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Montpellier, France
CORUM CONFERENCE CENTER

# A new technique for perforating steel bore casing to protect aquifers

25-29 September 2016

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# Project background

- Large groundwater resource in Victorian (1,000 GL/year)
- Large Tertiary age sedimentary basin aquifers
- Extensive network of State owned groundwater observation bores (State Observation Bore Network) plus numerous active and abandoned private bores
- Large number of bores are deep (>1,000m), some artesian
- Large number of bores are old
- Bores typically constructed with mild steel, poor annular seal

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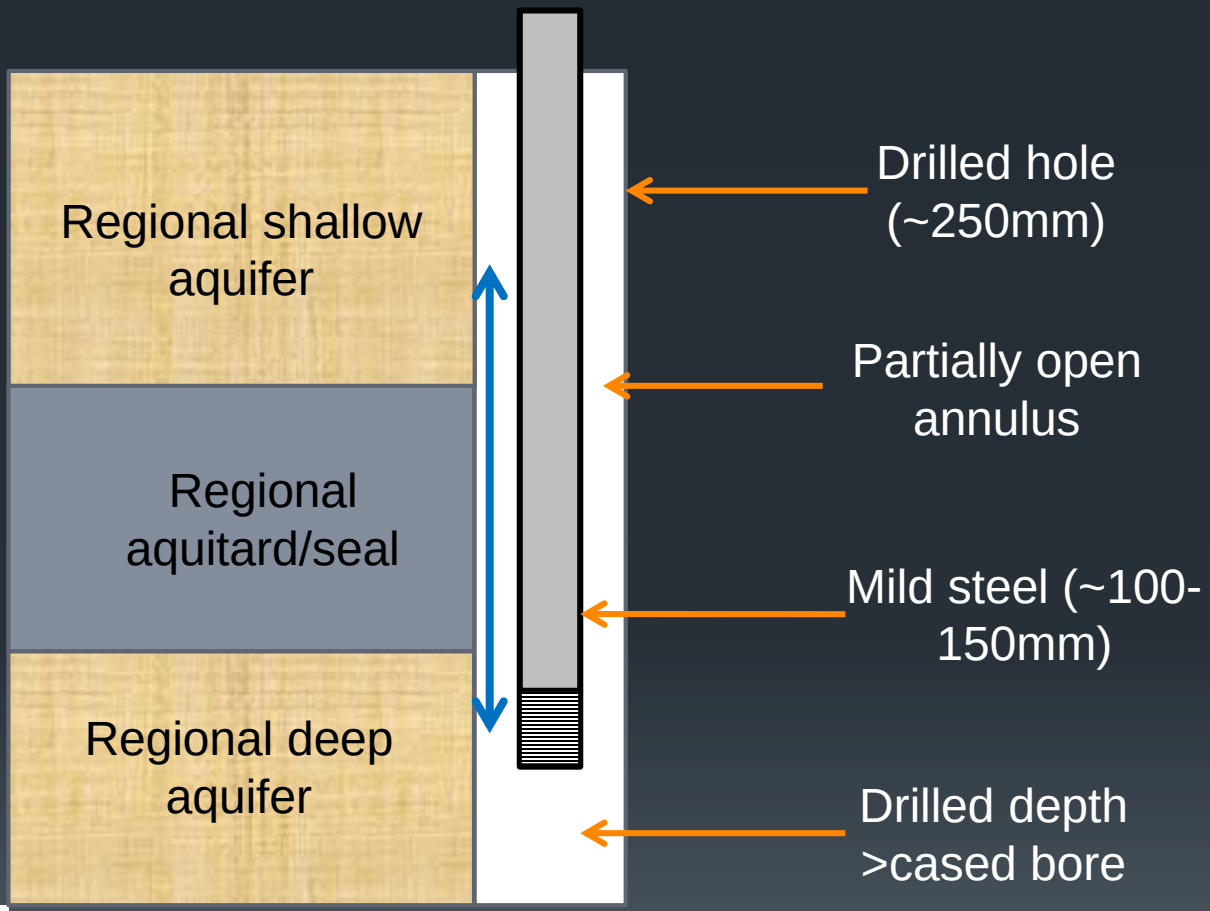
# Project background

- Typical State Observation Bore (old)

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# Project background

- This leads to a number of problems:
  - Unrepresentative data
  - Inter-aquifer leakage
  - Artesian break out (surface leaks)
  - Limited life span and expensive maintenance and repair

- Decommissioning or refurbishment requires perforation of casing to ensure good annular seals.

- Typical perforation methods mechanical or explosives can be
  - Expensive
  - Dangerous
  - Limited performance

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# Hydraulic perforation tool

- Rubberised hydraulic inflatable packer
- Initially proposed to swage steel casing out to seal against drilled hole to create seal.

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# Field Trials

- Used to perforate casing on 20 bores in southeast Victoria (10 decommissioned, 10 refurbished)
- Bores up to 1,000 m deep


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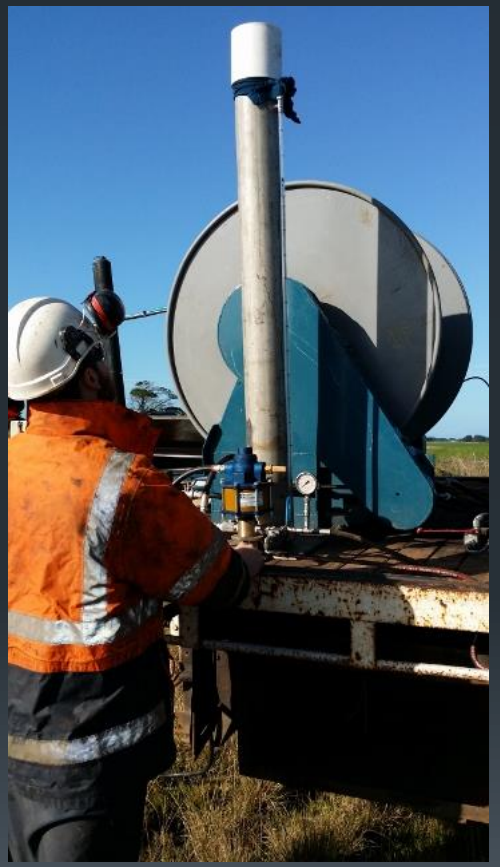
# Hydraulic perforation tool

- Rubberised hydraulic inflatable packer.

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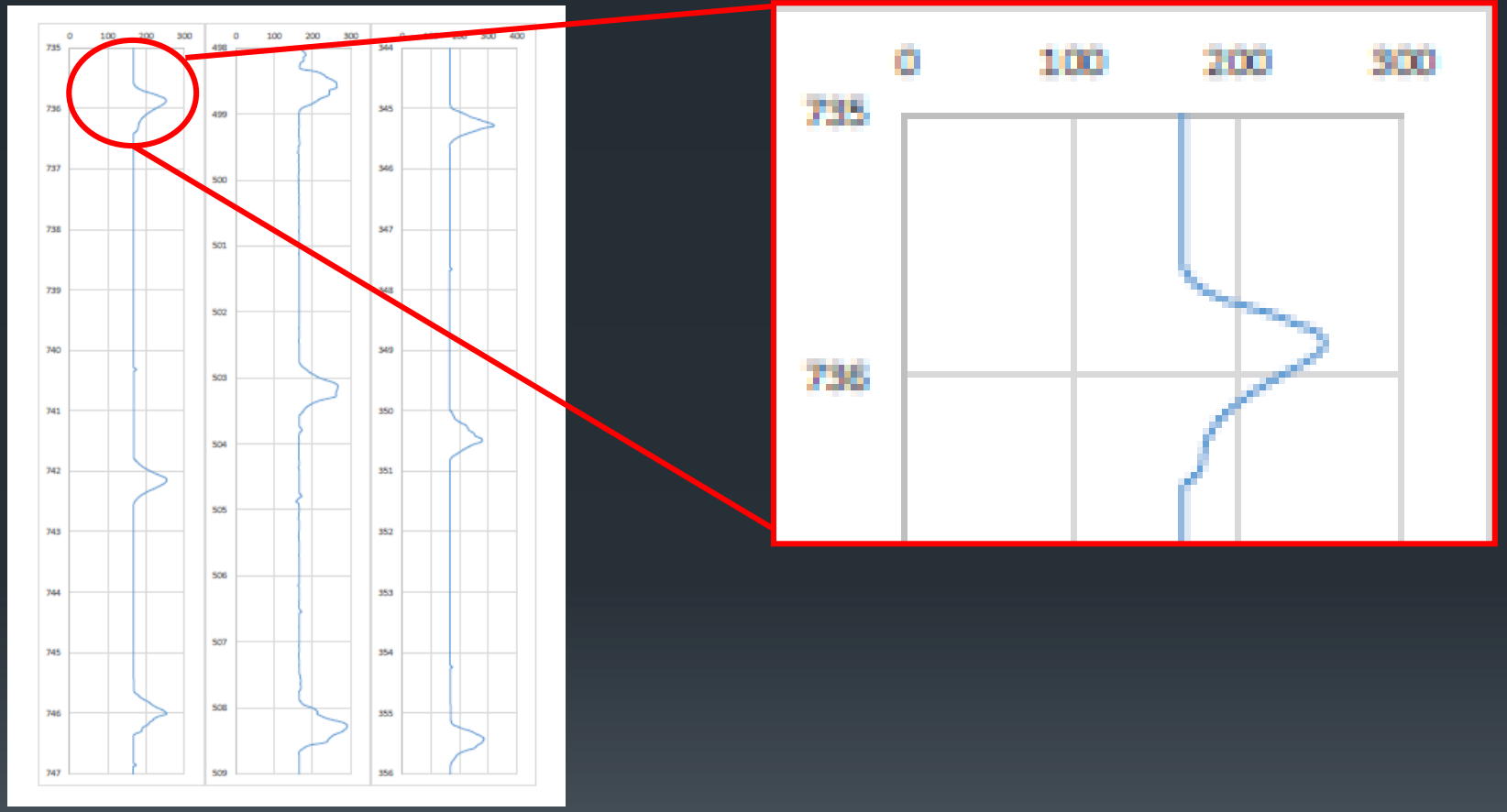
# Verification – calliper log

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# Verification

- Pressure yield of packer and injected volume.

| Depth (m) | Original Bore Diameter (mm) | Packer Diameter (mm) | Maximum Pressure (psi) | Pumped volume (L) | Estimated Inflated Diameter (mm) | Yield description | Post-Inflation Diameter (mm) |
|---|---|---|---|---|---|---|---|
| 345.0 - 345.6 | 160 | 140 | 4000 | 8 | 195 | Sudden Pressure Decrease | 320 |
| 350.0 - 350.8 | 160 | 140 | 4000 | 8 | 195 | Sudden Pressure Decrease | 280 |
| 355.2 - 355.9 | 160 | 140 | 3000 | 8 | 195 | Sudden Pressure Decrease | 285 |

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# Verification

- Downhole camera on selected bores




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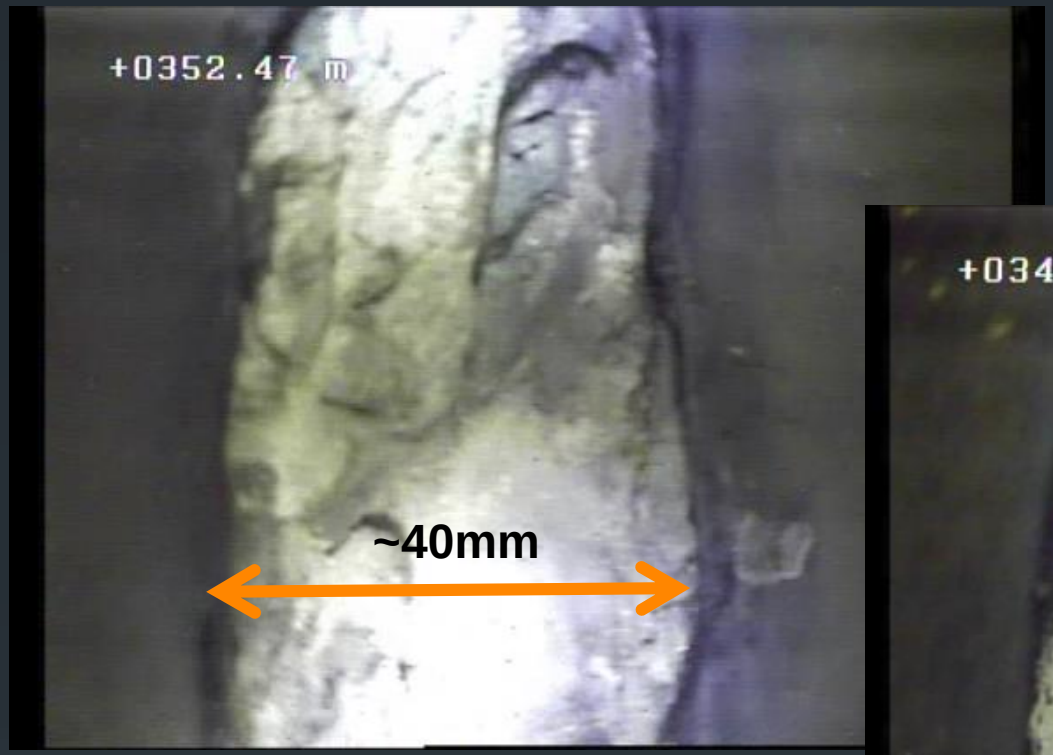
# Verification

- Downhole camera on selected bores





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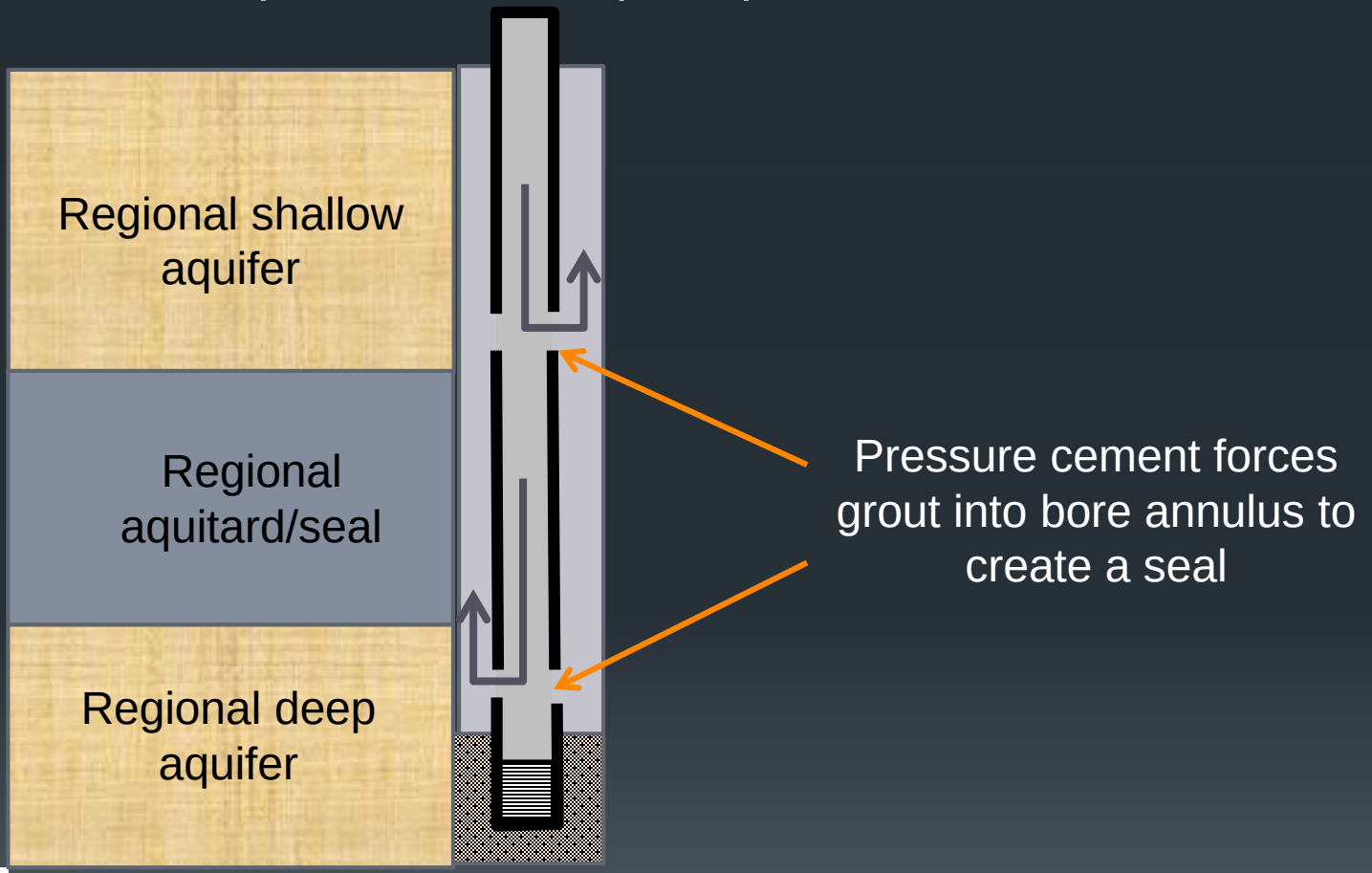
# Successful perforation

- Good cement penetration = aquifer protection or new bore life



# Lessons learned….

- Hydraulic packer system provides an effective, safe and repeatable method for perforating steel casing.
- However……..
- Packers can become wedged in bores (start with shallowest)
- Packers can burst (stay within inflation pressure limits)
- Design more flexible/expandable packer (provides greater clearance in bore)

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