

Processing and interpretation of 2D seismic from Inglewood Park, Calgary, Alberta

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Project overview

- Objective:
 - use 2D seismic from Inglewood Park to analyze the near surface for fluvial geomorphology and evidence of flooding
- Process:
 - acquisition (within the City of Calgary)
 - processing (Vista/ProMAX processing software)
 - interpretation
- Future work:
 - currently reprocessing
 - inclusion of other lines from survey
 - adding geological constraints to aid interpretation

The Bow River flood

- Bow river flooded in June 2013
 - damage estimates up to \$5B
- Flooding prevented the traditional field school at Castle Mountain
- City allowed field school to be done within city limits (Inglewood/Shouldice parks)

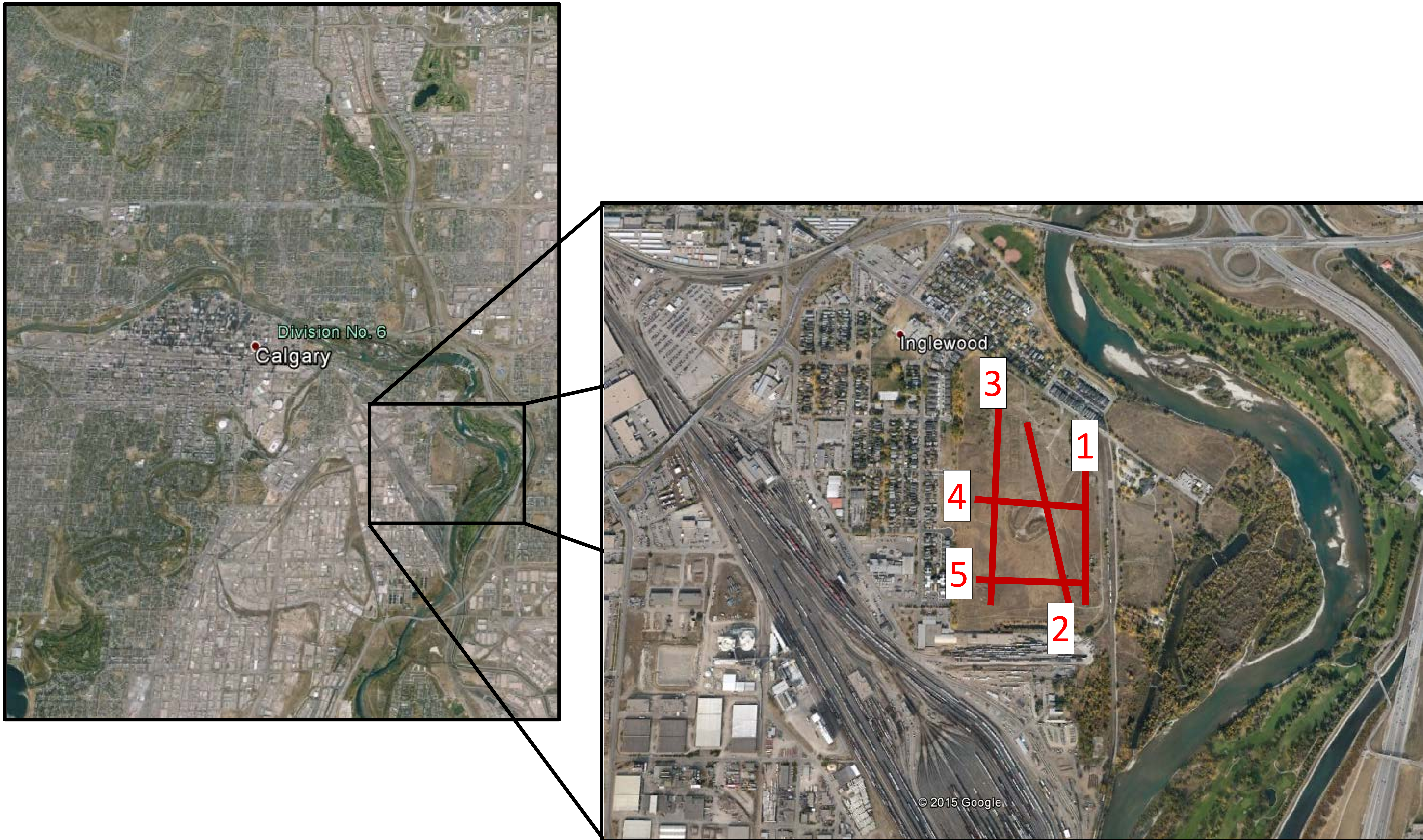


*Image from Reuters/Andy Clark



*Image from calgary.ca

Project area: Inglewood Park, Calgary



*Images from Google Maps 2015

Project area: Inglewood Park, Calgary

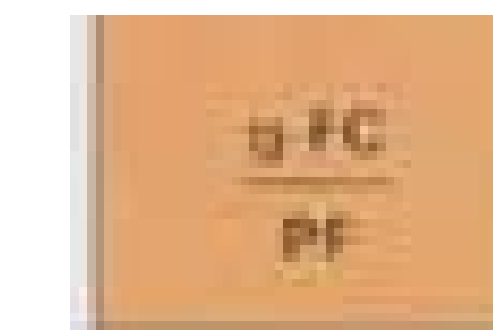
Inglewood Park, 1973. Gulf Oil Refinery



*inglewoodwildlands.ca

Geology

- Inglewood surficial geology:
 - sandy gravel overlying silt
 - fluvial channel sediment overlying lacustrine offshore sediment
- The Bow river surficial rock type correlates to flood risk



Sandy gravel overlying silt, fluvial channel sediment overlying lacustrine offshore sediment



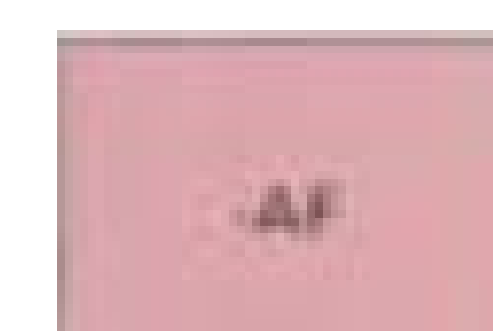
Silt and clay, lacustrine offshore sediment



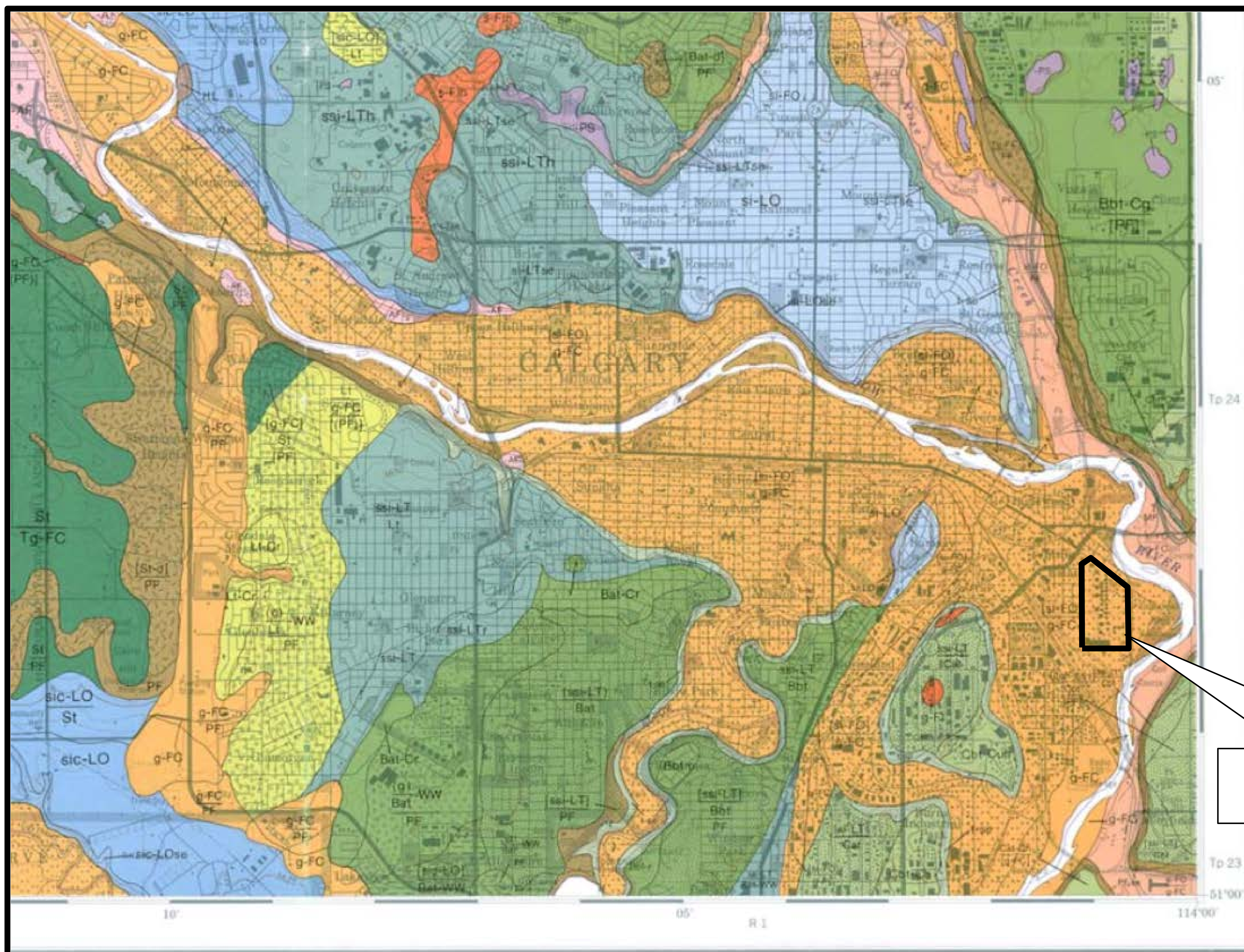
Silt and clay, lacustrine traction-load sediment (resulting from deposition on ice)



Till, glacial sediment



Gravel and sand, fluvial channel facies

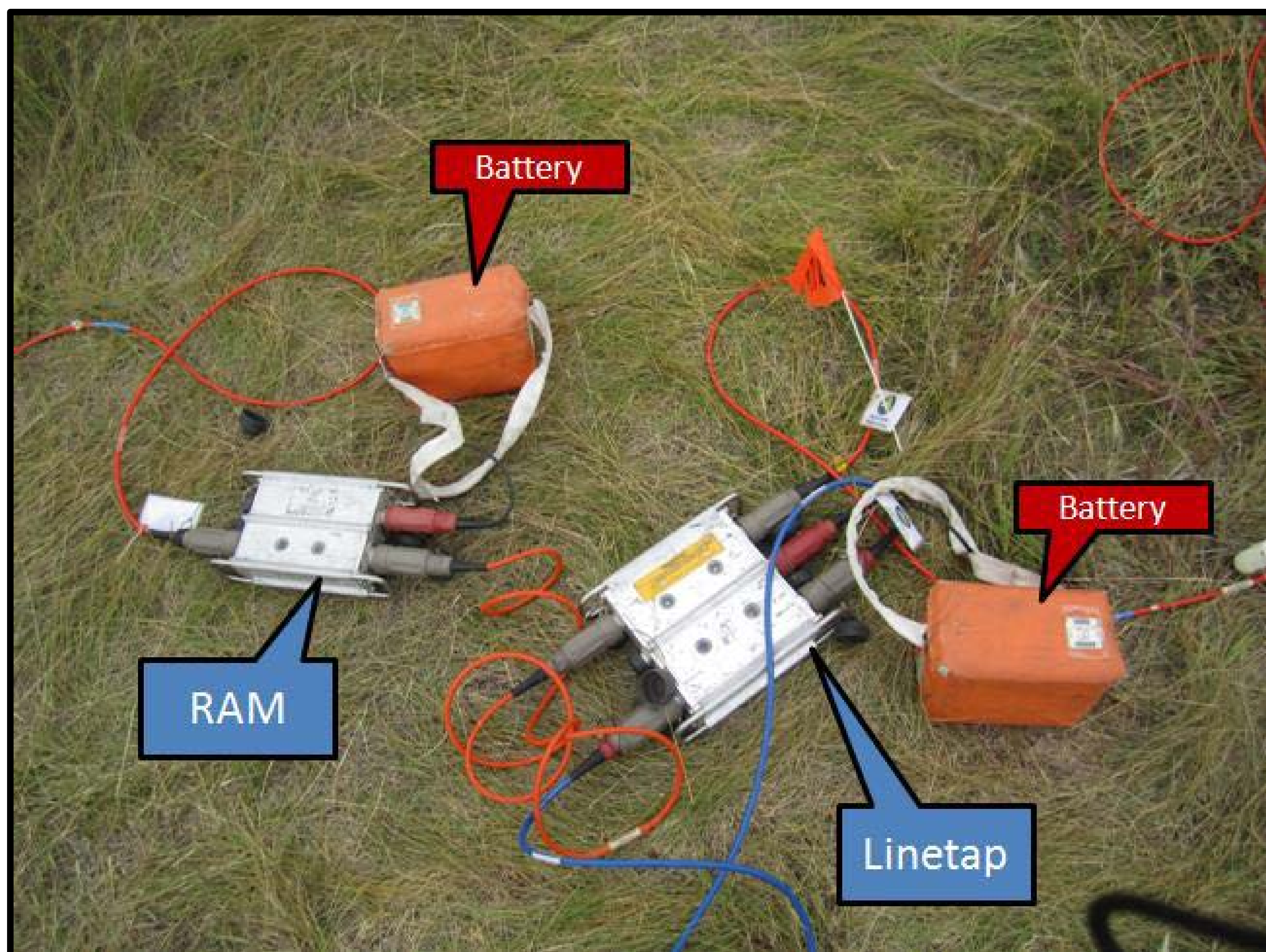


Project area

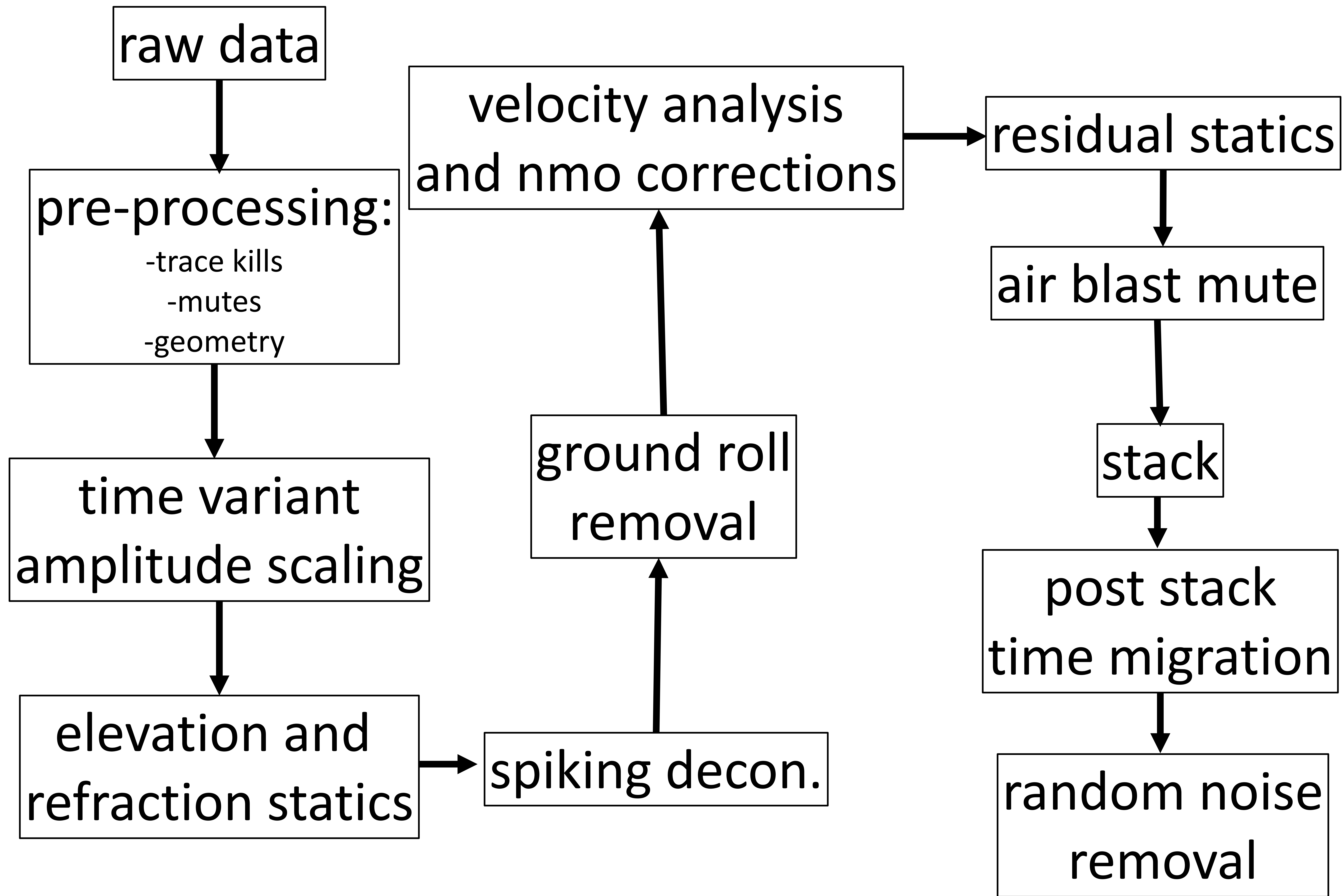
*map from Alberta Geological Survey

Acquisition

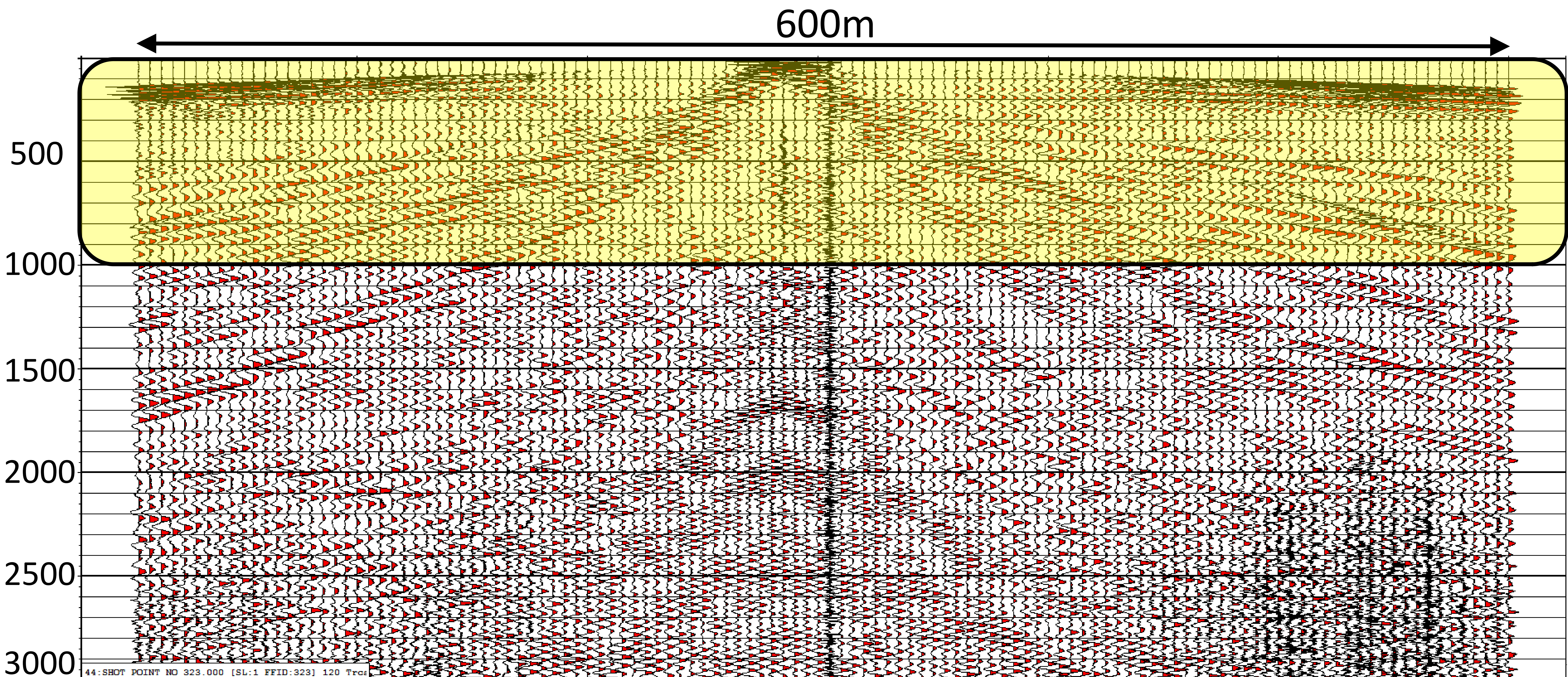
- Aries acquisition system
- Leaflet drop
- Single component acquisition
- Line 3 (600m)
 - 120 channels
 - 5 meter receiver interval
 - 5 meter shot interval (vibe)
 - 18 shot points missed (infrastructure/vegetation)
 - 1 ms sampling
- Field noise sources
 - train tracks
 - power lines
 - urban environment
 - aircraft



Processing (Vista)



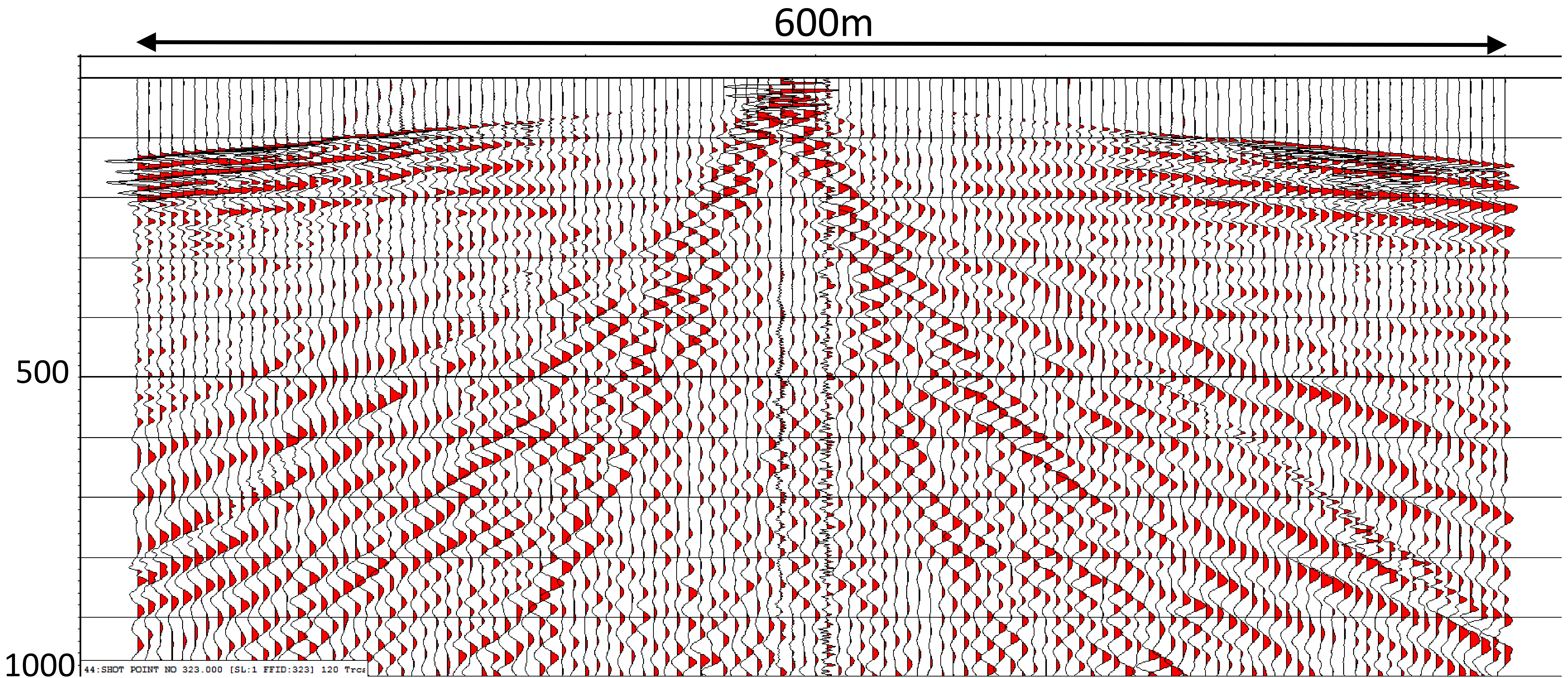
Shot gather plus AGC



- entire record at shot point near the centre of the line (3s)
- timing lines are every 100ms
- very noisy, note the dead trace

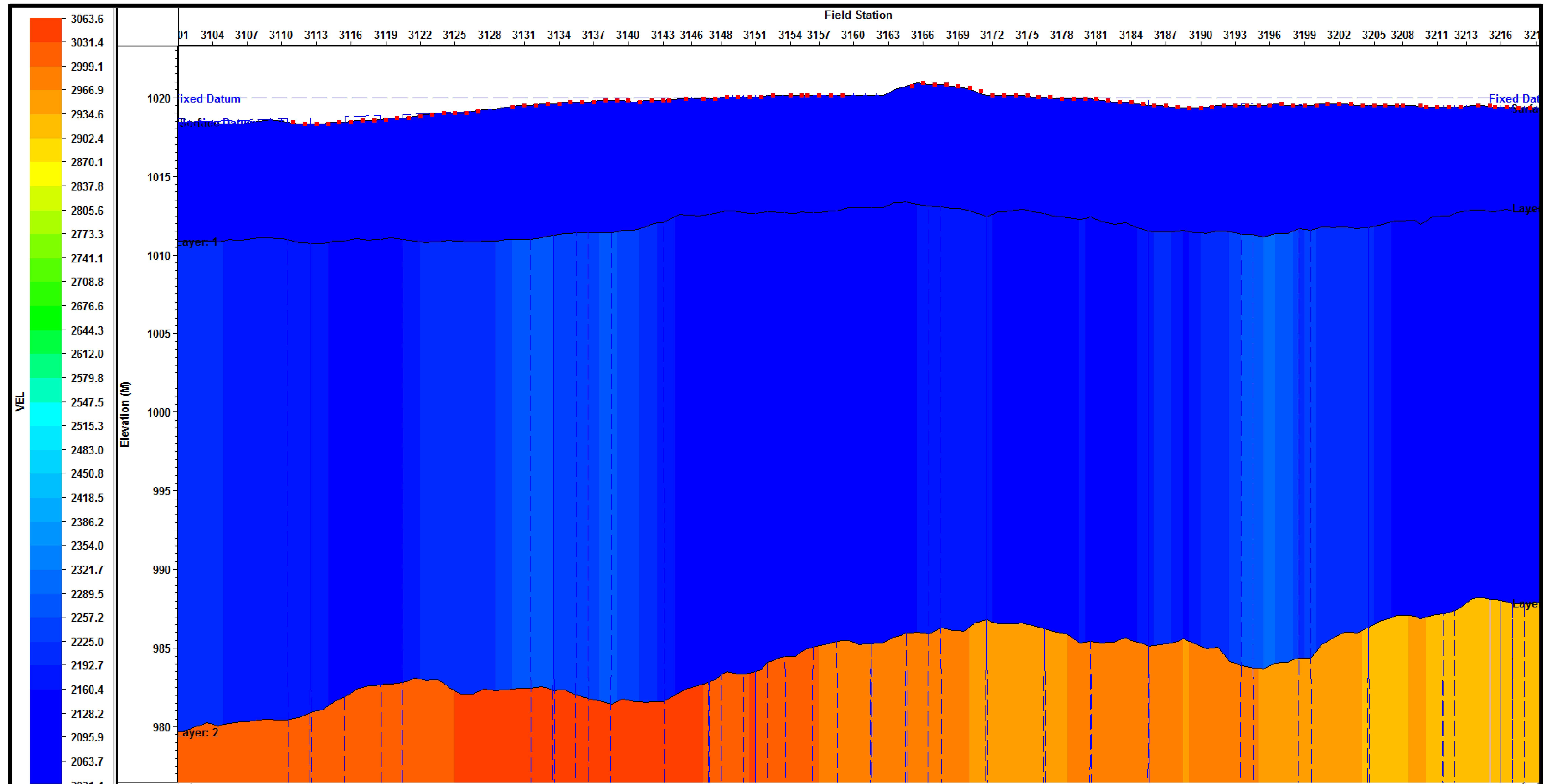
*All sections are oriented N-S, peaks are red

Shot gather plus AGC



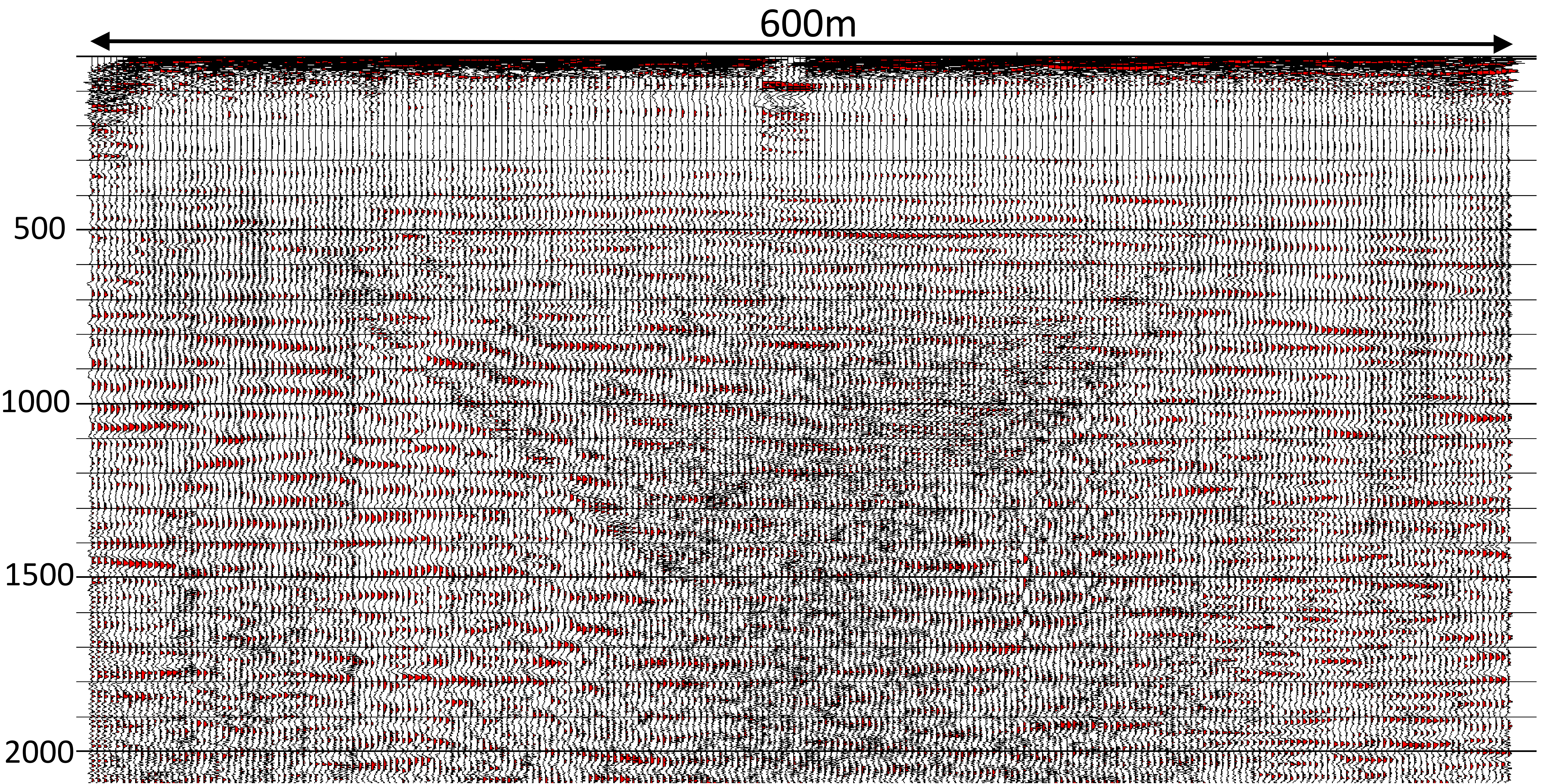
- first second at same shot
- interpretable refraction and direct wave
- reflections?

Near surface model from refraction analysis



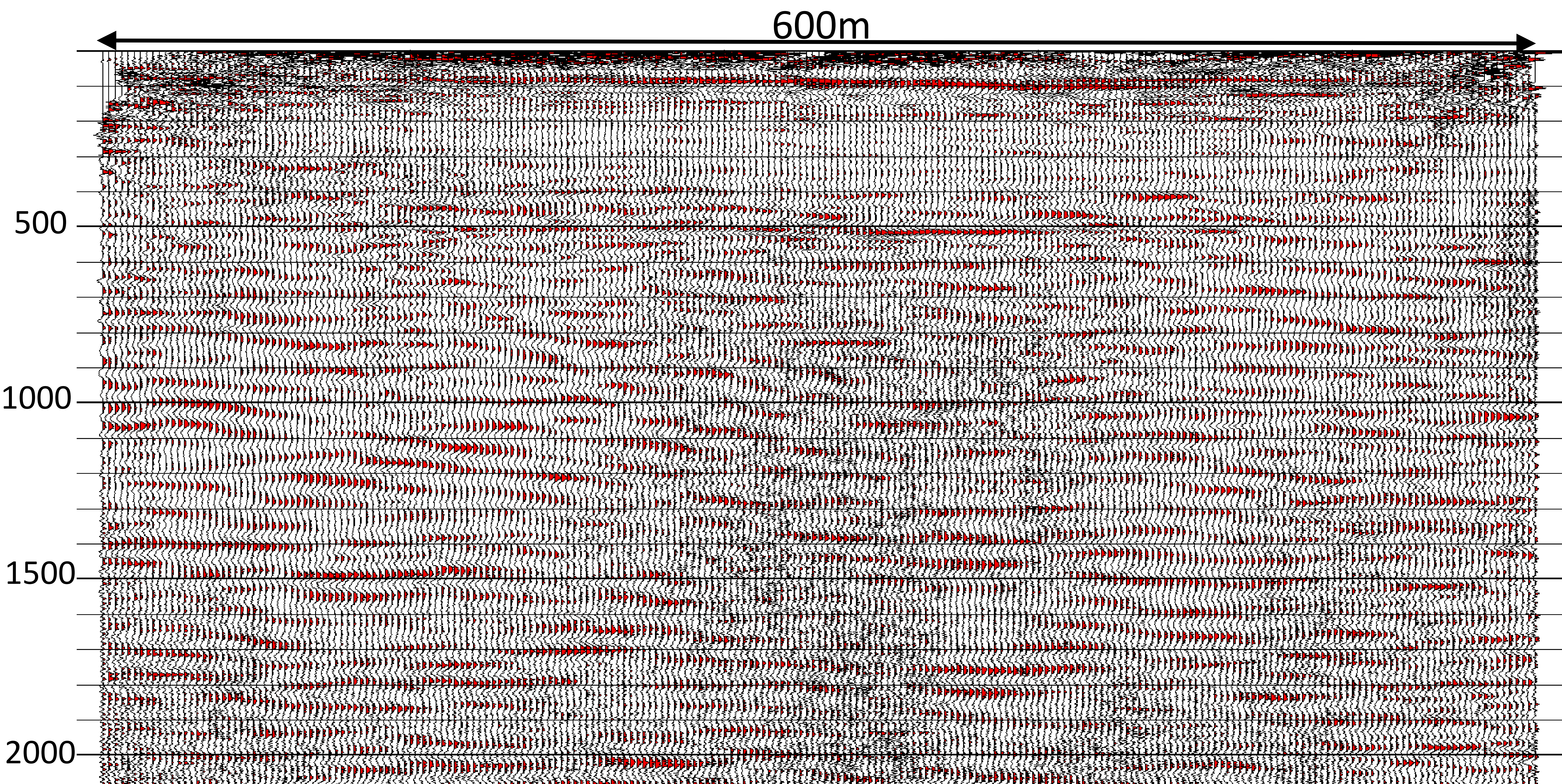
- two areas of velocity change in the near surface
 - correlate to potential incisions in the lower formation

Brute stack (first 2s)



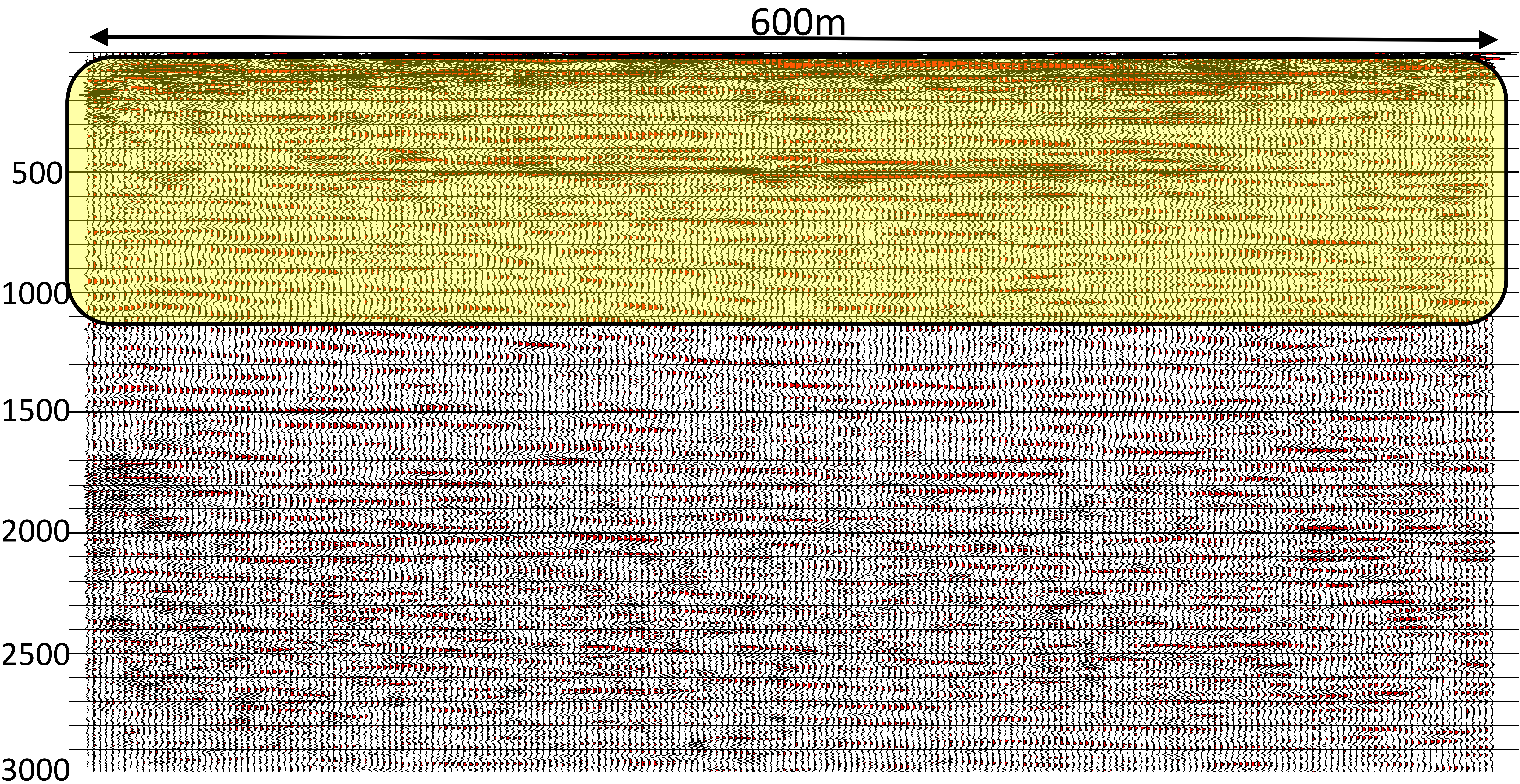
- very noisy - high frequency air blast
- odd centered artifact at ~ 100 ms

Stack with muted airblast (first 2s)



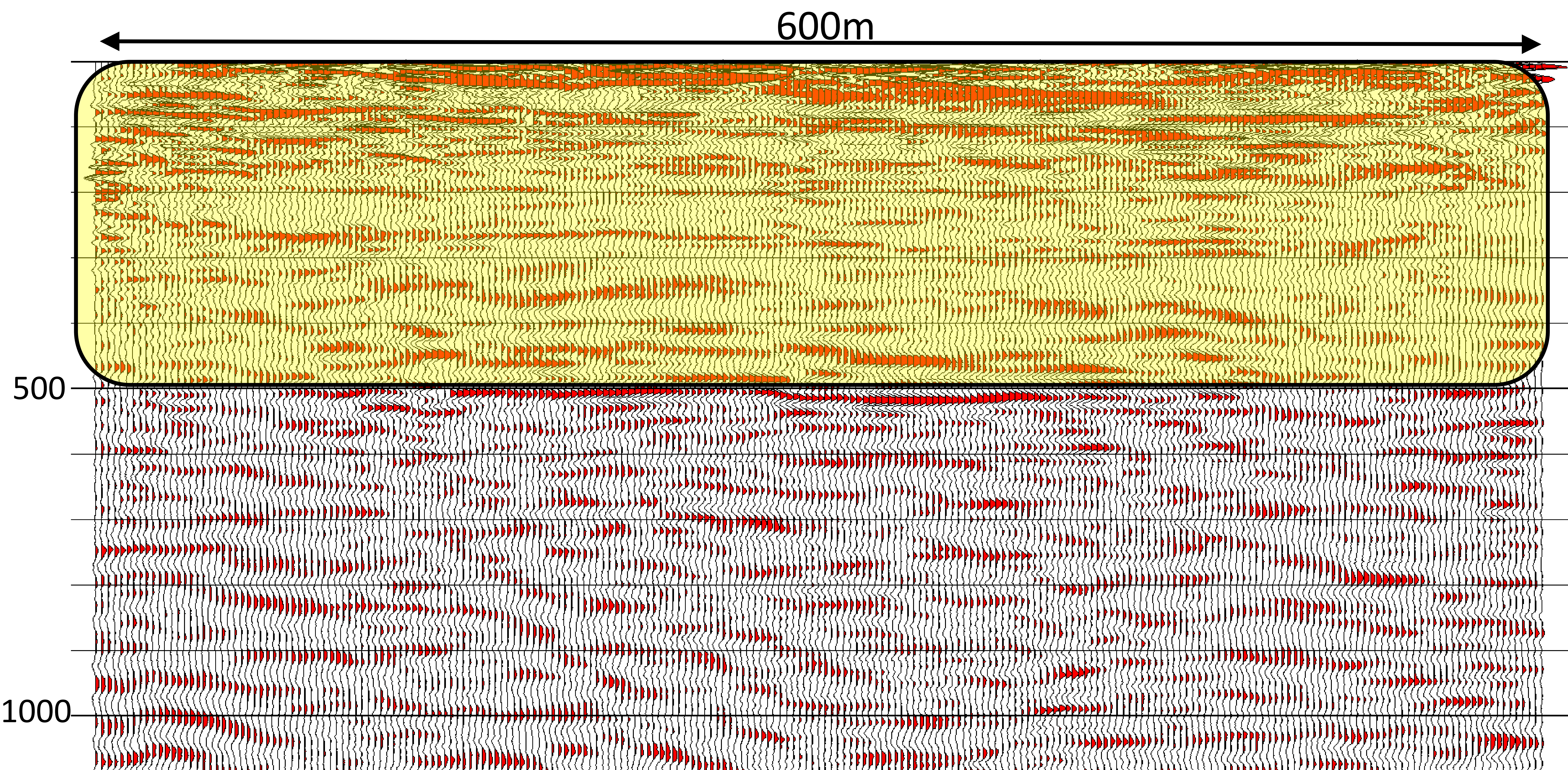
- more coherent signal – still very noisy
- centered artifact removed

Migrated stack (entire record)

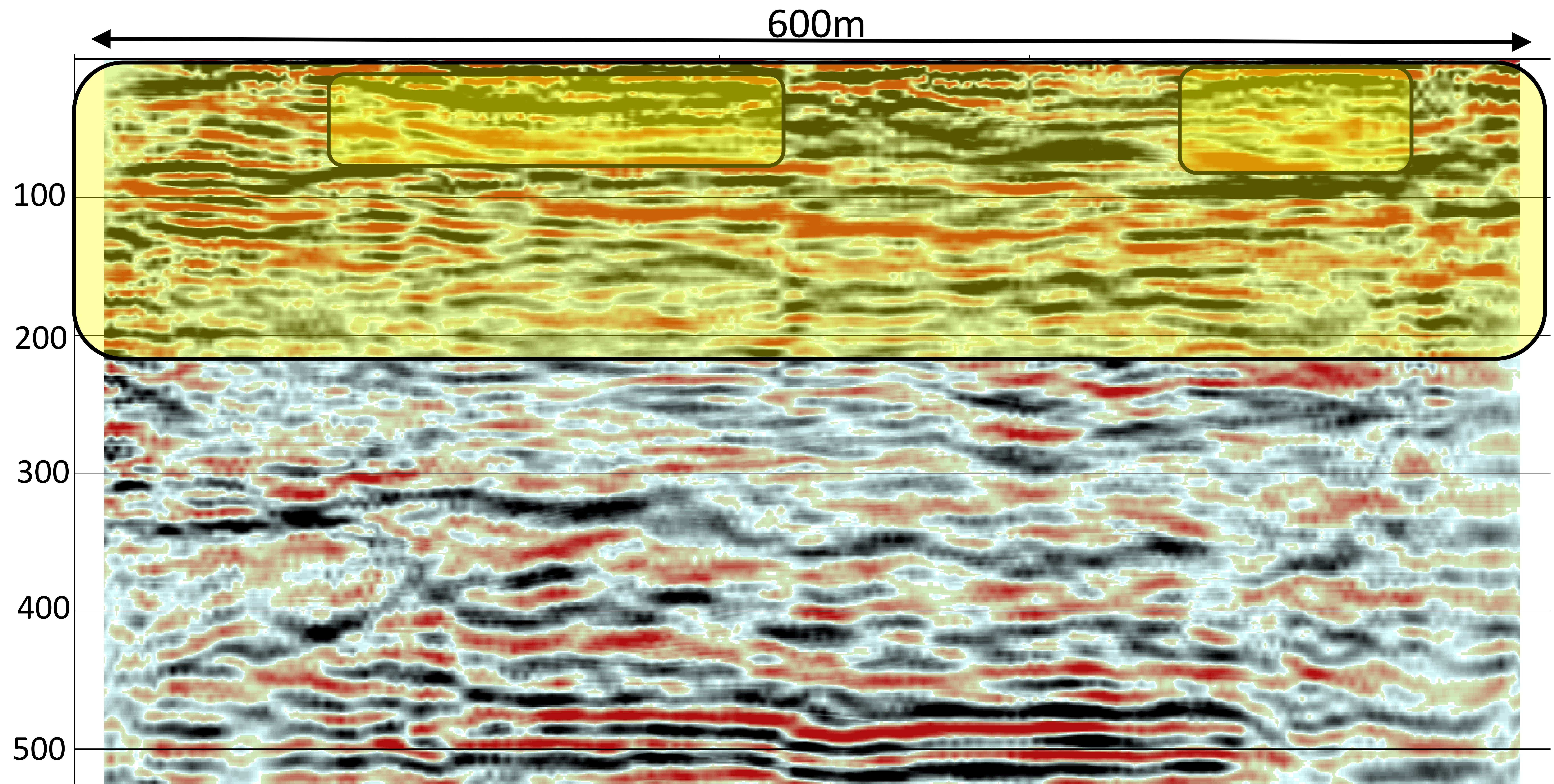


- pervasive reflections to about 1s

Migrated stack (first second)



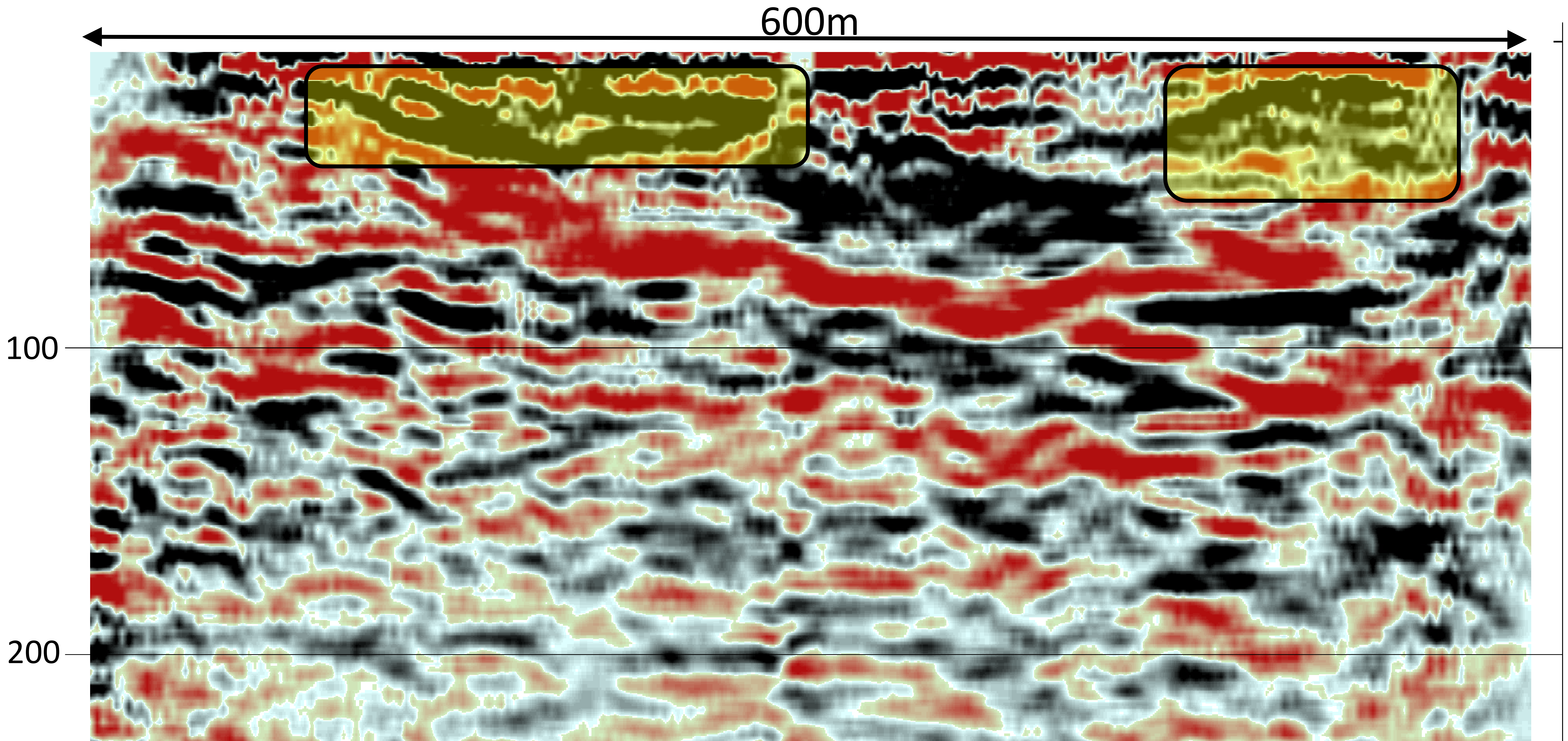
Near surface (first 500 ms)



*peaks red, troughs black

- fluvial geomorphology?
- what about ties to the refraction model?
- drape feature to the north ties well, potential amplitude anomalies further south

Near surface (first 200 ms)



Future considerations

- Reprocessing 2D and processing additional lines from the seismic program
 - more focus on the near surface, noise attenuation.
 - can we correlate the 2 identified anomalies to the other 2D lines?
- Acquisition of geologic information to tie together with 2D seismic data.
 - do the seismic/velocity anomalies correlate to expected rock mechanics in the survey area?

Summary

- Field school 2013 moved to urban Calgary as a result of flooding.
- 2D lines recorded in Inglewood Park
 - best line from shoot was processed and interpreted
 - lithological anomalies from refraction analysis may be indicative of fluvial systems
 - two near-surface features were highlighted on the seismic section
 - » may correlate to refraction anomalies
- Future work
 - reprocessing
 - integration with geological controls

Special thanks to

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- City of Calgary
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Schlumberger

HALLIBURTON | Landmark



Questions