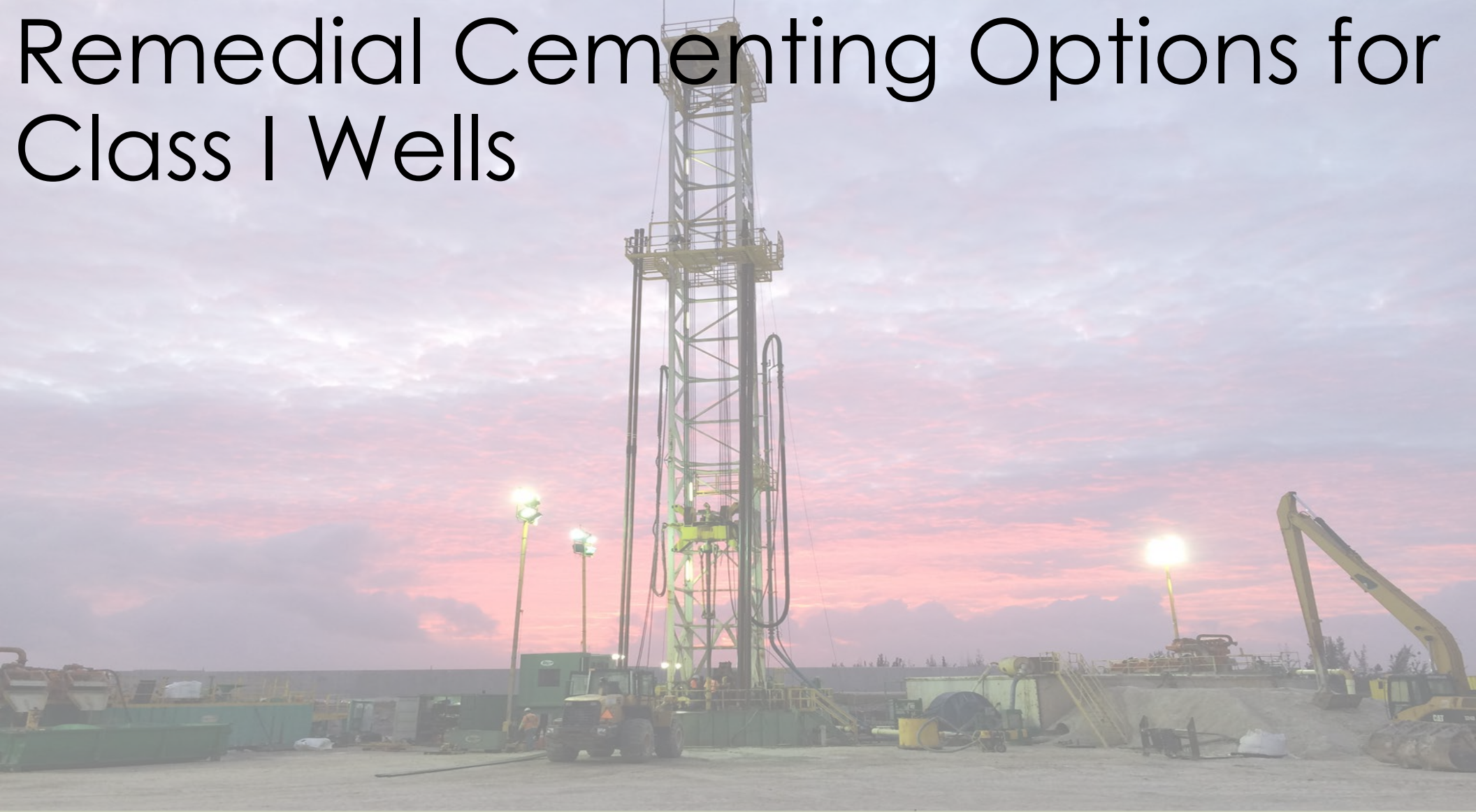


Remedial Cementing Options for Class I Wells



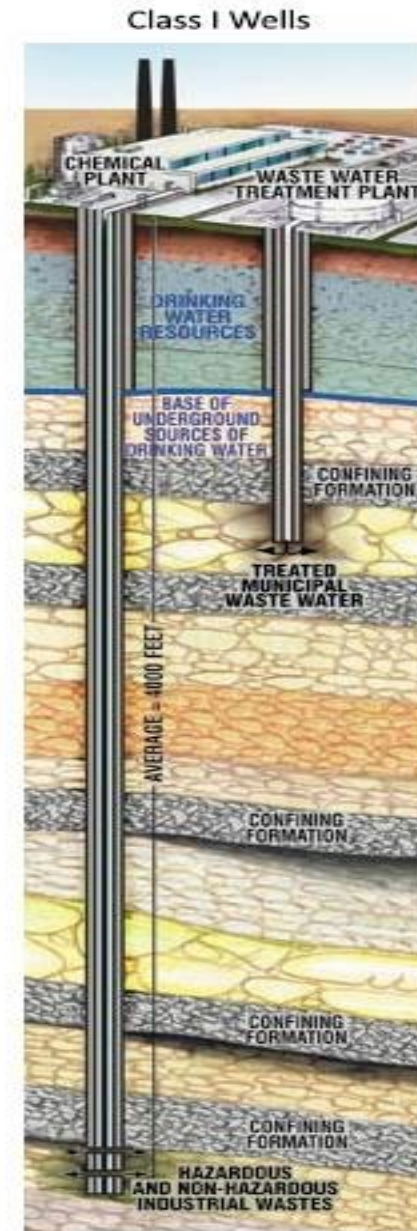
Randy Homburg | Geologist

SCS ENGINEERS

GROUNDWATER
PROTECTION COUNCIL

Cementing Program Objectives

- Zonal Isolation
- Casing Support
- Casing Protection
- Borehole Support
- Demonstrate mechanical integrity



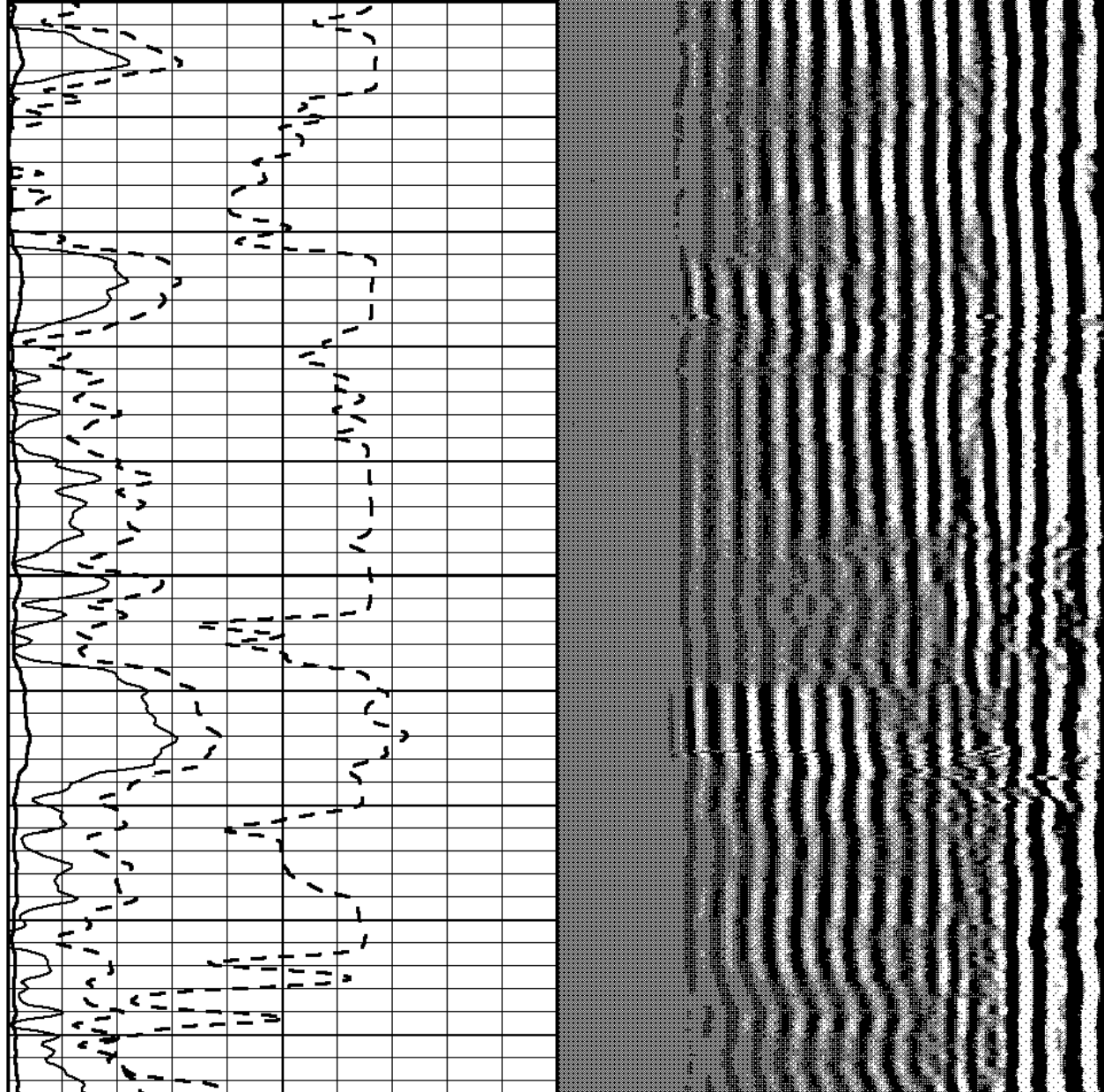
https://www.epa.gov/uic/class-i-industrial-and-municipal-waste-disposal-wells#non_haz

Cement Program Considerations

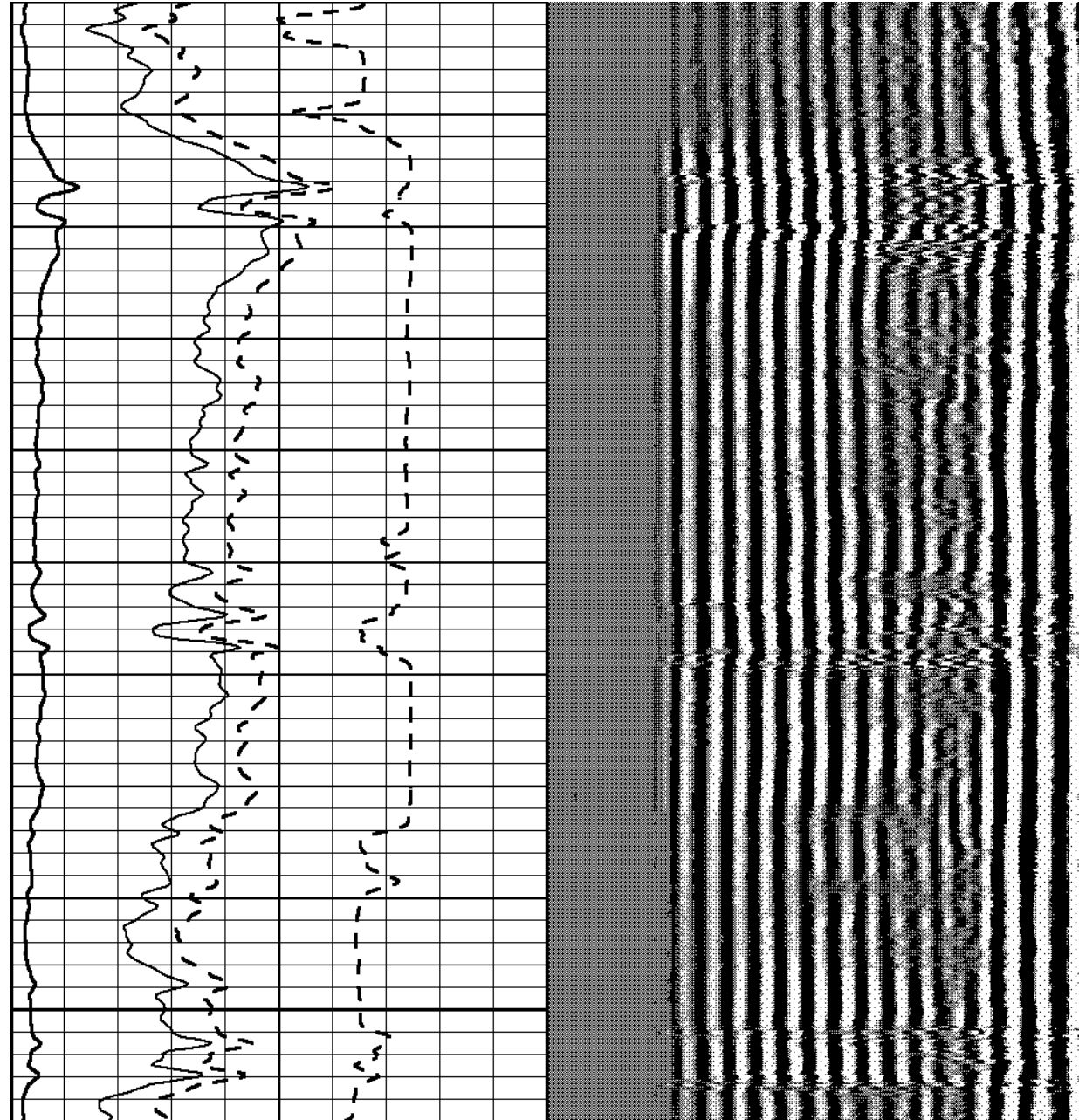
- Injection Fluid Compatibility
- Design of the Injection Well
- Subsurface Depth and Temperature
- Lithology



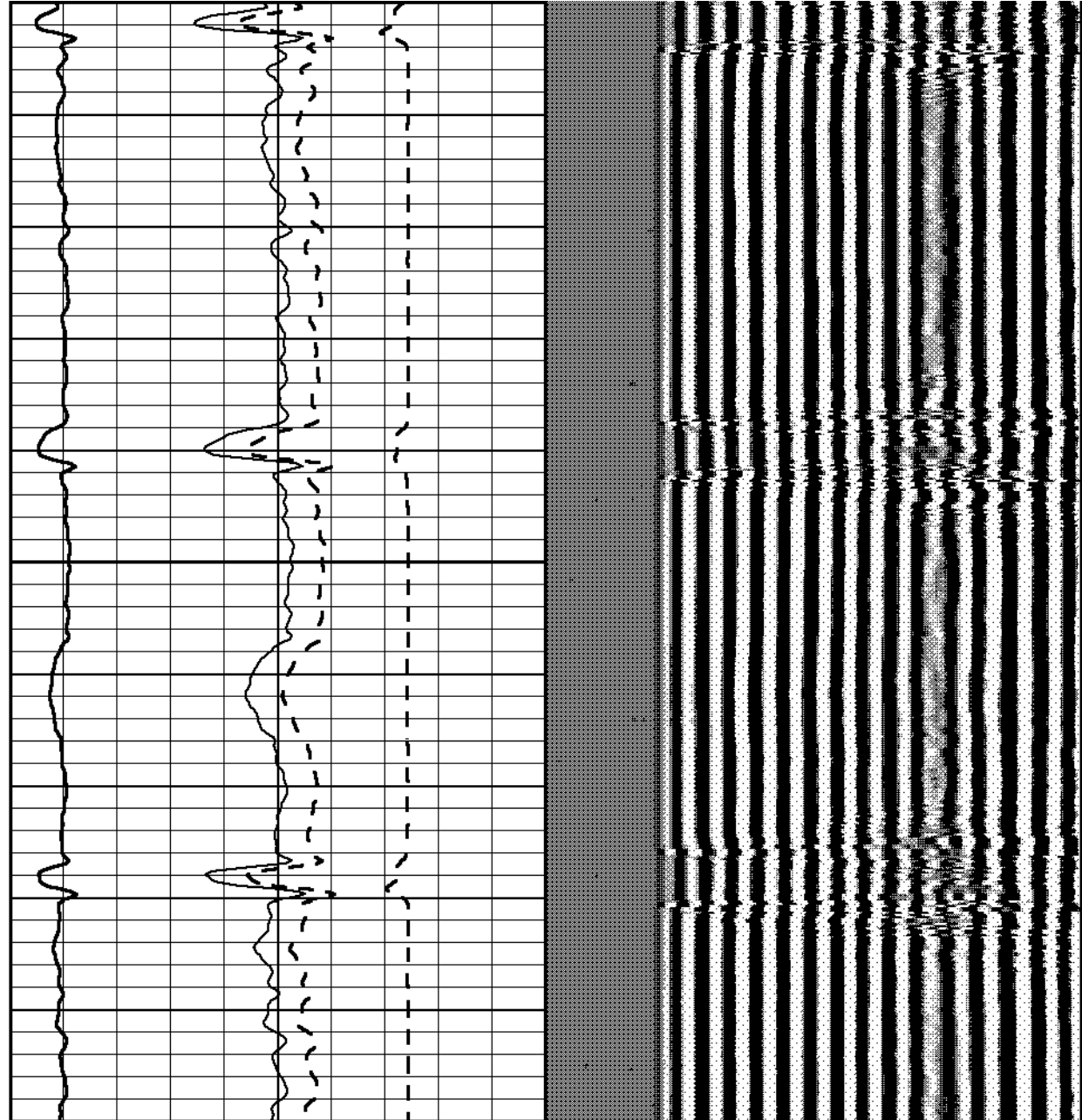
HOPEFULLY...



More Often...



unfortunately...



Remedial Cementing

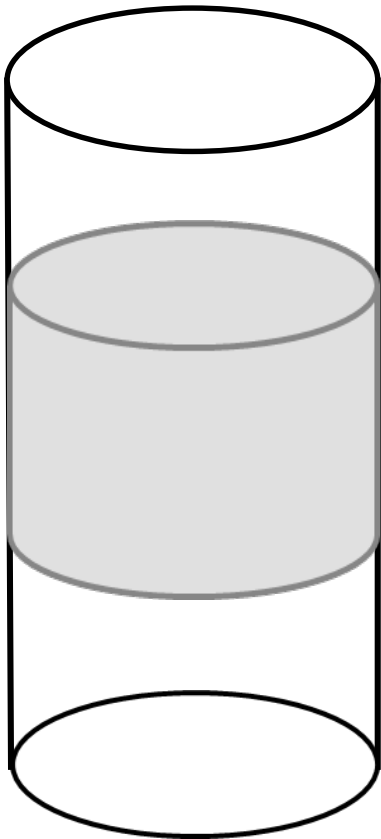
When primary cementing objectives have not been achieved, or when the cement or casing has failed over time

Two general methods of remedial cementing

1. Plug cementing
 - Cement placement to create a wellbore seal or plug
2. Squeeze Cementing
 - Correction process specifically designed to fill a void

Plug Cementing

A remedial technique involving placement of a volume of cement in a wellbore, casing or tubing

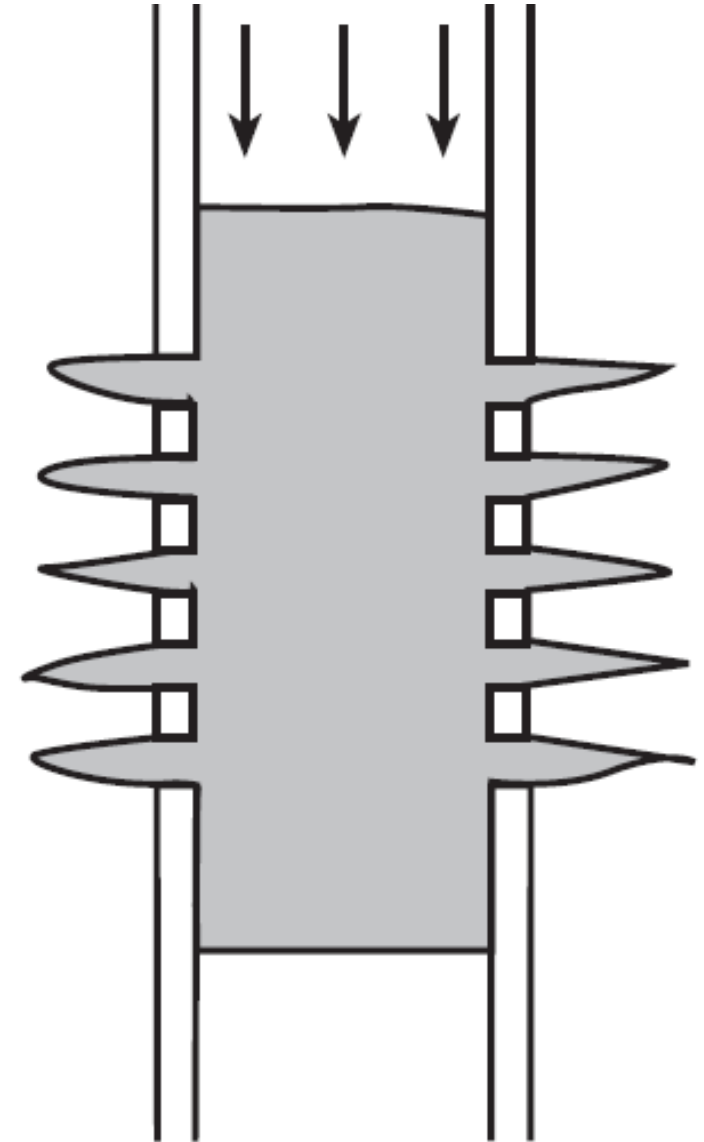


- Solving a lost-circulation problem
- Sidetracking or to initiate directional drilling
- Provide an anchor for an open hole test
- Plugging a zone or abandonment of a well

Squeeze Cementing

Squeeze cementing is the process of using pump pressure to inject or squeeze cement into a problematic void space at a desired location in the well.

- Repair primary cement job
- Repair improper zonal isolation
- Eliminate fluid intrusion
- Repair casing leaks
- Shut-off Injection interval



Squeeze Cementing Techniques

Low Pressure Squeeze

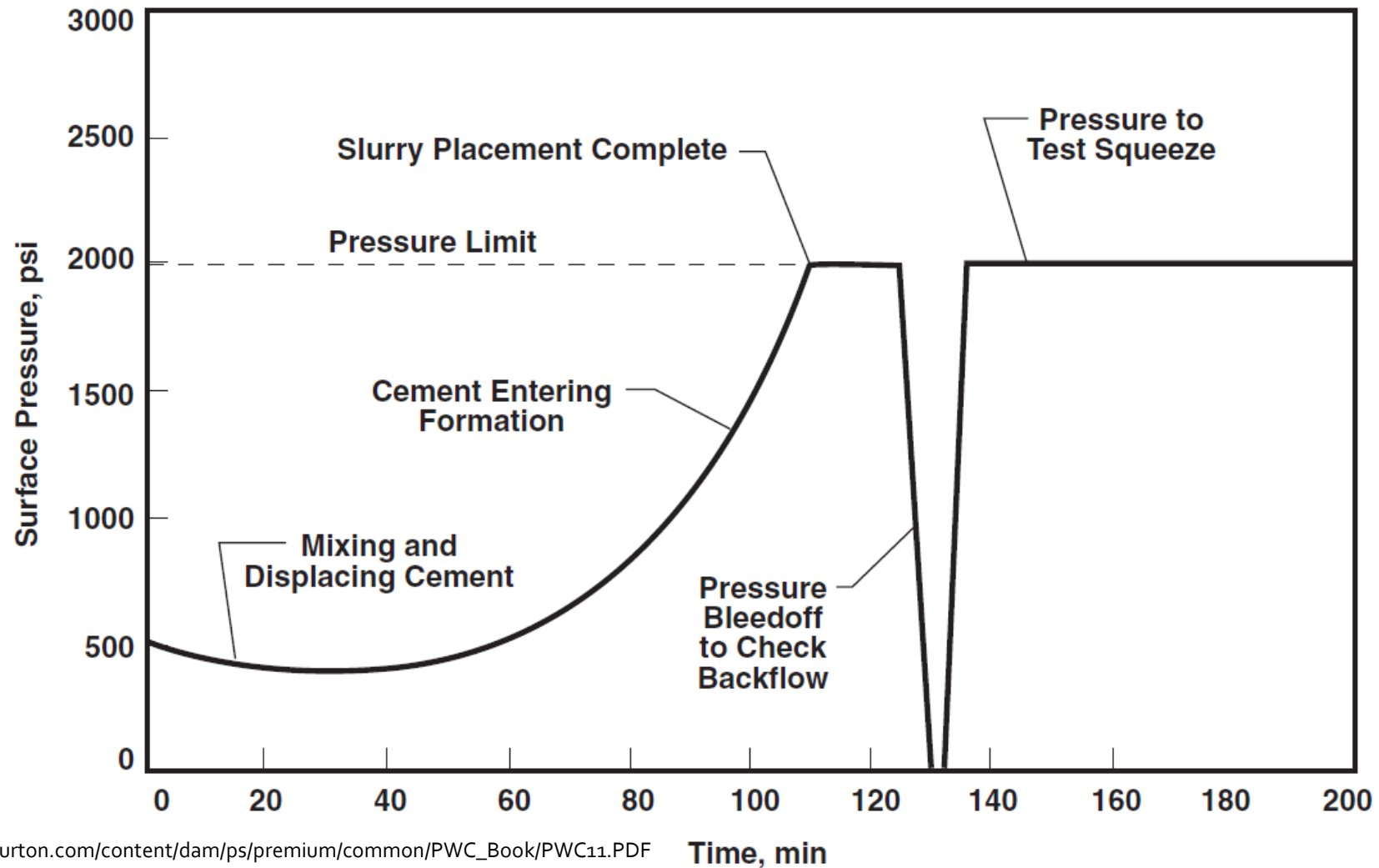
- Injection of cement slurry into zones at pressures below the fracture pressure of the formation
- Fill perforations or channels
- Typically small volumes
- Must take caution to ensure the formation is not fractured

High Pressure Squeeze

- Used when it is not possible to inject slurry at pressures below the fracture pressure
- Cement is placed at high pressure to displace the cement and seal off the formation or injection points
- Slurry volumes are typically high

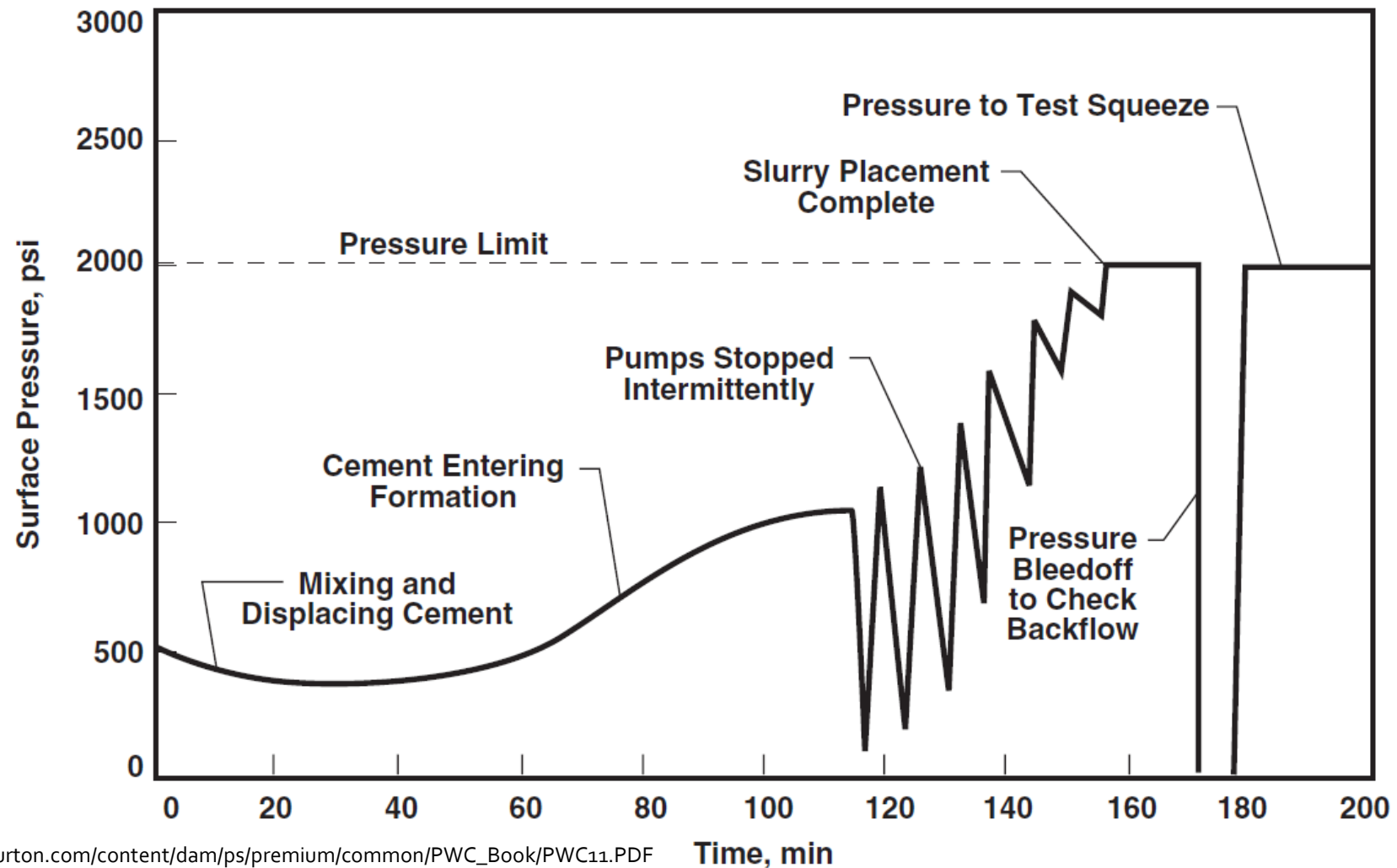
Squeeze Cementing Techniques

Running Squeeze



Squeeze Cementing Techniques

Hesitation Squeeze



Squeeze Cementing Techniques

Bradenhead Squeeze

- Performed by circulating cement slurry down to the squeeze interval, then pulling the work string above the top of the cement column
- The backside of the wellbore is closed in, and pressure is applied through the work string to force cement into the squeeze interval
- Casing and surface equipment are exposed to squeeze pressure, therefore they must have sufficient burst resistance

Squeeze Cementing Techniques

Packer/Retainer Squeeze

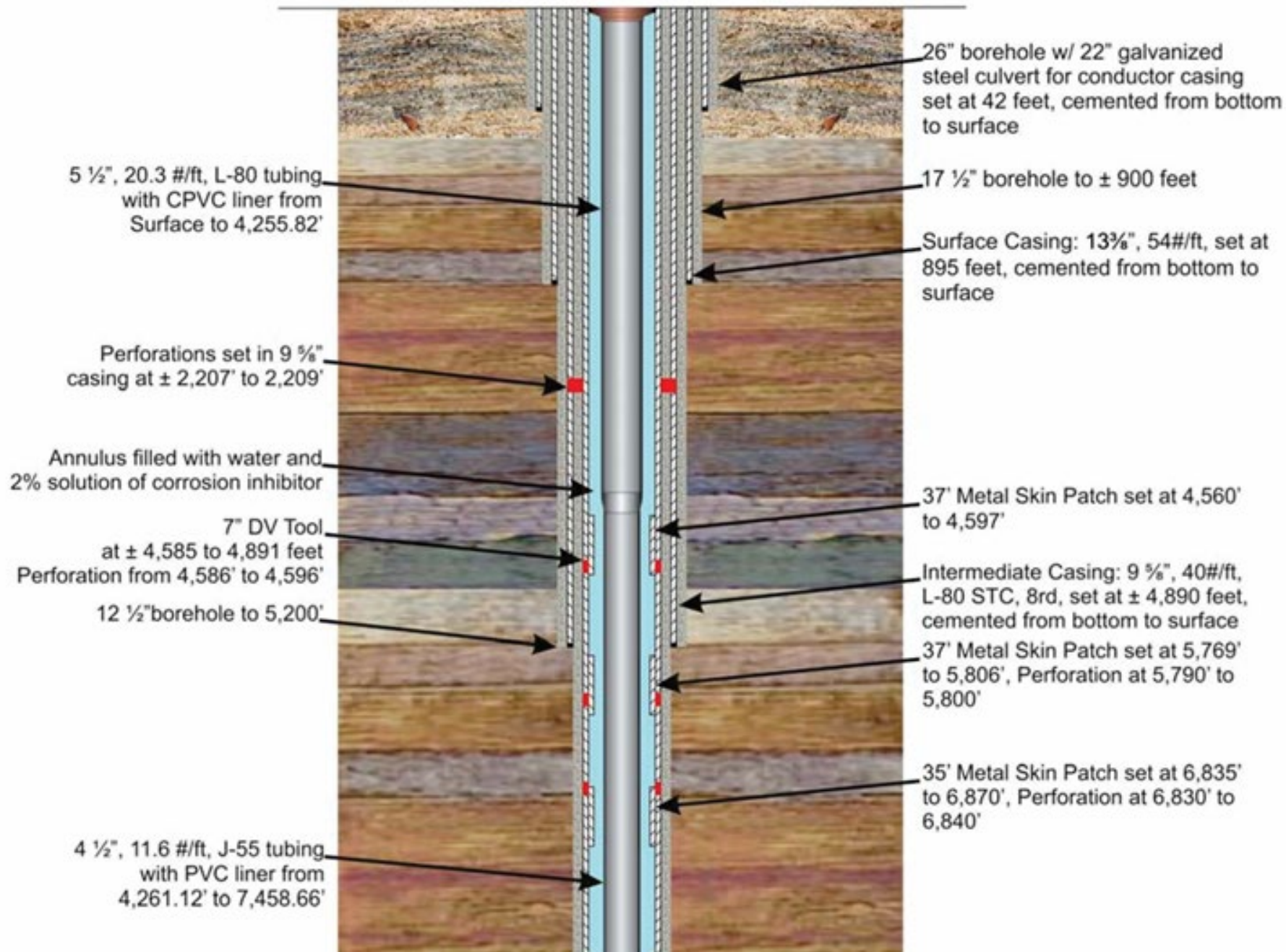
- Tool that are implemented to isolate the squeeze interval and place the cement as close to the squeeze target as possible before applying pressure
- Retainers or bridge plugs create a squeeze interval bottom, set just below the squeeze target inside the casing or tubing, and sealing off the wellbore below the target interval
- Isolates the upper portion of the casing or tubing and surface equipment from the cement and squeeze pressures
- Improves the placement and control of fluids during squeeze jobs
- Reduces the volume of cement needed

Injection Wells UIC 1 & 2

- Injection wells in the Illinois Basin
- Drilled depth – Over 12,000 feet bgs
- Open hole from bottom of longstring to total depth

Condition of well when we were retained:

- UIC 1: 7" tubing with a 9 5/8" longstring casing and a 9 5/8" compression packer at the casing shoe
- UIC 2: 5 1/2" tubing with a 7" longstring casing and a 7" compression packer at the casing shoe
- Incomplete set of CBL, cores and imaging logs
- UIC 1: Well would not pass MIT (APT)



Discussion

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