



Phreatic Surfaces in Highwalls

Alex Duran's thoughts for
discussion

BOHOGS - Caval Ridge



DATA - DATA

- Often limited to piezos at or near crest
- Actual measurements in pit less likely
- Do we really understand what is happening under the slope profile (ie the key part of the slope)?



Hydrographs

- Summary of what is happening in profile
- Plot of depth of piezo tip on Y axis and pore pressure on X axis
- Can assess if conditions are hydrostatic, artesian or vertical leakage
- Useful where different lithologies at play



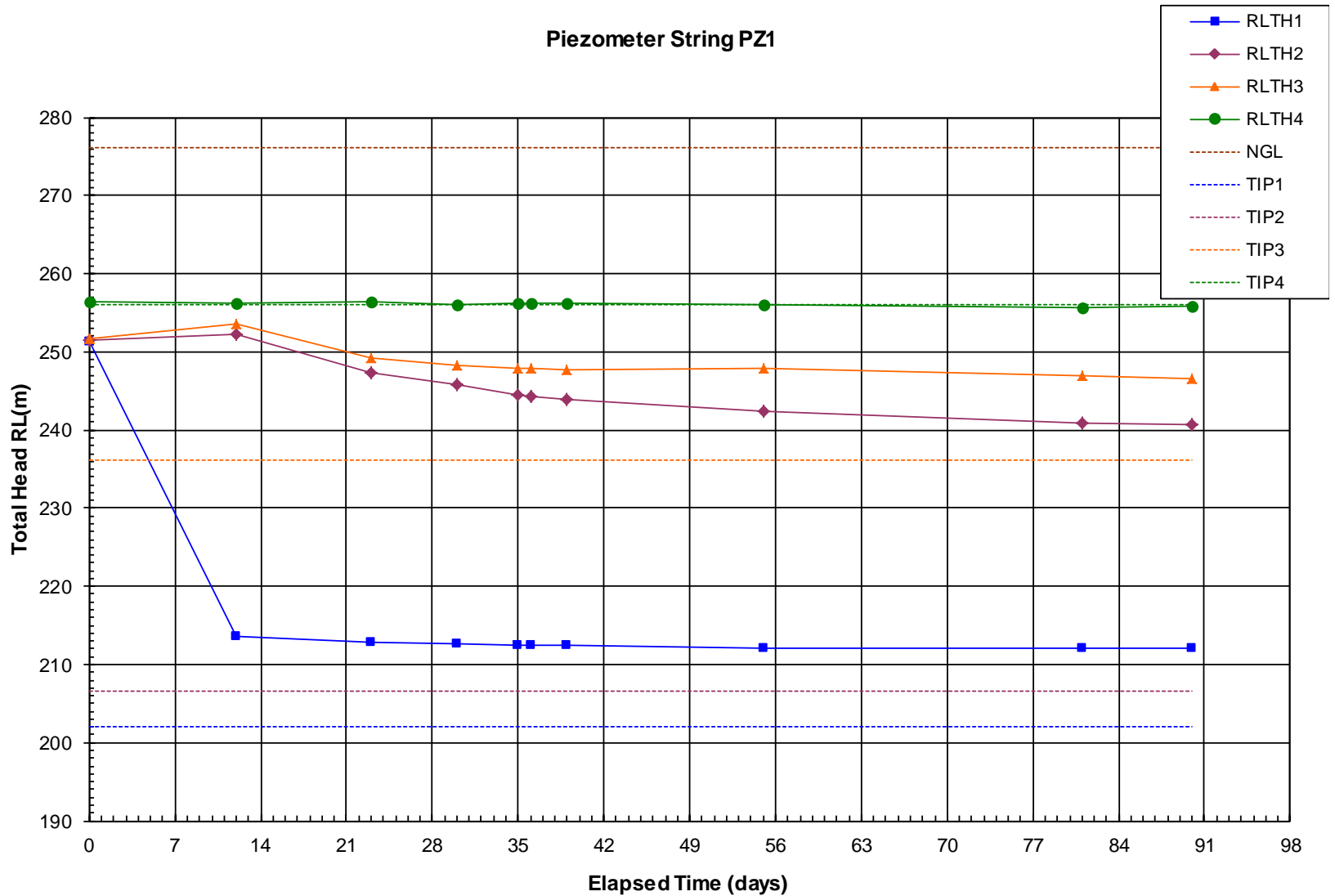
Case 1

- Four piezos
- Developed in front of advancing dragline strips at distance from 200 to 800m away
- Minor evidence of advancing face affecting measurements (ie drops of 1 to 2m in data over the three months)



Case 1

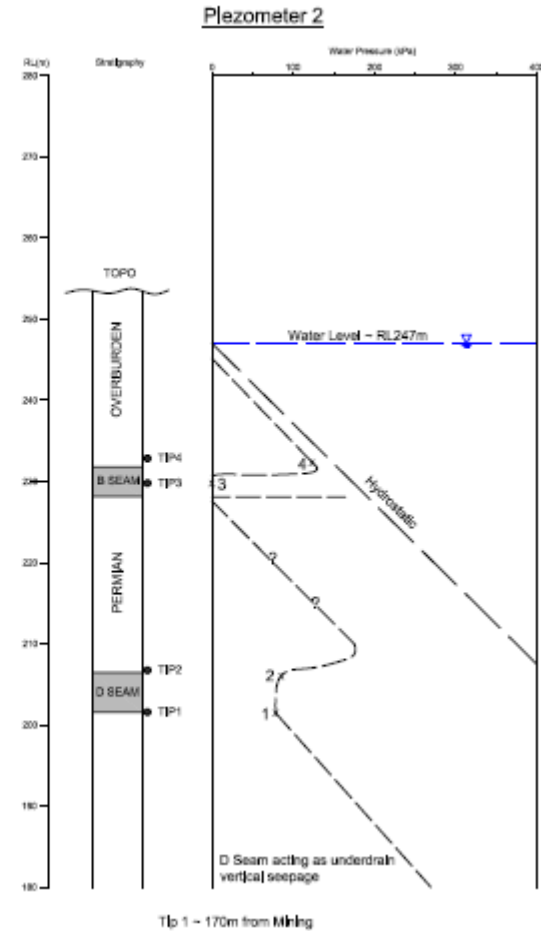
Piezometer String PZ1





Hydrographs

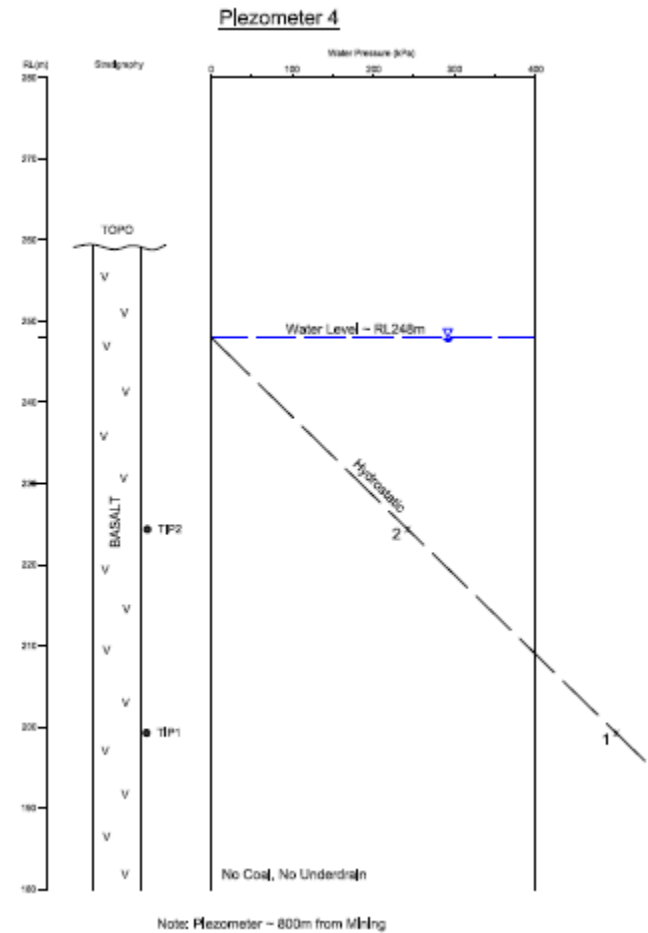
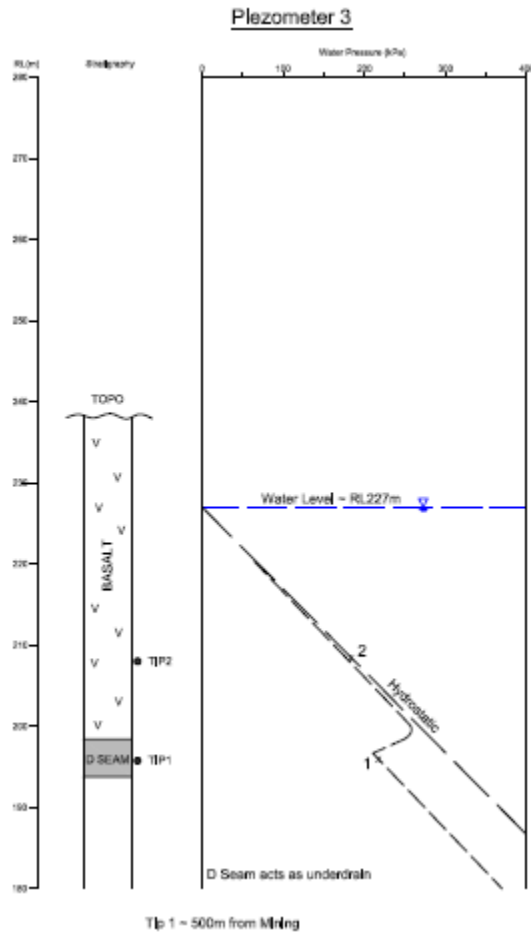
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- Pells Sullivan Meynink



Case 1 - Hydrographs





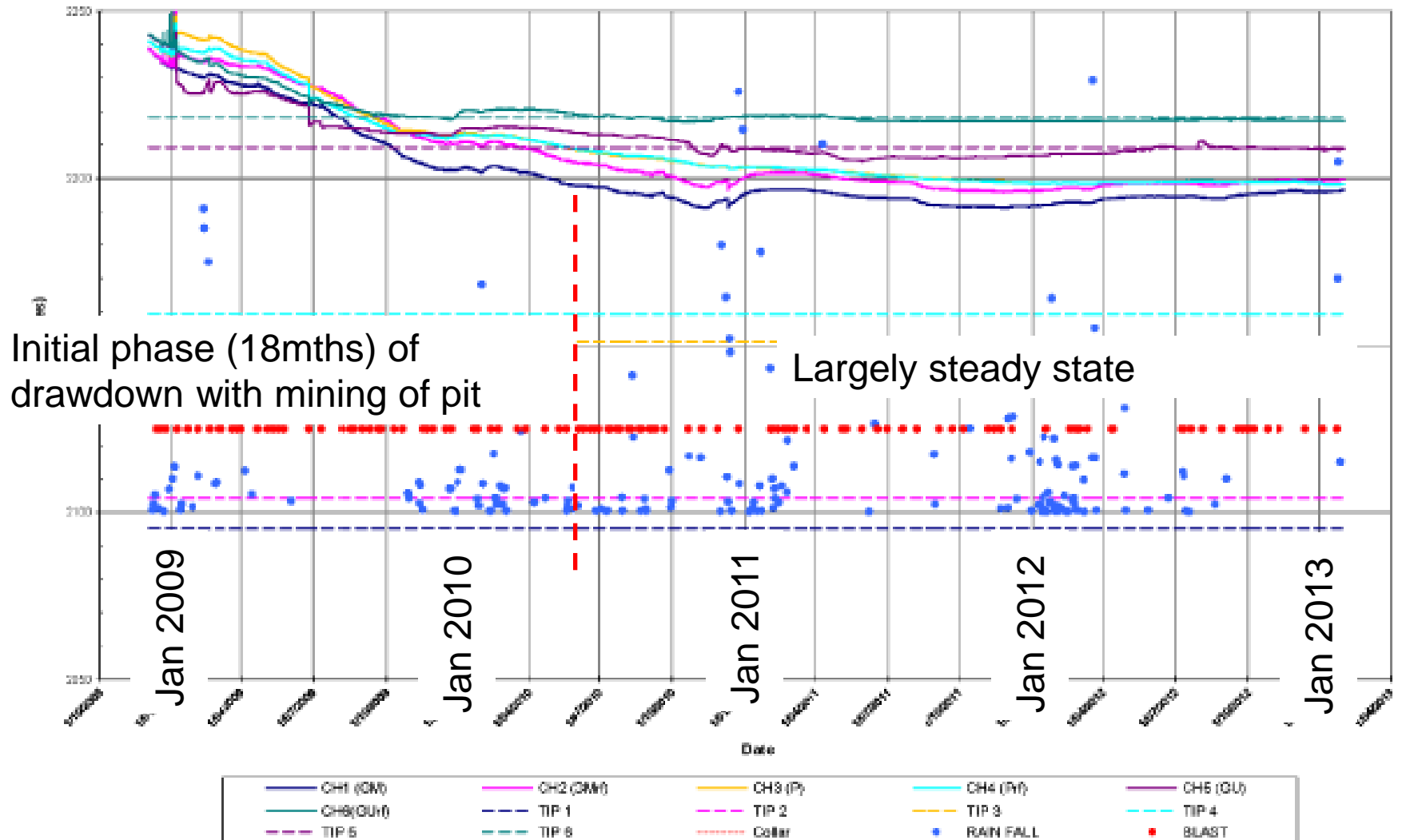
Case 2

- Truck shovel pit
- Piezos at crest, none in pit
- Three main coal seams



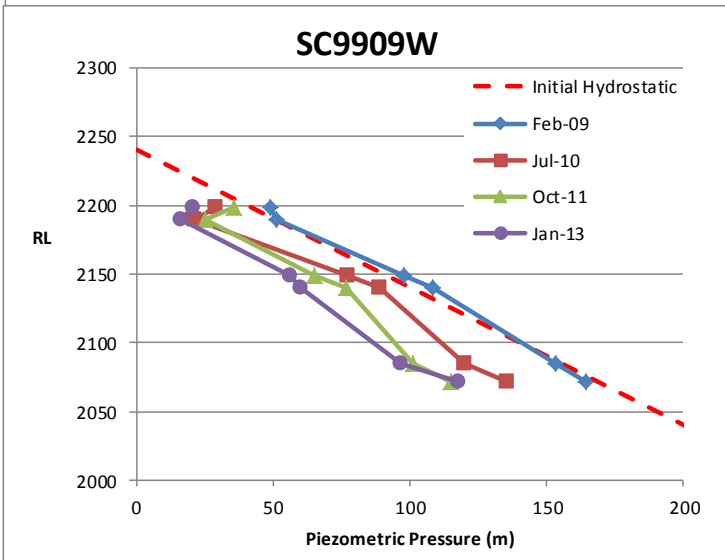
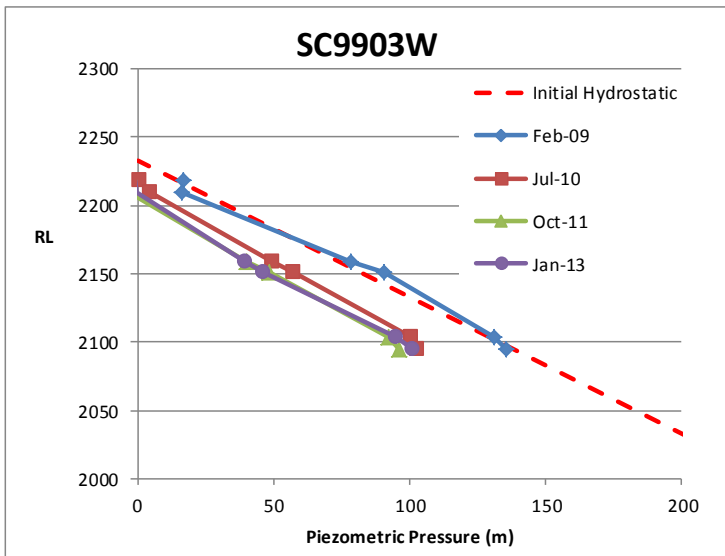
Case 2 – Piezo Data

Total Head (SC9903W) 2008 - 2013





Case 2 – Hydrographs



- Conditions hydrostatic with evidence of vertical leakage (sub-hydrostatic)
- Dropping levels with time
- Lower group highlighting vertical leakage to coal seams, as seen in Case 1



General Concept

- We are using a simplification of an isotropic material to often represent fracture flow

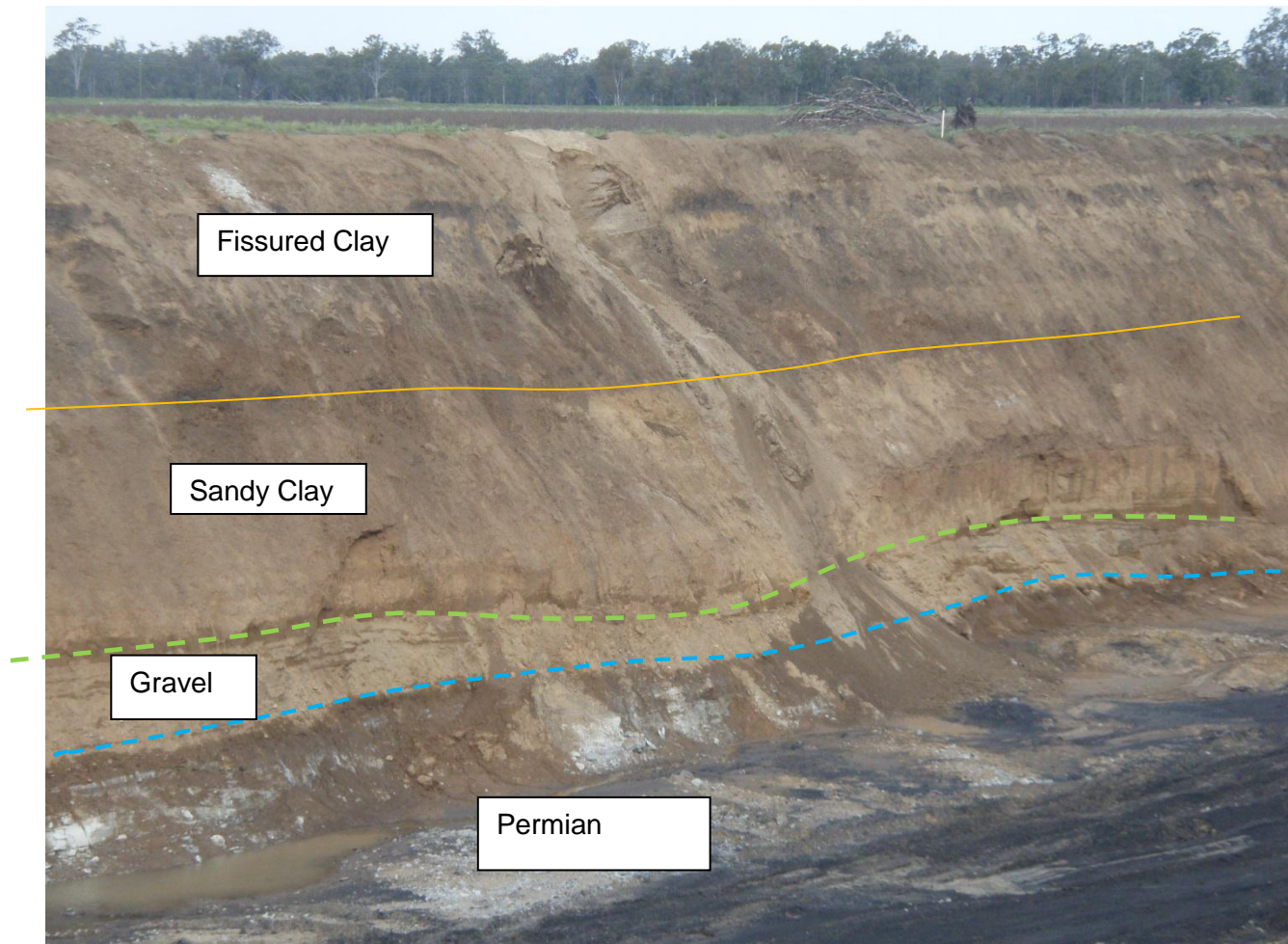


True Isotropic Behaviour

- Usually reserved for sands/gravels
- Under such cases the seepage we see reflects the actual groundwater profile

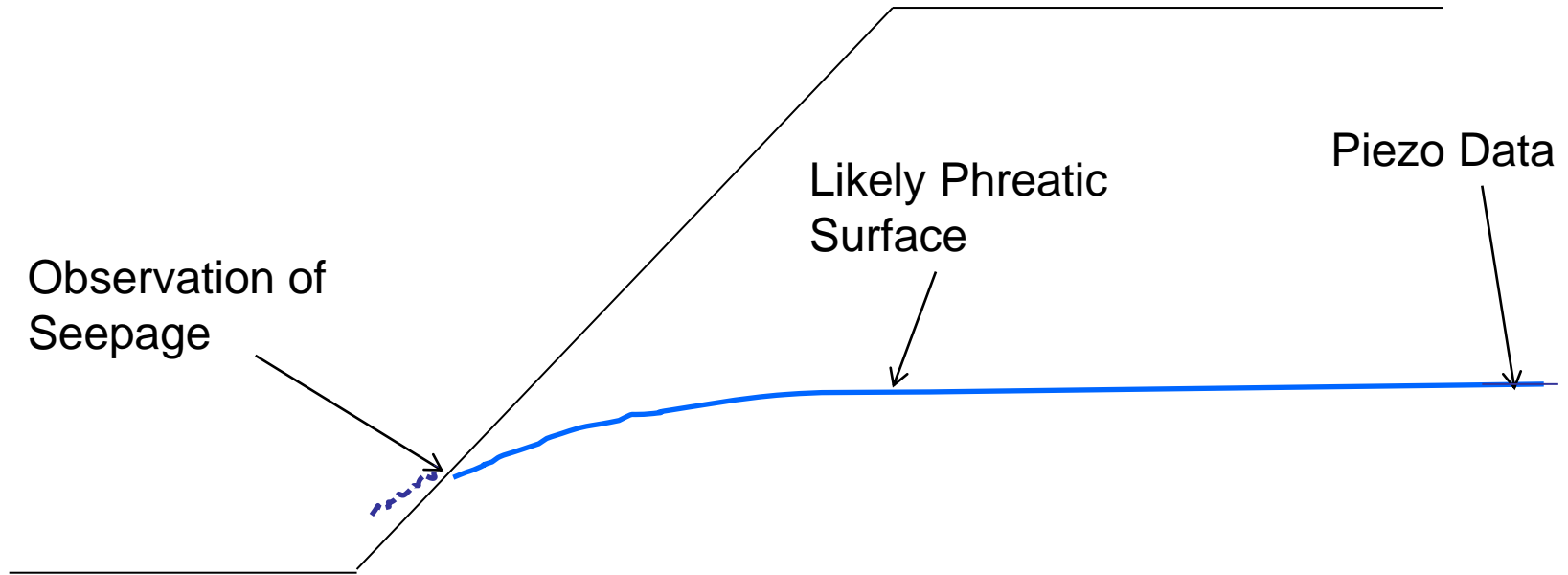


Alluvial Sequence





Alluvials



- Assumption and reality likely to be in accord

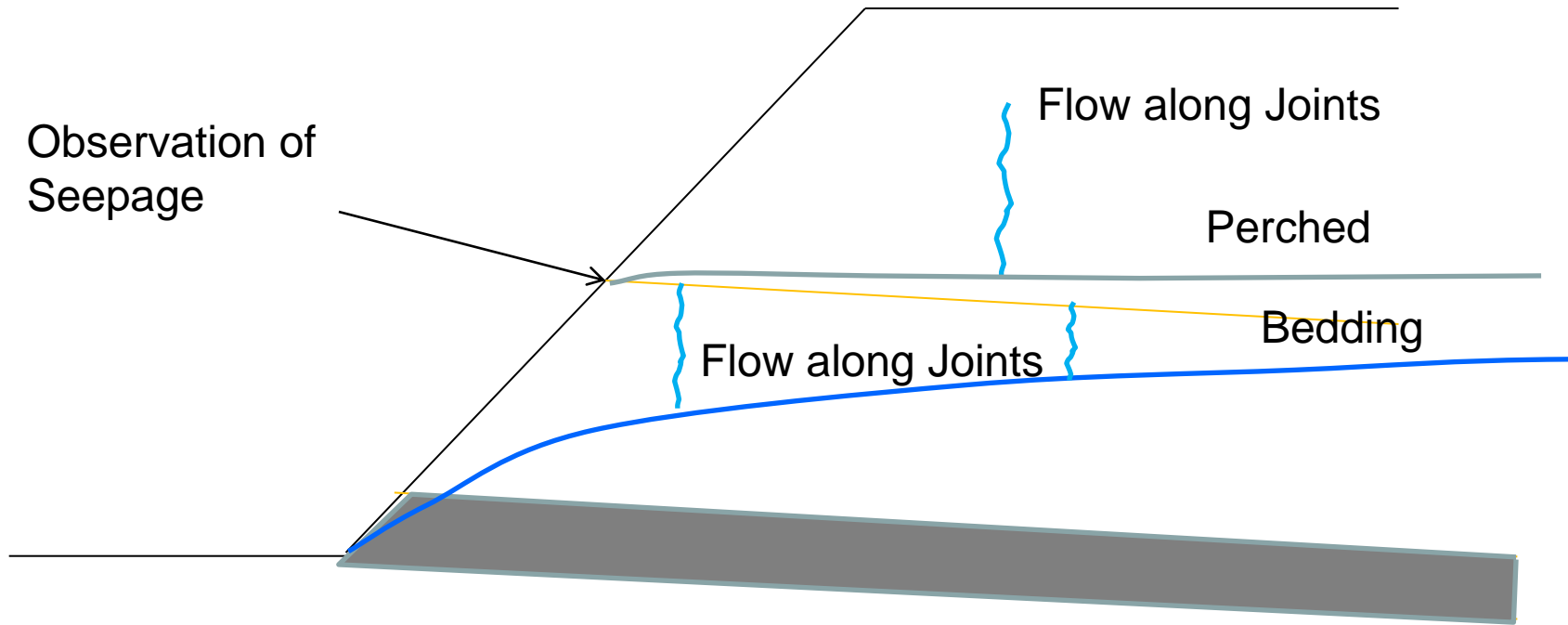


Fractures in Rock

- Complex flow controlled by fractures
- Bedding acts both as an anisotropic control and as leaky surfaces
- Leaky behaviour is the norm



Fracture Flow



- The coal seam can act as a significant under-drain



Perched?





Major Structures

- Concepts based from experience of Tim Sullivan are illuminating - Coupled Flow paper of Perth 2007 Slope Stability Conf
- Higher pore pressures around major structures
- Remainder of rock mass - depressurised



Structure Controlled





Structure Controlled





Structure Controlled

