

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

**APPLICATION OF OVERFLOW ENERGY,
LLC FOR APPROVAL OF A SALT WATER
DISPOSAL WELL, EDDY COUNTY, NEW
MEXICO**

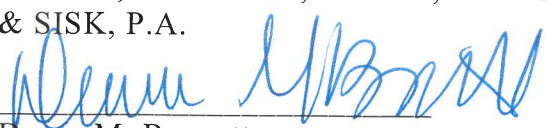
CASE NO. 20964

**MARATHON OIL PERMIAN, LLC'S
SUPPLEMENTAL INFORMATION FOR THE RECORD**

Marathon Oil Permian LLC ("Marathon") submits the attached supplemental information for the record in Case No. 20964. Marathon entered an appearance in this case and the undersigned counsel appeared on Marathon's behalf at the December 12, 2019 Examiner Hearing. Overflow Energy, LLC's consultant prepared a Fault Slip Potential ("FSP") analysis and testified about that analysis at the hearing. Marathon has reviewed Overflow's FSP analysis and prepared its own FSP analysis, attached as Exhibit A to Mr. Jon Buening's affidavit. As stated in Mr. Buening's affidavit, Marathon continues to object to the granting of Overflow's application based on proximity to a fault of concern.

Respectfully submitted,

MODRALL, SPERLING, ROEHL, HARRIS
& SISK, P.A.

By: 

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing was served on counsel of record by electronic mail on February 27, 2020:

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CASE NO. 20964

AFFIDAVIT OF JON BUENING

STATE OF TEXAS)
) ss.
COUNTY OF MIDLAND)

I, Jon Buening, make the following affidavit based upon my own personal knowledge.

1. I am over eighteen (18) years of age and am otherwise competent to make the statements contained herein.

2. I am a geophysicist with Marathon Oil ("Marathon").

3. I am familiar with the application that Overflow Energy, LLC ("Overflow") filed in this matter seeking approval of the RITA SWD 1 well.

4. Marathon protested Overflow's administrative application for the RITA SWD 1 well on July 23, 2019, and alerted the New Mexico Oil Conservation Division to Marathon's concerns regarding the location of the proposed well with respect to a fault of concern.

5. Marathon also protested Overflow's application when it was submitted for examiner hearing and appeared at the examiner hearing held on December 12, 2019.

6. Marathon protested the proposed RITA SWD based on seismicity concerns.



7. I had discussions with Overflow's consultants regarding Marathon's concerns.

8. Overflow's consultant provided me with data inputs used to run the Stanford Fault Slip Potential ("FSP") analysis.

9. It is my understanding that Overflow's consultant provided that FSP analysis at the hearing.

10. I re-ran the FSP analysis using the same inputs Overflow's consultant used, except that I inserted the current maximum horizontal stress direction applied from the Lund Snee and Zoback (2018) publication. The authors of this paper are the main creators of the FSP tool, and their work is considered the industry standard. When I inserted Overflow's inputs and the horizontal stress direction and ran the FSP, the results were very different than those presented by Overflow and continue to cause Marathon significant concern.

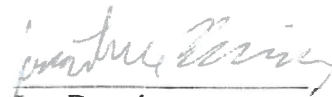
11. Attached as Exhibit A is a summary of the FSP analysis I ran using the above-described inputs.

12. Contrary to the hearing testimony and exhibits, the modeling predicts an FSP of 0.69 by 2045.

13. Marathon continues to object to the granting of Overflow's application based on proximity to a fault of concern.

14. I attest that the information provided herein is correct and complete to the best of my knowledge and belief.

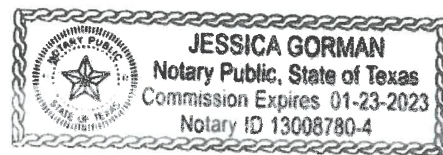
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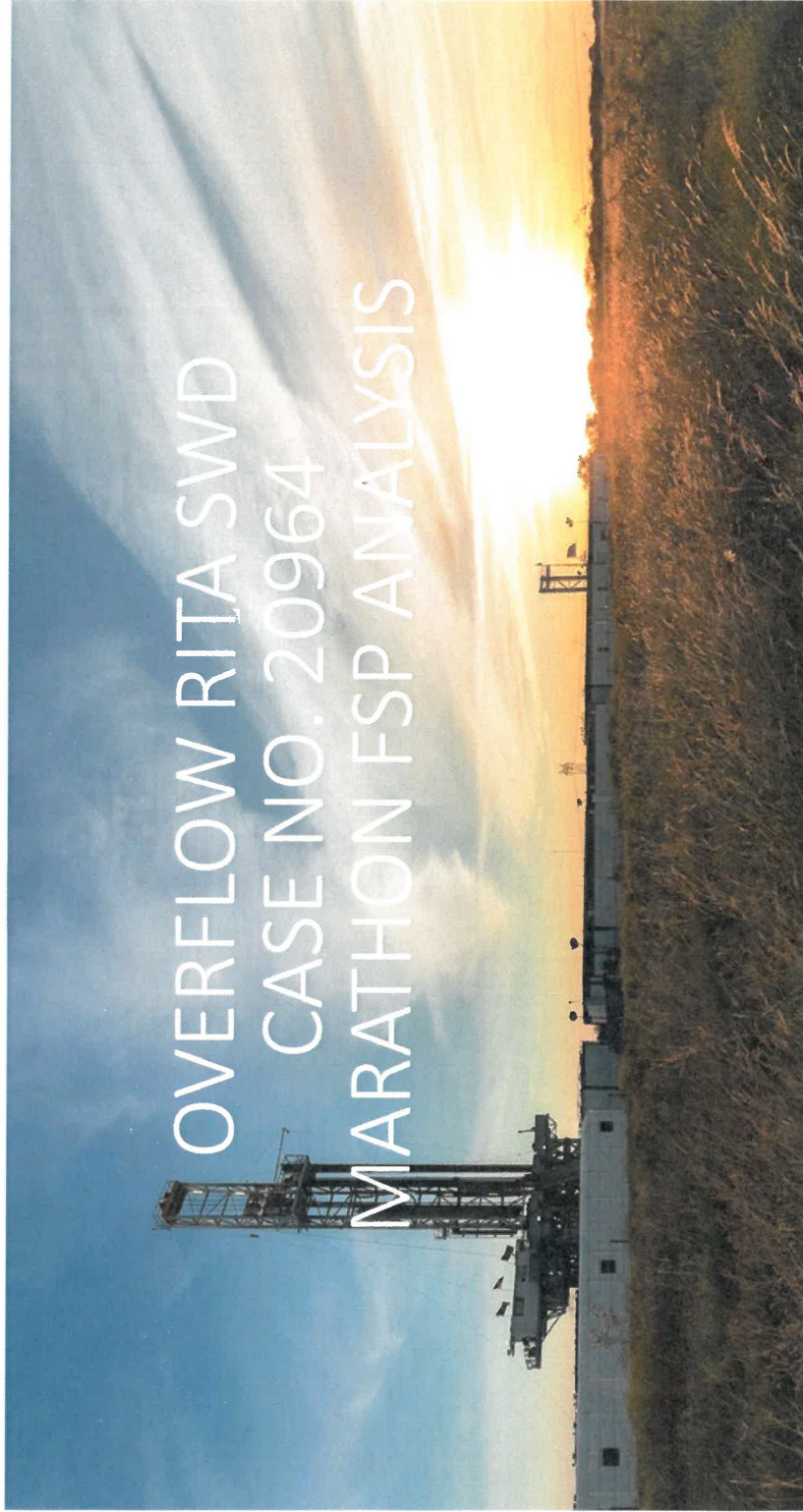

Jon Buening

SUBSCRIBED AND SWORN to before me this 25th day of February, 2020 by Jon Buening.

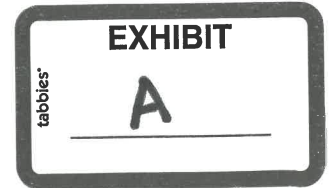

Notary Public

My commission expires: 1/23/2023





Jon Buening
February 18th, 2020



Area of Fault Slip Potential (FSP)

Analysis from Lund Snee and Zoback (2018)

Relative Stress Magnitudes, A_f Parameter (Simpson, 1997)

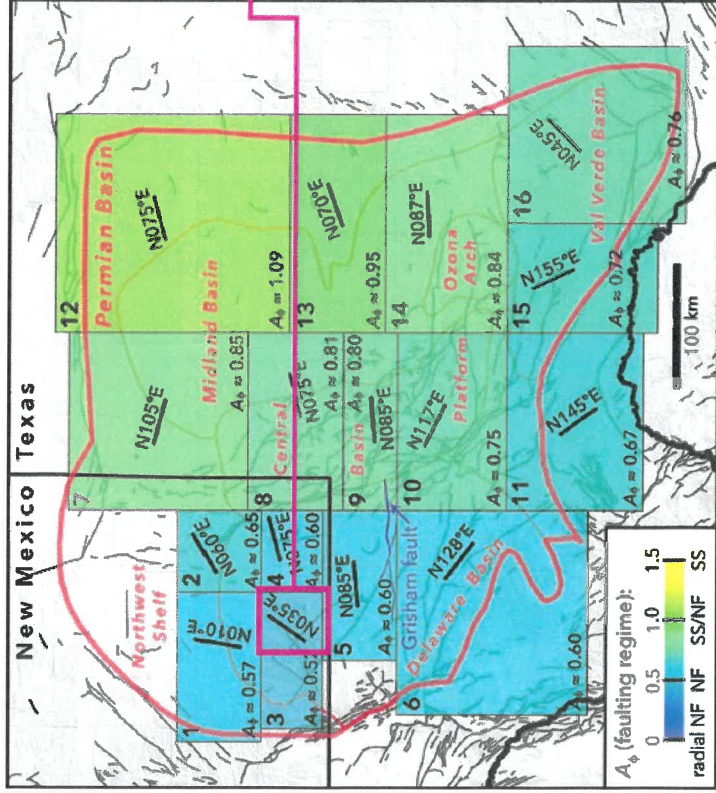


Figure 2. Map of study areas chosen for FSP analysis on the basis of broadly similar stress conditions. Text annotations indicate representative S_{max} orientation and relative principal stress magnitudes (A_f parameter) for each study area based on the data presented in Figure 1. Gray lines in the background indicate fault traces compiled from Ewing et al. (1990), Green and Jones (1997), Ruppel et al. (2005), and the USGS Quaternary Faults and Folds Database (Crome and Wheeler, 2000), to which we apply FSP analysis.

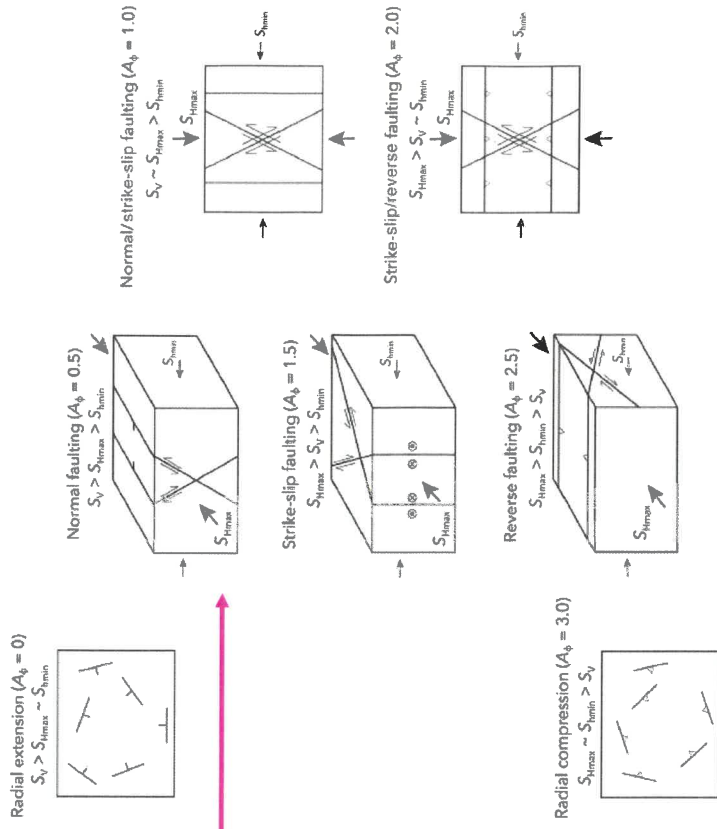


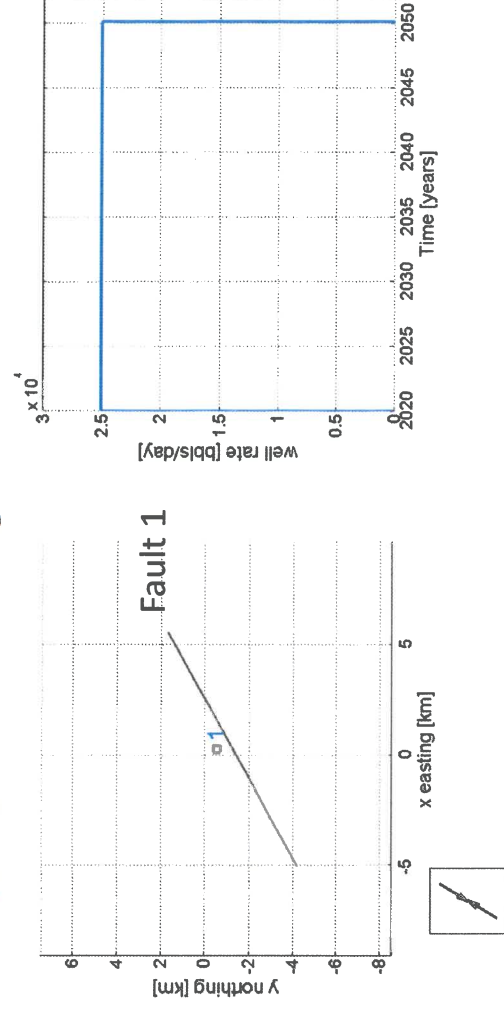
Figure A1. Schematic illustration of fault types active as a function of relative stress magnitudes (faulting regime) and corresponding A_f parameter

Input Summary

Parameter	Rita SWD	Comment
Faults	1	
Aquifer Thickness	200 ft	
Porosity	5%	
Perm	35 mD	
Injection well	1 @ 25K/day 2020-2050	Single Injection Well
Max/Min Horiz Stress	.86465/0.62875	* Numbers from Overflow for consistency
Coefficient of Friction	.6	
SHmax	035	

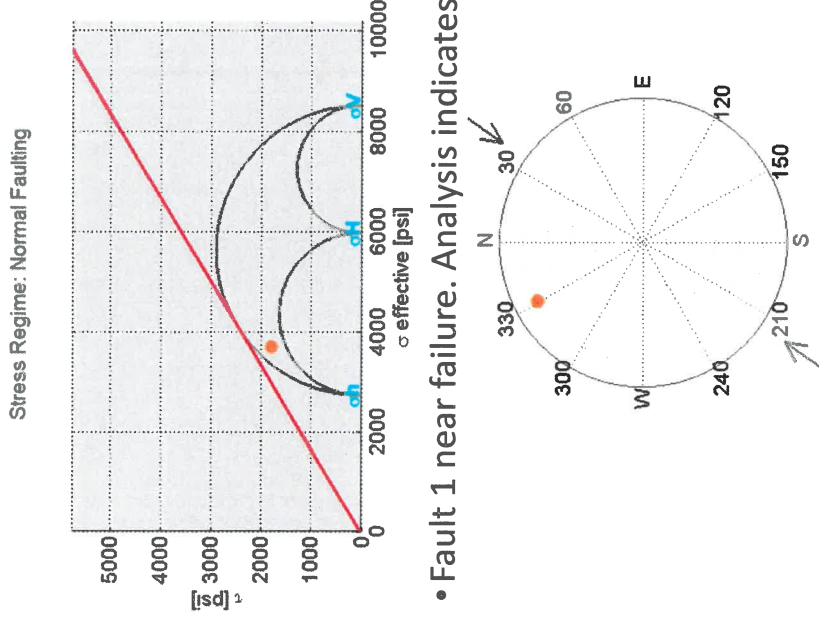
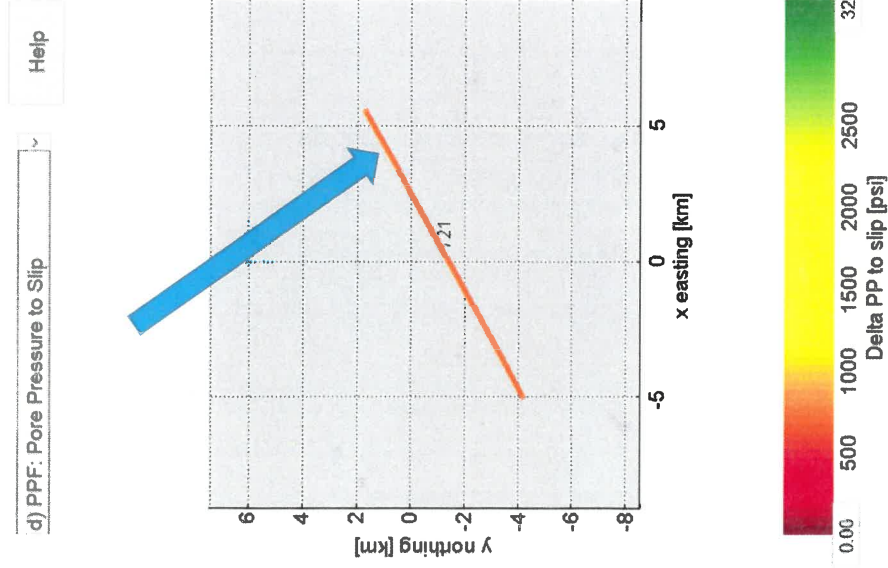
- Input parameters for reservoir properties, faults, and in situ stress in vicinity of injection well
- Only Fault 1 prone to slip and analyzed

Stress Regime: Normal Faulting



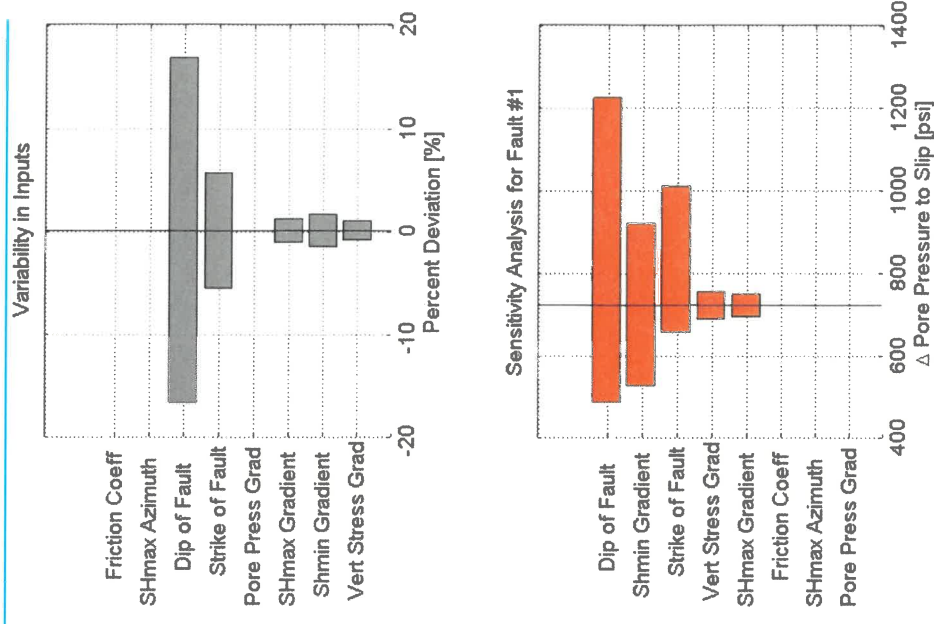
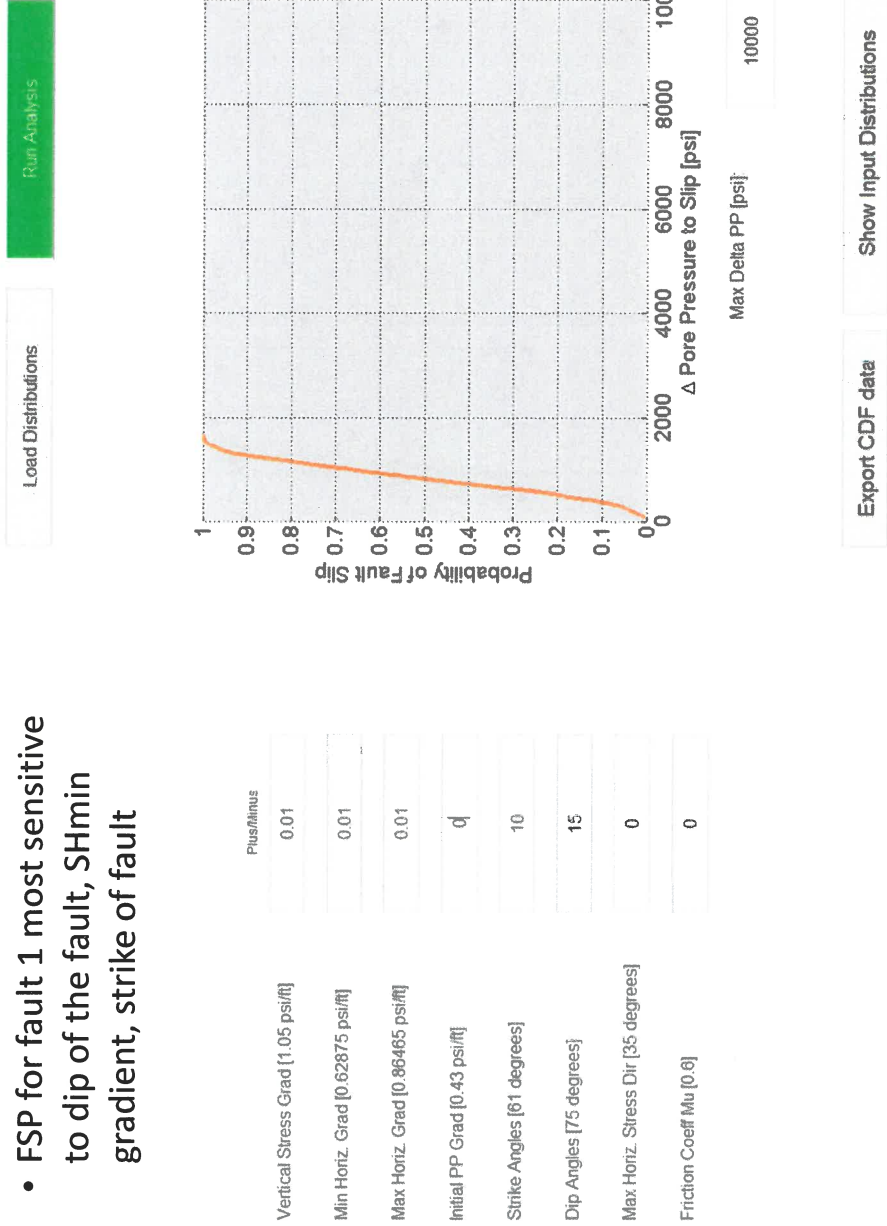
Geomechanics

Deterministic - change in pore to slip (fault 1) is 721 psi



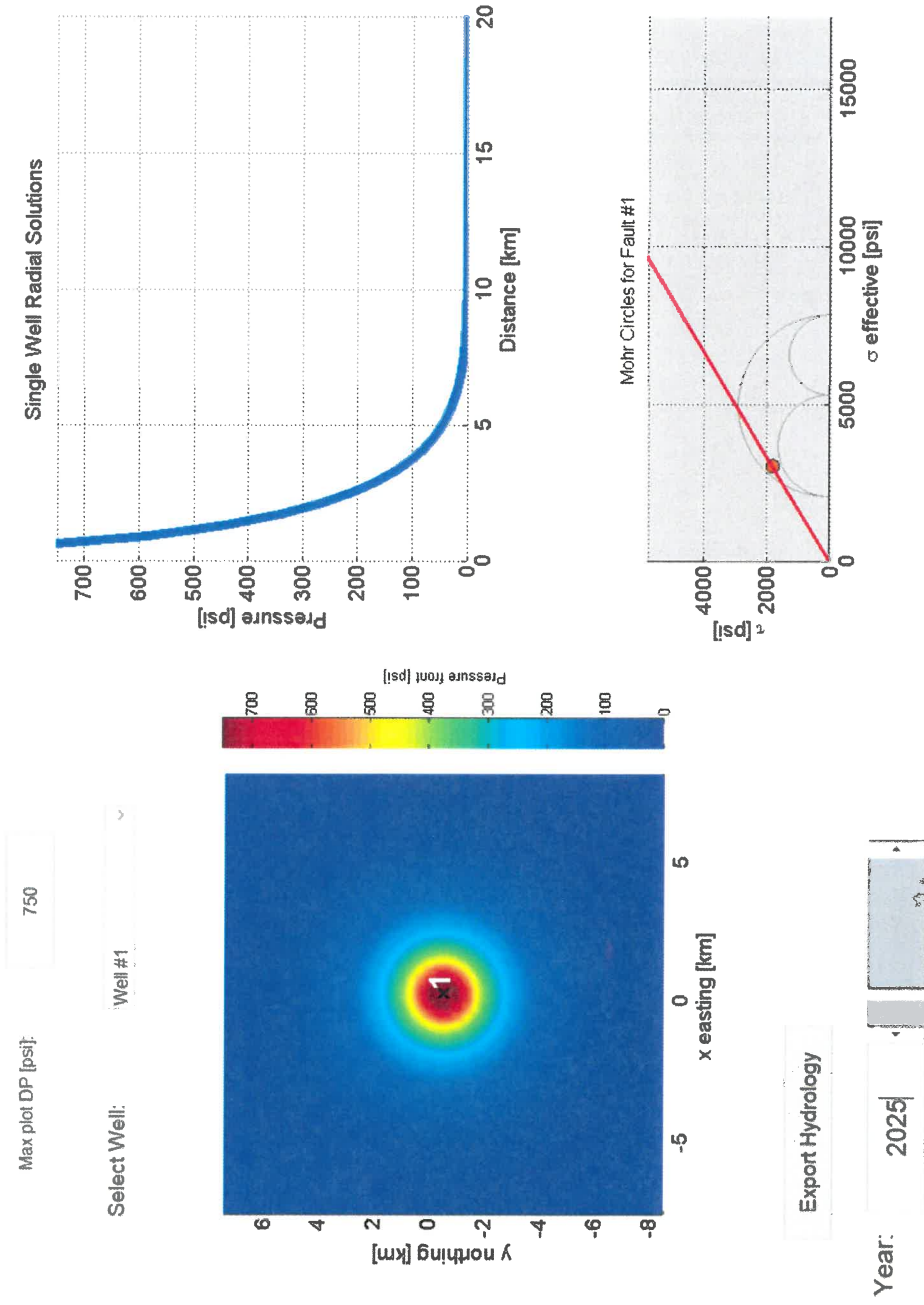
Probabilistic Geomechanics

- FSP for fault 1 most sensitive to dip of the fault, SHmin gradient, strike of fault



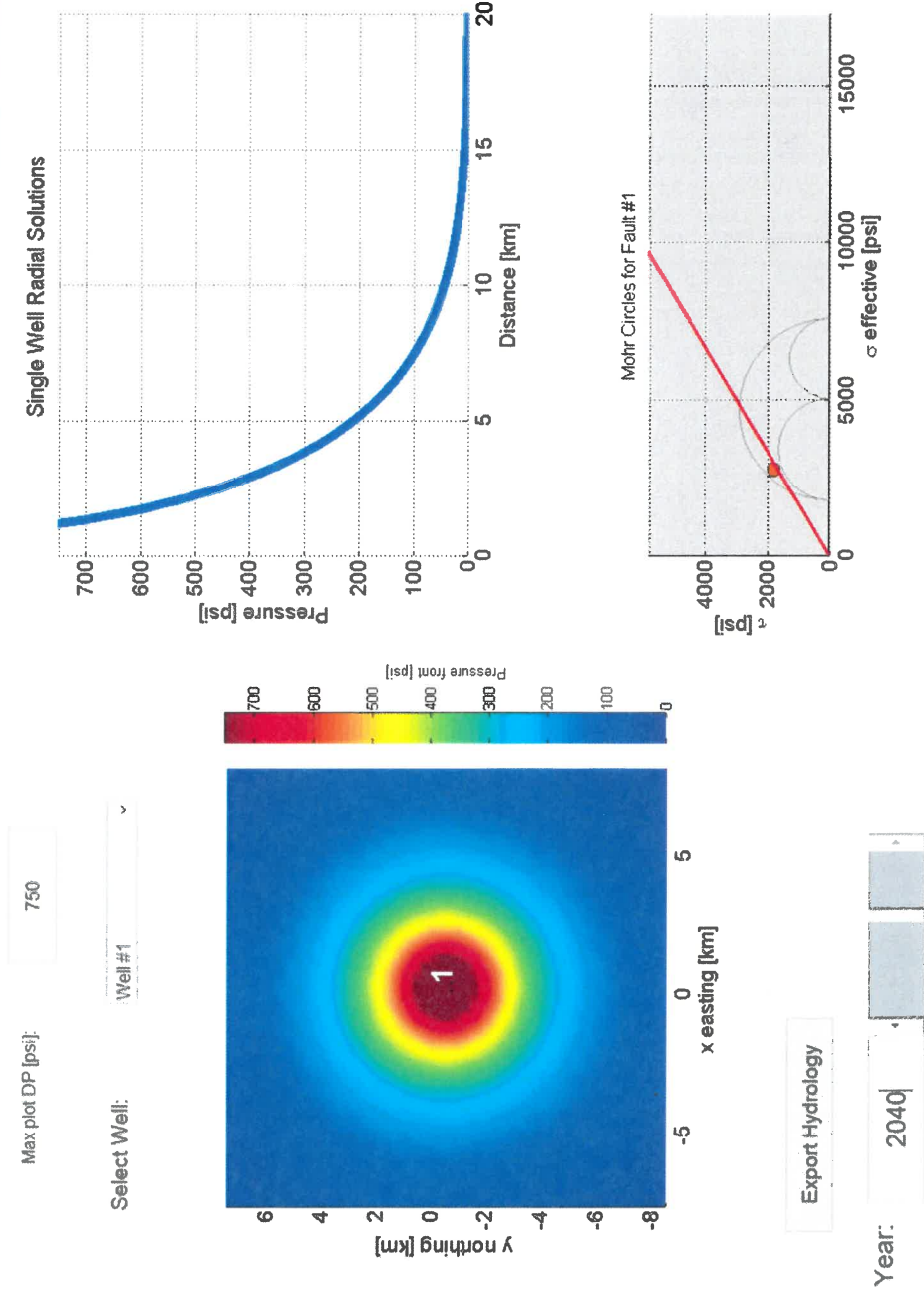
Hydrology- 5 years

Deterministic – change in pore pressure around injection well



Hydrology- 25 years

Deterministic – change in pore pressure around injection well

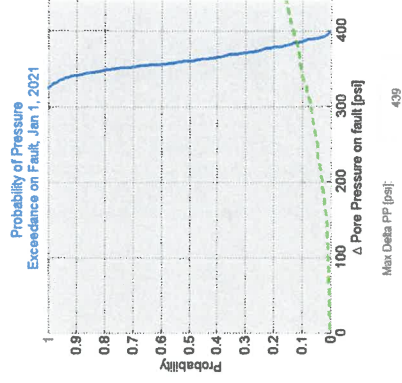


Probabilistic Hydrology

Exceedance pore pressure on fault 1

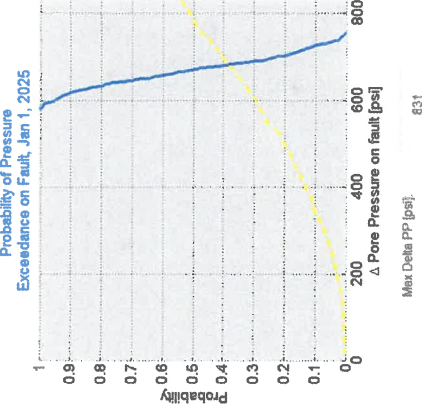
2021

FSP: 0.11



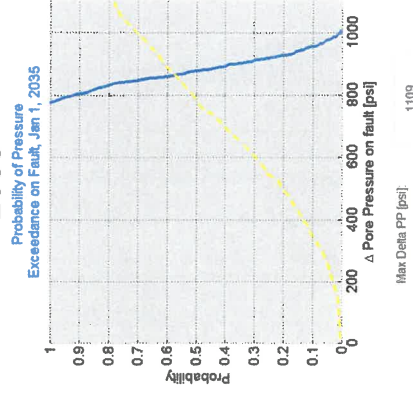
2025

FSP: 0.37



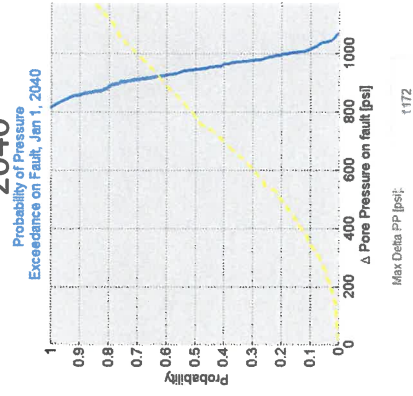
2035

FSP: 0.59



2040

FSP: 0.64



Summary

Pore Pressure on fault and FSP

- FSP for 1 faults around the Rita Injection well evaluated
- Fault 1 oriented to close the SHmax direction only fault prone to slip with increased pore pressure from injection well
- Geomechanics analysis indicated Fault 1 close to failure and estimated 721psi for slip
- Probabilistic and Integrated Analysis indicated that required 721 psi change can be reached and max FSP of 0.69 after 25 years of injection

c) Fault Slip Potential

