced Oil Recovery



Findings of BEG Case Studies

1. Texas has plenty of Water to support Shale Oil & Gas Production
2. Biggest demand on water remains to be agriculture
3. Siesmicity is related to injection primarily for disposal of produced water
4. Discharge of produced water with treatment offers increase water for cities and agriculture

State Regulatory Action: Texas & Oklahoma

- ▶ Texas and Oklahoma now have authority to require more information and seismic monitoring before issuing permits
- ▶ The Oklahoma Geologic Society and Texas Bureau of Economic Geology have expanded seismic monitoring networks and have concluded that injection is correlated with recent seismic events.
- ▶ Oklahoma issued new regulations in 2014 and Texas followed. Both states are identifying areas of concern
- ▶ Both have rejected some new applicants, limited injection or modified permits. As the science around disposal wells continues to evolve, agencies using “traffic light” system. The “yellow light” temporary permits where concern, and rejected others based on “red light” criteria.
 - Temporary (6 month) permits with shut in bottom hole testing every 60 days.
 - Agency can change limits with notice
 - Operator must monitor seismic activity
 - Mandatory shut down in the event of defined seismic activity
 - Change in injection zone to be higher above faults or basement rock.

Conclusions

- Plaintiffs are litigating over major issues.
- Experts can design sound studies based on accepted methods and methodologies.
- Utilizing Daubert criteria as guides will yield unbiased data and bases for technically sound conclusions.