Near Surface Geophysics in Onshore Pipeline Design – Petrobras' experience

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Summary

- Near Surface Geophysics
- Why Near Surface Geophysics?
- Most used methods
- Cases
  - Gastau Tunnel
  - EBAF Underground
- What's next

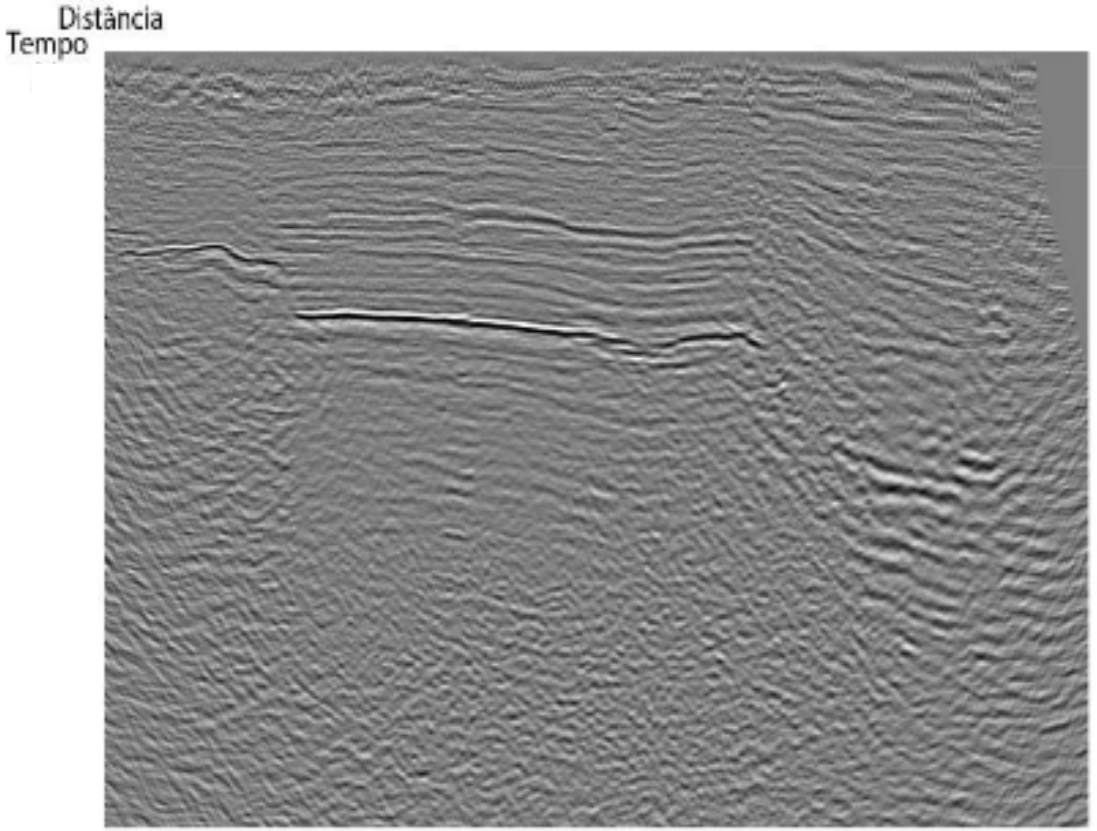
Near Surface Geophysics

- Geophysics is a subject of natural science concerned with the physical processes and properties of the Earth, and the methods used for their analysis.

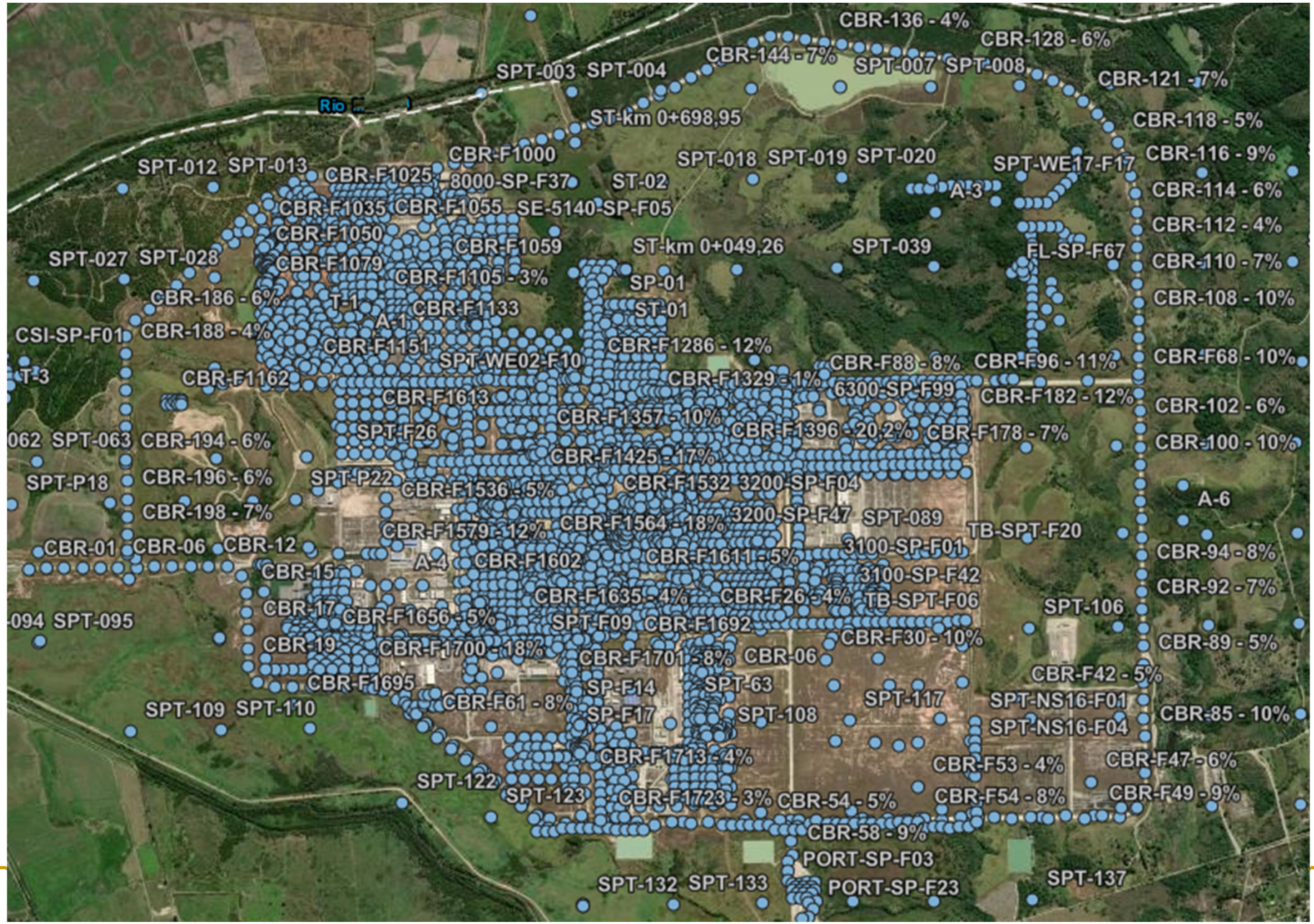
- Exploration geophysics is the use of geophysical methods for engineering purposes

Near Surface Geophysics

- Non-intrusive methods
- Concerned with depths up to a few hundred meters



Why Near Surface Geophysics?



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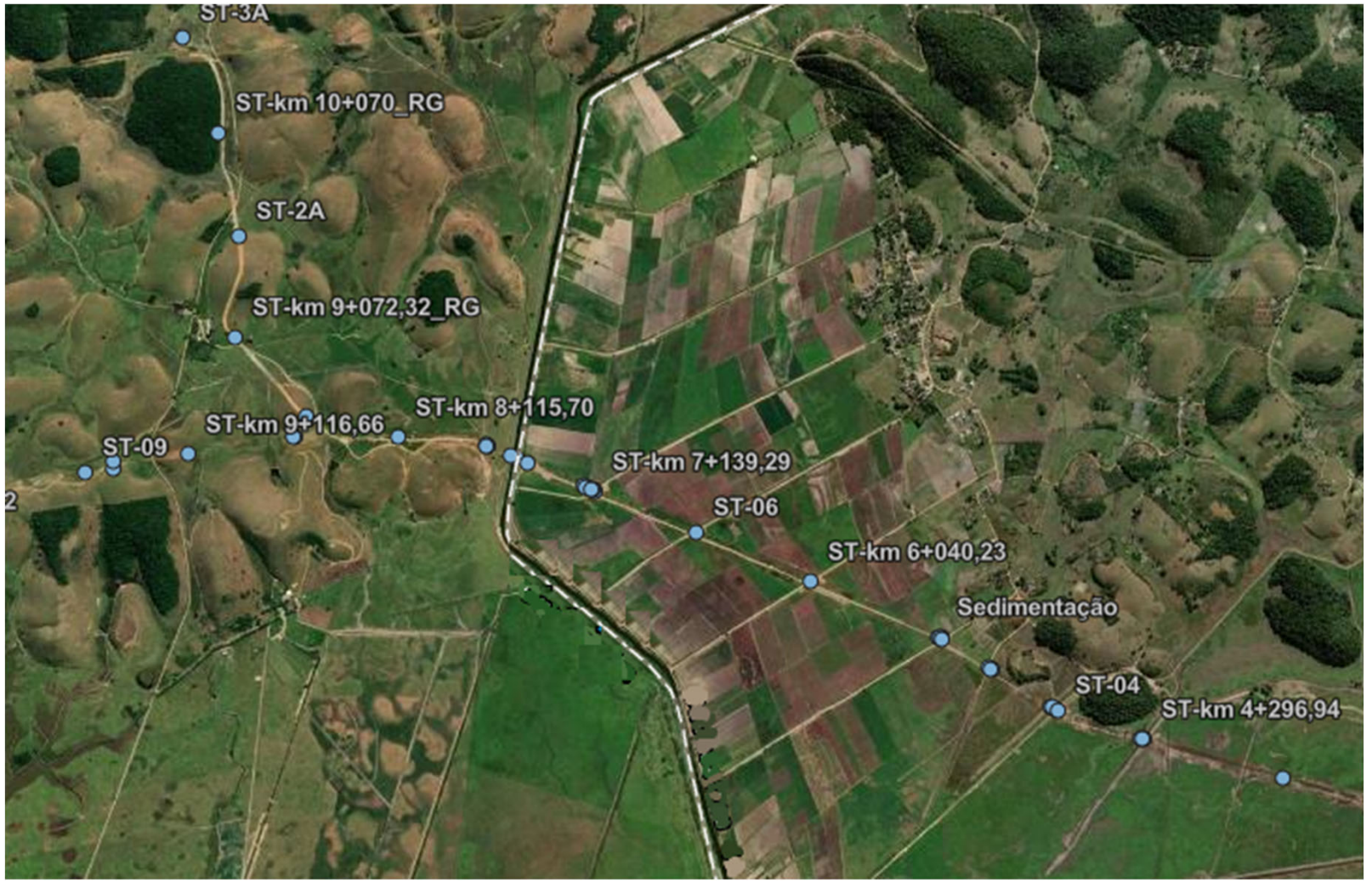

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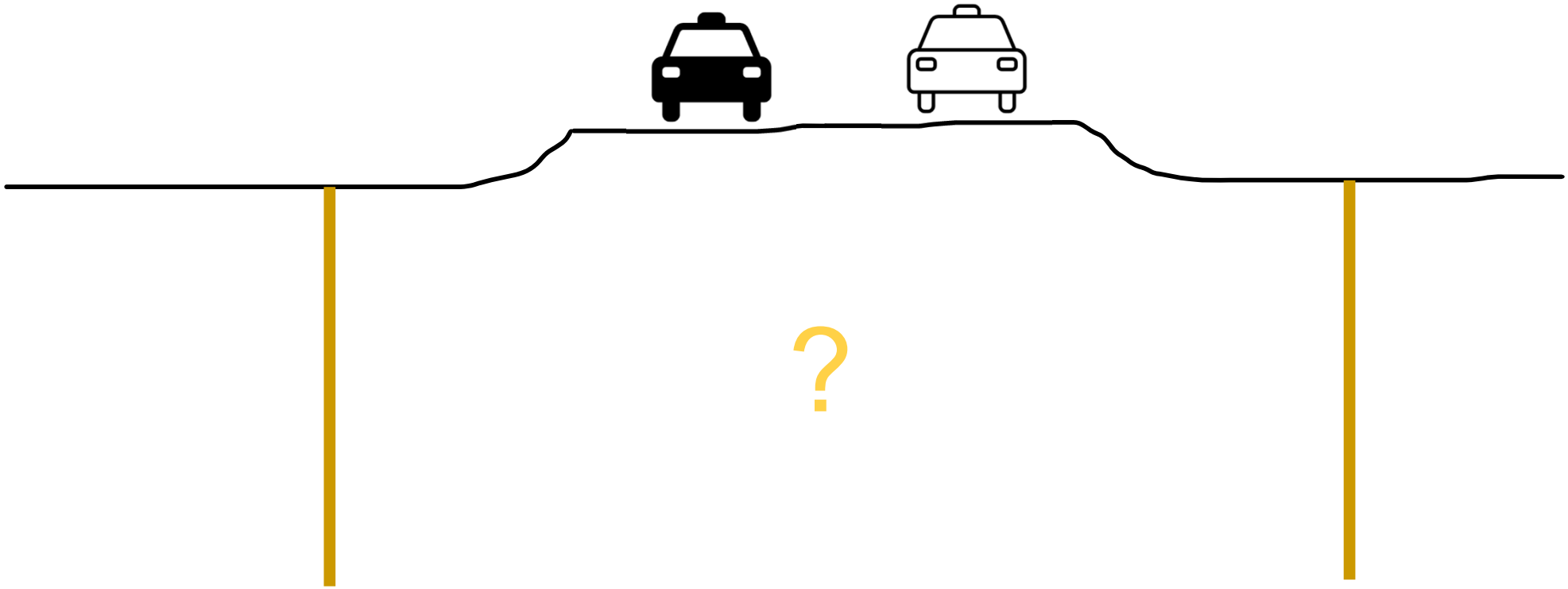


Why Near Surface Geophysics?

- Underground interference investigation
- Particularly relevant for older plants
  - Lost documentation
  - No georeferencing

Most used methods

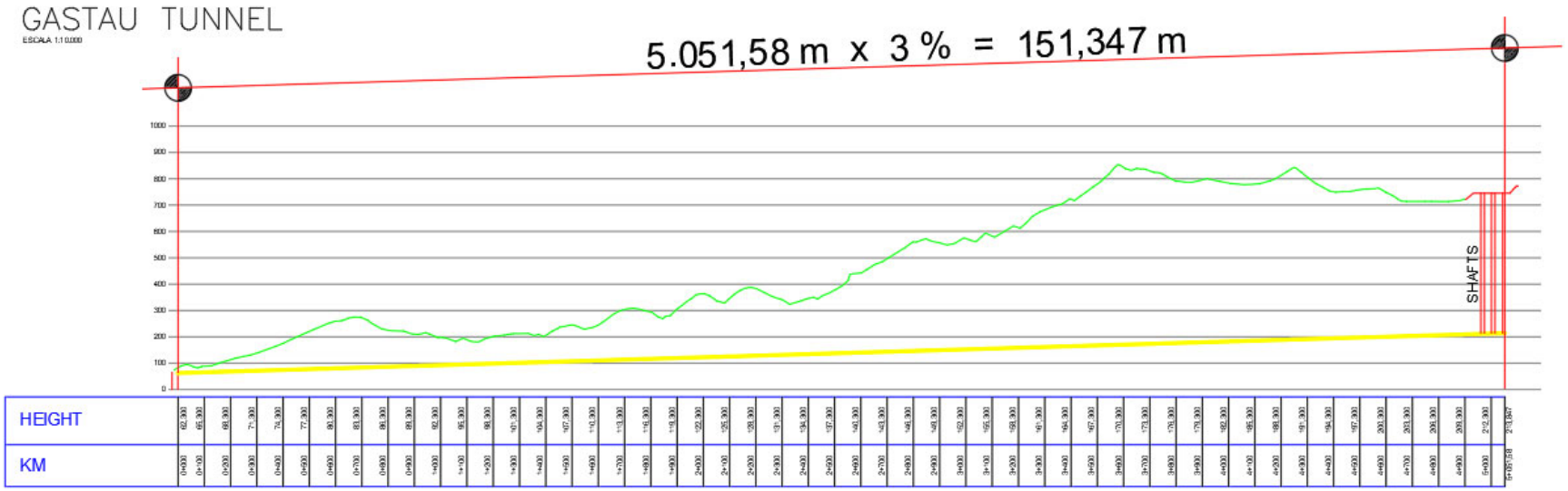
- Ground Penetrating Radar - GPR
  - Dieletric permittivity
- Resistivity profile
  - Electric Resistivity
- Refraction seismic
- Sub Bottom Profiler
  - Acoustic Impedance

Most used methods

- Combining different methods yields better results
- Combining with direct geotechnical soundings is also recommended

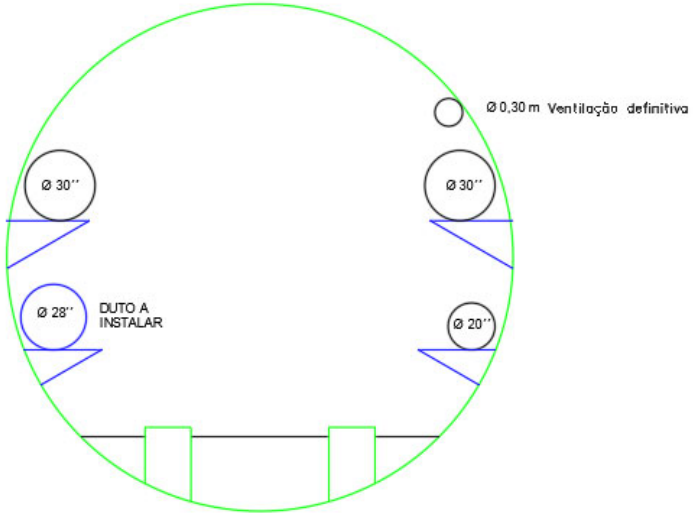
GASTAU Tunnel

GASTAU Tunnel

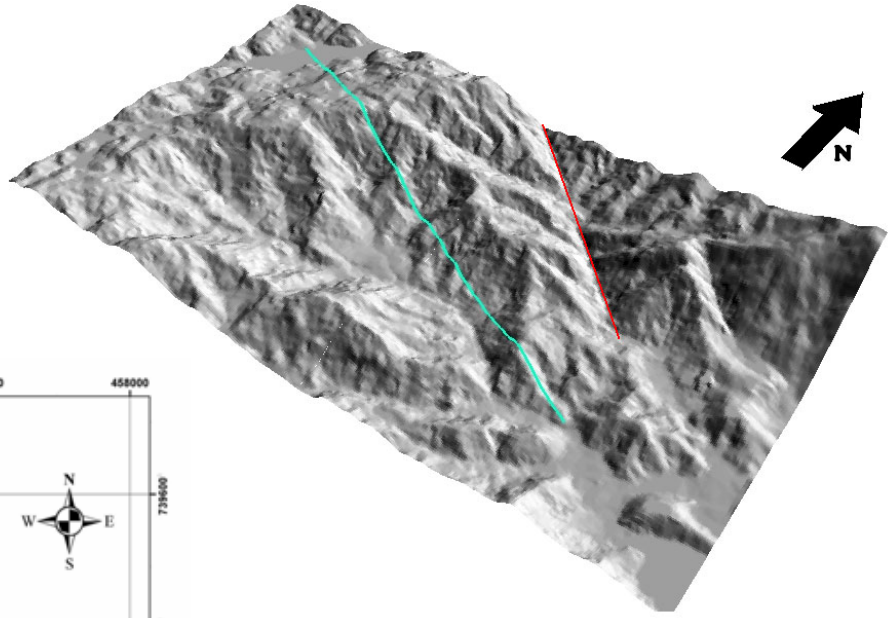


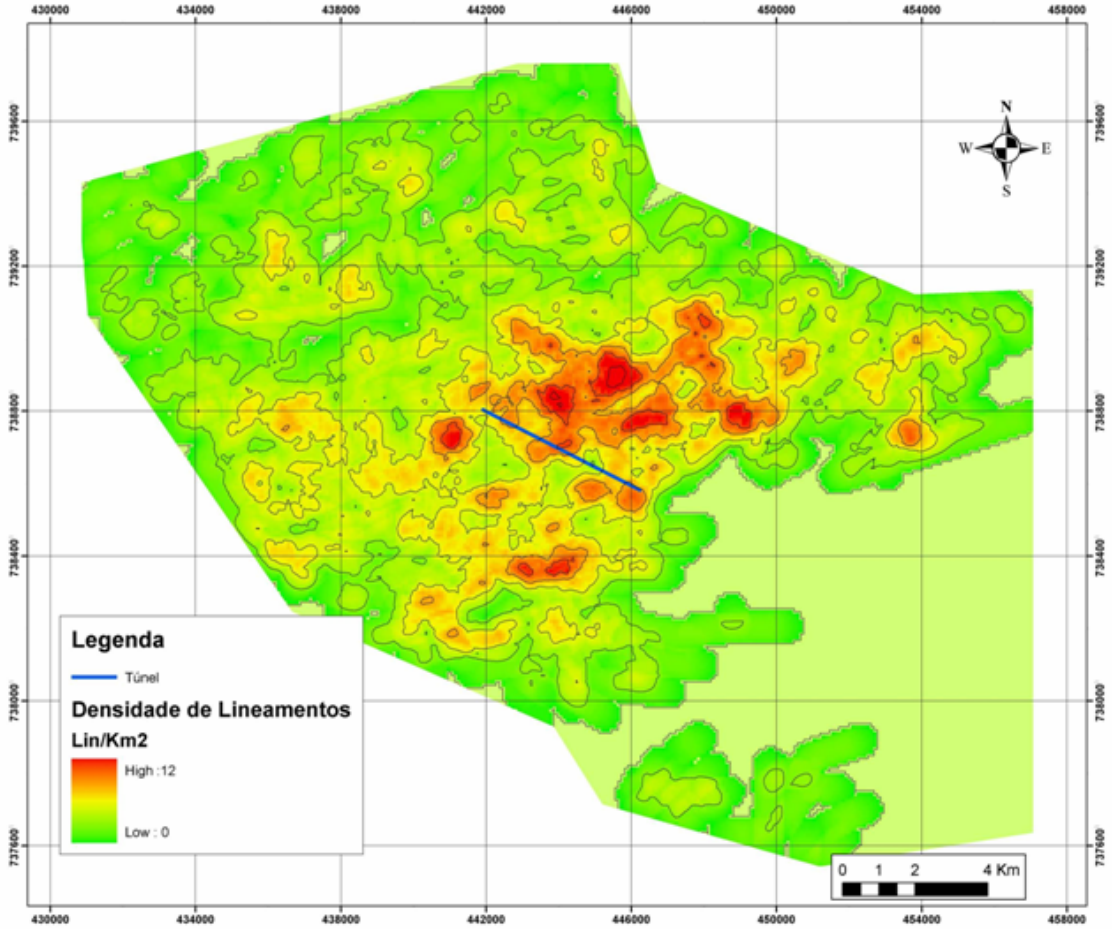
GASTAU Tunnel

- 7,2 m diameter; 4,9 km
- Investigation needed to determine geomechanics of the rock mass
- Limited access inside the park

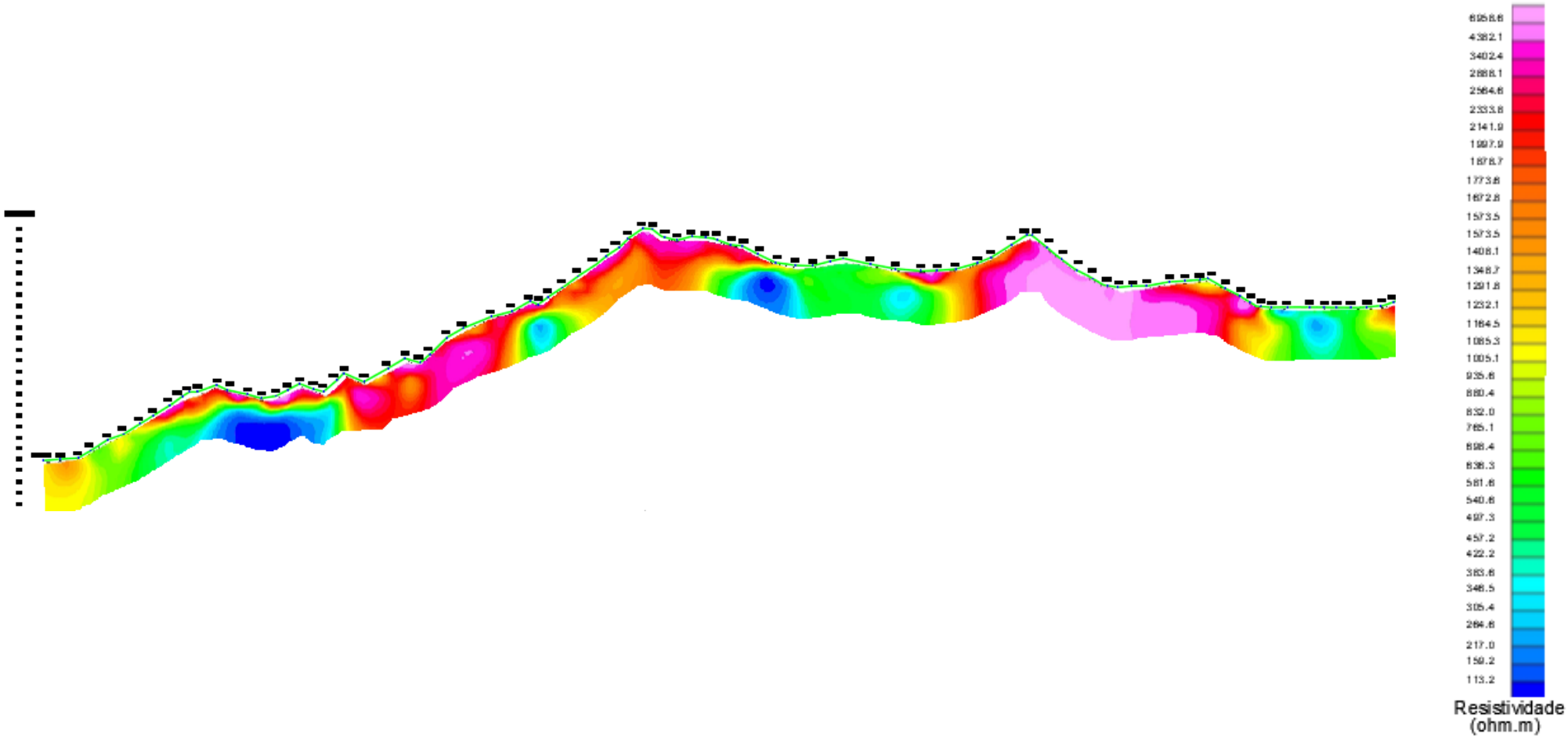


GASTAU Tunnel

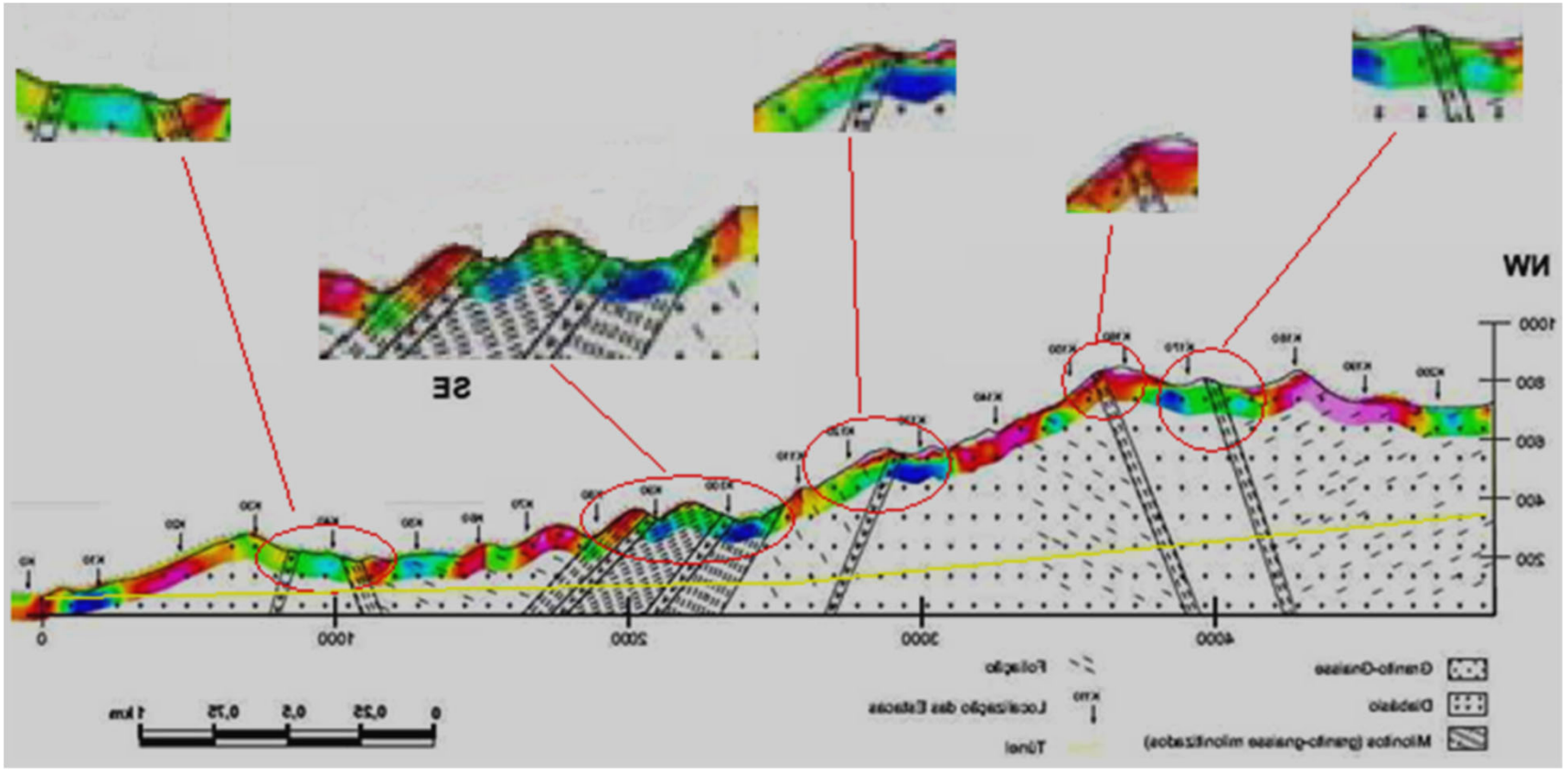




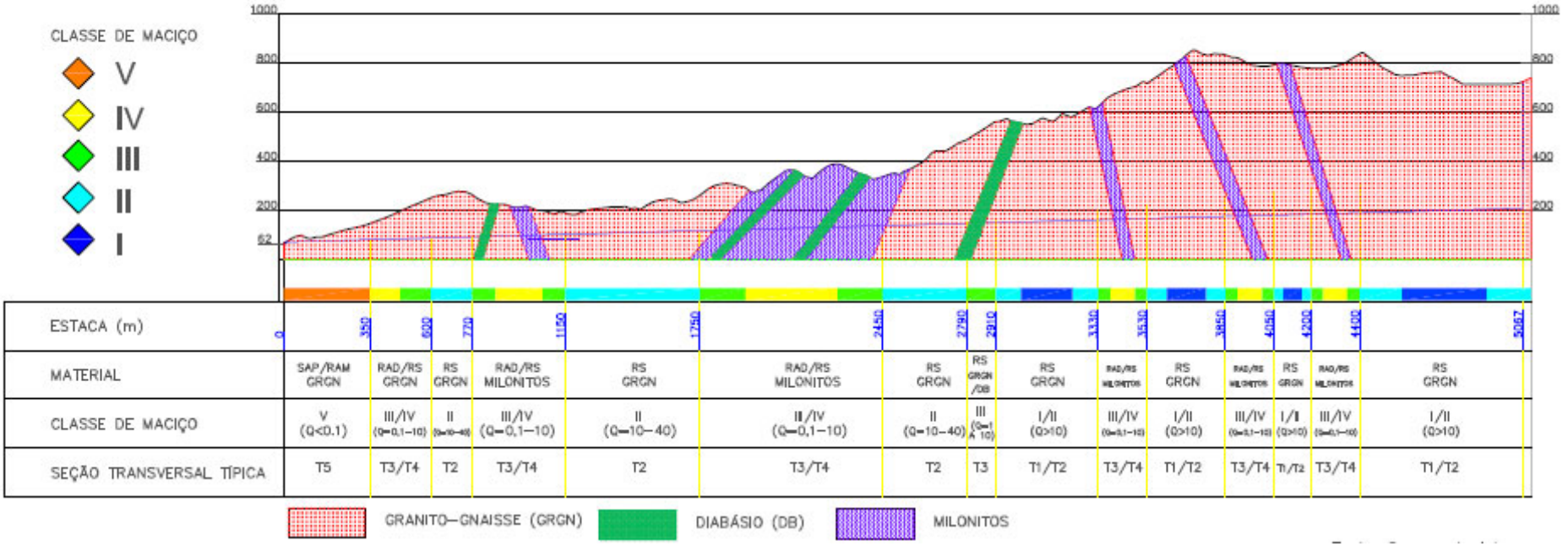
GASTAU Tunnel



GASTAU Tunnel

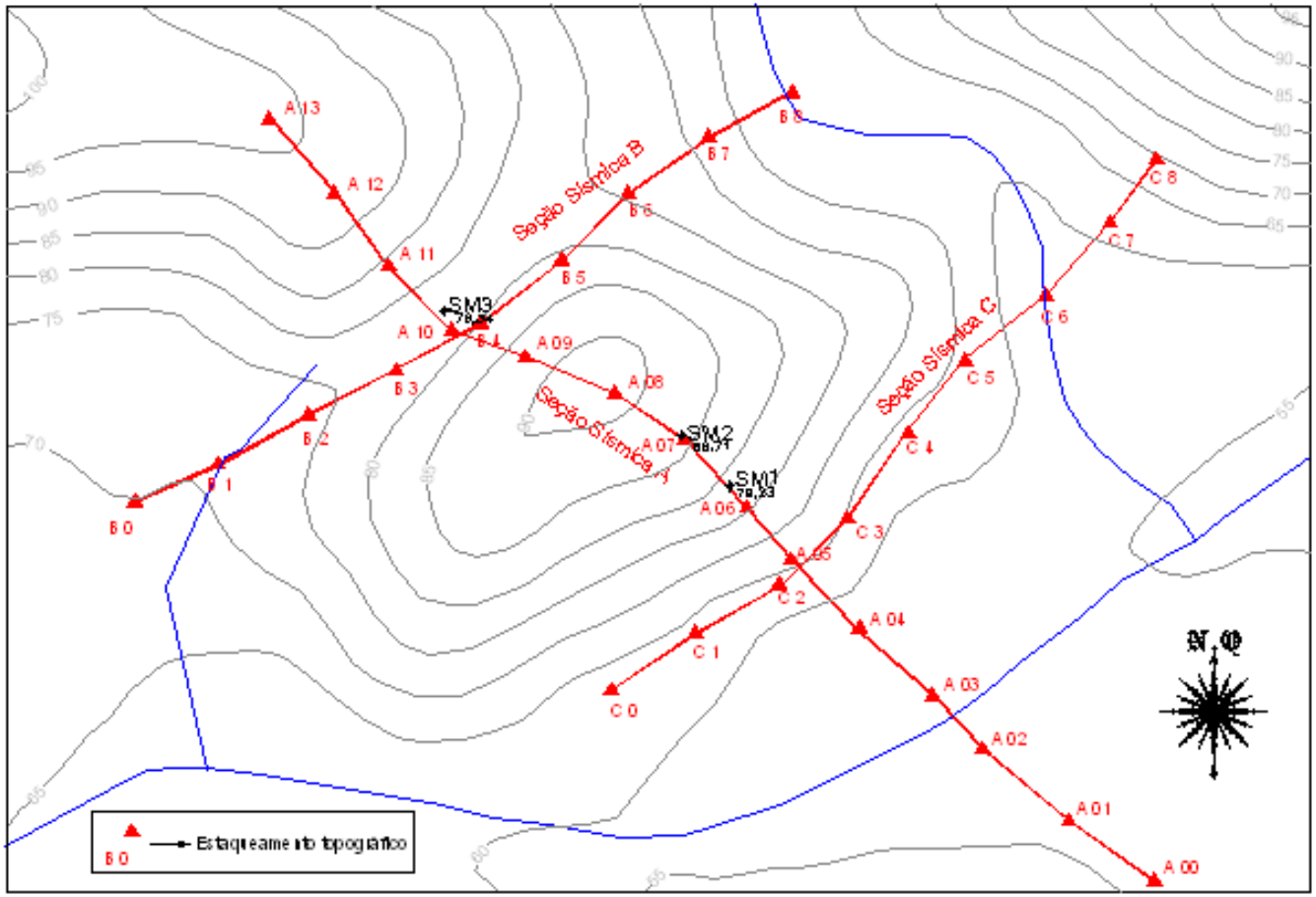


GASTAU Tunnel



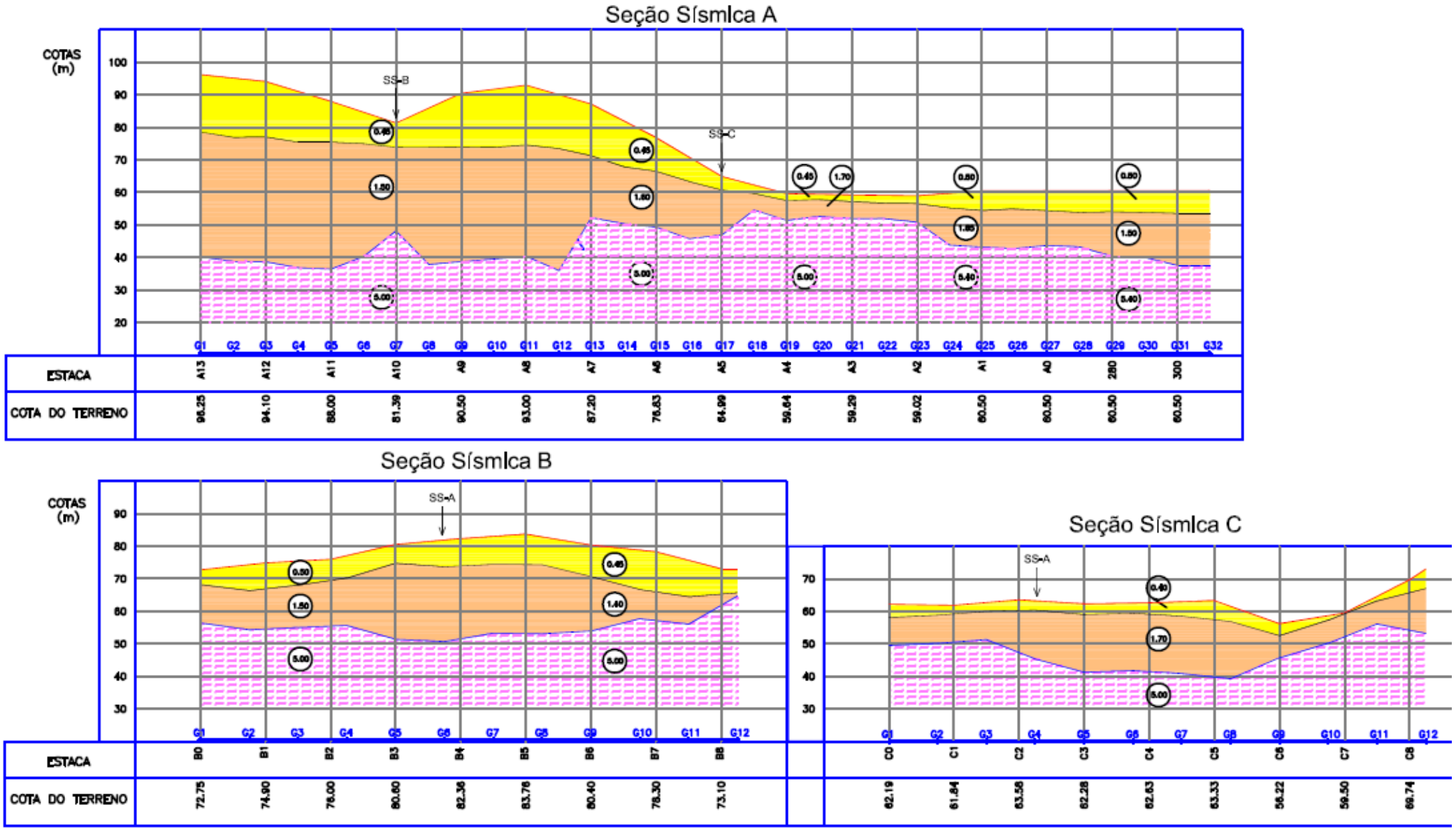
GASTAU Tunnel

- Tunnel entrance



GASTAU Tunnel

- Refraction Seismic



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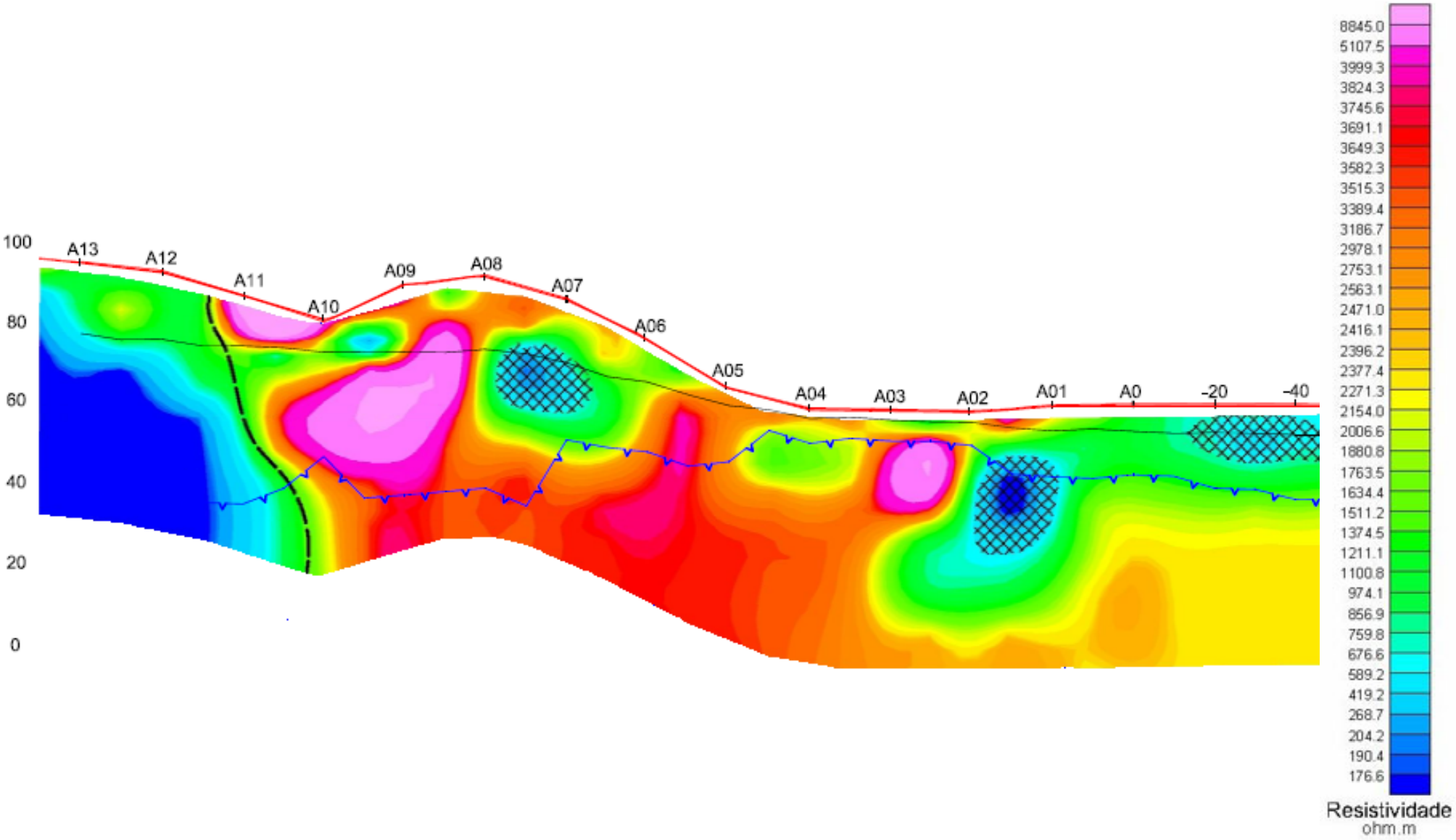


EBAF underground

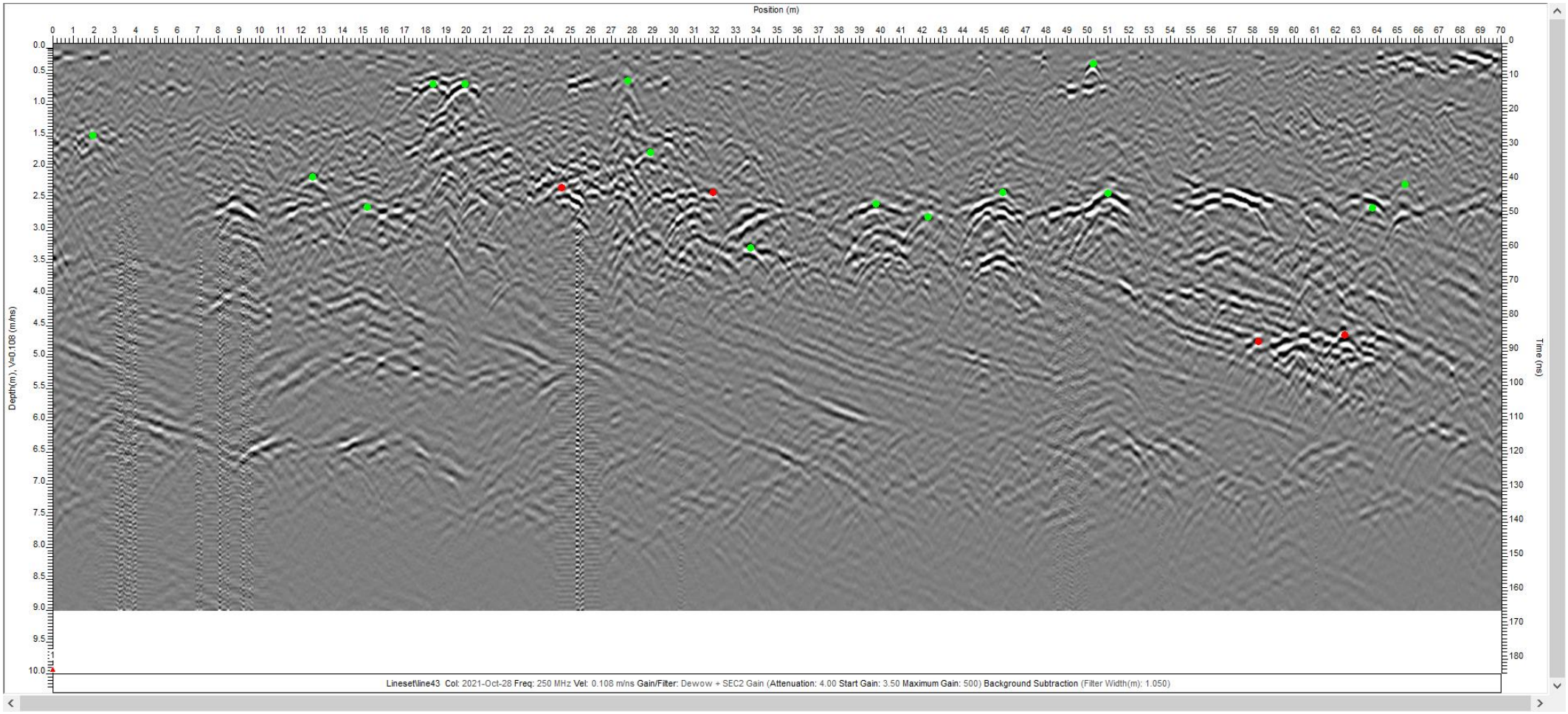
- Area operating since 1980's
- Sandy soil
- 500 m from ocean

- 250 and 500 MHz Shielded Antennas
- Coupled RTK-GNSS

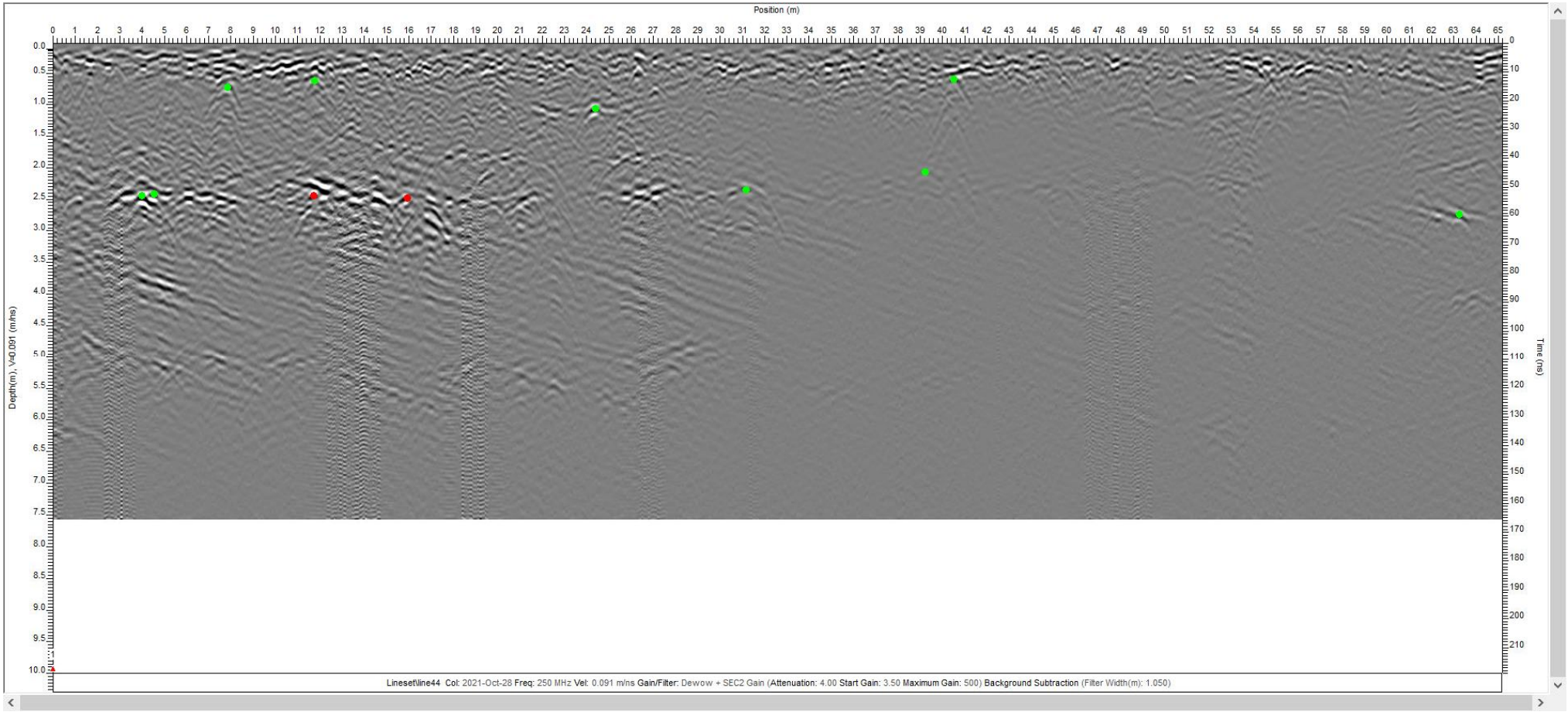
EBAF underground

- Significant Attenuation in portions
- Unclear Results
  - Sometimes no hiperboles at all, sometimes too many

EBAF underground

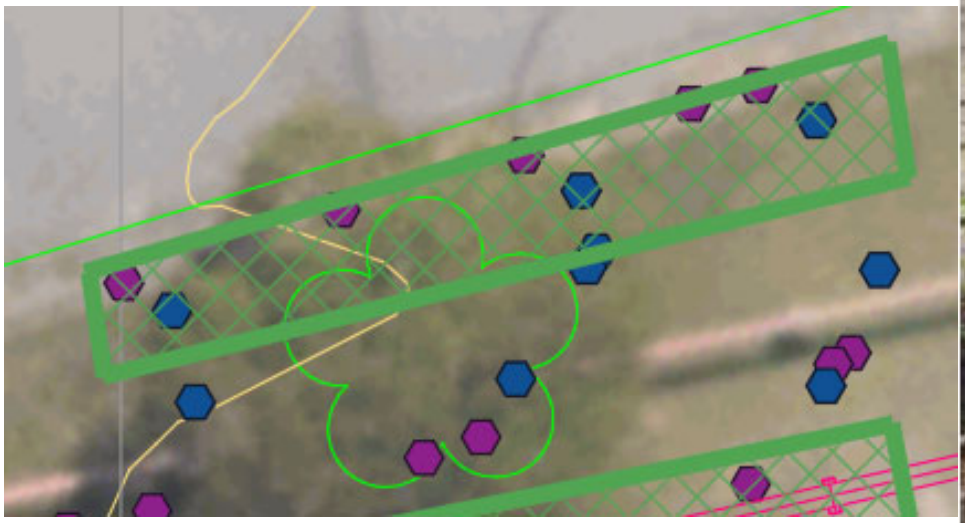


EBAF underground



EBAF underground

- Excavations for confirma



What's Next?

- Post-installation inspection in trenchless
  - Metal Magnetic Memory (MMM)
- Better geotechnical data in our facilities
  - Historical sounding reports

Thank You!

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