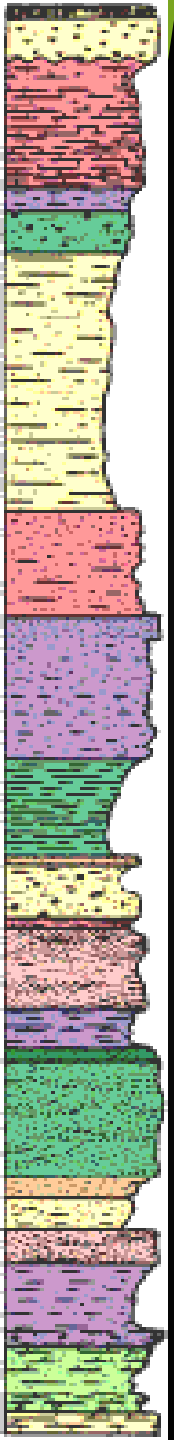

# Fifth UPDATE ON ENVIRONMENTAL ISSUES RAISED BY LITIGANTS AGAINST HYDROFRACTURING

**Presented by: Richard Bost, P.E., P.G. (Texas)**

I2M Associates

# Issues Raised in Recent Litigation

## Increasing, Litigants are Suing regarding Damages

### Examples of Issues Raised

- Air Emissions & Global Warming-**
- Compliance and Regulatory
- Economic
- Associated Activities: i.e.: Mining Sand/Transportation
- Nuisance: Odor & Noise **
- Seismicity-**
- Surface and Ground Water Contamination
- Water Use
- Waste & Toxic Chemicals Management and Disposal
- H2S/Produced/Flow Back Water Disposal-**


Positive proof of global warming.
18th Century
1900
1950
1970
1980
1990
2006

# Recent Studies are Refuting Litigant Claims

## Groundwater



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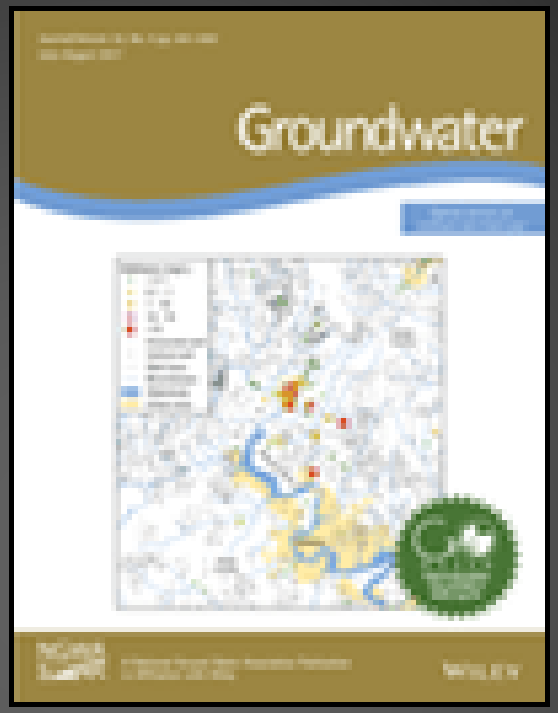



•Articles on Methane Occurrences in Aquifers Overlying Various Shale Plays in Texas
by Jean-Philippe Nicot, et al
Available online: 1 MAR 2017 | DOI: 10.1111/gwat.12508

# Outcomes in Recent Litigation

- 10 Circuit – Deferred on Rule re Disclosure of Injected Chemicals on Federal Land
- Oklahoma Horizontal Fracturing Impact on Producing Conventional Well
- Texas Seismic Damage – UT sets up seismic monitoring system to identify most prone areas and identify factors
- Texas Supreme Court Rules on Dish Tx Nuisance Case
- Texas H2S Blowouts near Injection Wells – Part of Case Settles and Intervenor Case Dismissed

# Factors Affecting Outcomes in Recent Litigation

- Timing of Case
- Statute of Limitations, Whether State Has Penalized
- What Company Knew or Should Have Known
- Uncertainty of Fractures in Zone
- Adequacy of Well Records
- Funding and Persistence of Plaintiffs/Anti-oil Forces
- Fear: that litigation may affect E&P operations: ease of operation, costs of permitting and reporting, risks from permitting and reporting

# Outcomes in Recent Litigation

- Sept 2017:  10th Circuit Federal Appeals Court – Deferred Ruling on Rule re Drilling & Disclosure of Injected Chemicals on Federal Land
- The Bureau of Land Management enacted the regulations in 2015, requiring drilling companies to disclose what chemicals they used within 30 days of any hydraulic fracturing on land owned or managed by the federal government.
  - The 10th U.S. Circuit Court of Appeals in Denver said it would be a waste of time to rule on the regulations, because the Trump administration has already begun the process of revoking them.
  - The ruling left the status of the regulations unclear.
  - Mike Freeman, an attorney who represents environmentalists in the case, said the regulations are in force until the Trump administration formally revokes them, and that could take months and get tied up in court.  BLM said it was a waste of money to enforce rules that will ultimately be revoked.

# Outcomes in Recent Litigation

- Oklahoma Fracturing Interference Case - **Small producer wins verdict against Devon in 'frack hit' case**
- August 2017: An Oklahoma jury awarded $220,000 to a company that says hydraulic fracturing of a horizontal oil well damaged its conventional oil well.
  - Issues:
    - Standard of Care,
    - Adequacy of old records and
    - Understanding of fractures and faulting in zone

# Outcomes in Recent Litigation

- Two Types of Texas Seismicity Cases
  - Seismic Survey damage on homes
  - Injection-induced ‘fracturing” earthquake damage
  - Issues:
    - Wrong parties sued
    - Proof of Cause : Effect relationship
    - Lack of Material damage not covered by insurance
  - Texas less studied than Oklahoma
  - USGS assumptions are based on trend analyses only
  - UT studies initiated discover increases in seismic events in portions of West Texas and near Denton

# Outcomes in Recent Litigation

- May 2017:  Texas Supreme Court Rules 2-Year Statute of Limitation Precludes 2011 Lawsuit: Dish, Tx + 18 Residents v. 5 Oil Companies
- Natural Gas Pipeline Co of America vs Justiss, 398 SW 3d. Found that statute met when 1992 compressor noise levels had increased, “conditions worsened” and Texas had investigated & found a violation two months before lawsuit filed in 1998.
- Plaintiffs claimed that combined effect of 4 compressor stations, completed in May 2008, plus a metering station completed in June 2009, constituted a continual noise Nuisance and Wolf Eagle report dated September 2009 was when they discovered they were being exposed to TIC air pollutants as well as benzene.
  - Plaintiffs first complained in 2006 vociferously
  - TCEQ April 2008 investigation found no odors and no air violations; air monitoring system found air quality similar to other urban areas and no exceedances of PCLs
  - TxDSHS tested blood and urine of 28 residents,  no values higher than normal population except benzene in one smoker only.
  - Similar facts as in other “Wolf Eagle” cases where Robinson precluded evidence. This case odors & noise without health proving health claims.
  - Less throughput at stations in 2009 and Texas found no violations; therefore no worsening of air quality or noise levels after February 28, 2009.

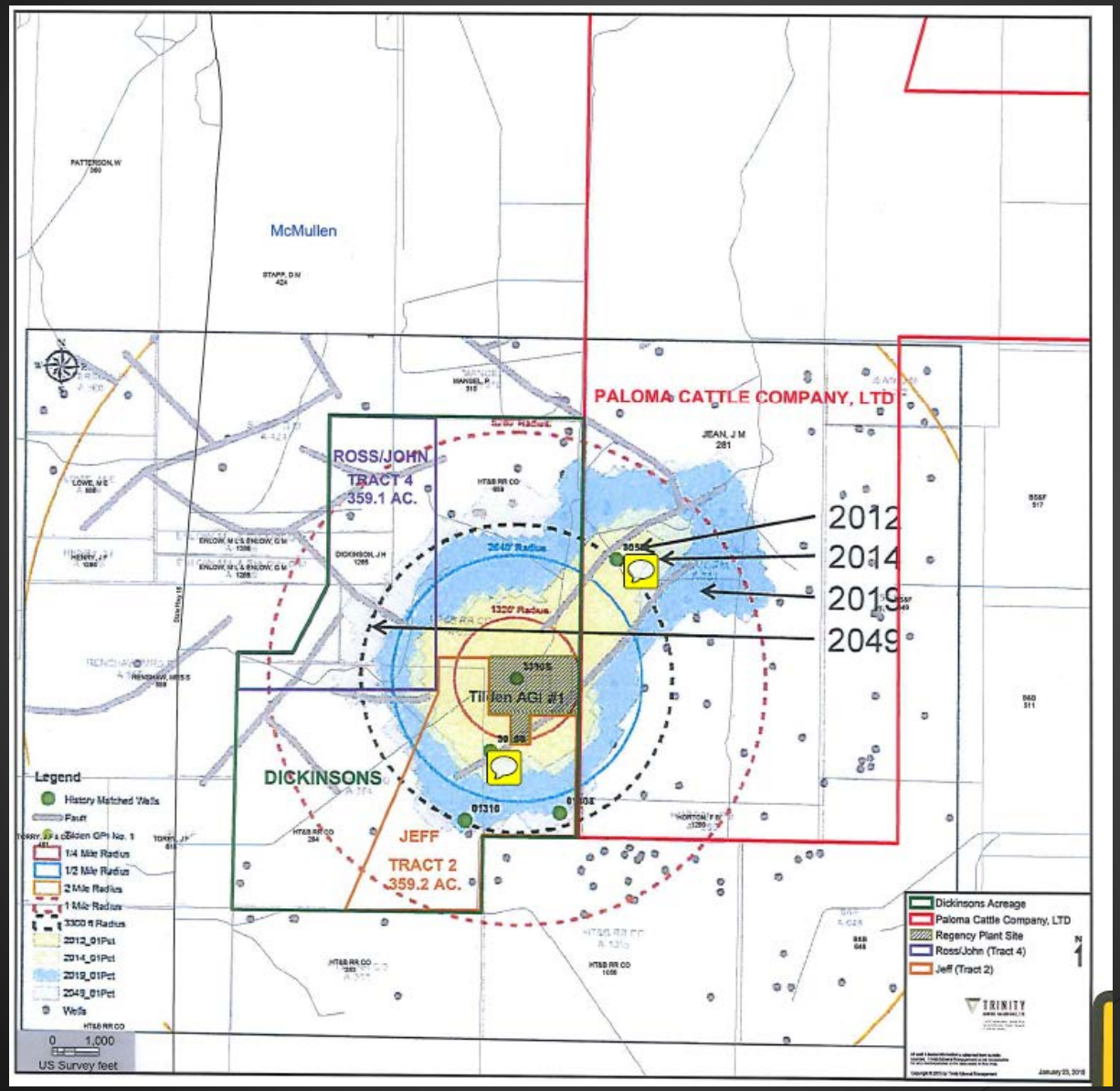
# Outcomes in Recent Litigation

- Texas H2S Blowouts near Injection Well in South Texas
  - Quintanilla, Dickinson Swift vs Regency
  - Sour gas is treated removing H2S and CO2 using cryogenic technology developed in Canada; liquid is injected into spent zone
  - Acid gases affect formation and is highly corrosive; 20 ppm is OSHA limit; IDHL is 100 ppm.
  - H2S injection began in 2007; two blowouts in 2012.
  - Judge refuses to dismiss or change venue
  - Swift intervenes in 2015.
  - Case Settled with Original Plaintiff Property and Mineral Rights Owners
  - At Trial, Judge rules intervenors are late joining the case; case may be appealed.

# Outcomes in Recent Litigation

- H2S Blowouts near Injection Well in South Texas
  - 35% H2S and 60 % CO2 injected a mile deep in old oil and gas field
  - Eagle Ford production increasing production of sour gas
  - Modelling and permit for ¼ mile radius injection zone in Wilcox Formation
  - 15% H2s Acid gases 3300 feet from injection well measured in production tank
  - H2S escapes a workover well 1/3 mile away and kills cattle
  - RCT orders re-plugging wells within 2/3 mile of injection well and consideration of a deeper alternative injection zone
  - Multi-million settlement
  - Several similar injections wells in Texas including West Texas
  - H2S injection is Banned in some states and in Canada

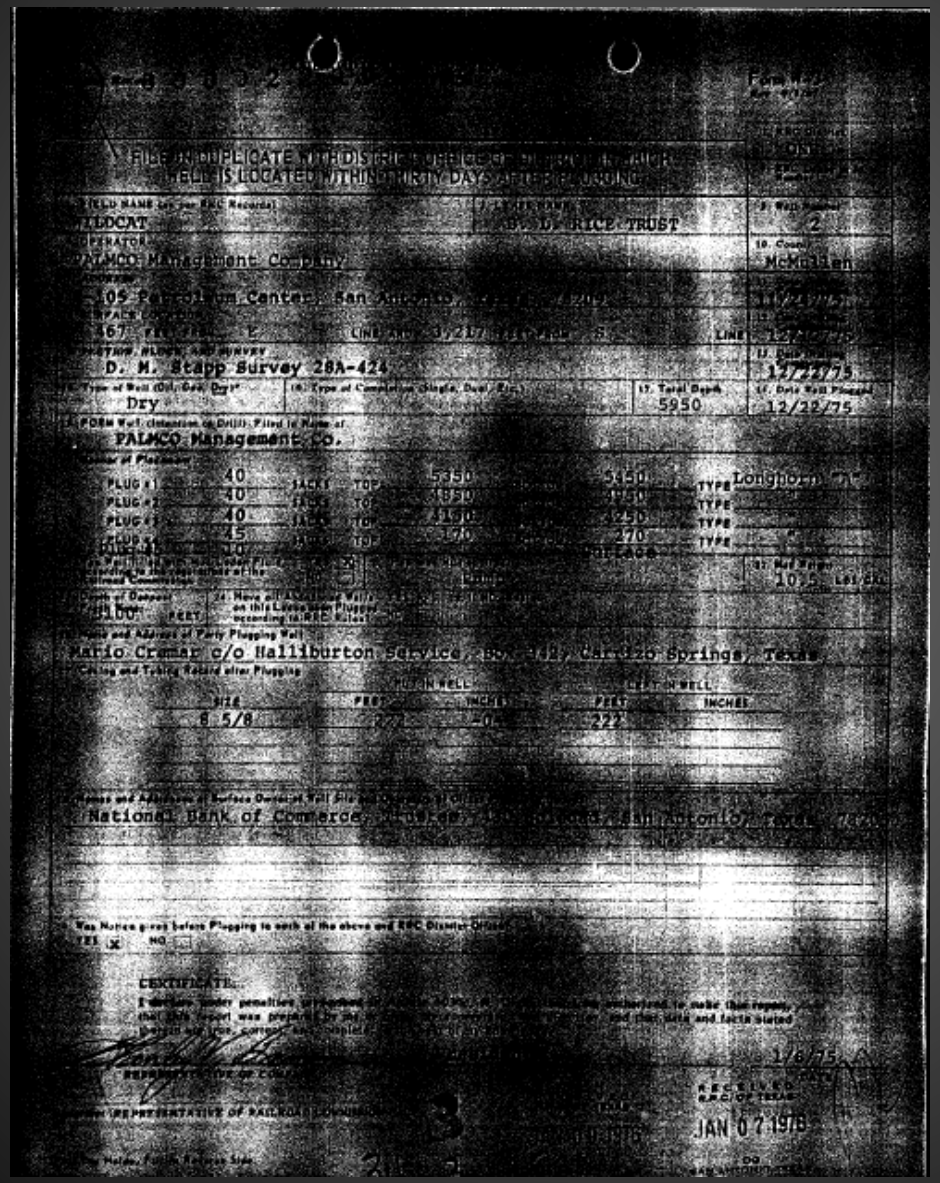
# South Texas Comparison of Plume Models



# Potential Lessons from Recent Litigation

- Cases illustrate horizontal fracturing and injection issues
  - Lack of data hampers injection zone and fracture zone modelling
  - Current RCT H2S contingency plans are focused only on injection well releases and not release(s) from old wells – no provision for injection seismicity issues
  - Fracturing and Injectate impact on target zone not well understood; inaccurate predictive “reservoir” models
  - Fractures and faults not noted in initial Seismic Surveys, resolution of 50 foot displacement
  - Uncertainty on adequacy of old well records
  - Adequacy of old grouts and casing to withstand new pressures and corrosivity and seismic events
  - Lack of monitoring  to detect a release
  - Lack of contingency response crews and equipment to address a release

# Example of State Well Record in Project Area



D. M. Stapp Survey 28A-424

Dry

5950

12/22/75

PALMCO Management Co.

Longhorn

Mario Cramar c/o Halliburton Service

National Bank of Commerce

JAN 07 1976

# Outcomes in Recent Litigation

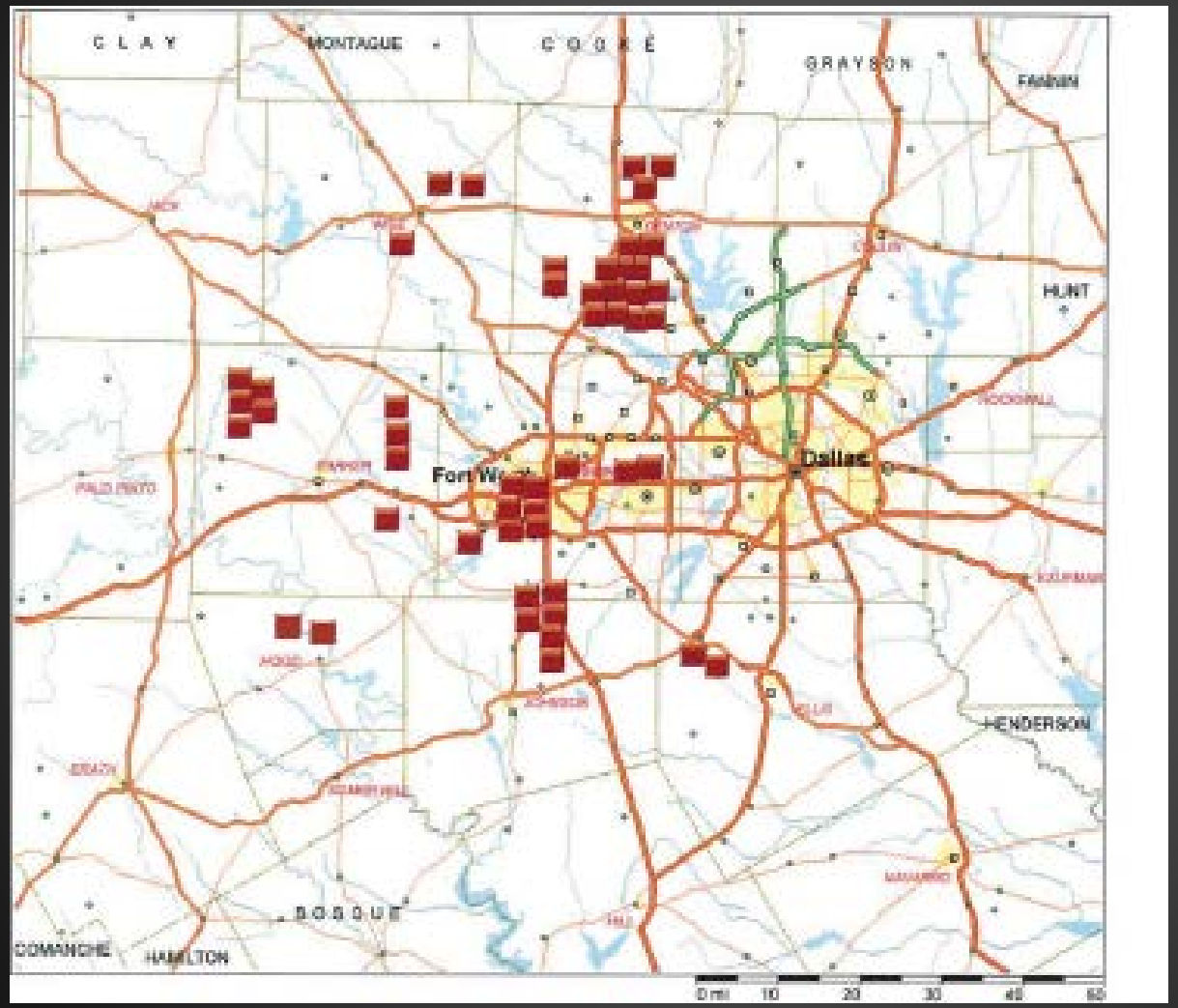
- Opportunity for application of new technologies and Legal Tests
  - Micro-seismic surveys and advanced geophysics
  - 4-D plume monitoring
  - Drone monitoring and monitoring networks
  - Contingent met stations and real-time release weather modelling tied to emergency notification systems
  - “Daubert” challenges

# Daubert and Robinson Factors

Under Federal & Texas Rules, there are factors to consider when determining whether expert testimony is admissible:

1. Whether the theory is generally accepted in the scientific community (testing and validation); USGS, CDC, TX Health Department findings
2. Whether the theory/method has been subjected to peer review and publication; reviewed and "verified" by expert panel
3. Whether the potential or known rate of error is acceptable; accepted statistical and probability methods utilized
4. Whether the theory/method has been tested or can be tested. Alternative explanations tested and eliminated

# Rich Data Monitoring Locations



# Rich Correlations

**Table 4.** Pearson's correlation nonmethane volatile organic compounds

| | Benzene | Chloromethane | Dichlorodifluoromethane | Toluene | *m*- and *p*- Xylene |
|---|---|---|---|---|---|
| Benzene | **1.0** | | | | |
| Chloromethane | 0.0723 | **1.0** | | | |
| Dichlorodifluoromethane | −0.0791 | −0.0999 | **1.0** | | |
| Toluene | **0.8927** | 0.1292 | −0.1324 | **1.0** | |
| *m*- and *p*-Xylene | **0.8658** | 0.0686 | −0.1368 | **0.9543** | **1.0** |
| C12 hydrocarbon | 0.1823 | −0.1746 | 0.2925 | 0.1744 | 0.257 |

**Table 5.** Correlation of methane to chemical constituents

| Chemical | Correlated to Methane |
|---|---|
| Methane | 1.0 |
| 3-Methylhexane | 0.81 |
| C5 Hydrocarbon | 0.68 |
| C9 Hydrocarbon | 0.68 |
| 2-Methylbutane | 0.64 |
| C7 Hydrocarbon | 0.55 |
| C8 Hydrocarbon | 0.55 |
| Trichlorofluoromethane (F-11) | 0.53 |
| Hexachlorobutadiene | 0.36 |
| Tetrachloroethene (PCE) | 0.35 |
| C4 hydrocarbon | 0.34 |
| Methylhexane | 0.33 |
| C6 Hydrocarbon | 0.33 |
| 1,2,4-Trichlorobenzene | 0.33 |
| Diethyl trisulfide | 0.29 |
| Chloroform | 0.29 |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