Class II Well Inspections

- Class II well classification
- Class II well construction requirements
- Types of inspections
- Operating and Monitoring requirements

Class II Well Classification

IIR – Enhanced recovery wells

- Used for the secondary or tertiary recovery of oil and gas and for the maintenance of reservoir pressure

Class II Well Classification

IID – Salt water disposal wells

- Disposal of salt water (brine) produced from oil and gas production wells
- Disposal of other waste streams associated with oil and gas production

Class II Well Classification

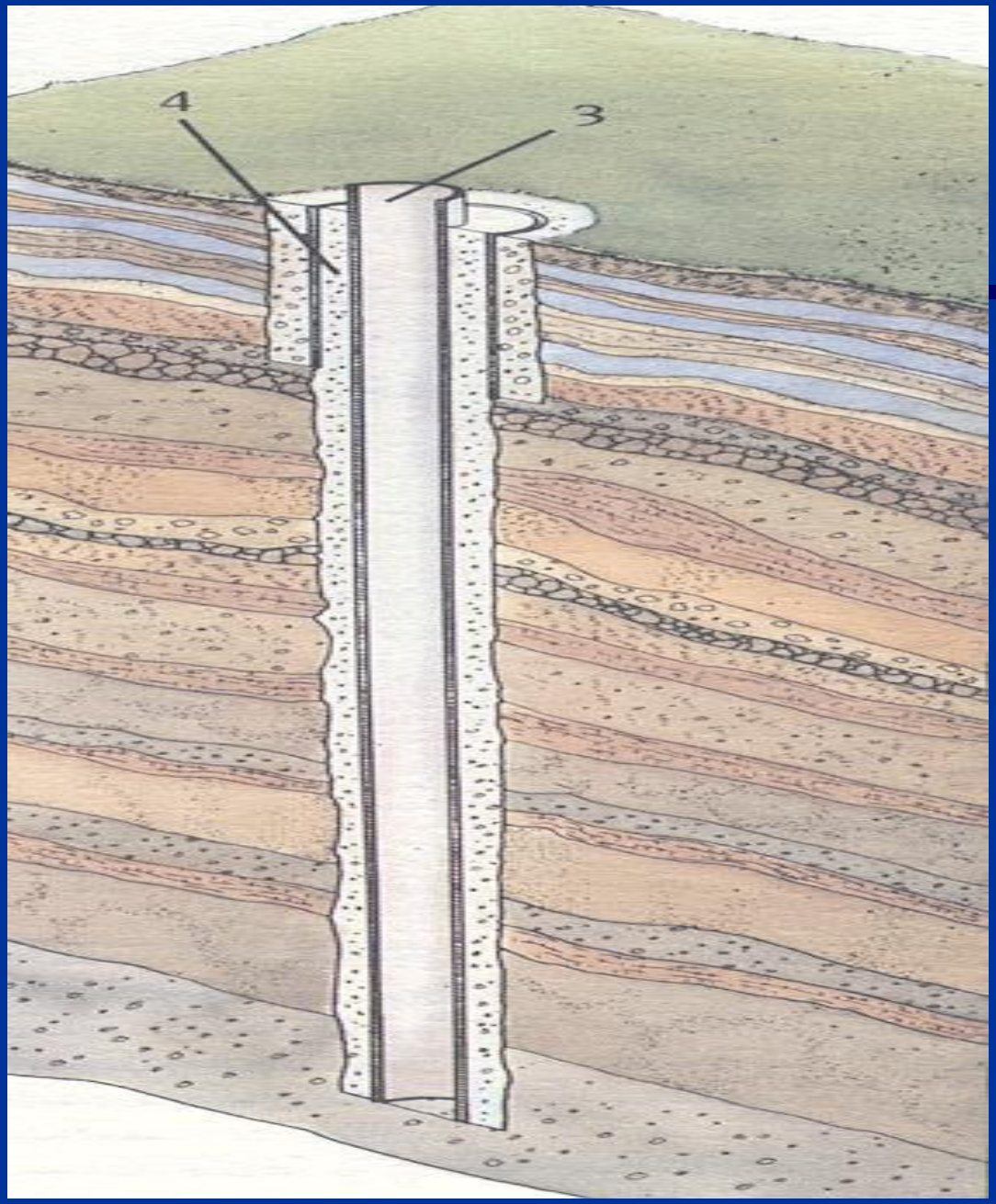
IIH – Hydrocarbon storage wells

- Inject hydrocarbons that are liquid at standard temperature and pressure.

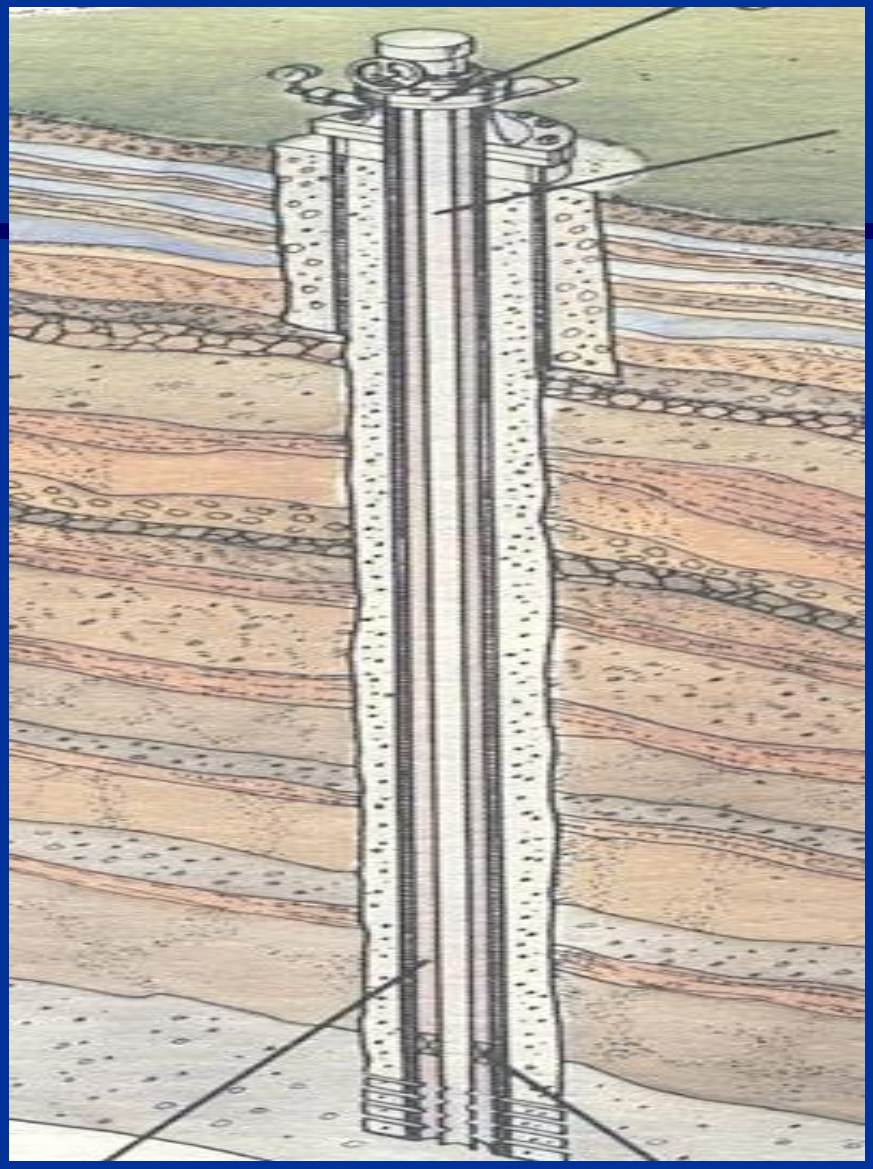
Class II Well Construction Requirements

- New Class II wells inject into a formation separated from any USDW by confining zones free of faults and fractures.
- All Class II wells are cased and cemented to prevent movement of fluids into or between USDWs.
- Casing and cement for newly drilled wells shall be designed for the life expectancy of the well.
- Casing and cement programs shall consider factors such as: location of USDWs, pressures, formation fluids, lithology.

Well Construction Technology 1st Step: Surface Casing



2nd Step: Intermediate or Long String Casing



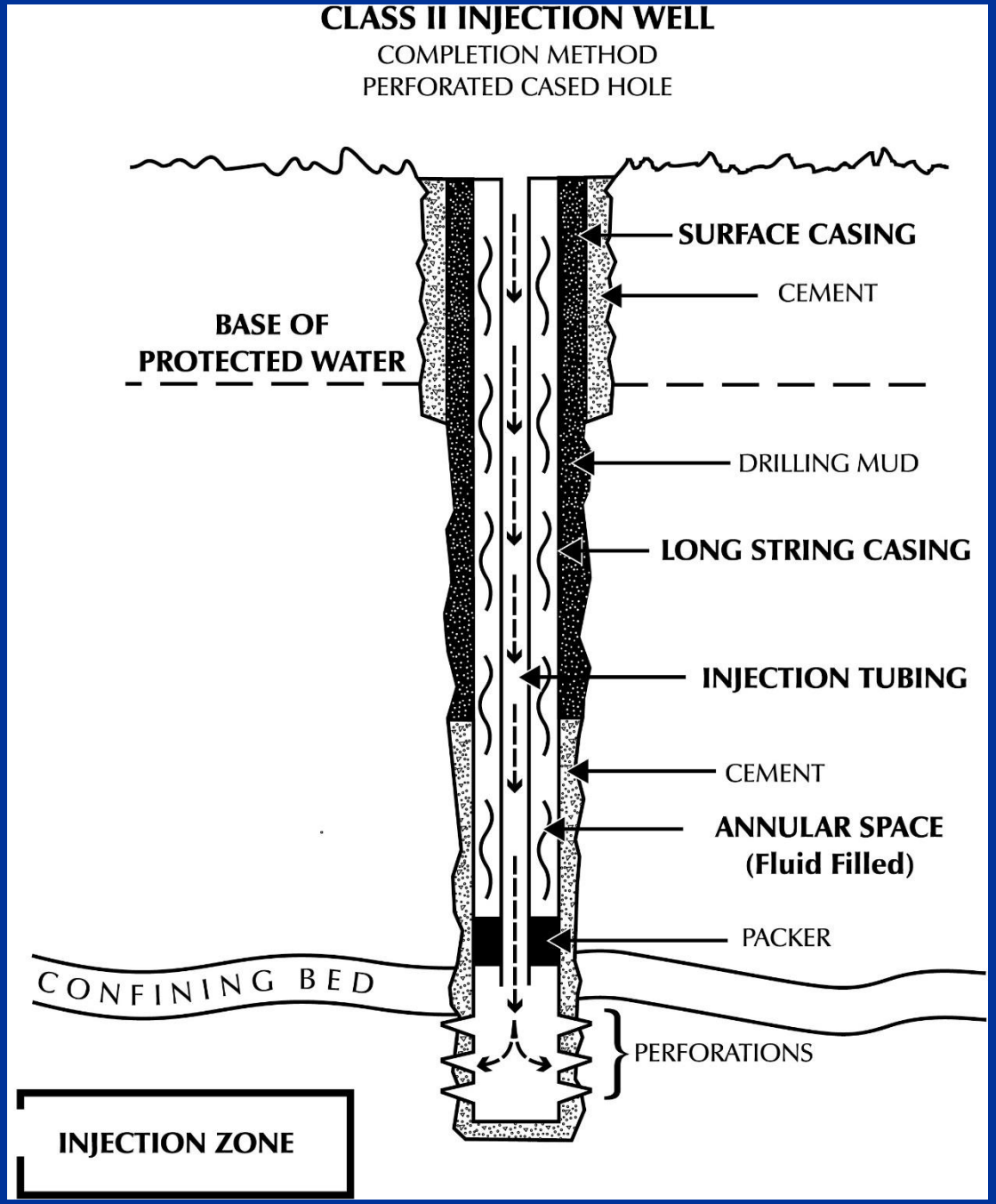
3rd Step: Well Perforation

Tubing and Packer

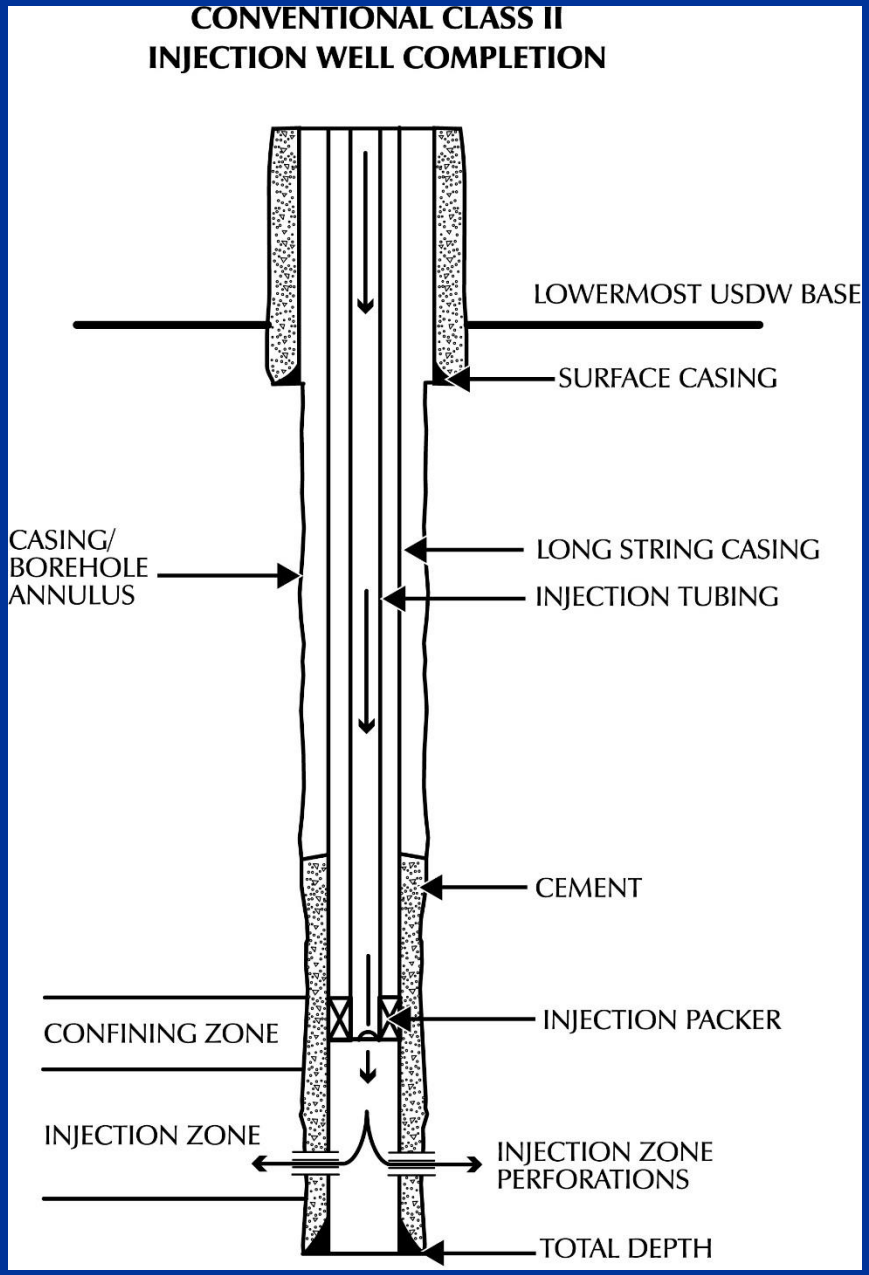
Class II Injection Well

Completion Method

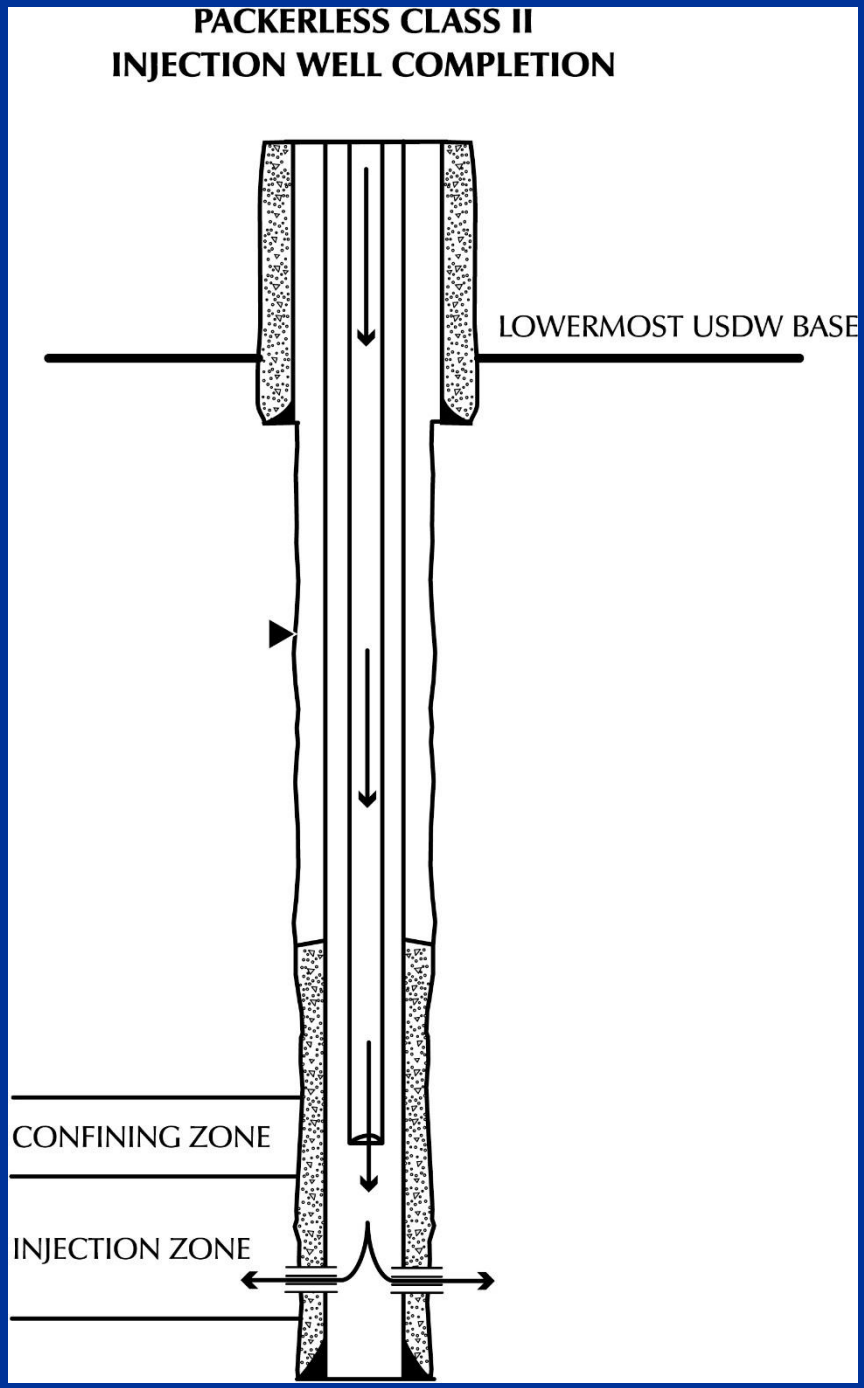
Perforated Cased Hole



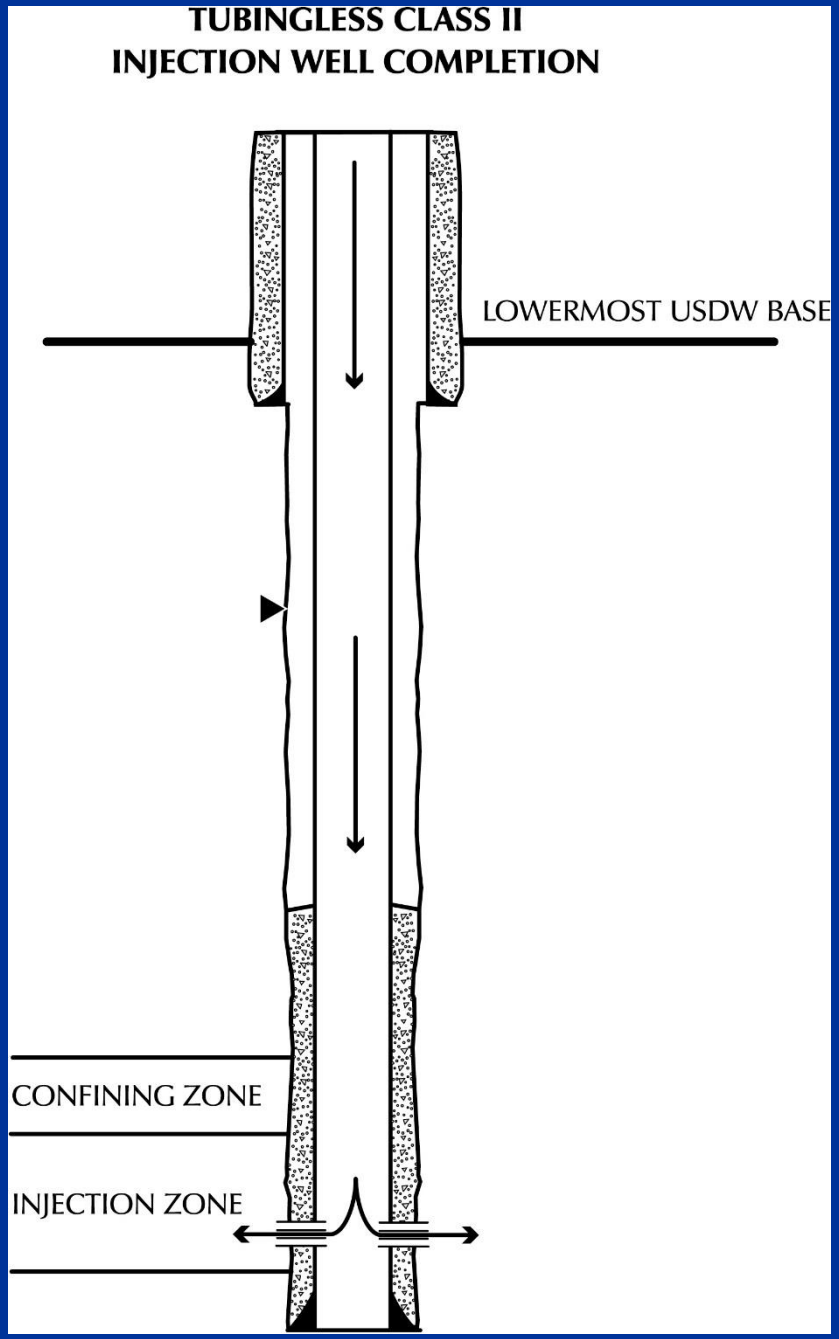
Conventional Class II Injection Well Completion



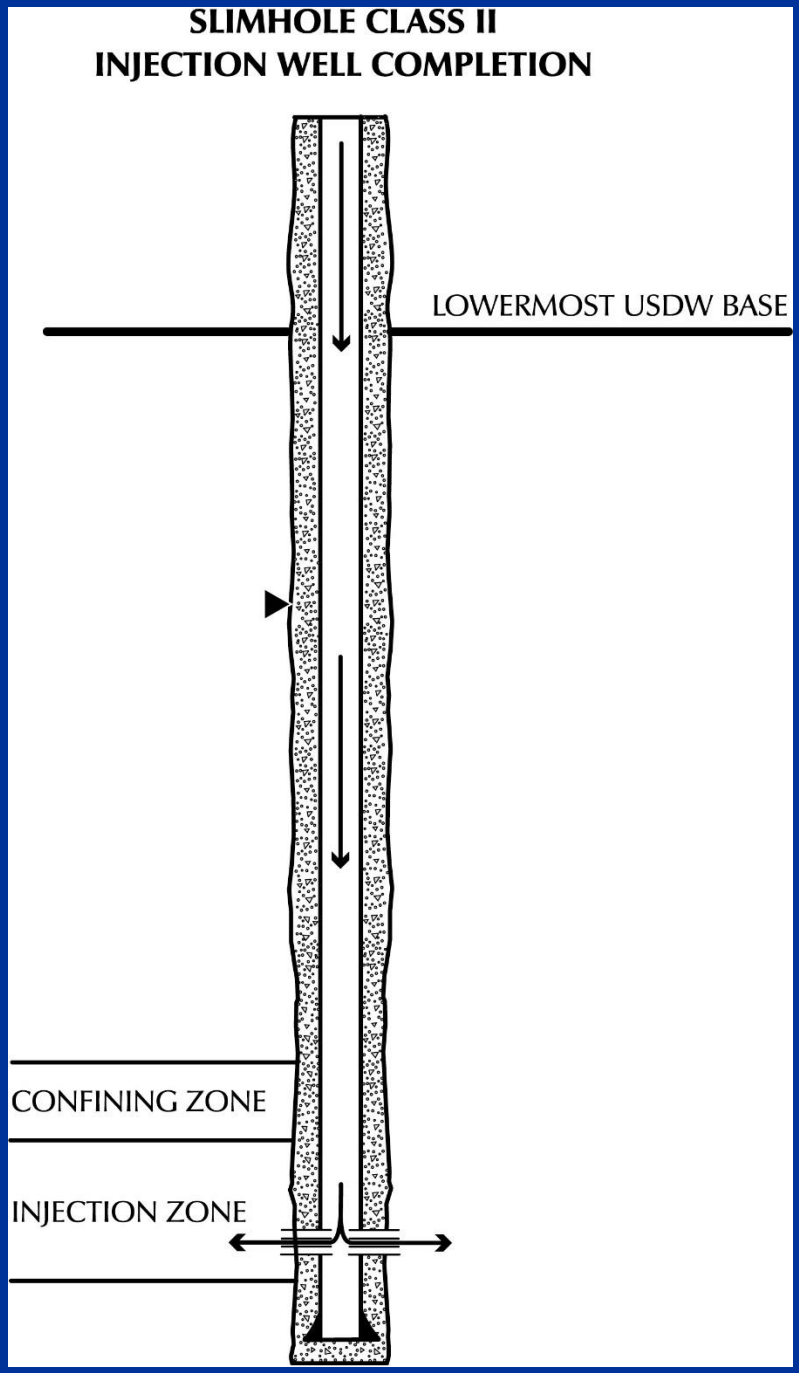
Packerless Class II Injection Well Completion



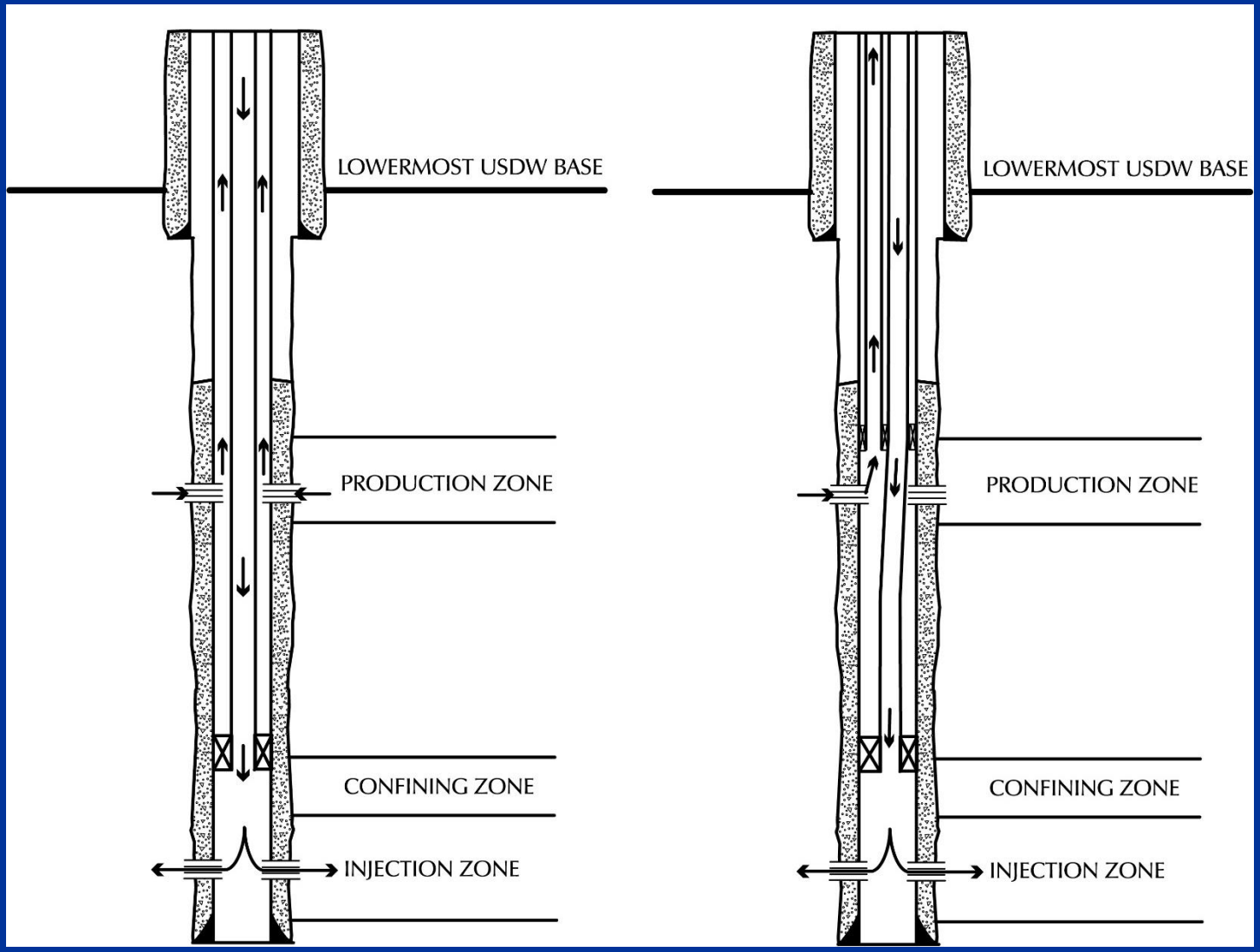
Tubingless Class II Injection Well Completion



Slimhole Class II Injection Well Completion



Dual Completion Class II Injection Well Completions



Types of Inspections

- Routine or operational
- Drilling/Workover
- Well logging/Testing
- Frac job
- Plugging and abandonment
- Compliance and enforcement
- Sampling
- Citizen complaint

PREP for INSPECTIONS

- Well Construction (downhole & surface)
- Operating Limits (pressures/rates/vol)
- Site Access (locked/gated/etc.)
- Equipment Needs (gauges/tools)
- Operator contact information

Typical Operating and Monitoring Requirements

- Injection pressure
- Flow rate and cumulative volume
- Fluid analysis
- Annular pressure
- Shut-in Equipment
- Flowback

Surface Equipment

Wellheads / Cellars

Tanks

Pressure Gauges

Flowmeters

Volume Meters

SCADA Devices

Shut-In Devices

Wellheads and Gauges

- CO2

Wellheads and Gauges

- SWD

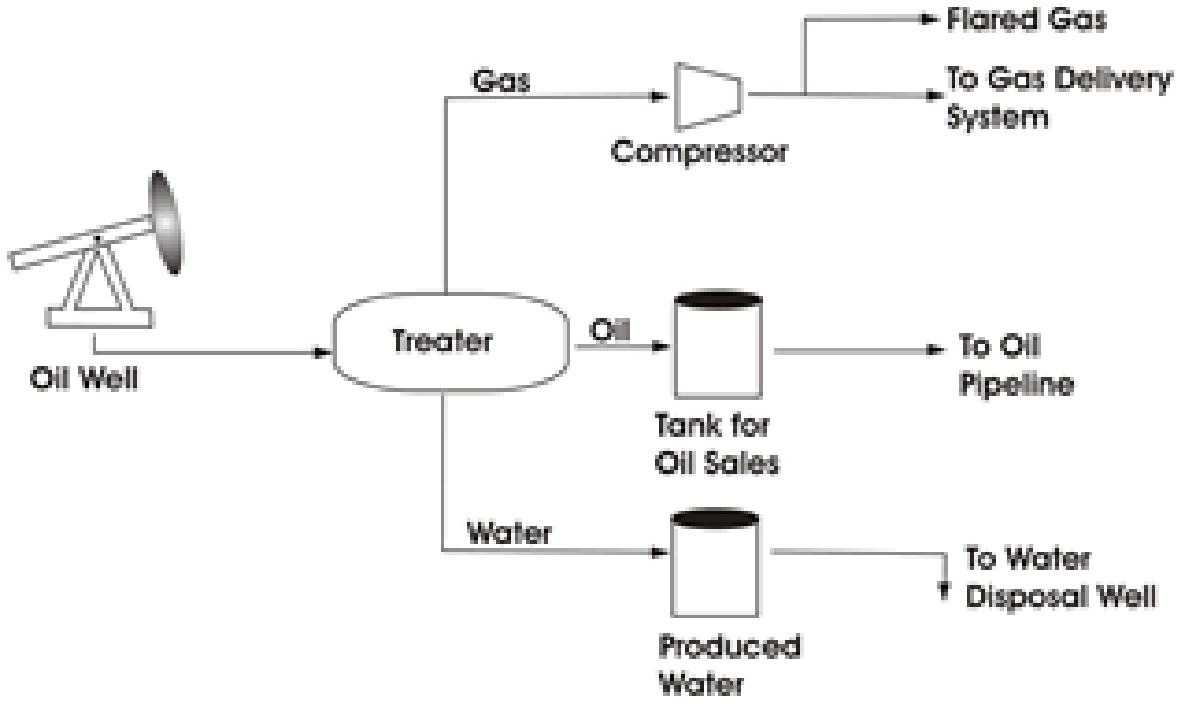
Wellheads

- SWD

Wellheads

- SWD

Wellsite



Example of a Single Well Oil Battery

Wellsite

Wellsite

Flow Meters

Volume Counters

Combination Meters

Shut-in Devices

Chart Recorders

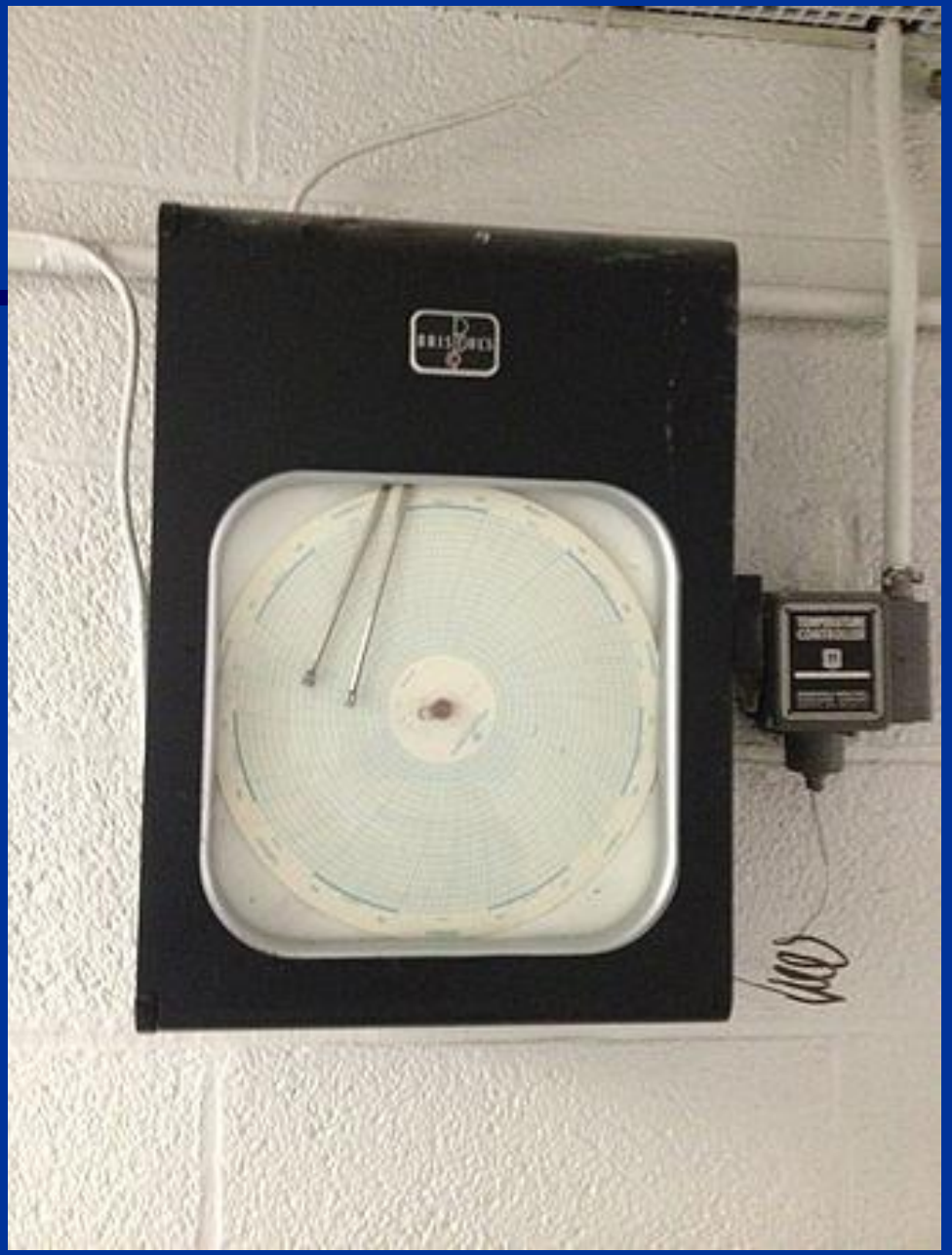


Chart Recorders

Frac Pressures/Gradient

- Frac Gradient is presented in psi/ft
- Reflects the frac pressure at depth
- Best Measured with a Step Rate Test

Frac Pressures/Gradient

- Frac Pressure is the pressure at the formation face that causes the formation to fracture
- Two pressures contribute to the bottom hole pressure:
  - Hydrostatic head of the fluid column
  - Surface pressure (injection pressure)

Frac Pressures/Gradient

- Hydrostatic Head contribution:

  Must know fluid contribution to psi
  - Depth
  - Specific Gravity

Frac Pressures/Gradient

- Hydrostatic Head contribution:

  Ph = (SG) (0.433 psi/ft) (D ft)

Frac Pressures/Gradient

- Hydrostatic Head contribution:

  Ph = (SG) (0.433 psi/ft) (D ft)

- For a 5000 ft well, with a SG = 1.003

Frac Pressures/Gradient

- Hydrostatic Head contribution:

  Ph = (SG) (0.433 psi/ft) (D ft)

- For a 5000 ft well, with a SG = 1.003
  Ph = (1.003) (0.433) (5000)
  Ph = 2171 psi

Frac Pressures/Gradient

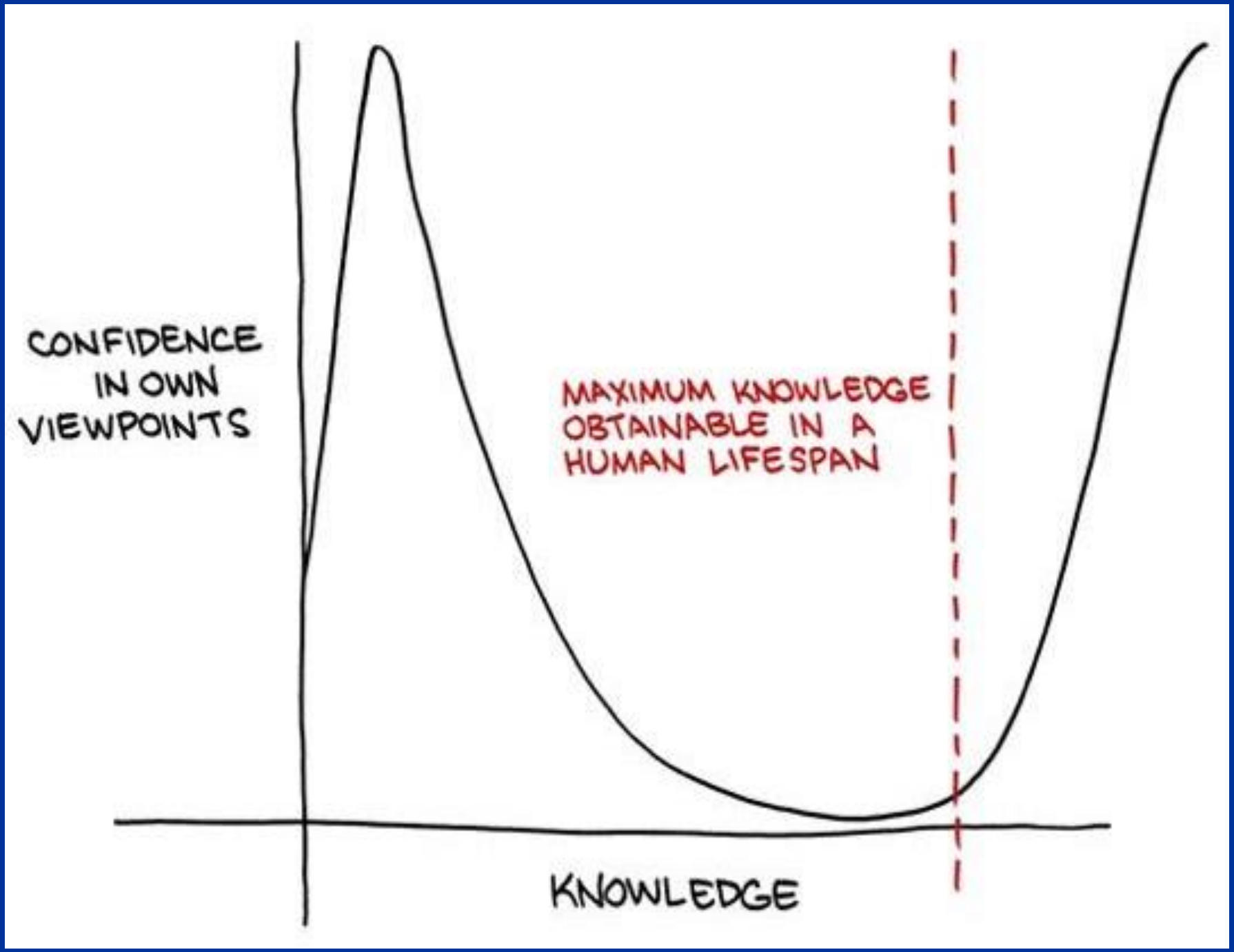
- If you know the frac gradient of your injection formation, the hydrostatic head contributes to that pressure, the remainder is added at the surface.
- If your frac gradient is 0.765 psi/ft, how much surface pressure can be added to the previous well example before frac?

Frac Pressures/Gradient

- For a 0.765 psi/ft frac gradient, the frac pressure at the formation face is:

  Pf = (0.765 psi/ft)(5000 ft)
- Pf = 3825 psi

- Ph = 2171 psi(from example)
- Pmax = 3825 – 2171 = 1654 psi


CONFIDENCE IN OWN VIEWPOINTS
MAXIMUM KNOWLEDGE OBTAINABLE IN A HUMAN LIFESPAN
KNOWLEDGE