Approaches to Shallow Gas

Northwestern Shelf, Australia

The Problem ...

Shallow Gas, SCP, SCVF, Zone Anomalies

Conventional Method …

Long section milled windows (+100’ / 30m)

- Time
- Swarf
- Disposal

Mechanical bridge plug in inner casing

- Casing size specific
- Limited casing contact area
- Potential damage to casing

Cement

- Porous
- Shrinks
- Cracks
- WOC time

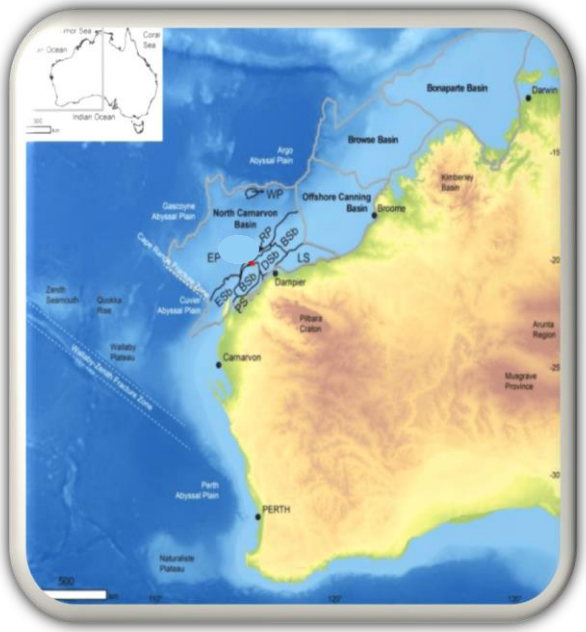
Field Proven Alternative Method

Bismuth Alloy Viscosity & Expansion

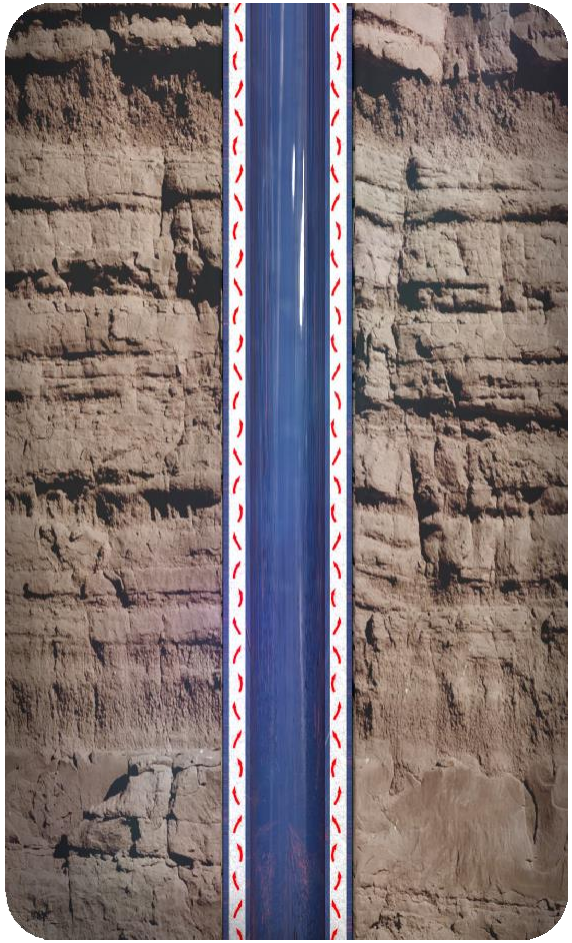
Case Study

Chevron: Australian Northwest Shelf

- 34 well P&A campaign (19 offshore and 15 onshore wells)
- Zone anomalies and gas migration
- Limited success using conventional method
- Chose to use BiSN for optimized P&A solution



Alternative Method



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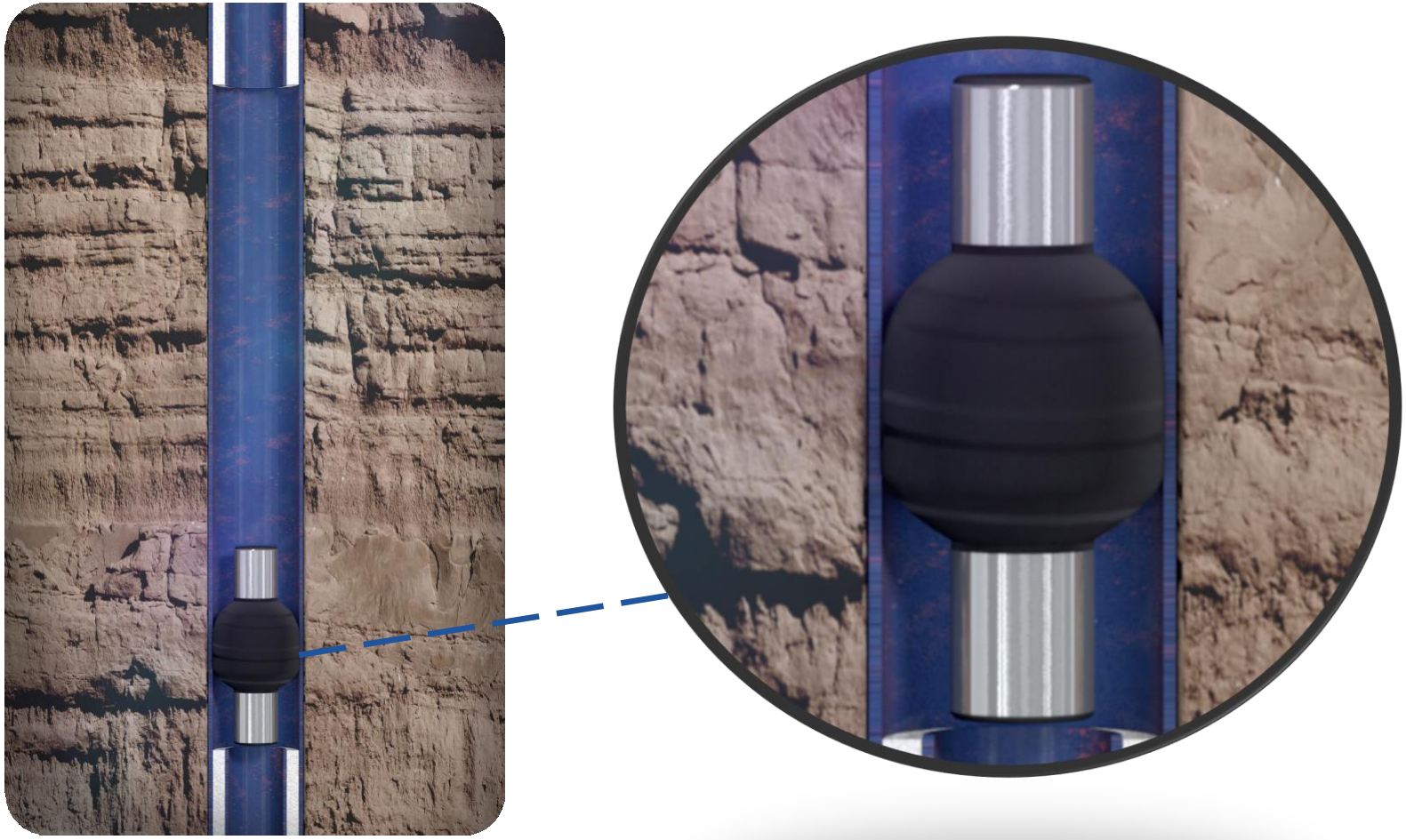

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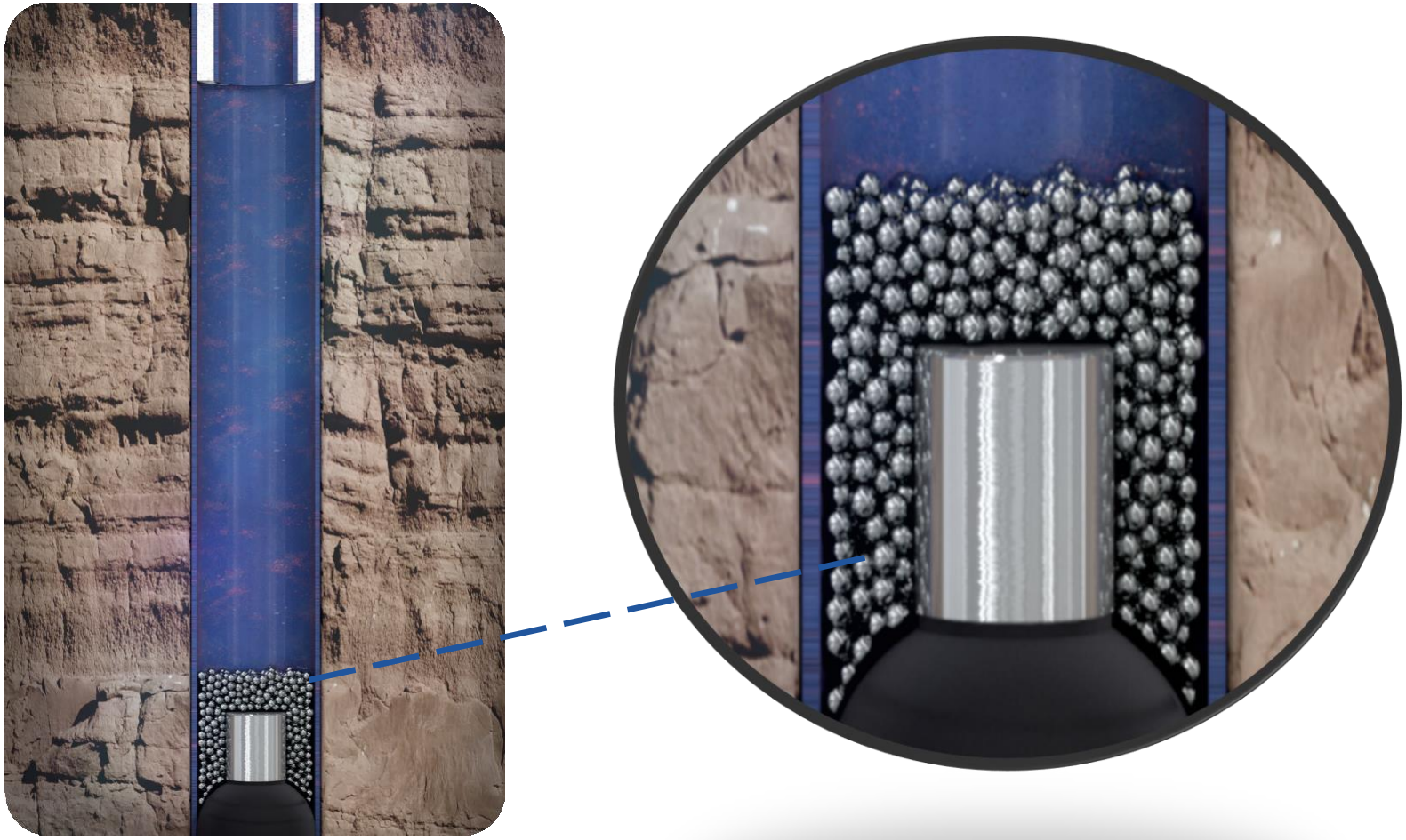

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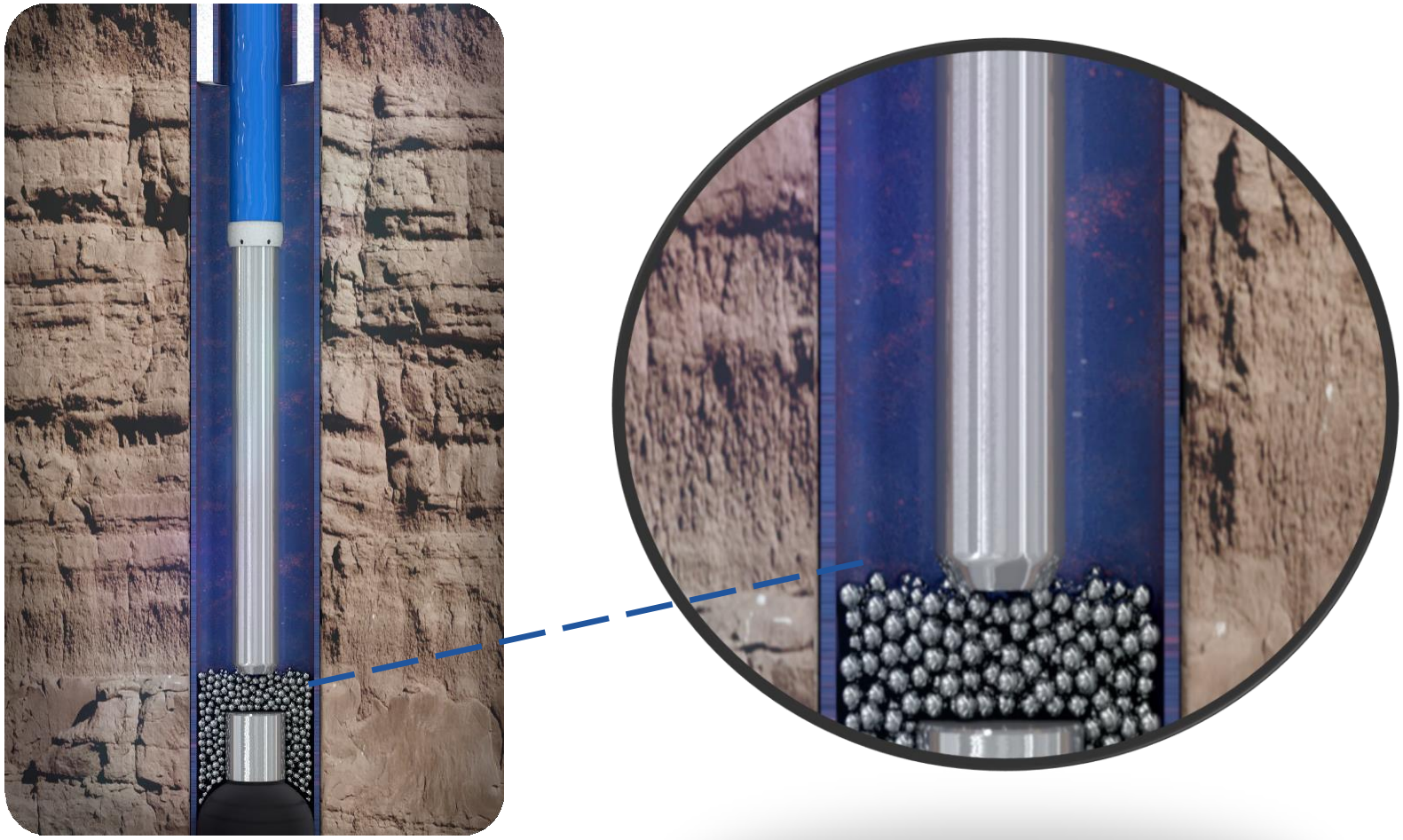

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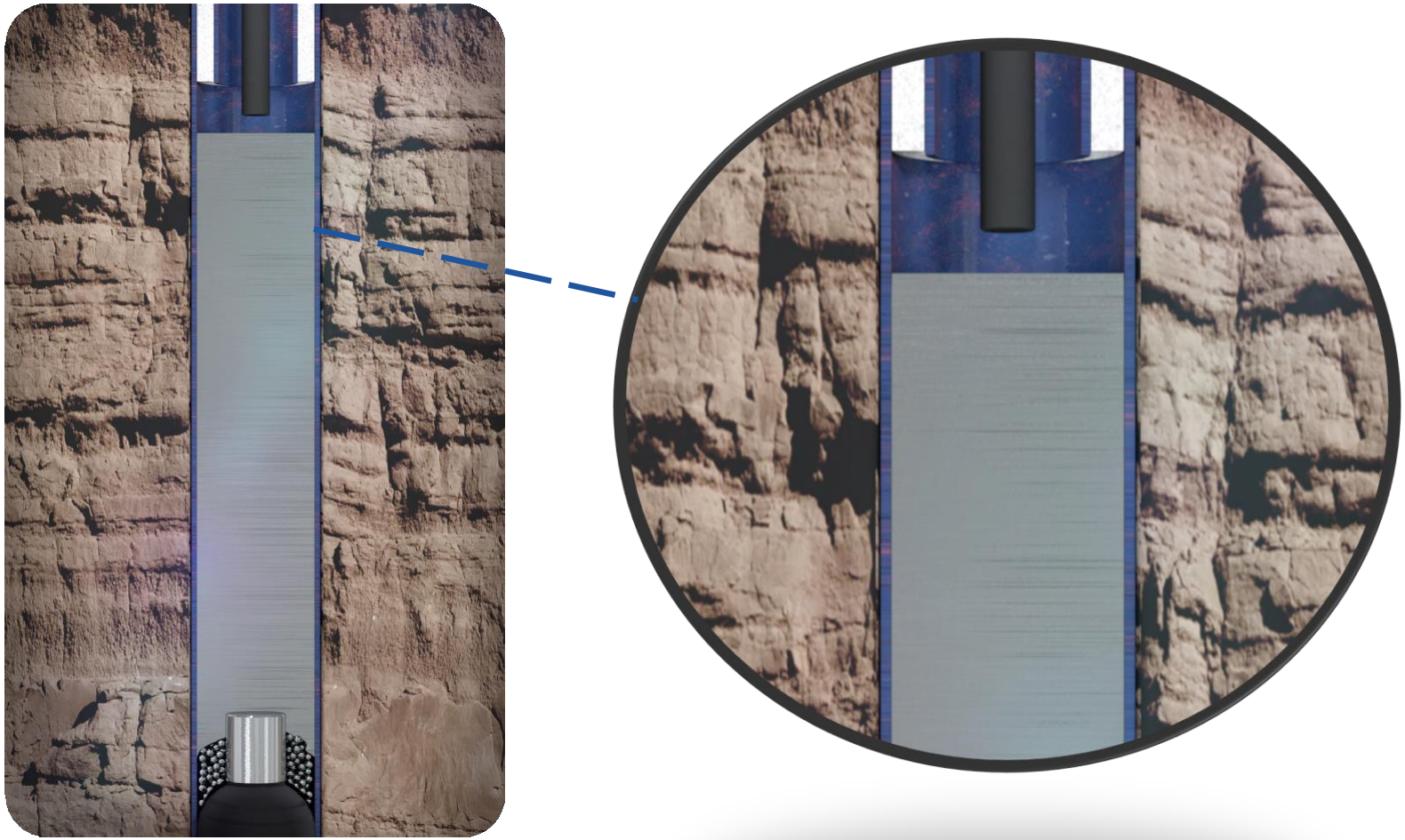

Tool Set in Glass Casing

Results

- Window reduced: 100’ to 20’ (30m to 6m)
- Reduced swarf to dispose
- Inflatable packers successfully set and tested
- BiSN Wel-lok M2M plugs successfully set and tested, positive and inflow
- Shallow gas zone successfully isolated
- Campaign resulted in significant cost savings

Update

- 30 wells - Norwegian North Sea
  - Aker BP – Valhall
  - Accepted as a barrier by PSA (NORSOK D-10 standards)

- 3 wells - Offshore California
  - Chevron – Grace platform
  - 2 casing strings section milled
  - 20+ wells scheduled for 2022

Jeff Fulks

Global Applications Manager

Houston, TX

www.bisn.com

Jeff.Fulks@bisn.com

Mobile: +1 832 724 0621

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Wel-lok M2M™