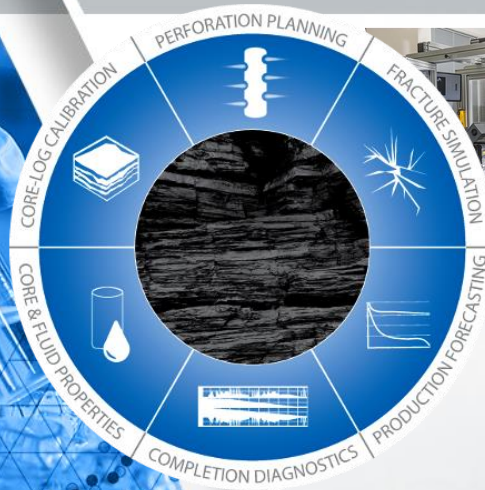


# Insights Into Potential CO<sub>2</sub> Injectivity Issues Caused by Incompatibility With Storage Rocks



**OVER 80 YEARS OF INNOVATION**



## 01 | Exposure Effects on Geology

Ascertain the effects of exposure to low pH fluids, as a function of pH, with/without contaminants on the geology of the seal

## 02 | Mechanical Integrity

Evaluate the mechanical properties and their effects on the integrity of the seal, including potential for reactivation of faults

## 03 | Alterations to Threshold Entry

Determine the threshold entry pressure of the seal and how that may change with contact to low pH fluids and time of exposure

## 04 | Seal Capacity Calculation

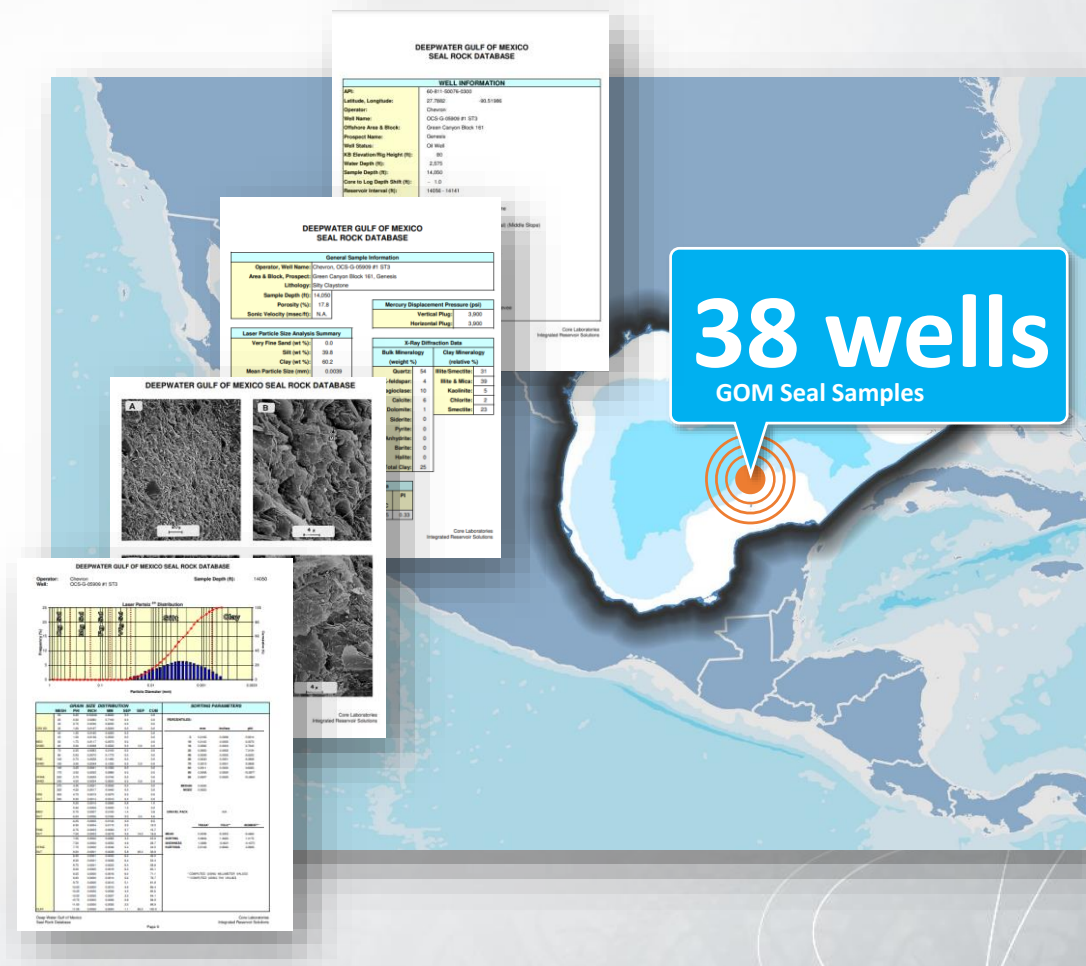
Quantify the rock-gas-fluid properties for the computation of maximum column height and conversion of capillary pressure systems, and for comparison with available published values

## 05 | Wellbore Cement Interactions

Evaluate the implications of CO<sub>2</sub>-brine interactions on various wellbore cements (including CO<sub>2</sub>-resistant blends) over time.

## 06 | Injectivity Considerations

Dissolution & precipitation, mobility impacts on relative permeability, solubility, digital rock physics, **rock-fluid compatibility**





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## 01 | Exposure Eff

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with/without contaminat

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**SPE-230571-MS**

## Formation Damage Concerns and Laboratory Considerations with CO<sub>2</sub> Injection in Carbon Storage Wells

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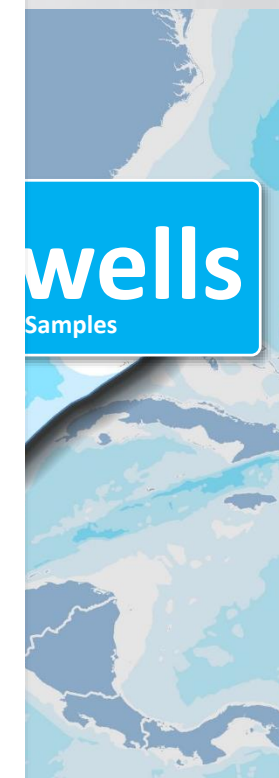
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## Abstract

As interest in carbon capture and storage (CCS) continues to grow, it is increasingly important to evaluate the impact of CO<sub>2</sub> injection on the reservoir. Among the various technical challenges, formation damage is a critical factor influencing reservoir integrity and long-term injectivity. This paper presents laboratory testing methods and evaluation criteria designed to improve our understanding of both the origin and extent of formation damage associated with CO<sub>2</sub> injection

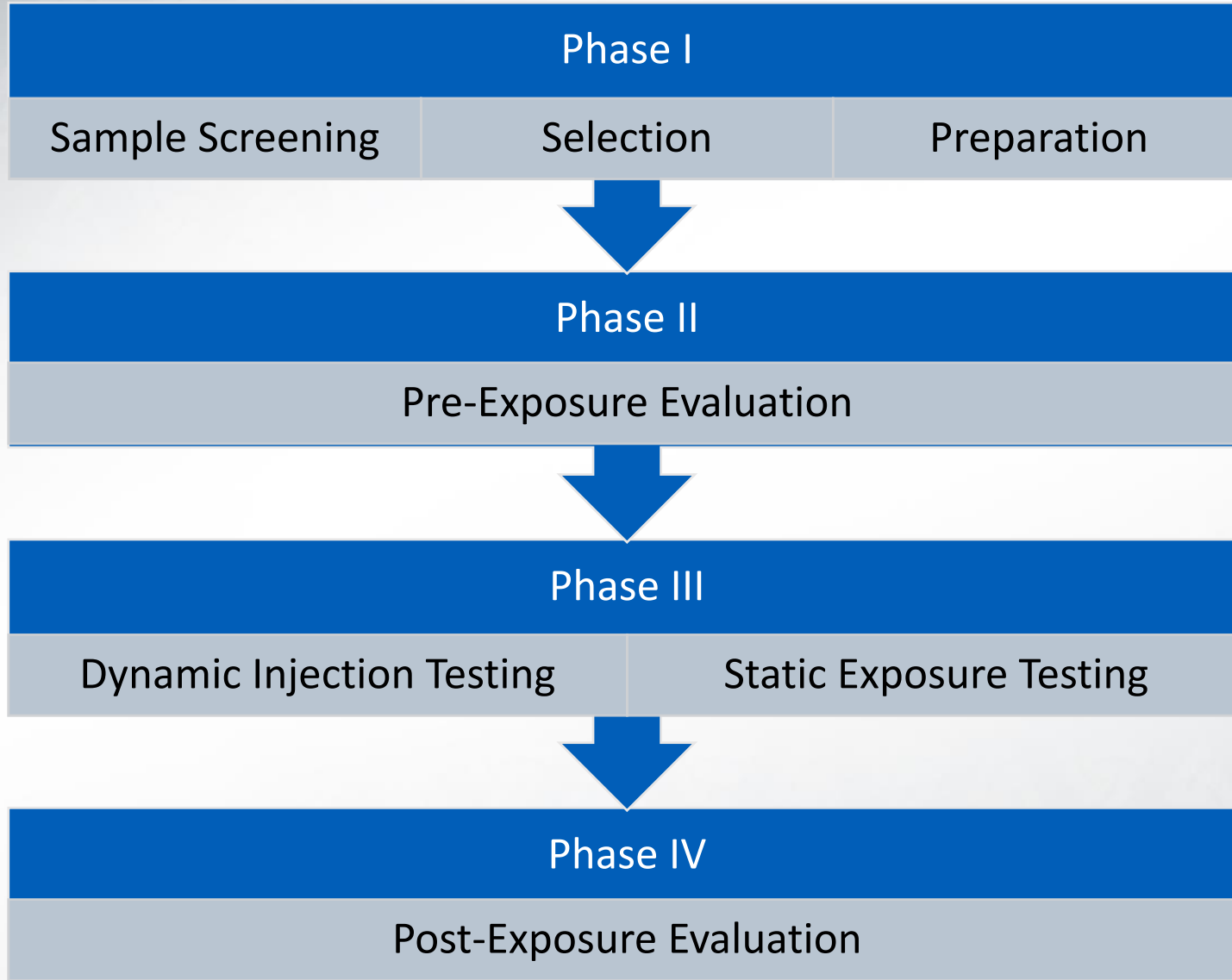


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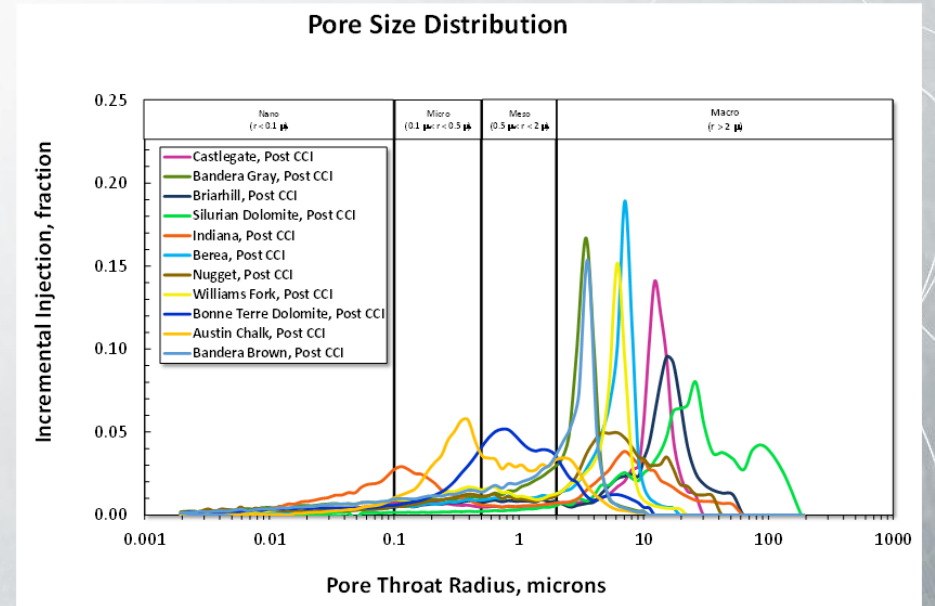


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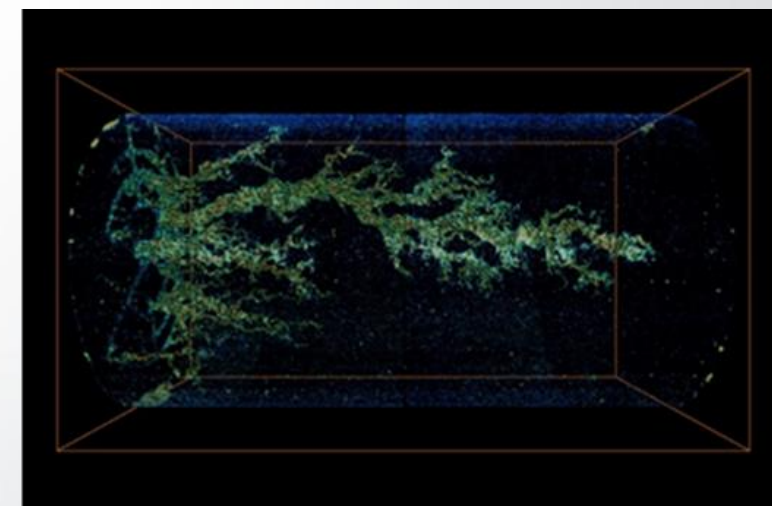
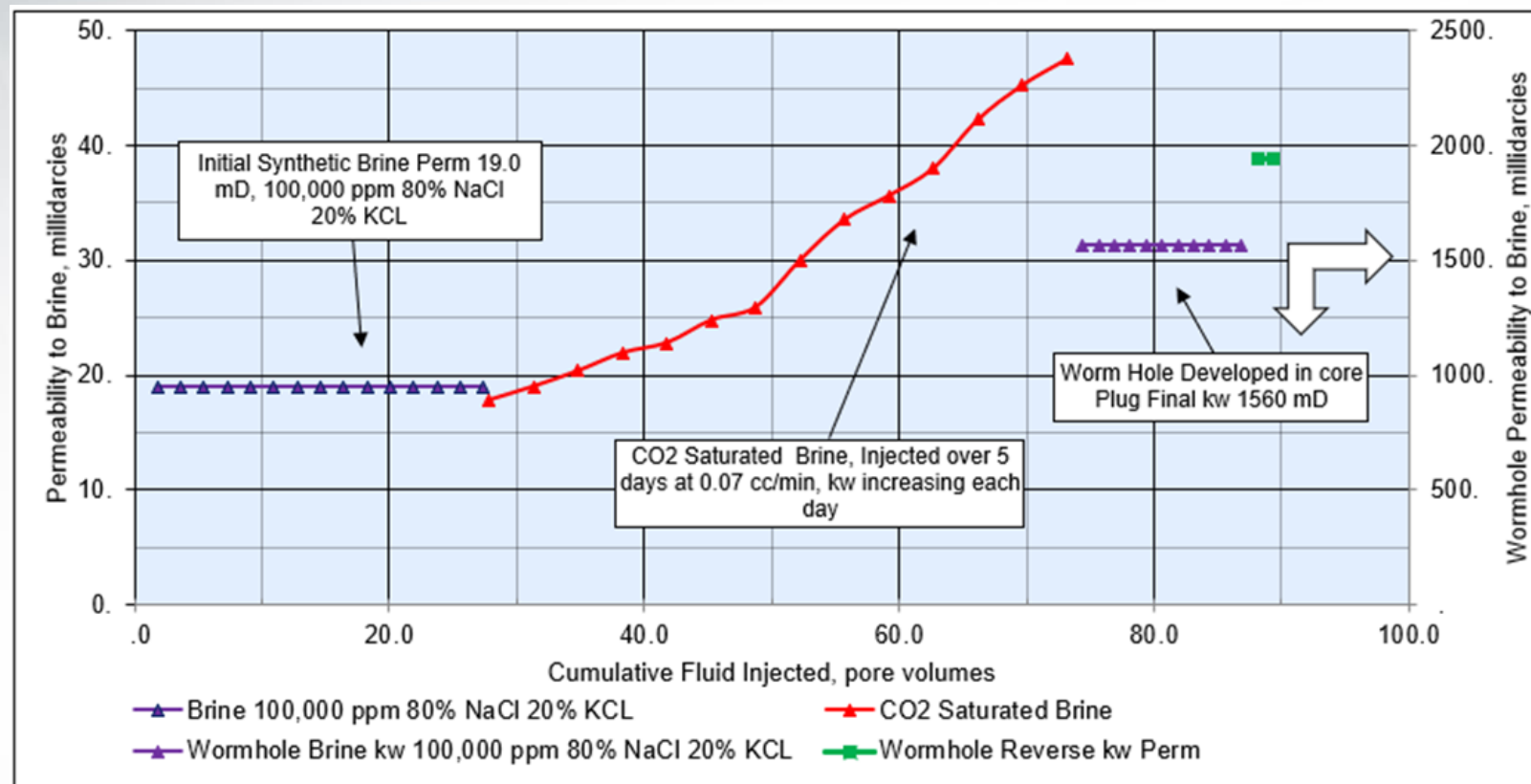
# Corefloods to examine compatibility



| Formation Name       | Rock Type |
|----------------------|-----------|
| Silurian Dolomite    | Dolomite  |
| Bonne Terre Dolomite | Dolomite  |
| Mt. Gambier          | Limestone |
| Indiana              | Limestone |
| Austin Chalk         | Limestone |
| Castlegate           | Sandstone |
| Briarhill            | Sandstone |
| Berea                | Sandstone |
| Nugget               | Sandstone |
| Williams Fork        | Sandstone |
| Bandera Gray         | Sandstone |
| Bandera Brown        | Sandstone |

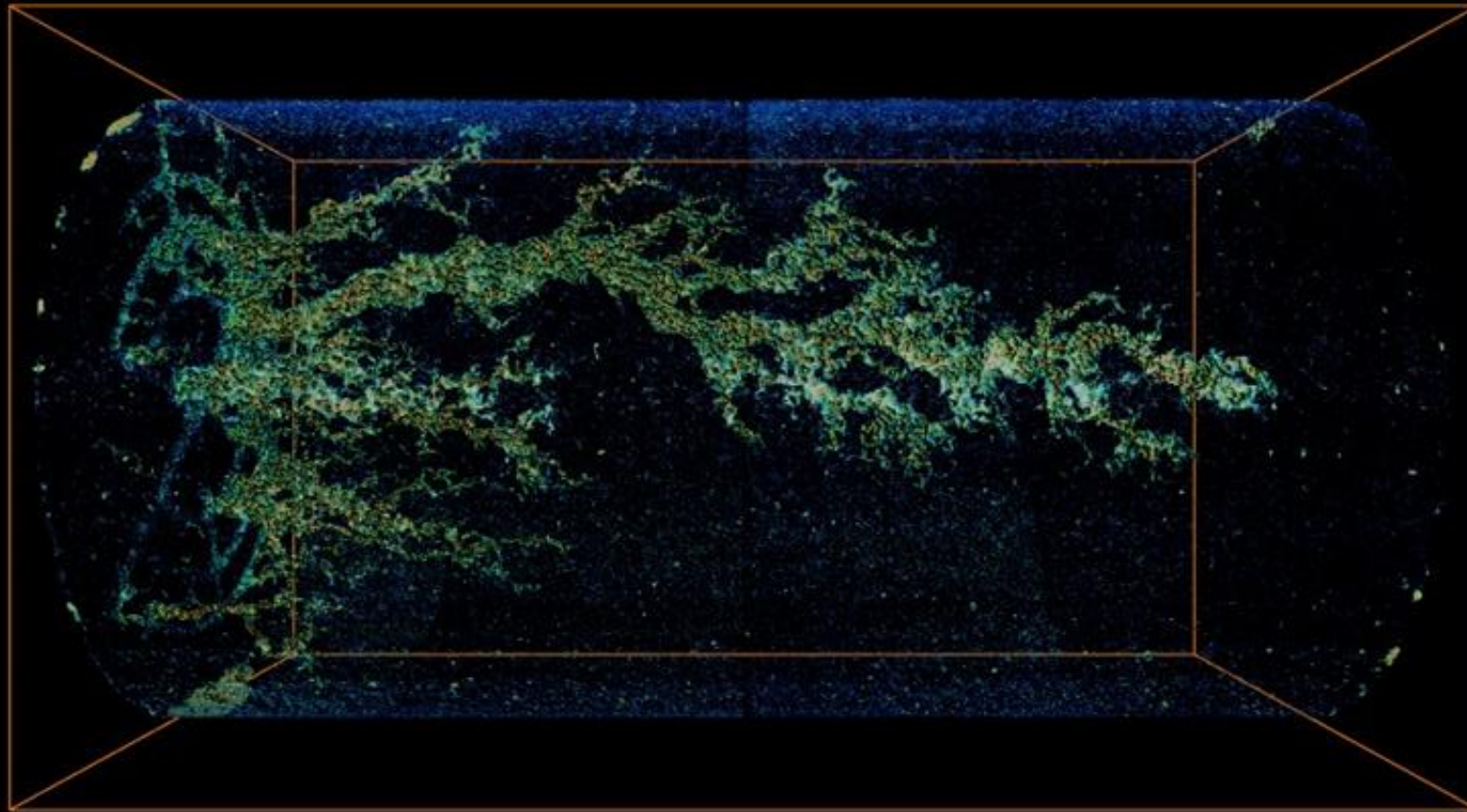
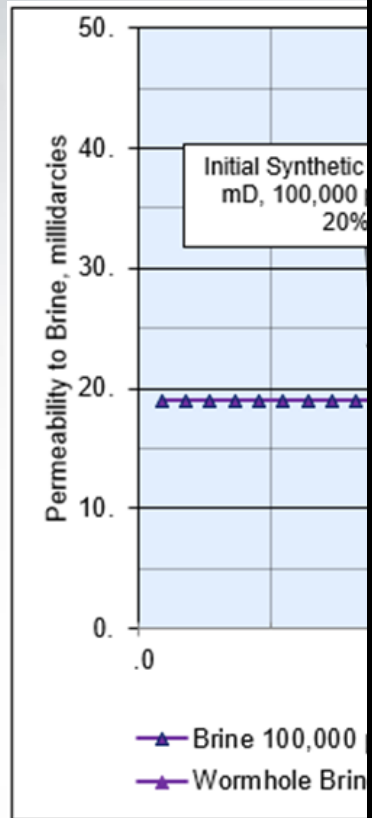


# Indiana Limestone – wormholing and storage bypass



| Initial Permeability (mD) | Final Permeability (mD) | % of original permeability |
|---------------------------|-------------------------|----------------------------|
| 19.0                      | 1560                    | 8200%                      |

# Indiana Limestone – wormholing and storage bypass



Initial

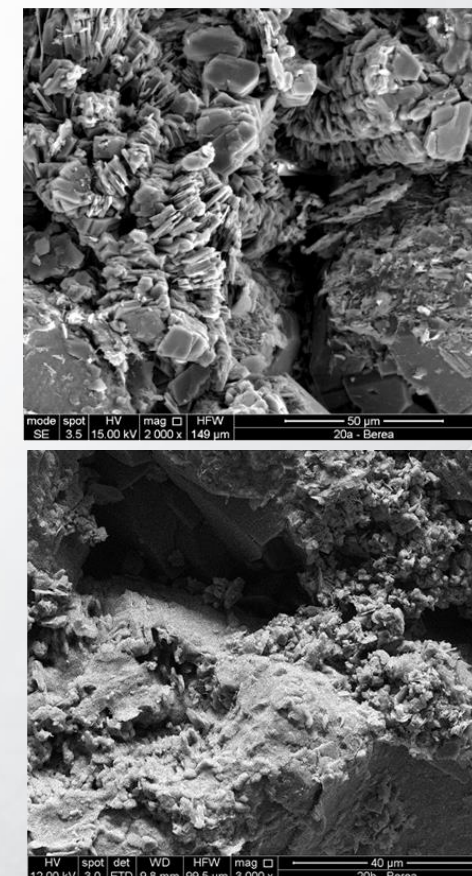
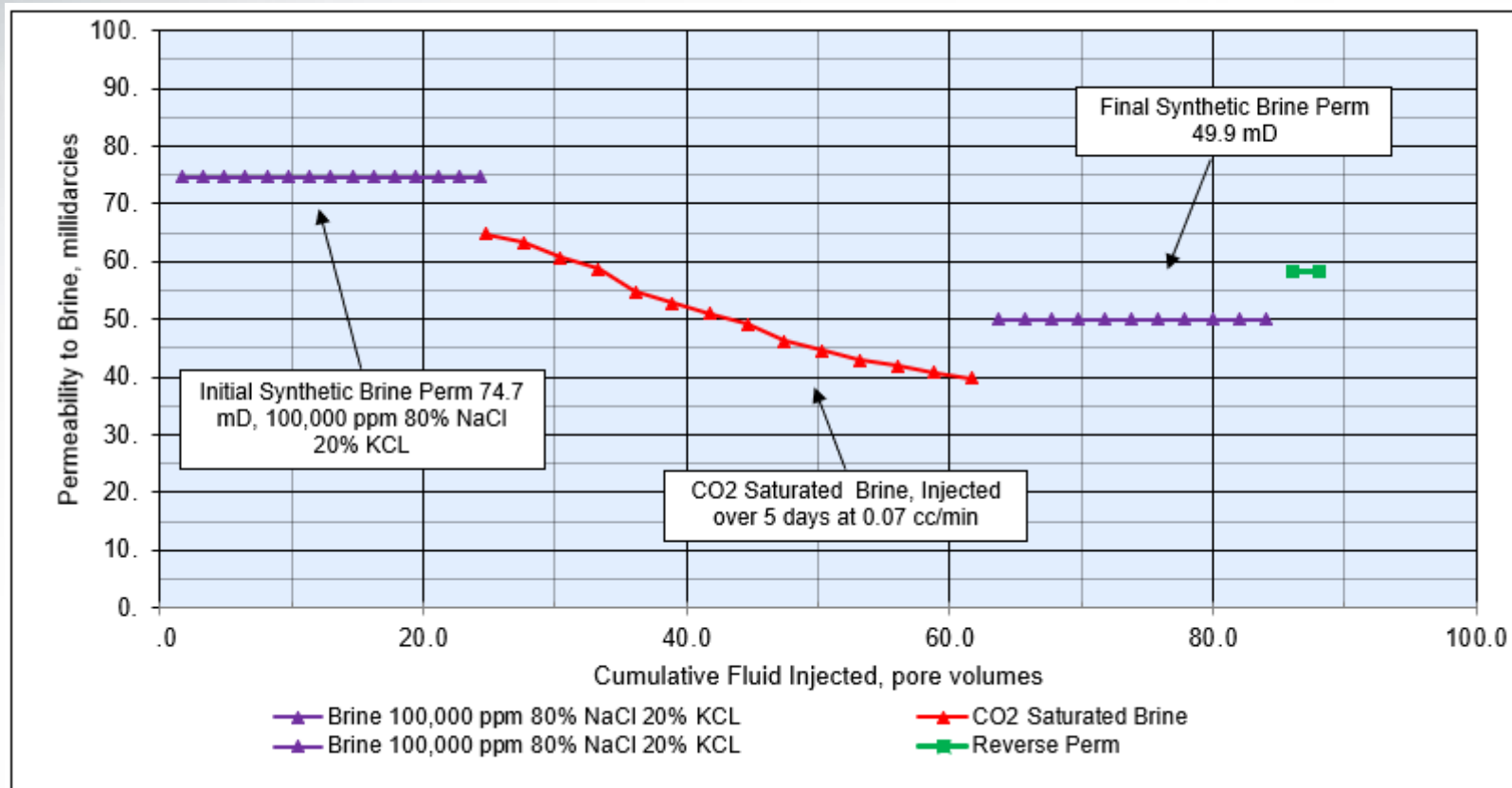
19.0

1560

8200%

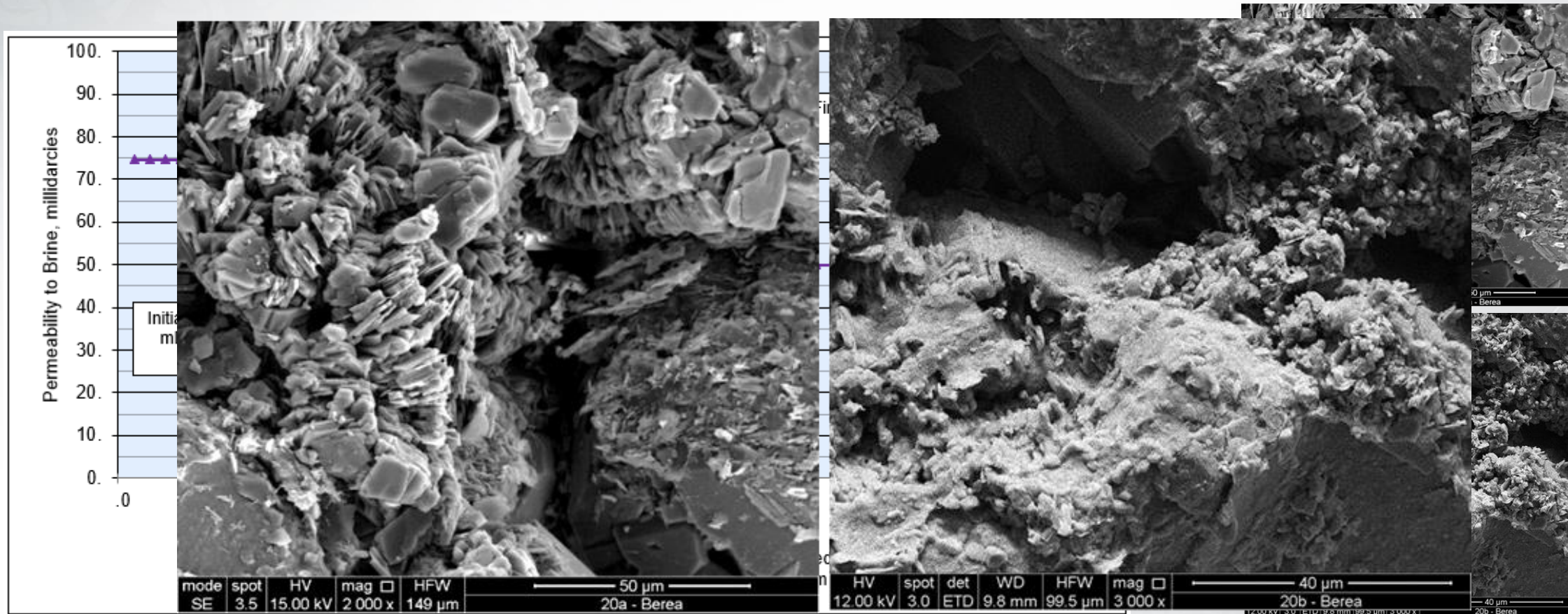
Permeability

# Berea Sandstone – fines migration and injectivity loss



| Initial Permeability (mD) | Final Permeability (mD) | % of original permeability |
|---------------------------|-------------------------|----------------------------|
| 74.7                      | 49.9                    | 67%                        |

## Berea Sandstone – fines migration and injectivity loss



| Initial Permeability (mD) | Final Permeability (mD) | % of original permeability |
|---------------------------|-------------------------|----------------------------|
| 74.7                      | 49.9                    | 67%                        |

- Study showed damaging mechanisms due to fluid-rock interactions, dependent upon specific storage complex properties
- These could impact injectivity and storage capacity
- Study didn't consider things like scaling
- Where does this overlap with regulator requirements and is injectivity an overlooked aspect?



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