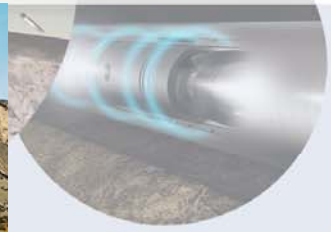
Active Acoustic Ranging

Schlumberger



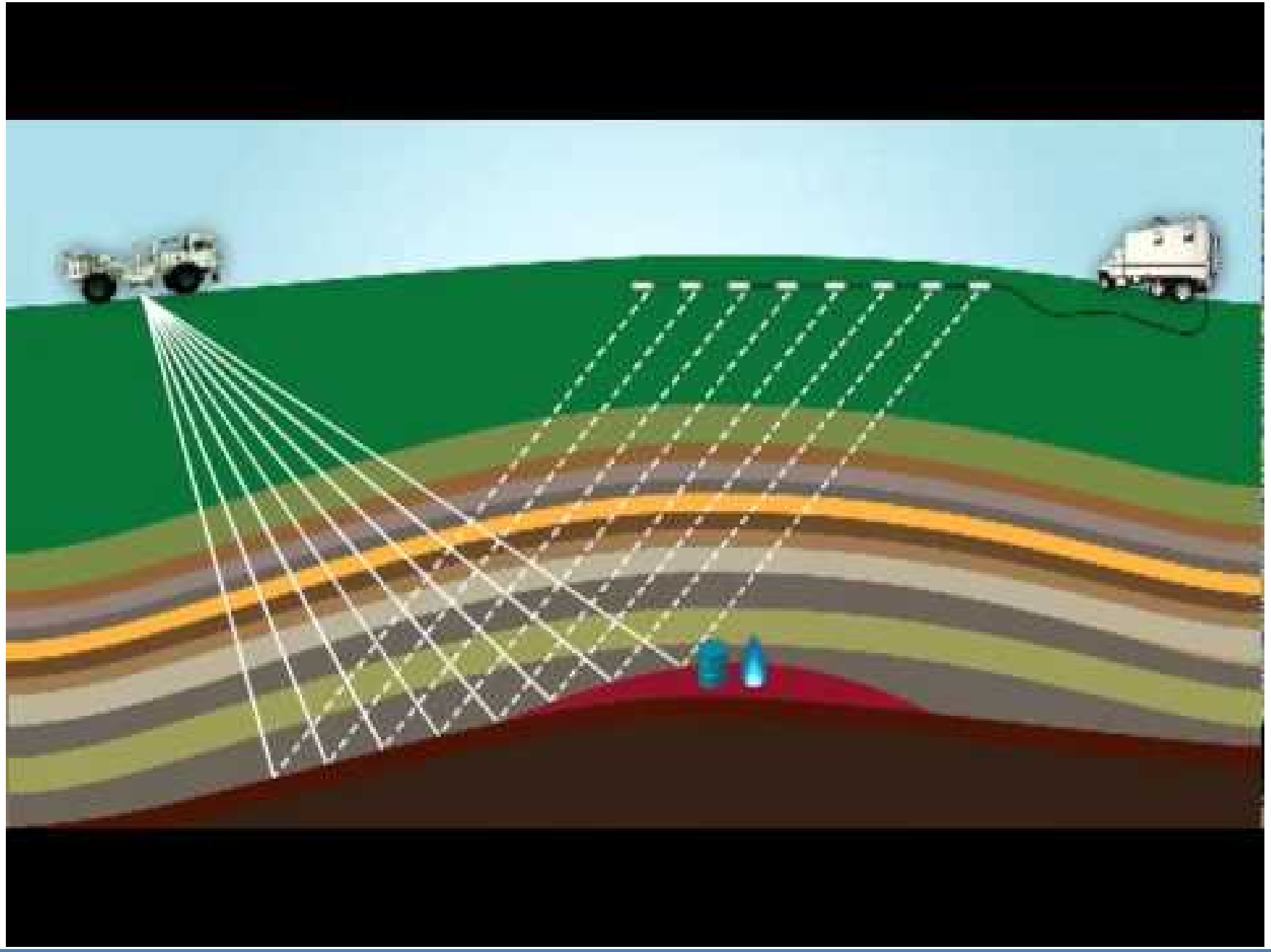



Benny Poedjono

PTE Advisor Wellbore Surveying

Surface Seismic Acquisition



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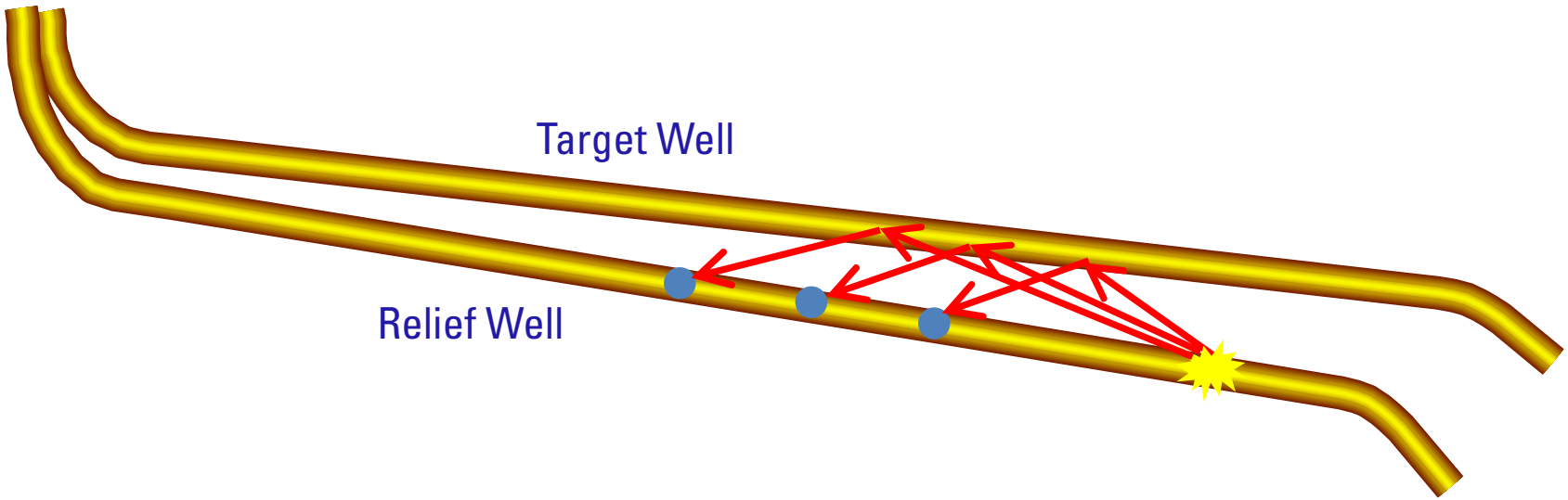
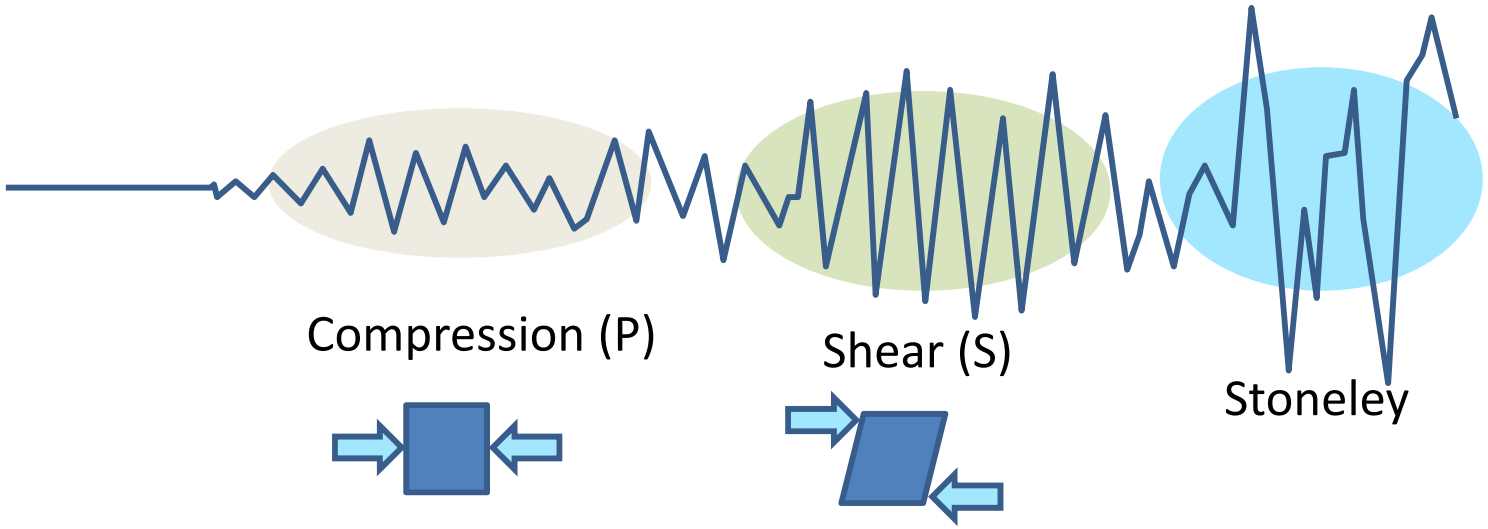
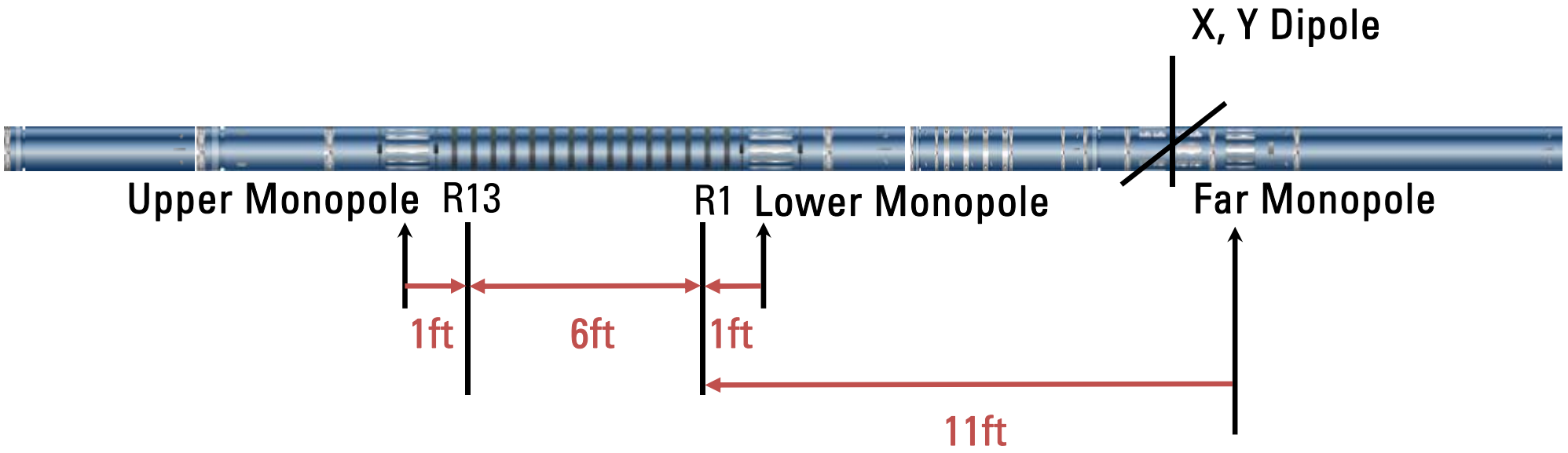




SonicScanner

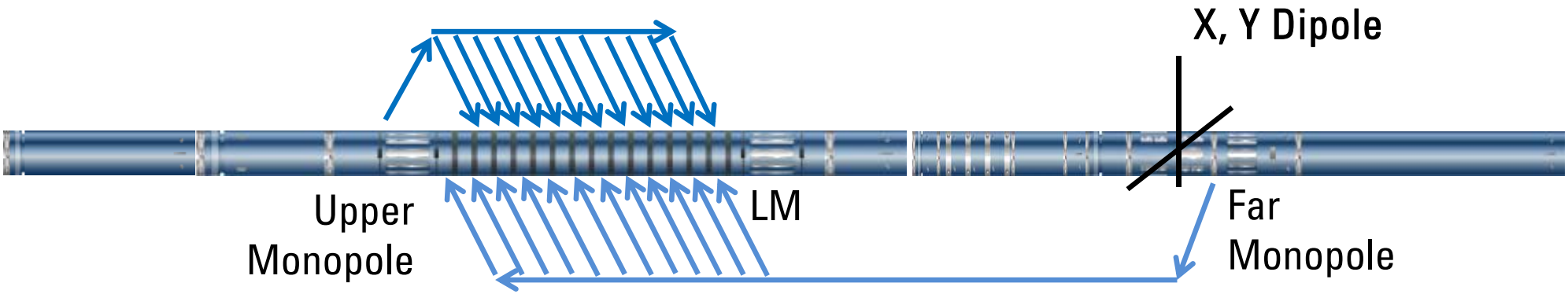
- Designed to detect acoustic reflection

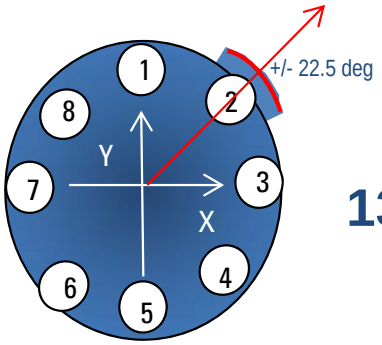


Upper Monopole Spacing	1 – 7 ft
Far Monopole Spacing	11- 17 ft

SonicScanner

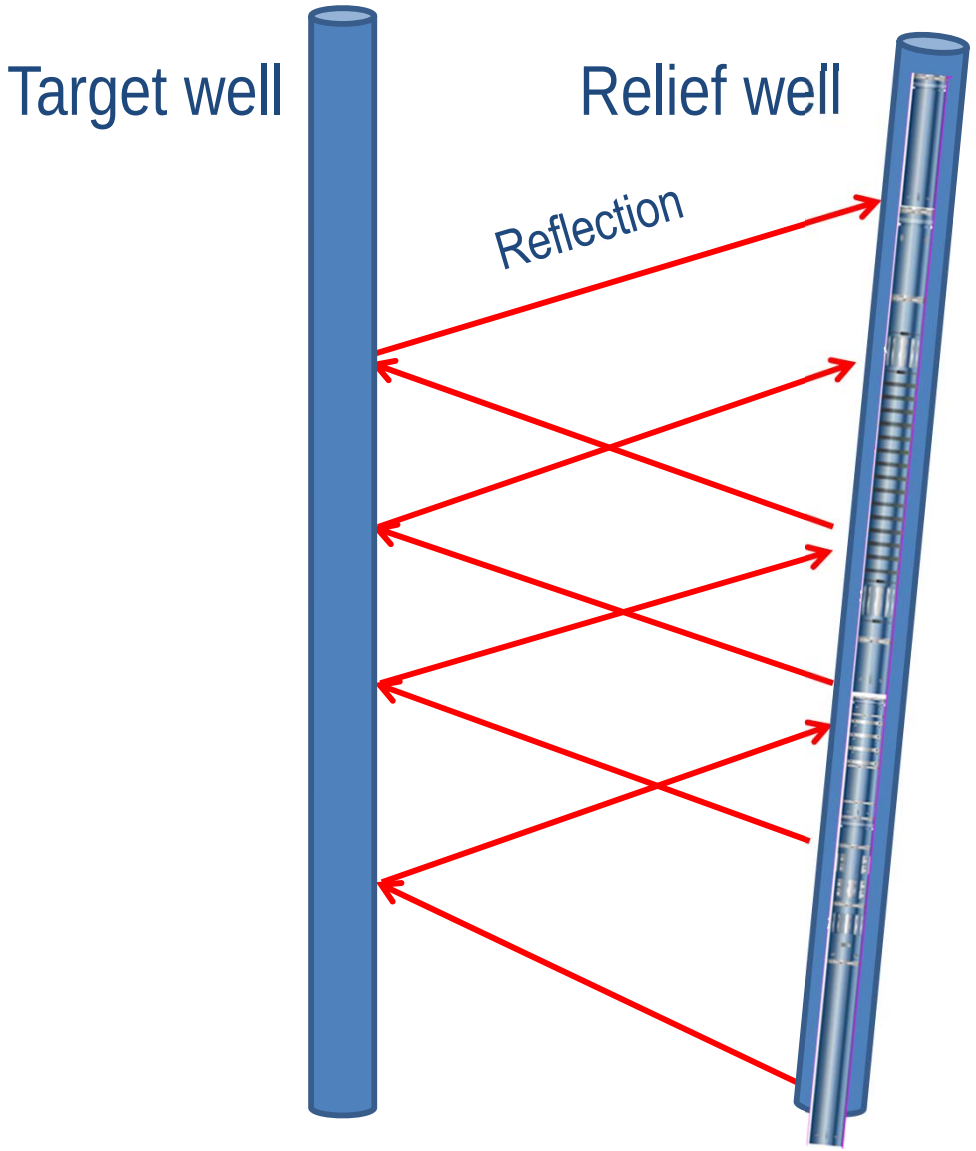
- Designed to detect boundaries, sonic reflection
  - Azimuthal measurement; 22.5 deg resolution

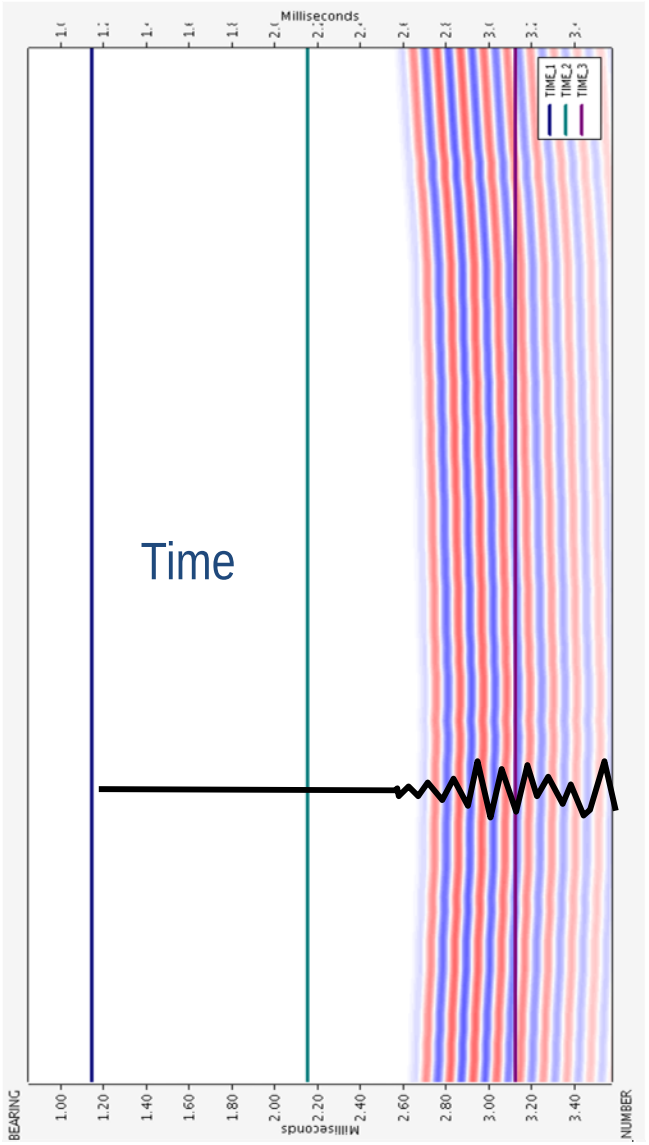




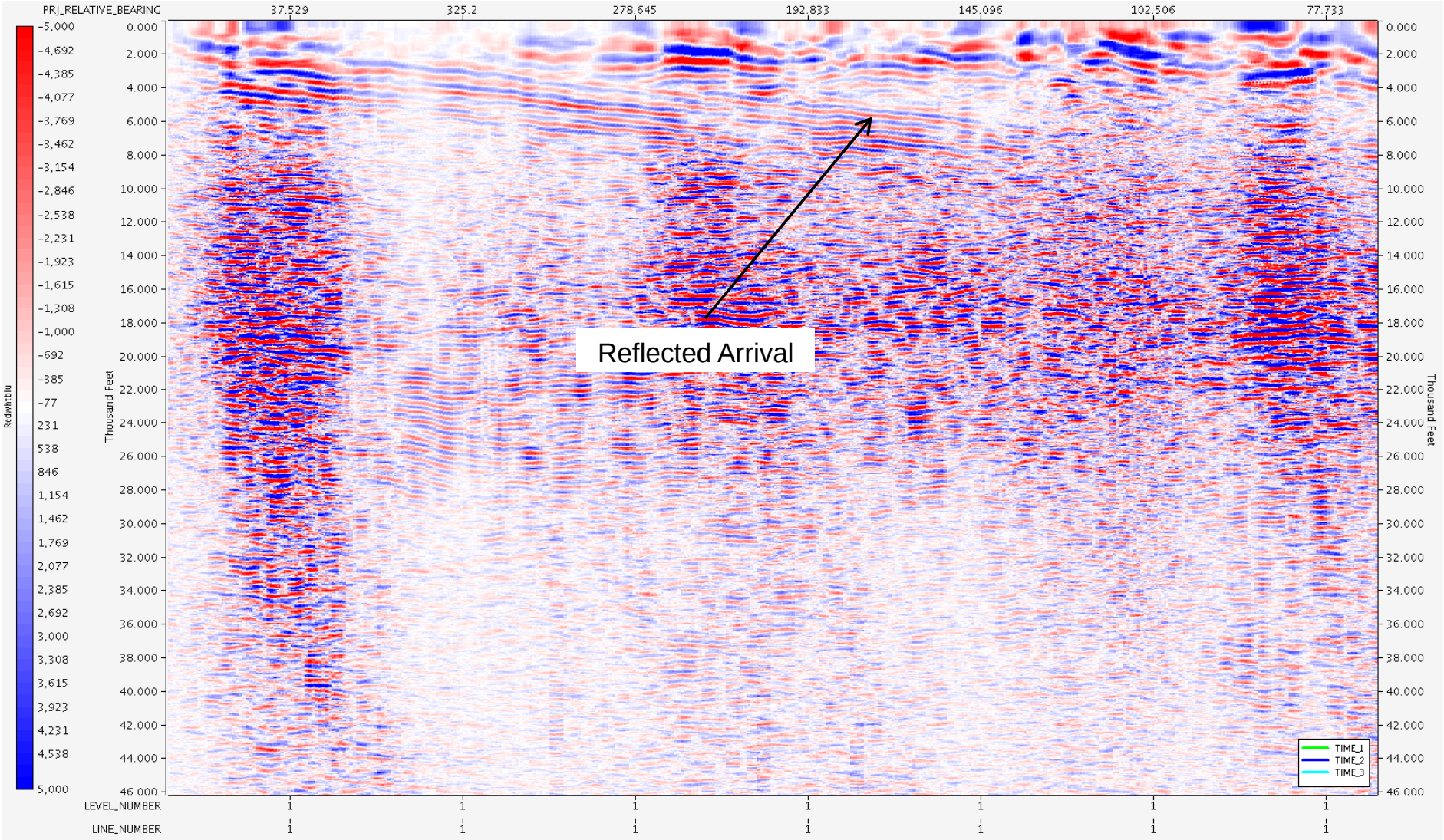
13 receiver stations * 8 receivers / station = 104 receivers

Active Acoustic Ranging

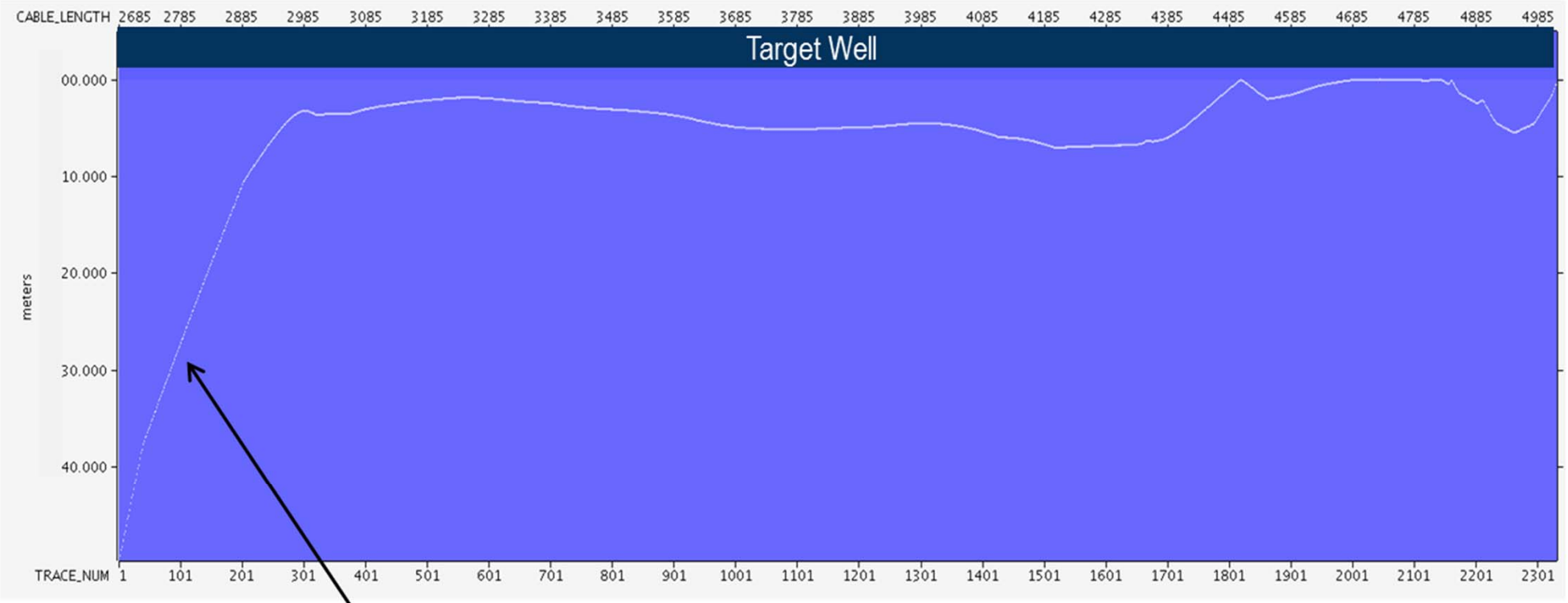




Active Acoustic Ranging – Parallel

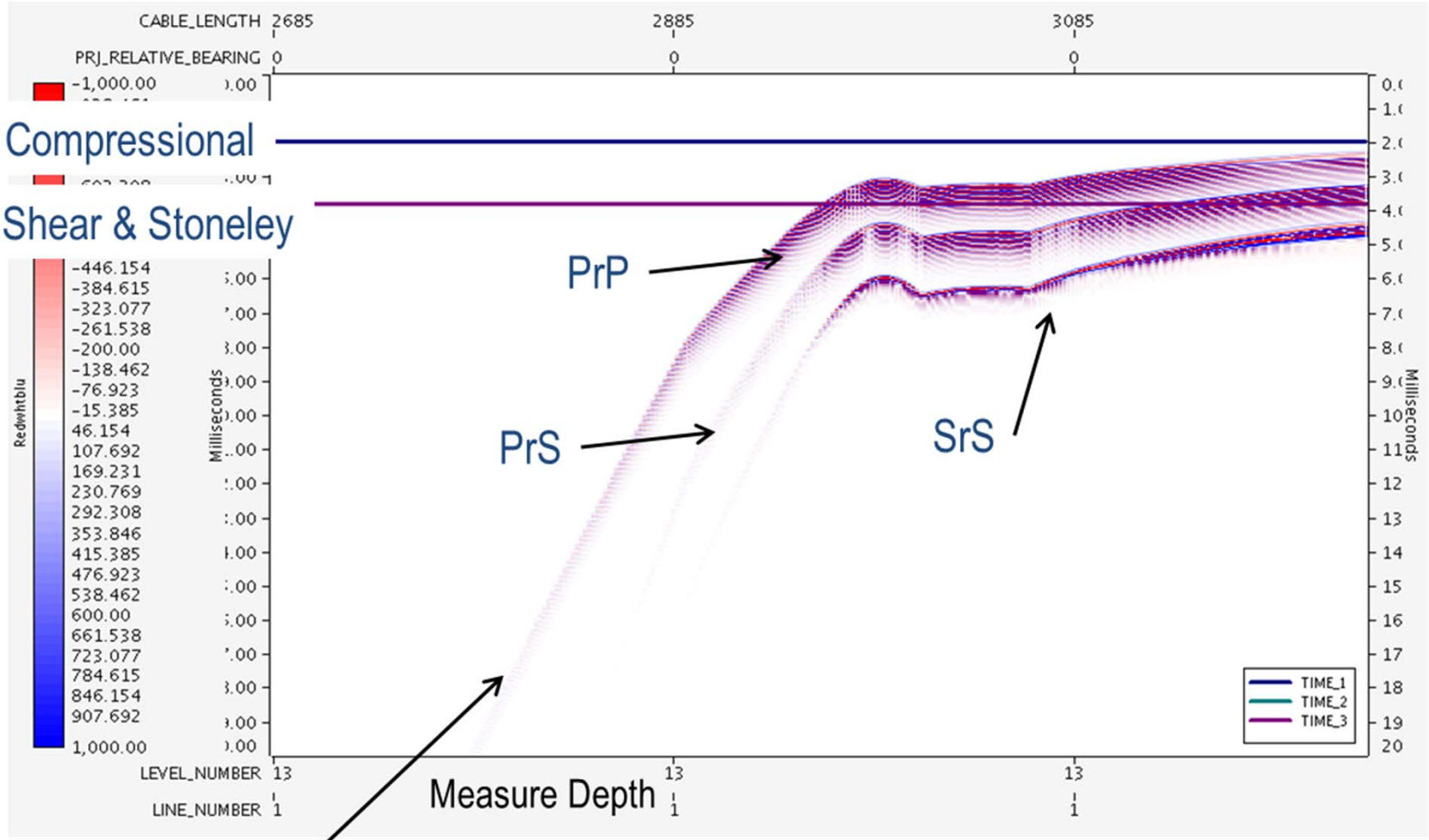


Acoustic Modelling - Trajectory

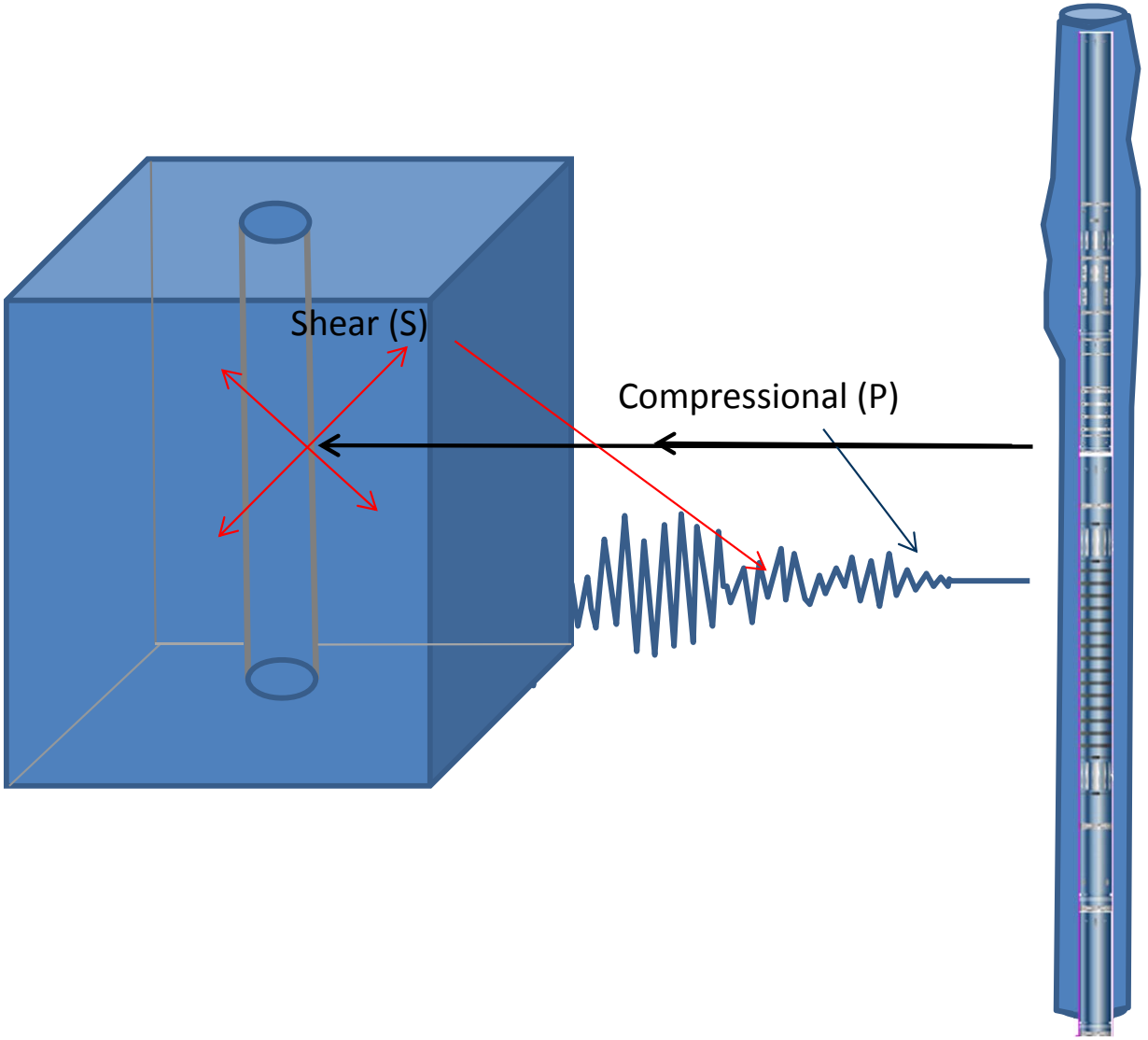


Relief well approaching Target well

Acoustic Modelling- Reflection



Acoustic Anisotropy



Active Acoustic Ranging - Accuracy

- Record Time
- Slowness
- Transmitter
  - Monopole (Compressional/Pressure)
  - Dipole (Shear)
- Reflection Type (PrP or SrS)
- Attenuation (Q-Factor)

- Theoretical ranging distances at the maximum record time
  - 165 ft. @ 60 us/ft
  - 82 ft. @ 120 us/ft

Active Acoustic Ranging - Accuracy

Distance ~ 0.5 – 1 ft.

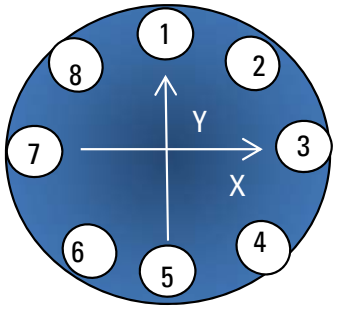
- Formation Slowness
- Anisotropy (velocity model)
- Wave Path
  - Straight rays used in calculation

Vertical Resolution ~ 1.5 ft.

- Reflection pattern allows determination of the MD of the event down to approximately 1-3 samples (0.5 ft. – 1.5 ft.)

Azimuthal Direction

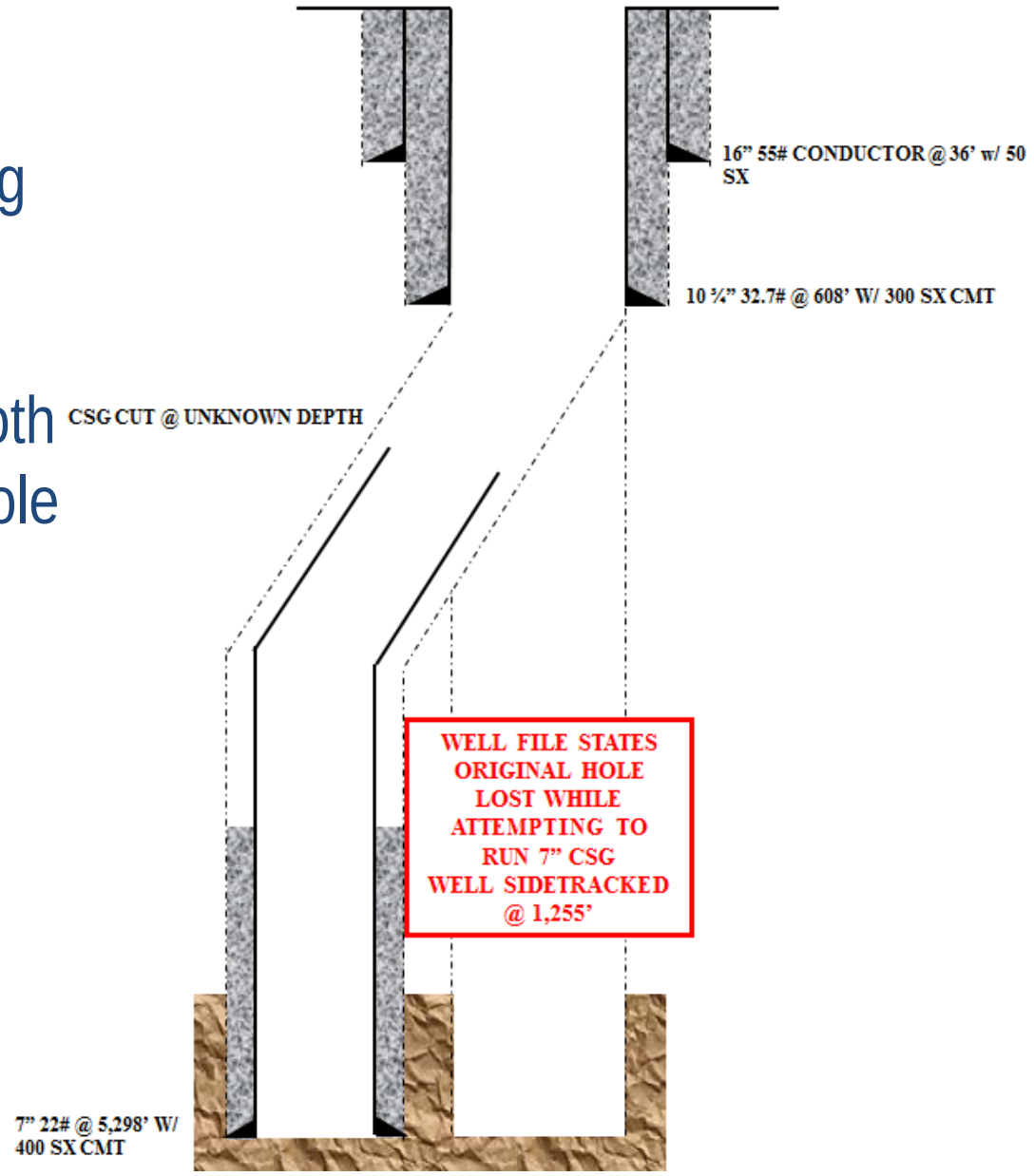
- 8 azimuthal receivers can resolve the side of the target well within +/- 22.5 deg
  - Perpendicular orientation to the target (3DLD)



Active Acoustic Ranging – Example 2

Two wellbore present before drilling

- Unable to intercept either well
- Acoustic Ranging was run for
  - distance and direction to both the open hole and cased hole wells



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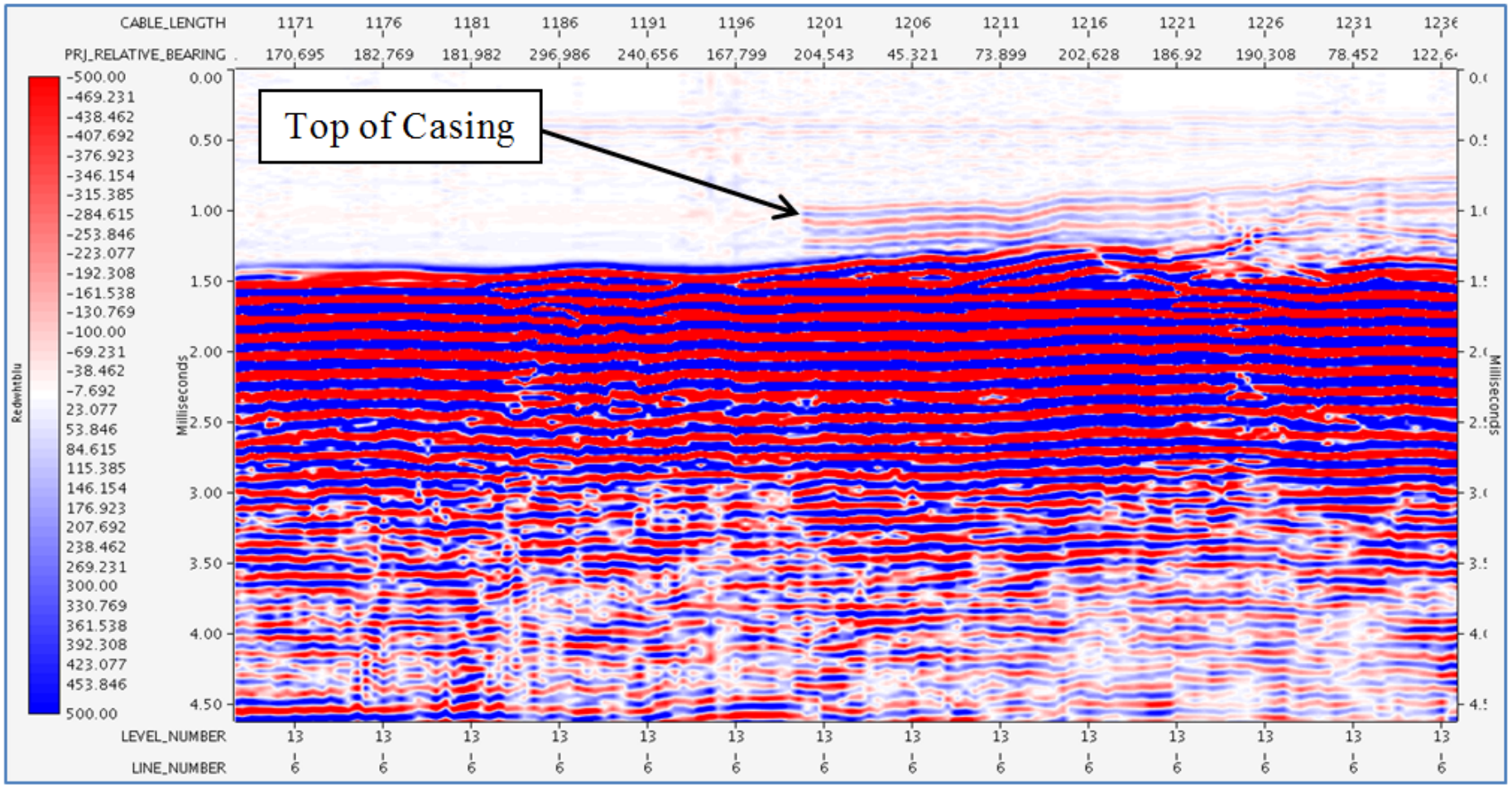

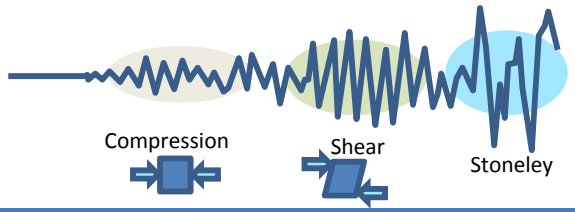

Active Acoustic Ranging – Example 1

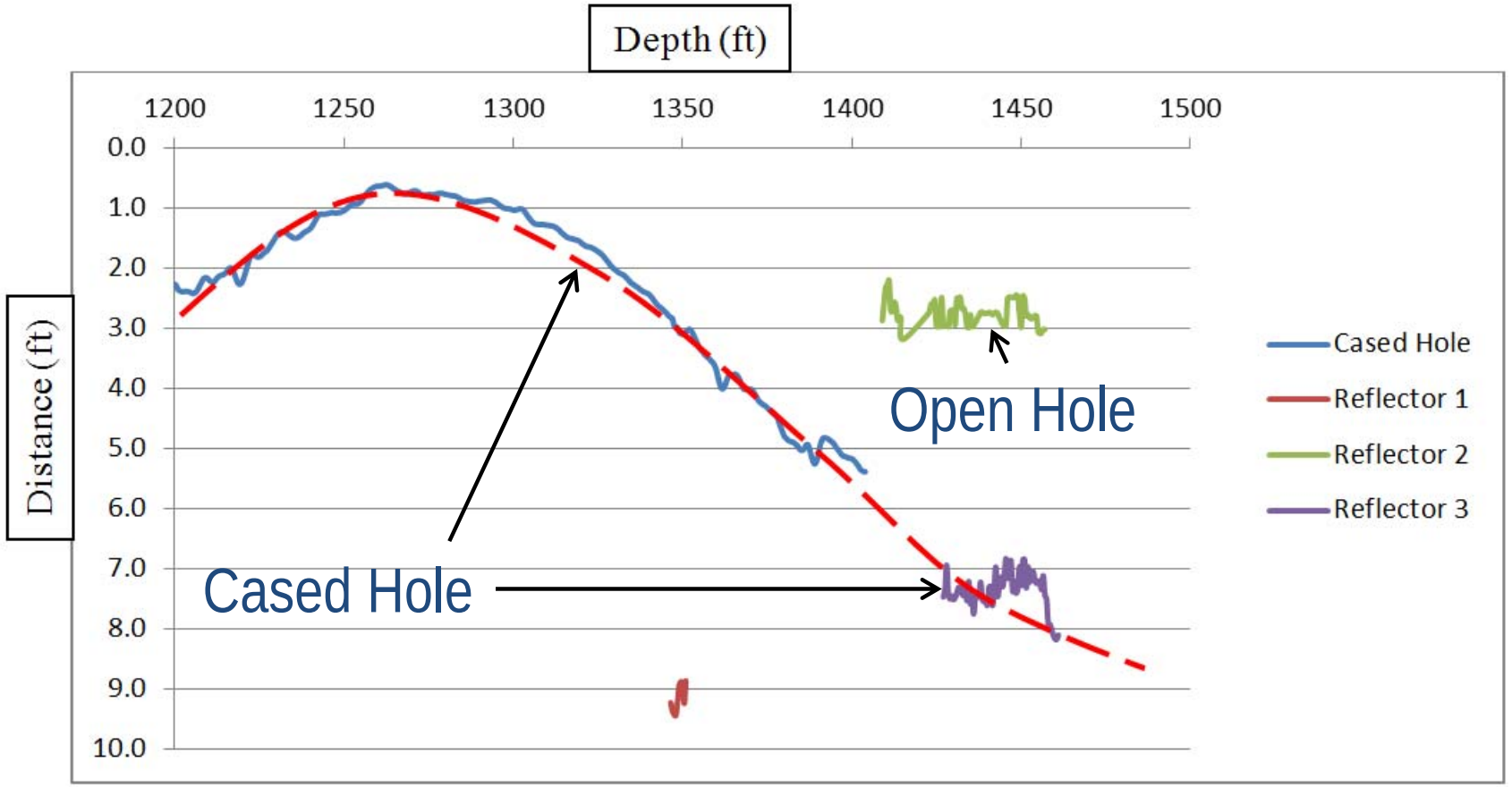

Figure 12 – Distance to reflections overlayed with a curve connecting the cased hole refraction and reflector 3