Sask. Bakken

Coiled Tubing
Annular Fracturing

Williston Basin
Petroleum Conference

May 3rd 2010

Trends in Multi-stage Fracturing

- Closer spacing of fracture intervals

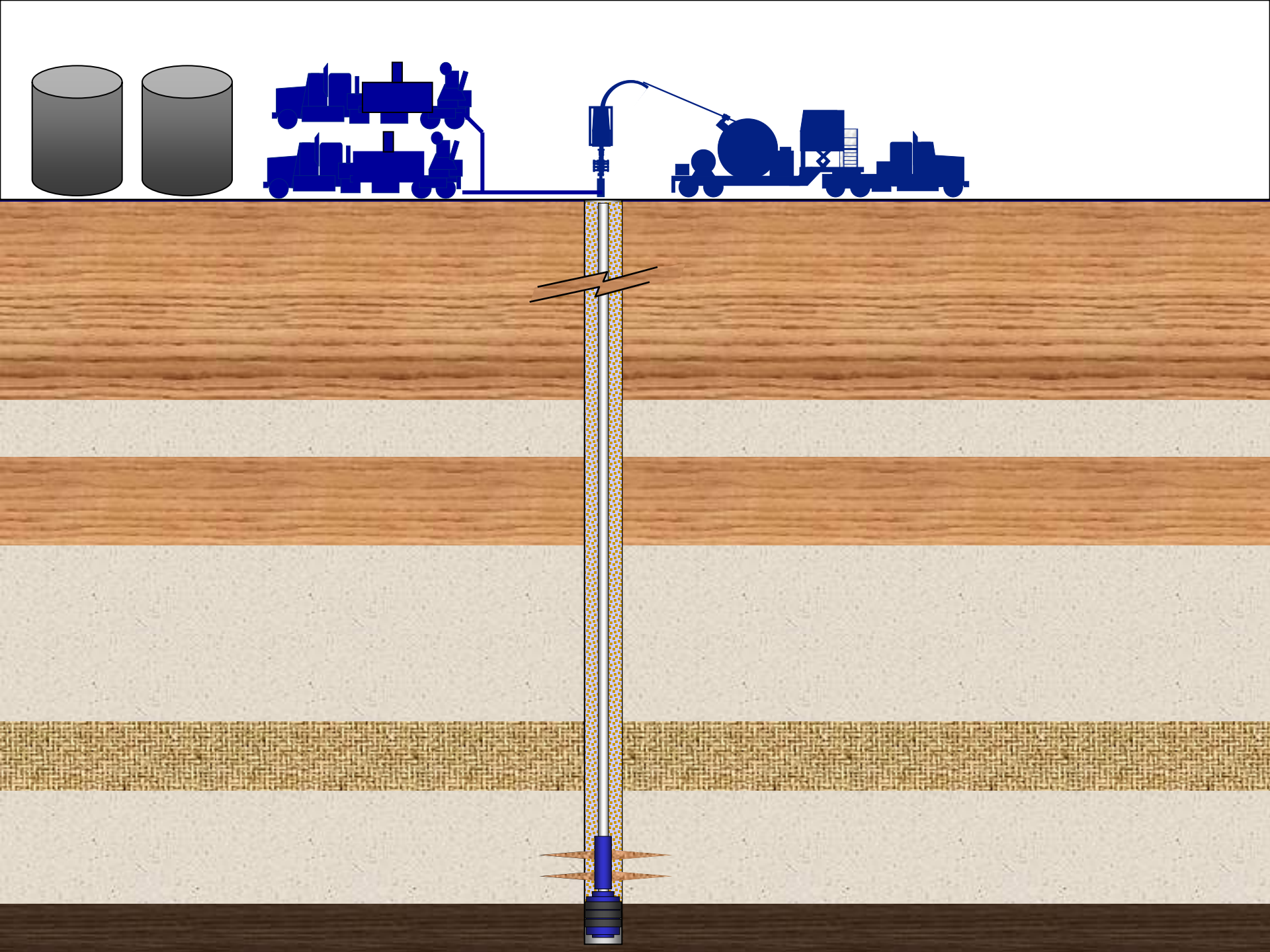
  100 – 200 foot intervals
- Smaller fracs per stage, but up to 40 stages
- Impossible (too expensive) to size enough balls
- Going to cemented liners & Mono-bore wells

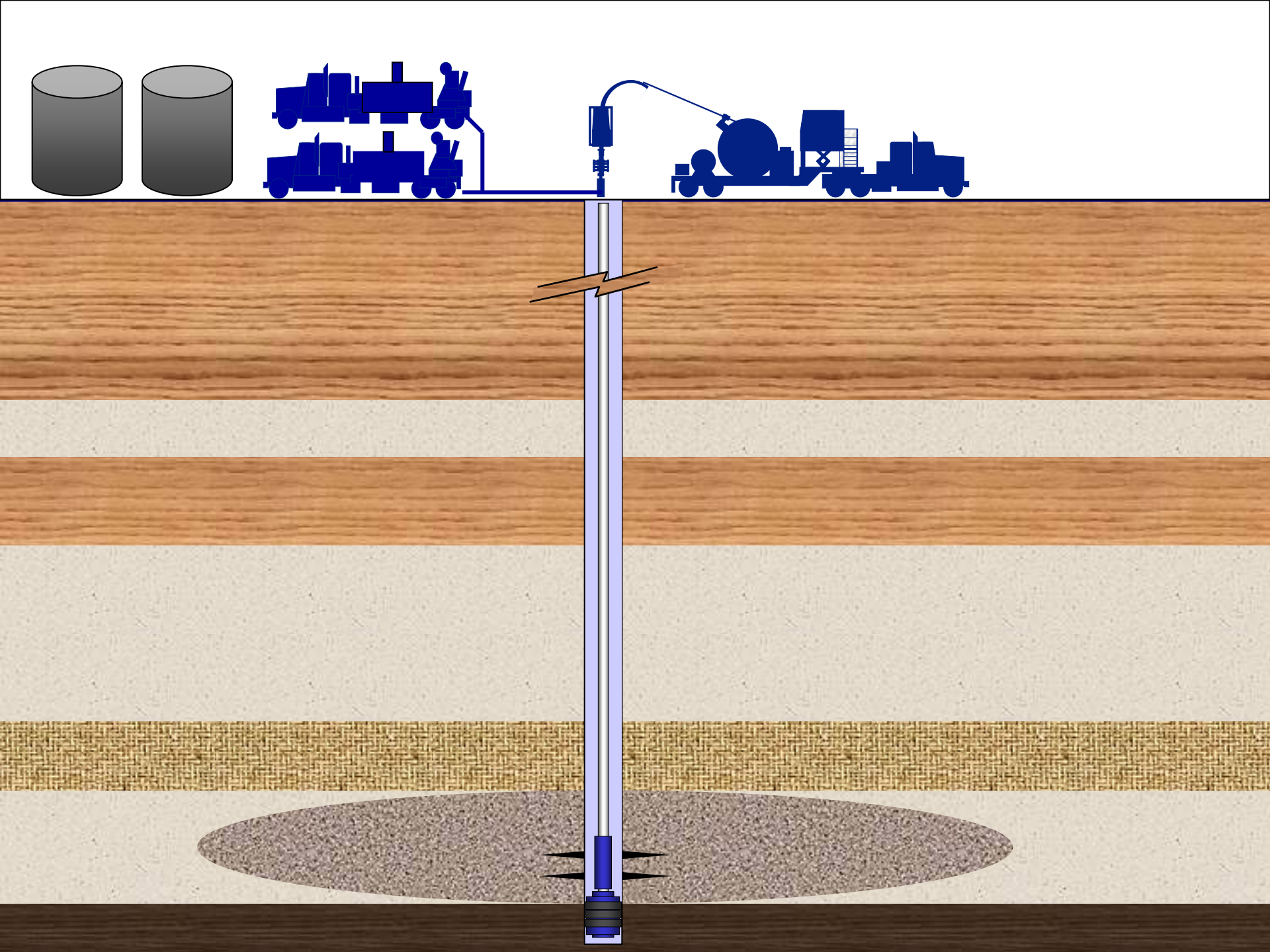
Annular Fracturing Techniques

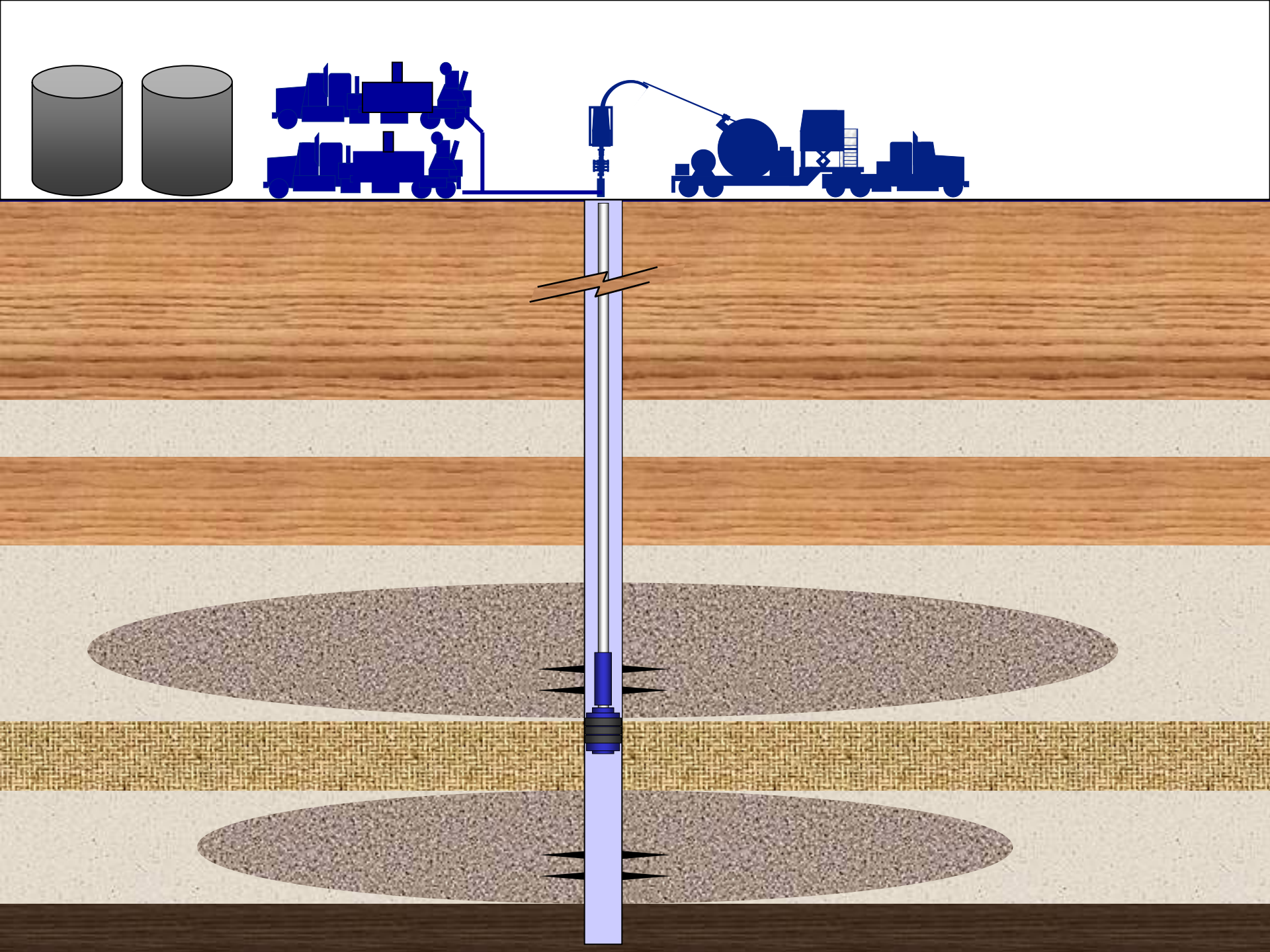
Coiled Tubing is in the wellbore during the fracture treatment

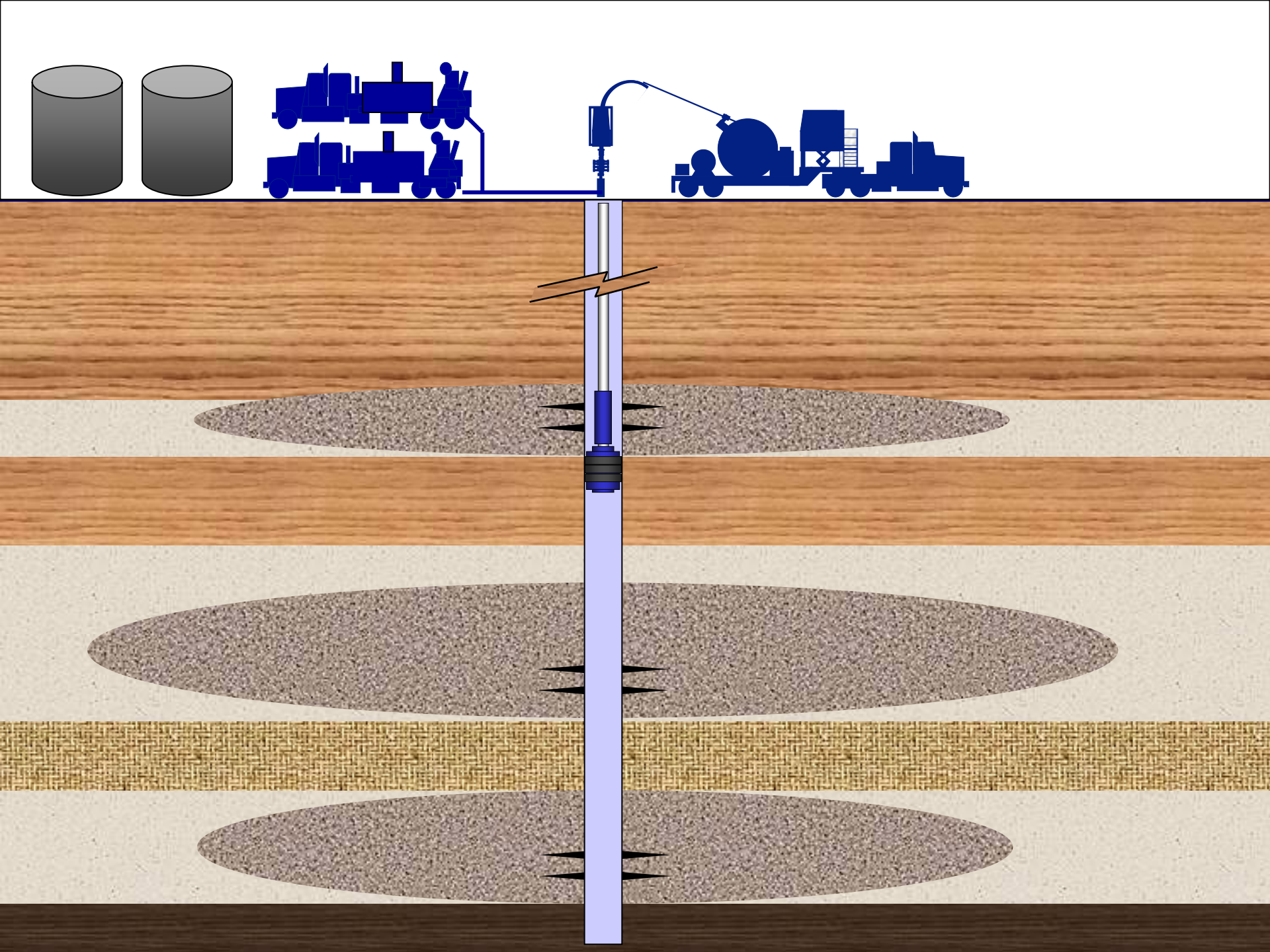
Works with either cemented liners or external liner packers

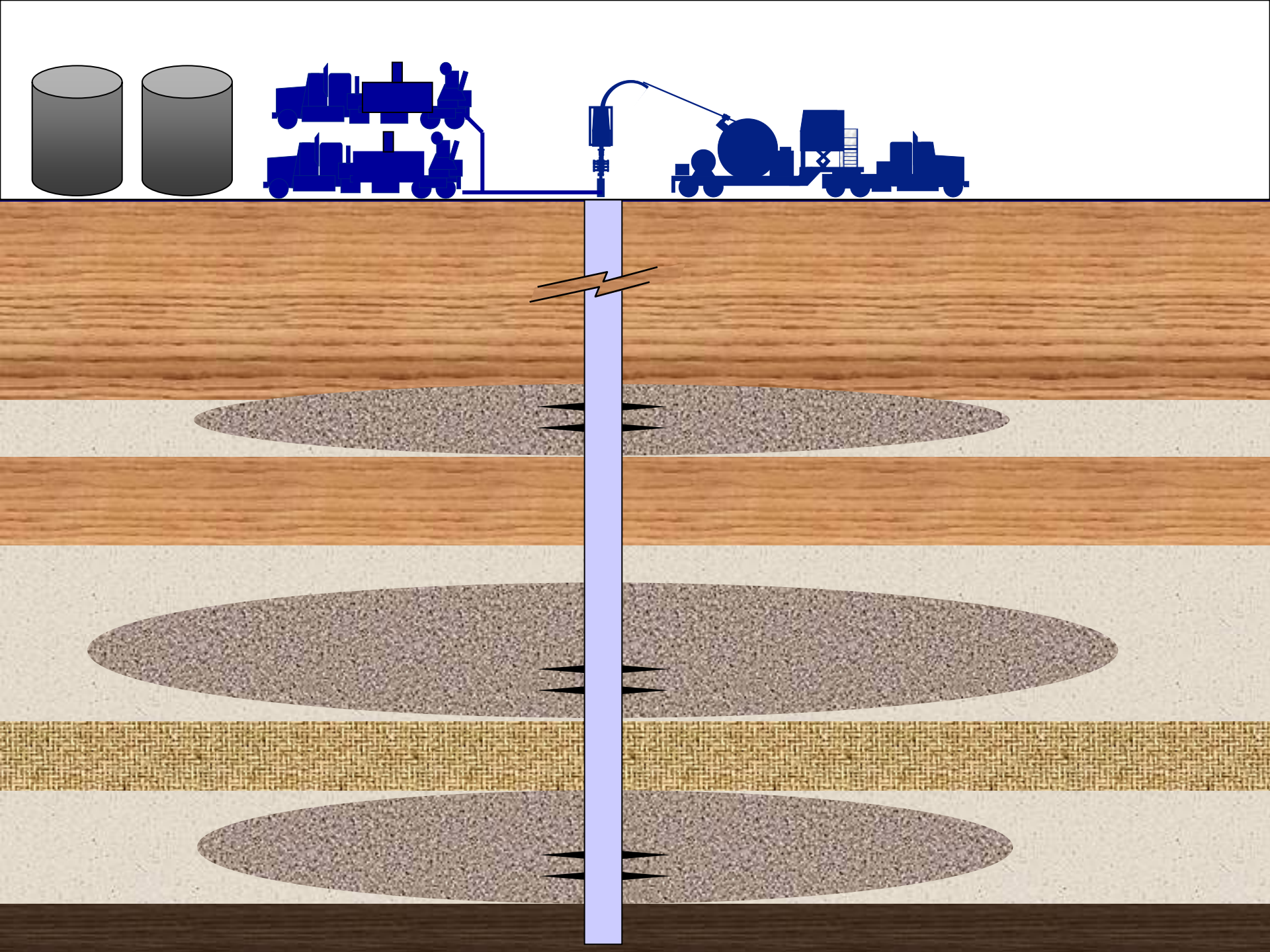
Coiled Tubing Annular Frac BHA











Benefits – Annular Fracturing

- Works with cemented liners
- No limit to how many stages you can do
- Quick recovery from a screen out
- Bigger Sand, better conductivity
- Higher Sand Concentrations
- Dead leg monitoring – optimise your frac
- No ports to drill out
- Full bore wellbore – future remedial work

Annular Frac Tools

BJ Canada utilises the proprietary* BJ Opti-frac SureSet™ frac tool or NCS supplied Mongoose™ frac tool

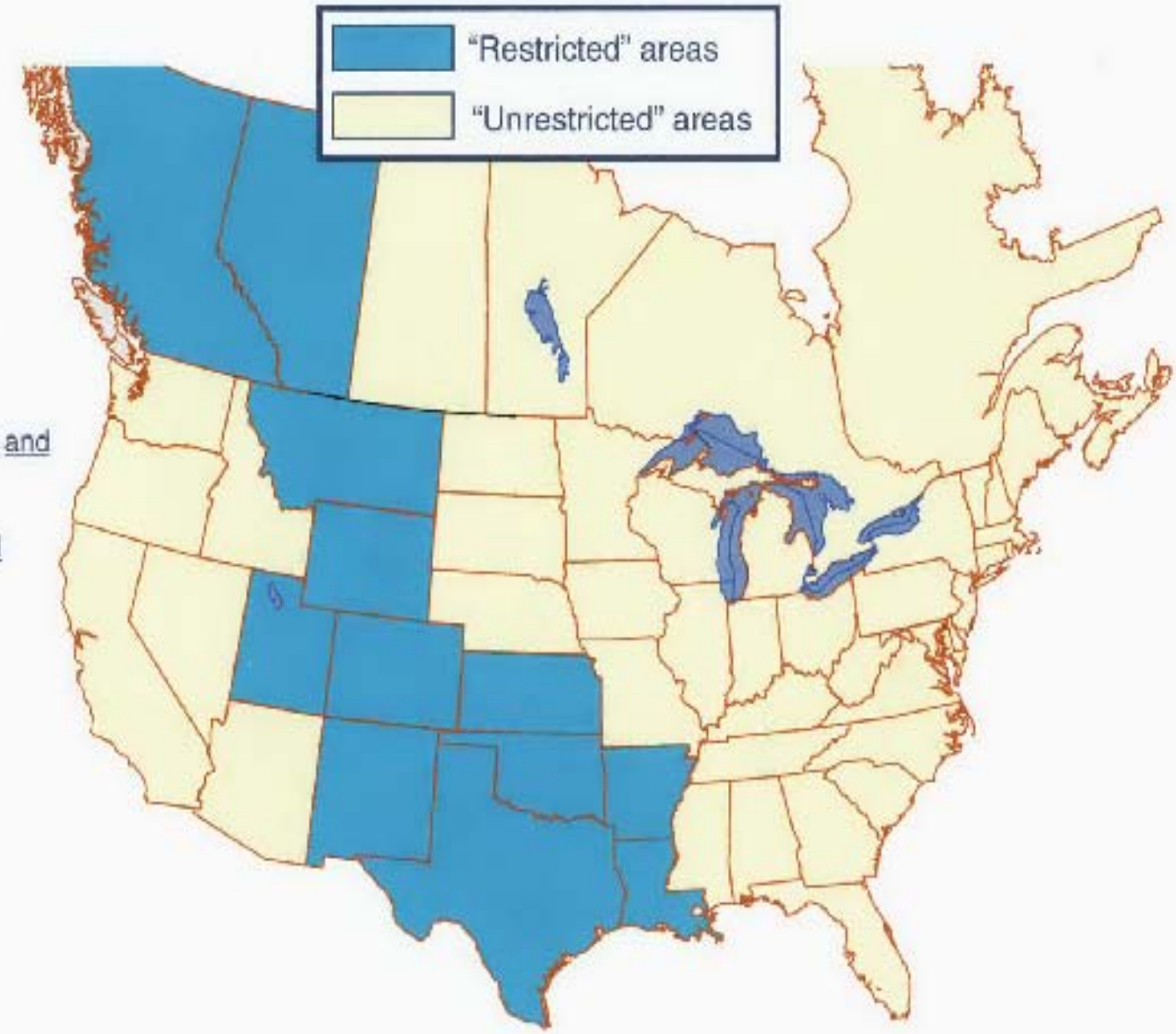
** Technology Licensed from ExxonMobil Upstream Research Company*

ExxonMobil Annular Frac Patent

- BJS, Halliburton, Schlum. Licensed in 2005
- 3% royalty on the total cost of the frac
- Montana & Alberta restricted to six stages*
- Unlimited stages in Saskatchewan & Dakotas

Future License Restrictions

ExxonMobil
Upstream Research



Future Restrictions

- Restrict use to 6 treatments or less in wells:
  - Where EM holds no interest; and
  - Within specified "restricted" geographic areas (blue); and
  - Below 5000 ft TVD

Track Record – BJ Canada Annular Fracturing BHAs

August 2009 – Present

- 200+ Canadian Wellbores frac'd
- 2,900+ individual frac stages
- 70+ million pounds of proppant placed
- We have done up to 40 stages in a single trip

Ported Collars

(The next step)

Development Drivers

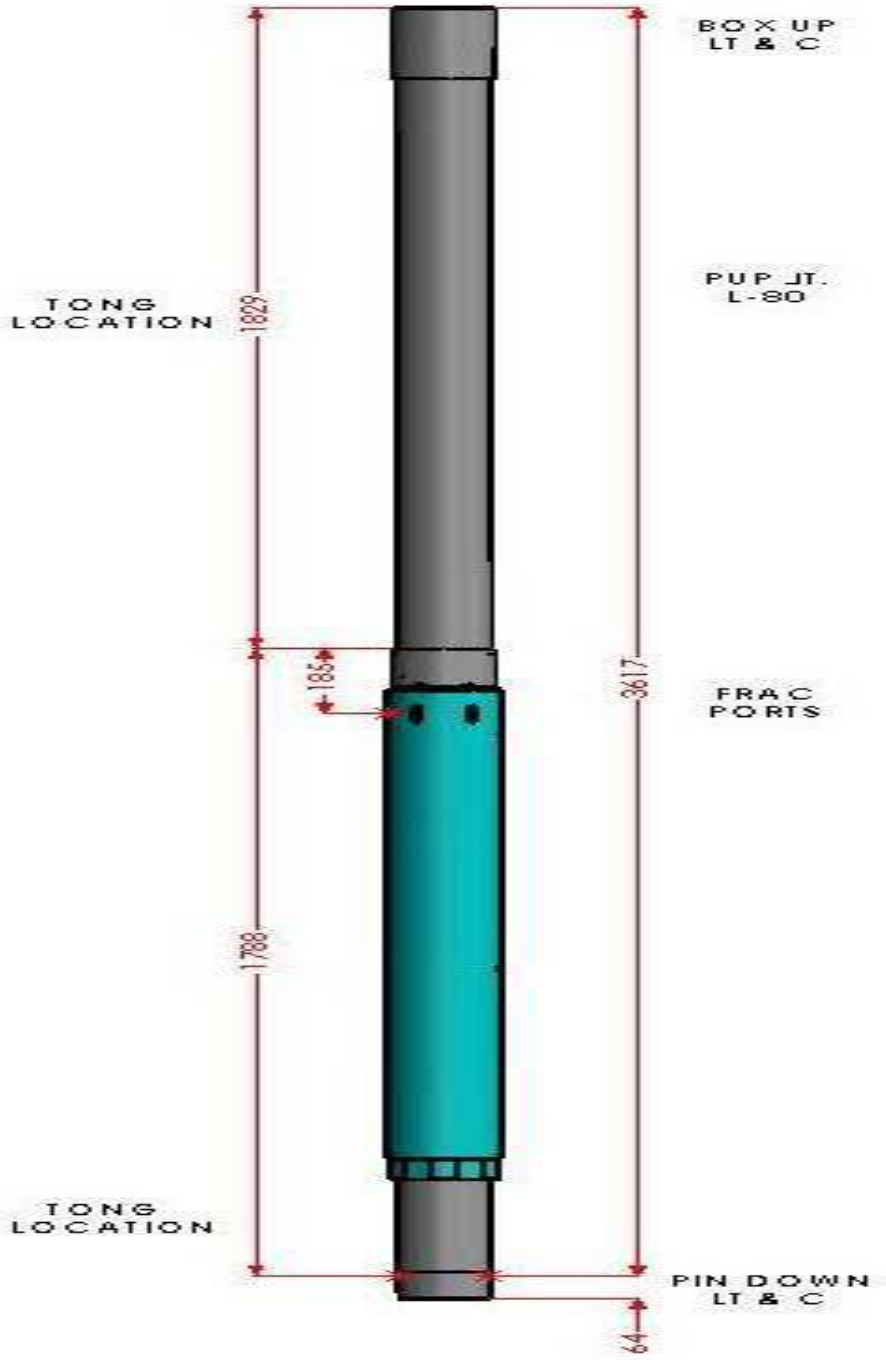
- ExxonMobil 6 stage limit in Ab & Montana
- 3% royalty is expensive
- Eliminate abrasive perforating – save time, fluid, and money
- Faster & Cheaper

Ported Collar

6 ft Pup Joint
used for running

Uphole

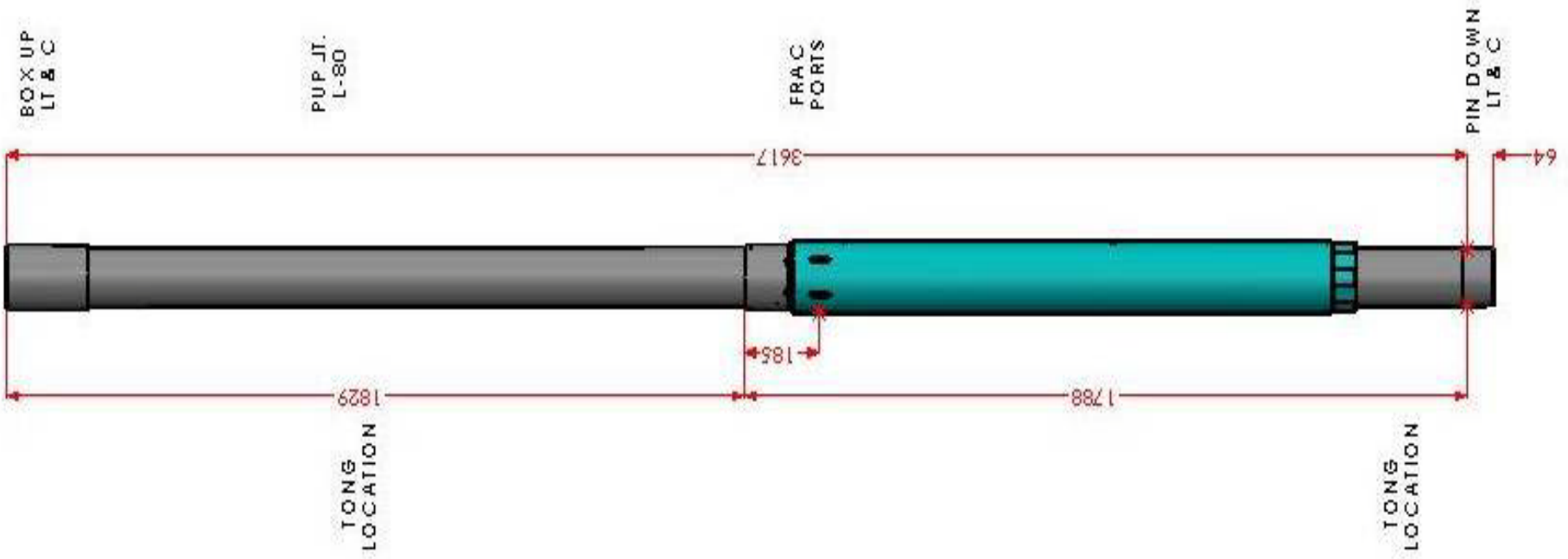
9 ft Ported Collar
4” ID x 5.85” OD



Ported Collar

Uphole

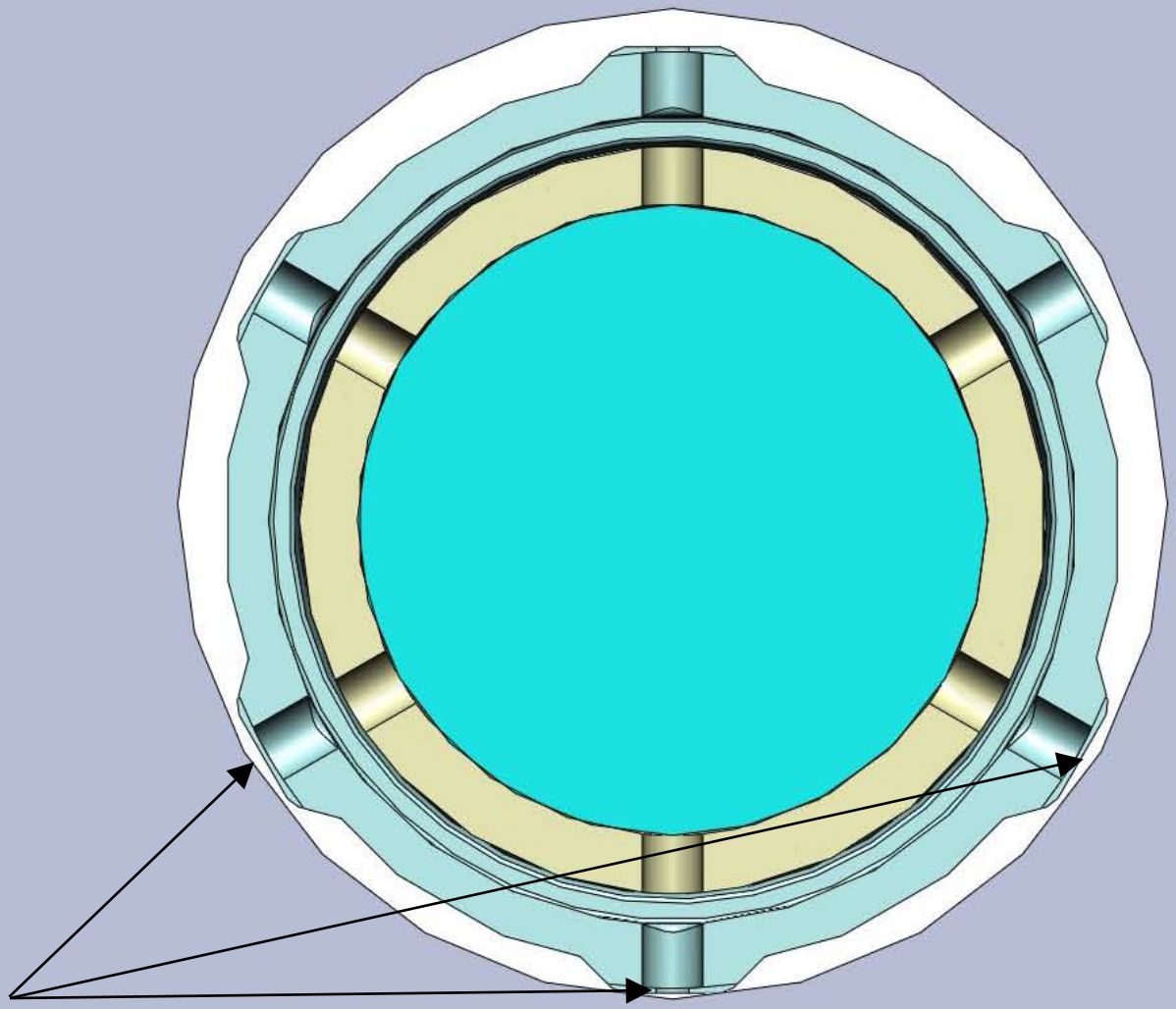
Toe



6 ft Pup Joint
used for running

9 ft Ported Collar
4” ID x 5.85” OD

Ported Collar Section View

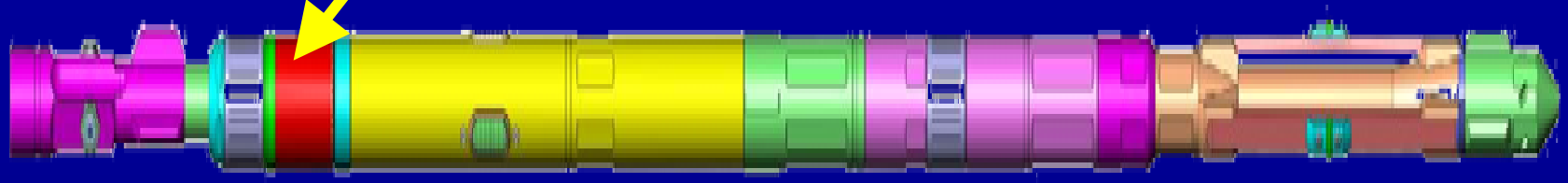


Minimum
Cement
Thickness

Annular Frac Mode

Uses Existing Frac BHA

Packer sets in Ported Collar and allows pressure differential

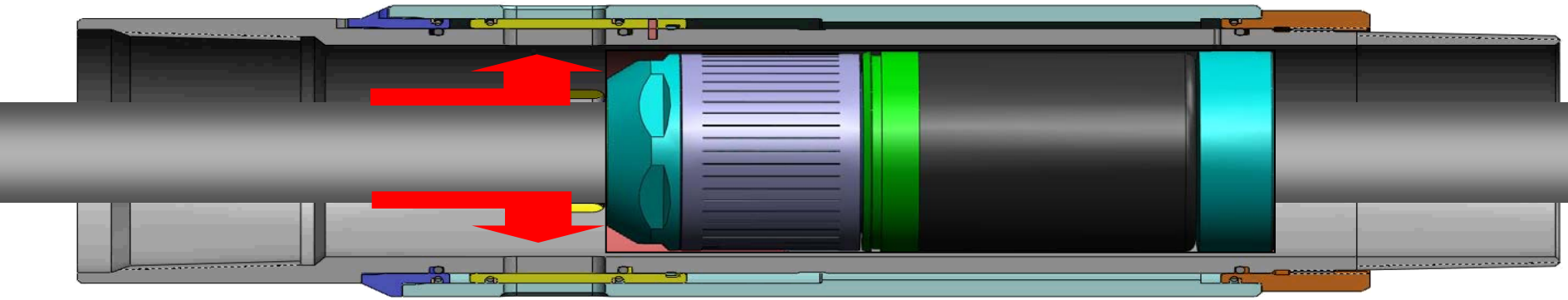


Sand Jet perforator is contingency

Mechanical CCL locates in custom length liner collar

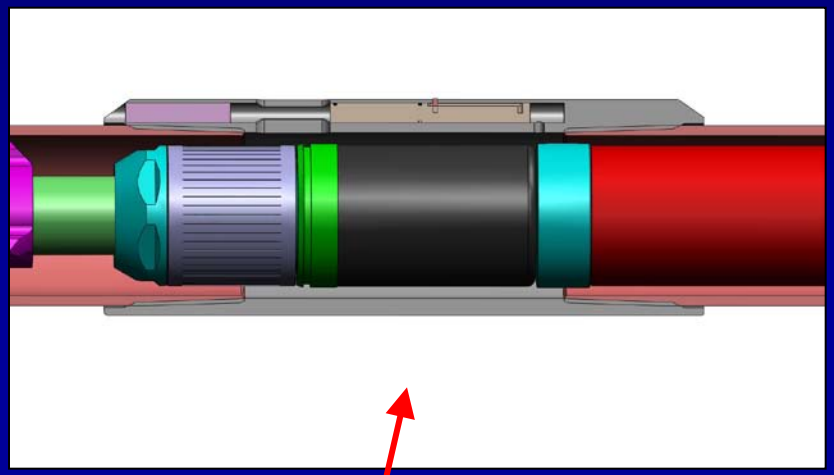
Ported Collar

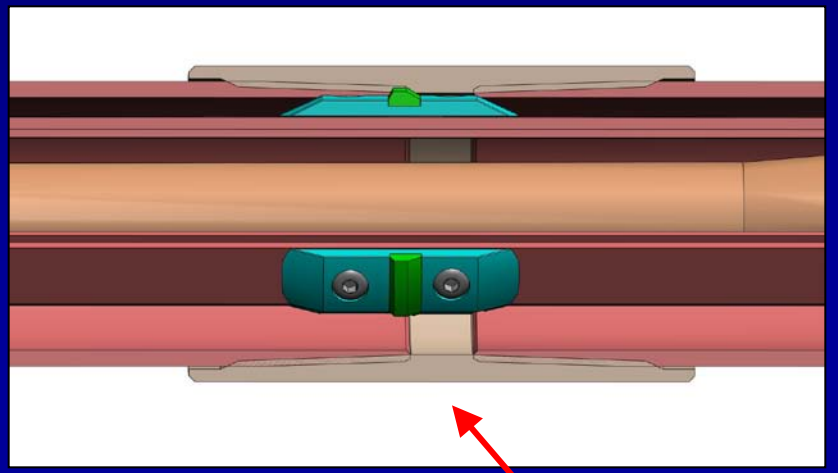
Annular Frac Mode



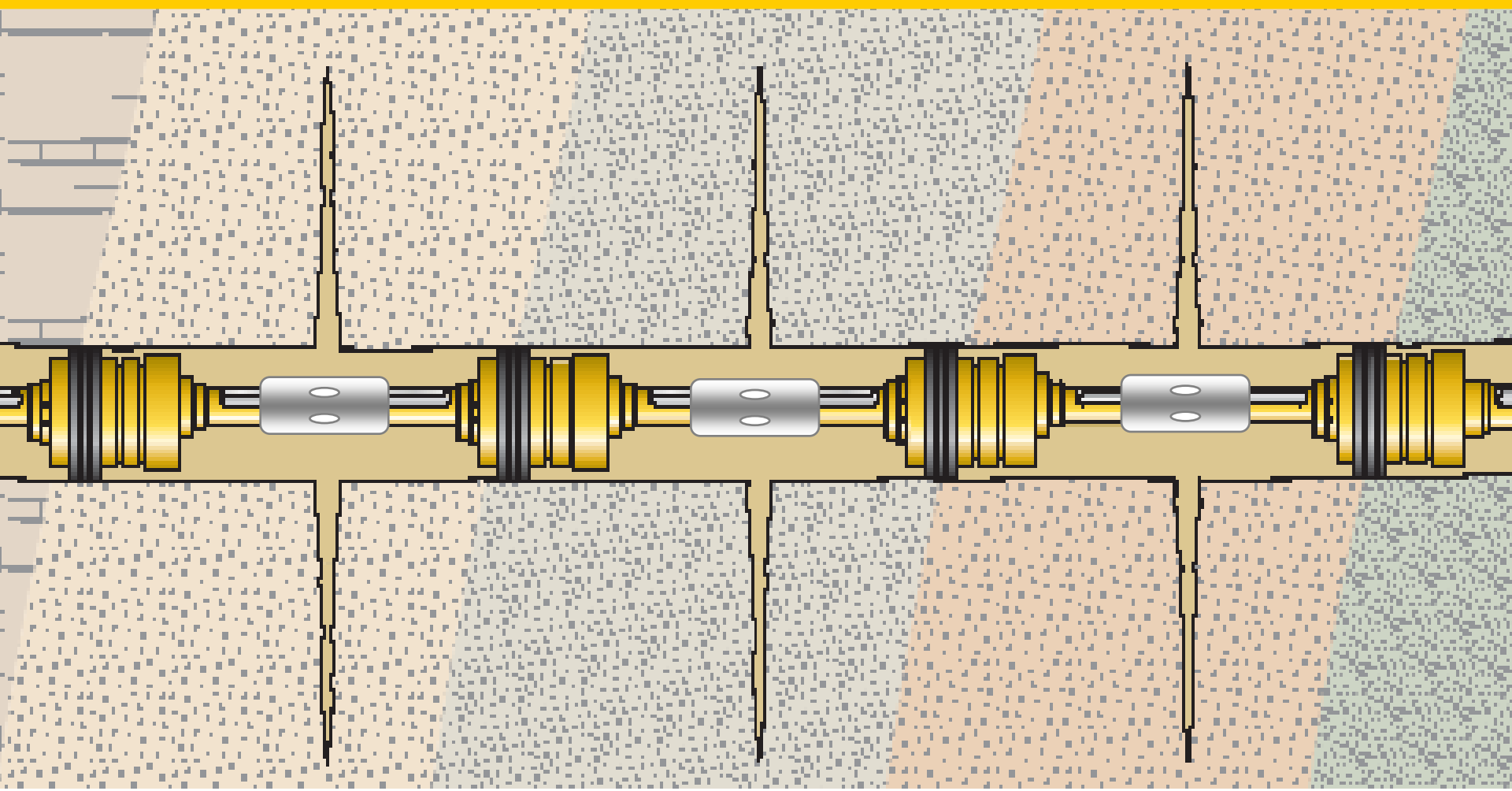
Annular Frac Mode

Open Port With Annular Frac BHA

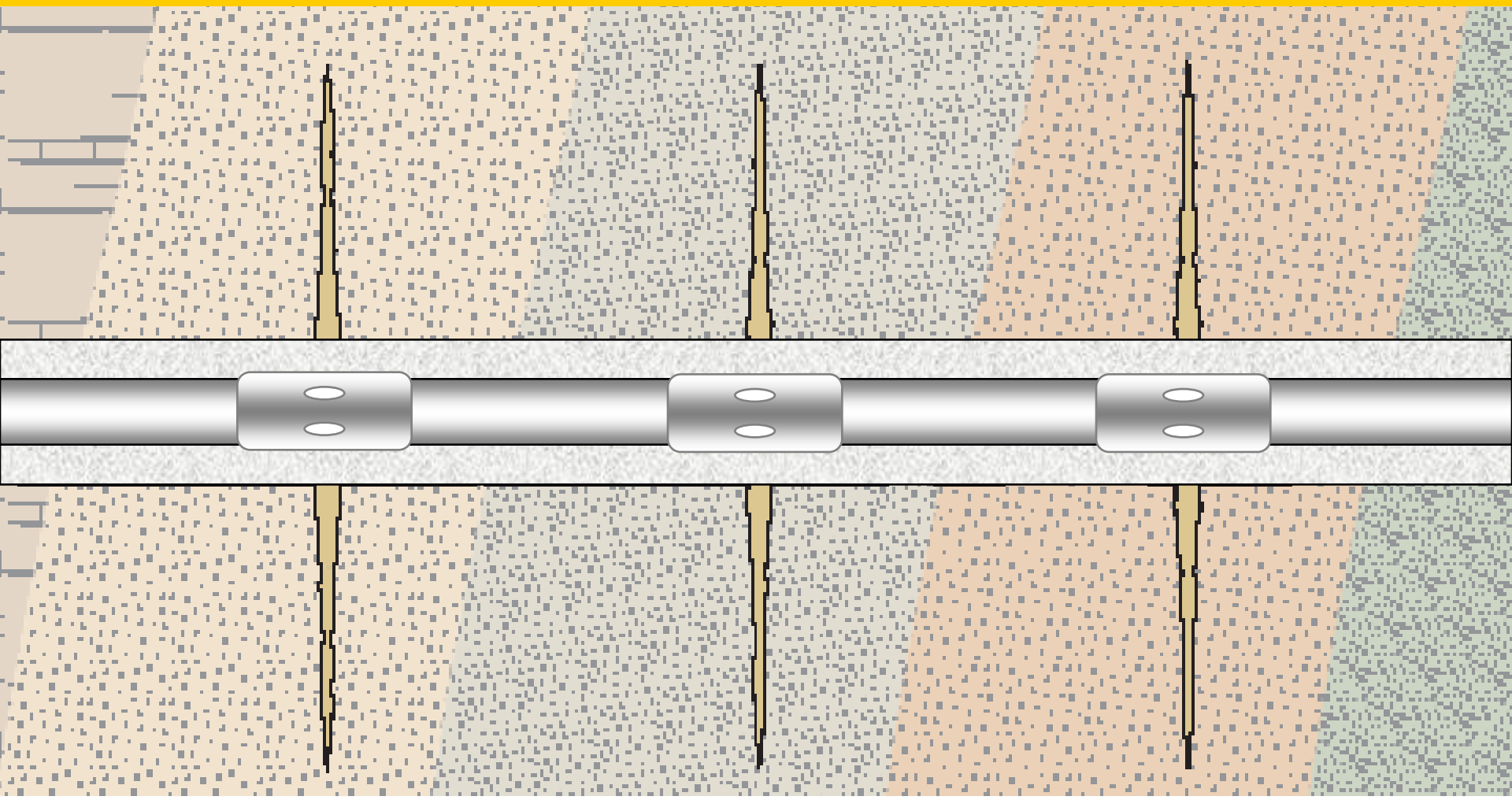




Works With Liner Packers



Works With Cemented Liners



Ported Collars - Advantages

- Unlimited number of Zones
- Works with cemented liners or open hole packers
- Better fluid management, flush is pad for next stage
- Quick recovery from screen outs
- True dead-leg, maximise pad size, sand ramp, sand concentrations, etc.
- Wellbore left full drift, no mill-outs of ball seats
- Faster than Abrasive perforating fracturing
- Abrasive perforator contingency built in to tool

Track Record – BJ Canada
Ported Collar Annular Fracturing

January 2010 – Present

- Two wellbores completed and frac'd with Ported Collars and packers (no cement)
- Six wellbores completed and frac'd with Ported Collars and cemented liner
- One wellbore installed, awaiting frac

Questions ?