Geophysical alluvial exploration using the Aquares Resistivity method

DEMCO
Dredging
Exploration
Mining
Consultants

Demco NV

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Alluvial exploration

Mining = Finding!!!

Drilling - boreholes

- Expensive – time consuming
- Discontinuous information
- Sampling – concentrations

Geophysics

- Fast - Economical
- Continuous information (high density)
- Defining geological structures – sampling locations

Geophysical Methods

Quantitative methods (sediment thicknesses/depths)

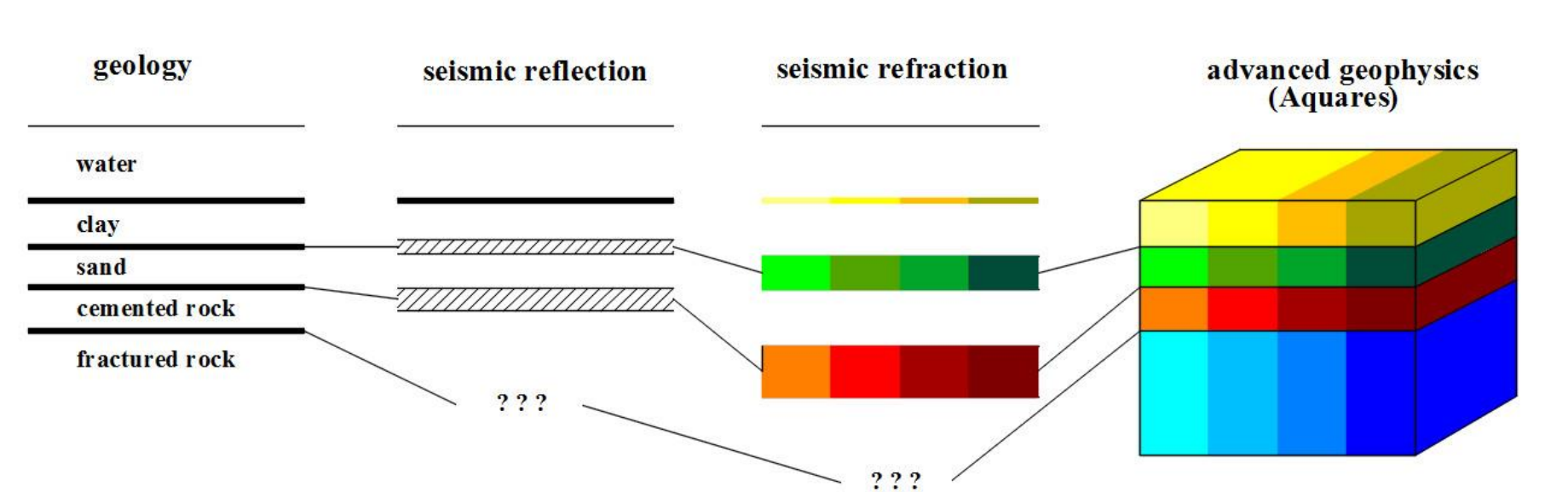
- **Reflection seismics (diffractions in gravel!) (boomer/chirp/parametric echosounder/sparker)**
- **Resistivity**

Qualitative methods (rock/sediment qualities)

- **Refraction seismics (inaccurate thicknesses)**
- **Electromagnetics (limited penetration in high-conductive environments)**
- **Resistivity**

Enhanced (advanced) geophysics

High quality geophysical methods generating accurate quantitative as well as qualitative information in a georeferenced 4D model



Aquares:

Seabed towed cables -> high quality

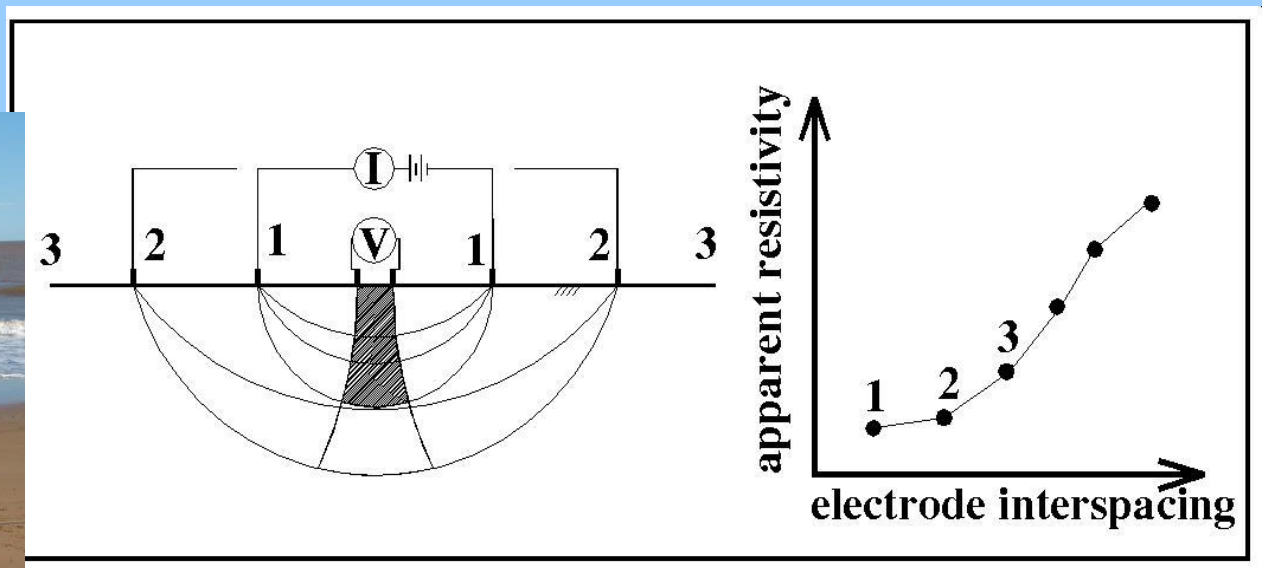
Accuracy: no acoustic velocity information required

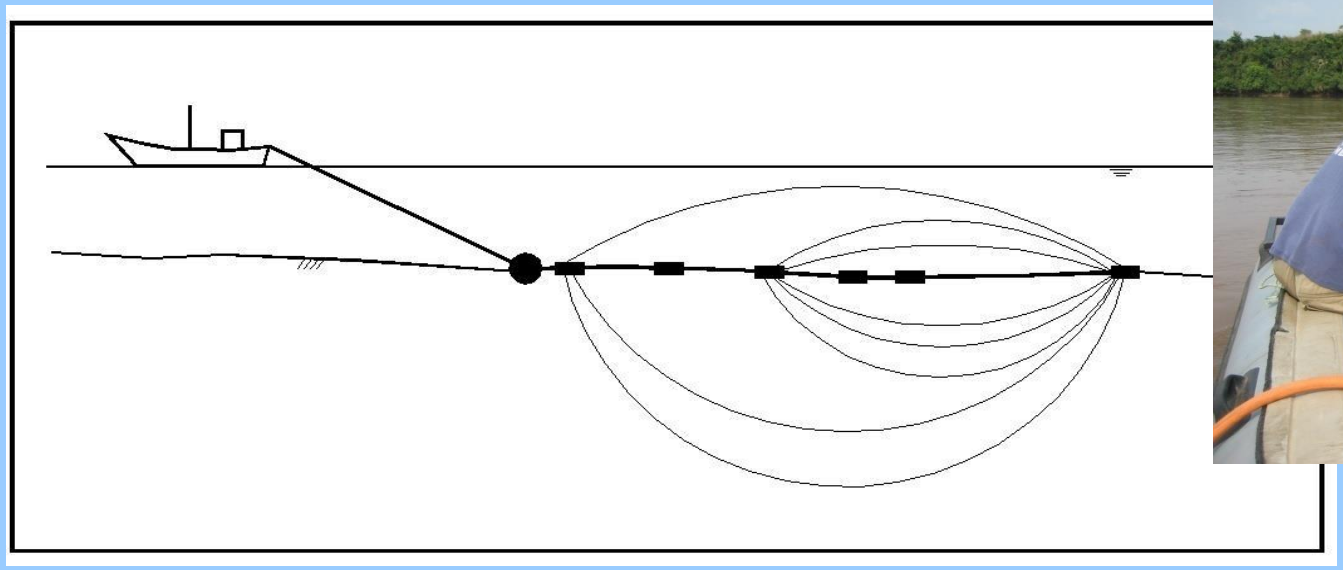
Quantitative: depths and thicknesses

Qualitative: resistivity value distinguishes between different rock and sediment qualities

4D model: every point in space has a resistivity value attached to it

Principles of Electrical Sounding

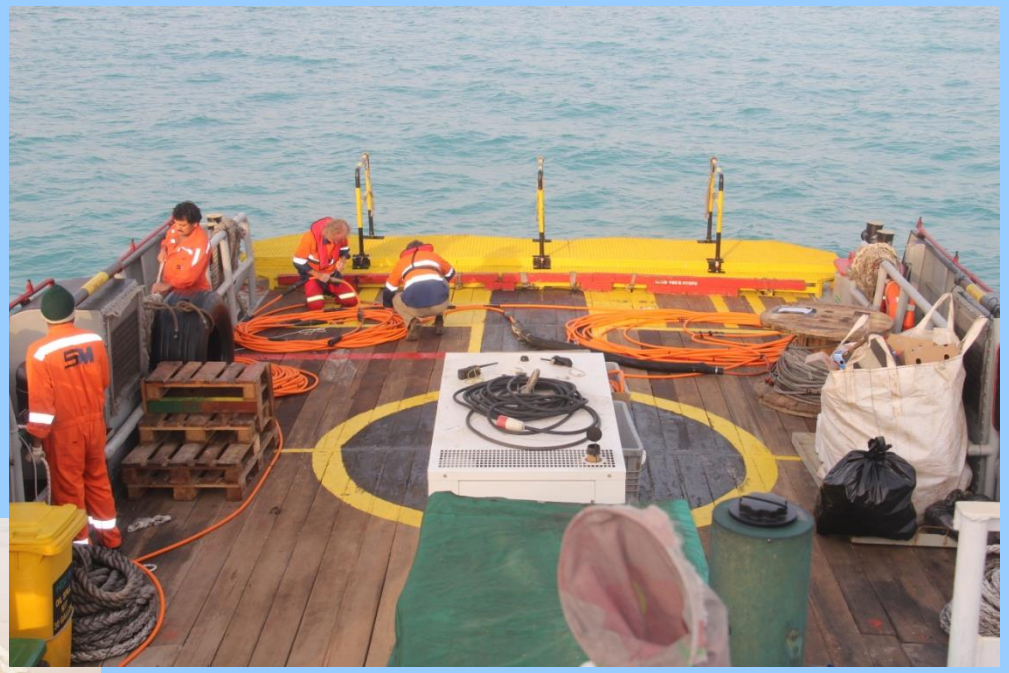




Applications

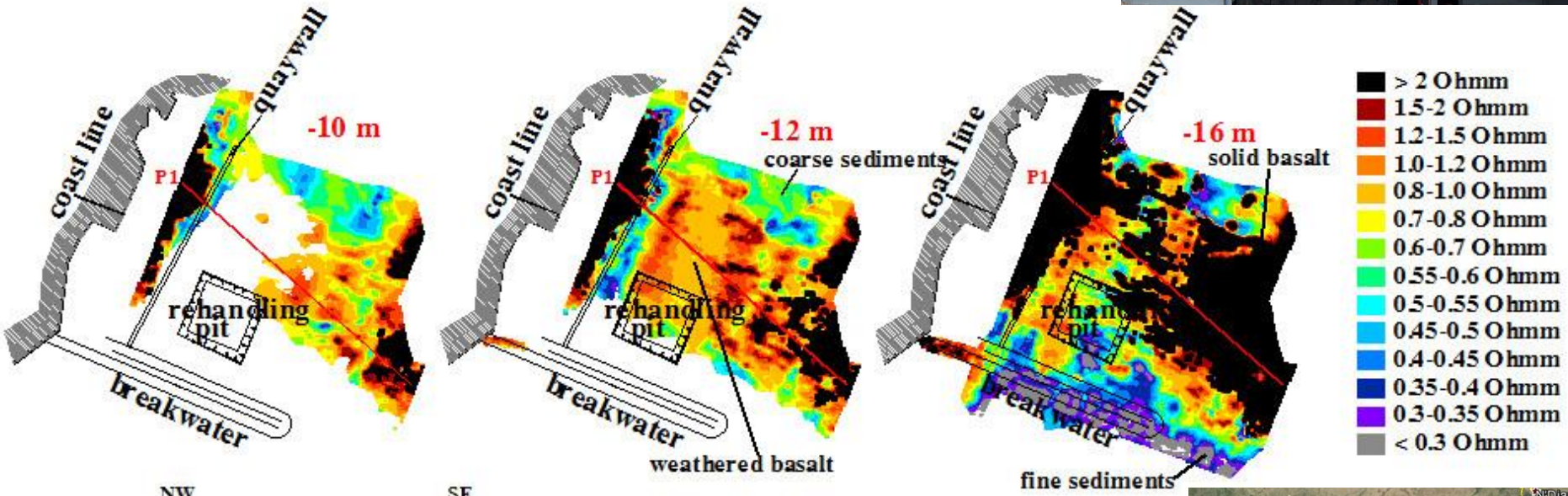
- Dredging geological exploration
- Sand searches – reclamation projects
- Port Design
- Pipe/Cable route surveys
- Alluvial mineral exploration (diamond / gold / gravel)

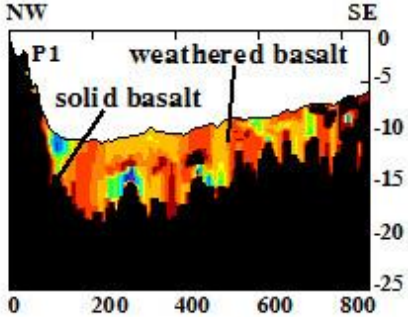
Geophysical Equipment

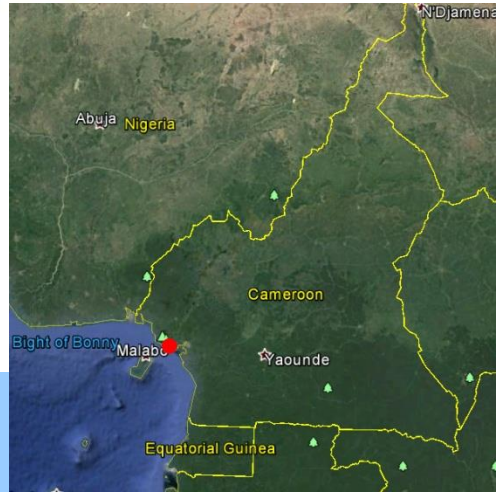


4D resistivity modelling

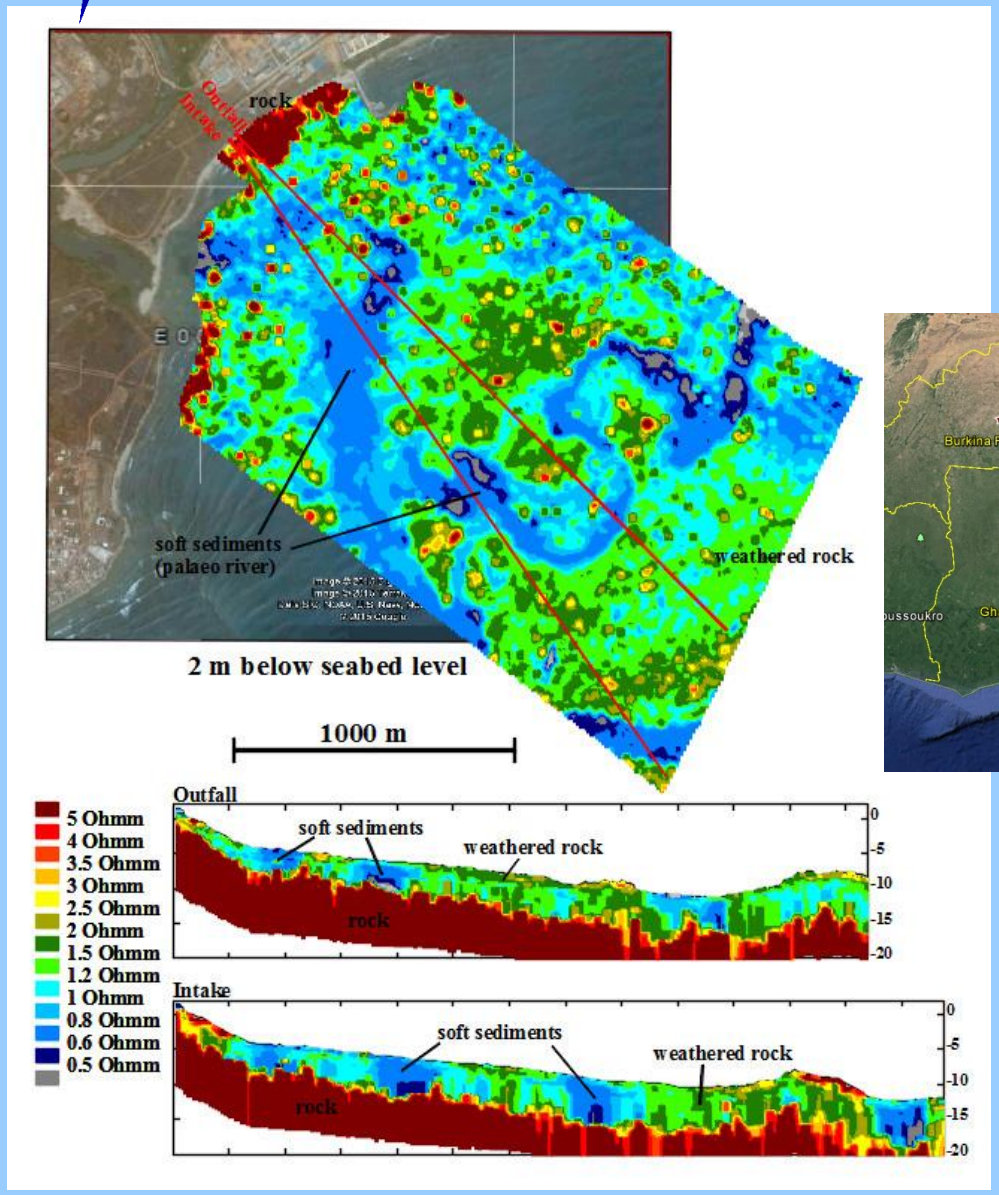
Port of Limbe, Cameroon

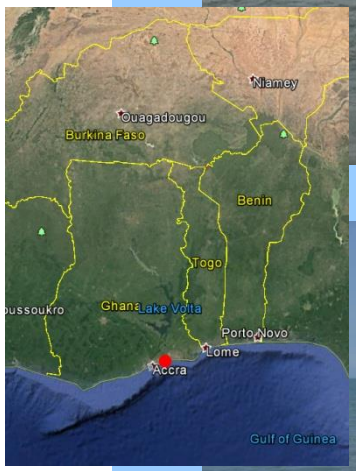


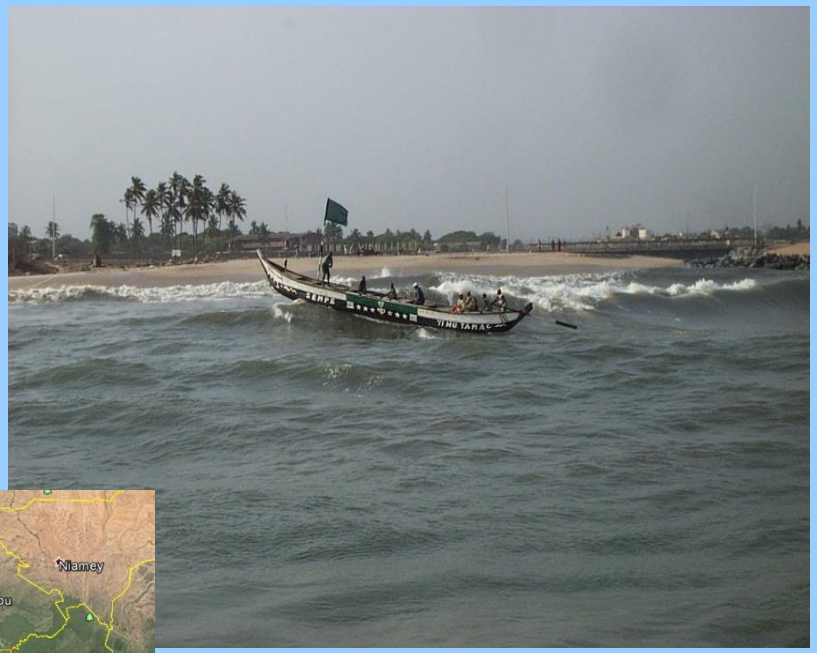




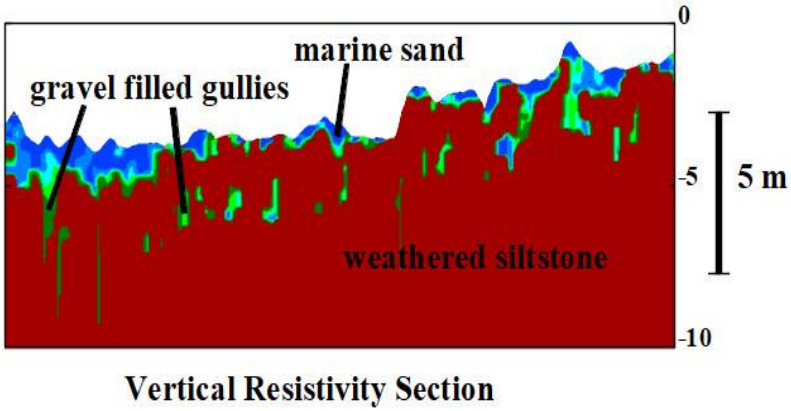
4D modelling
Ghana – Water intake





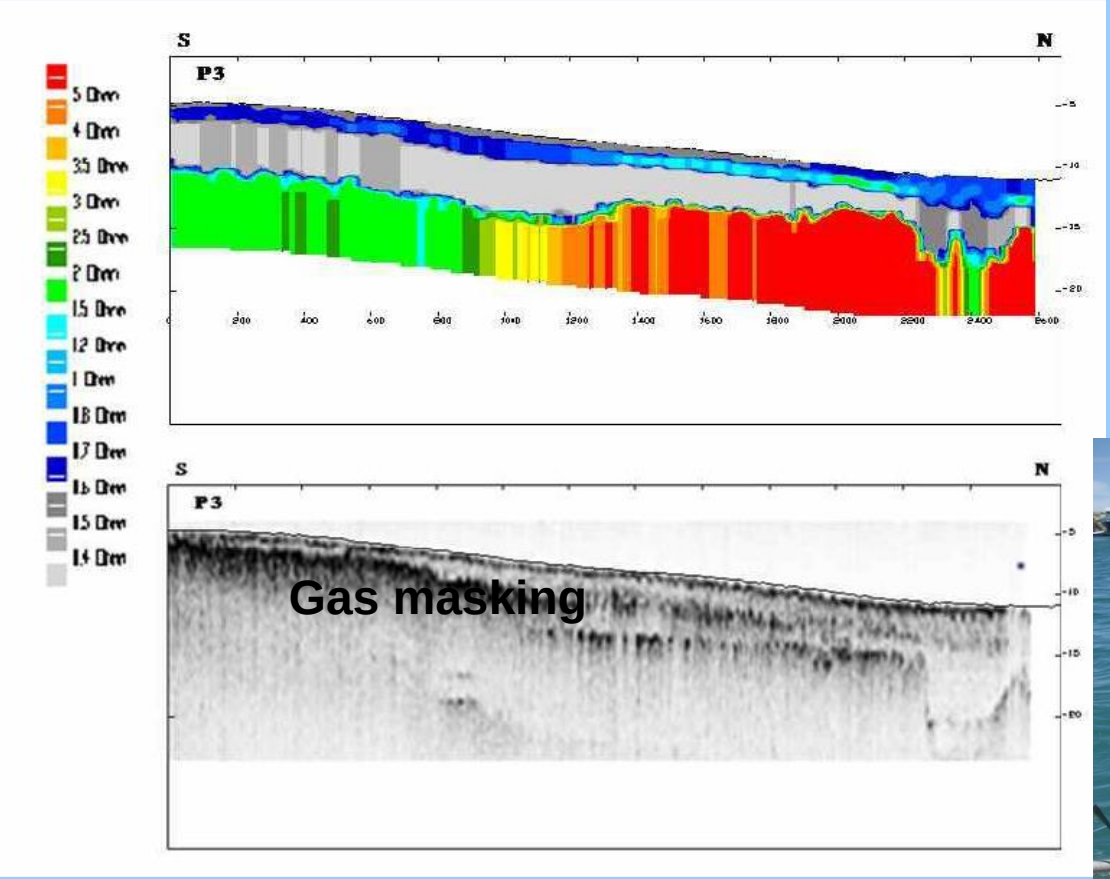


Surfzones resistivity surveys

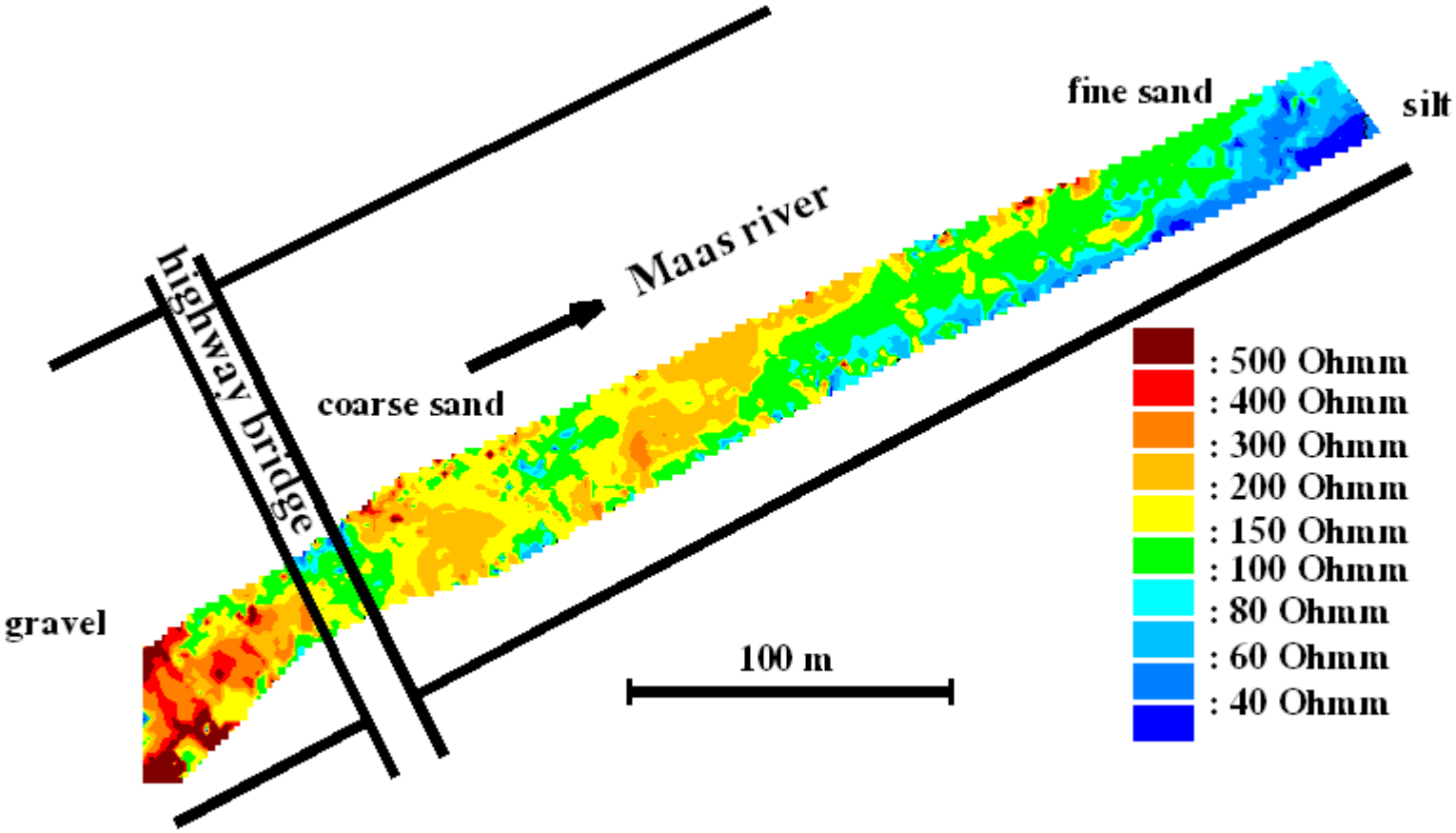


Combining resistivity with seismic reflection and sidescan sonar

Luderitz - Namibia

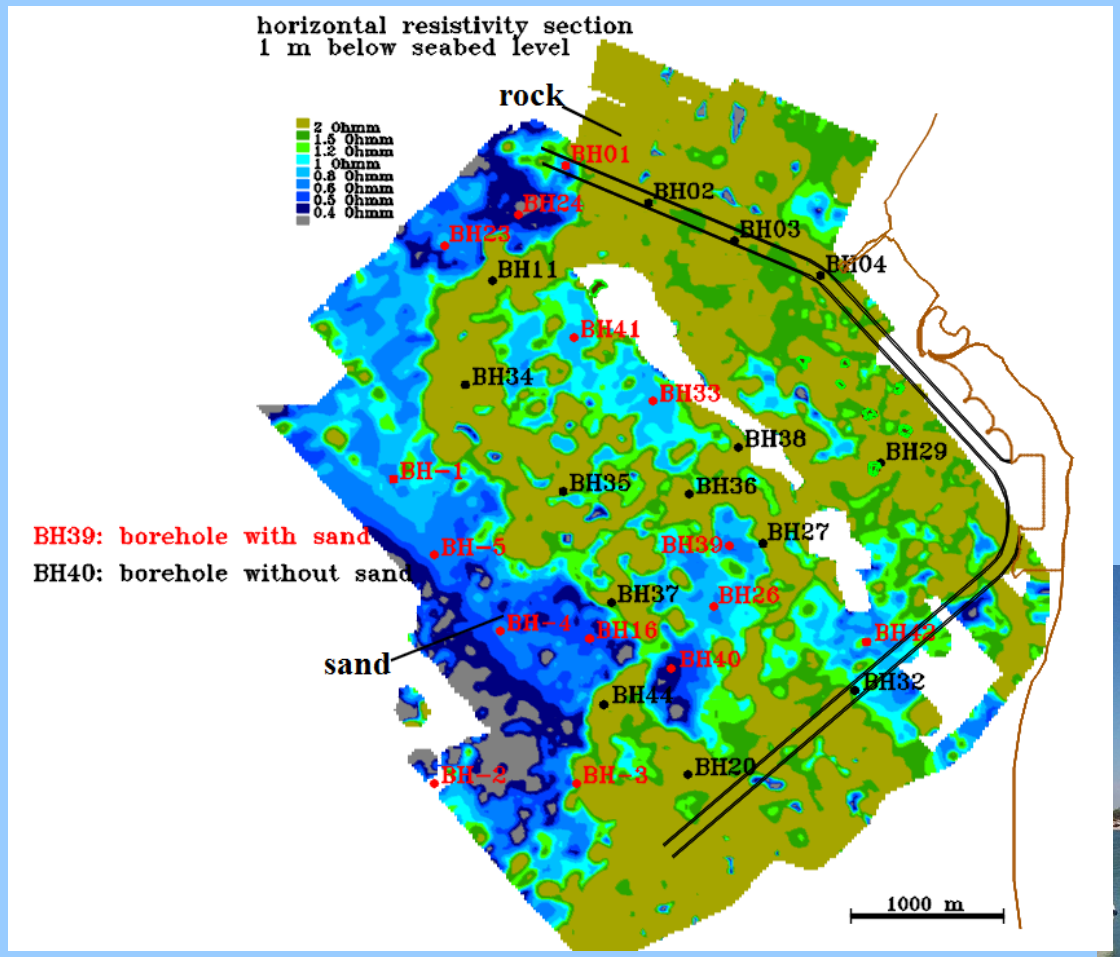


Resistivity and grain size
Qualitative information



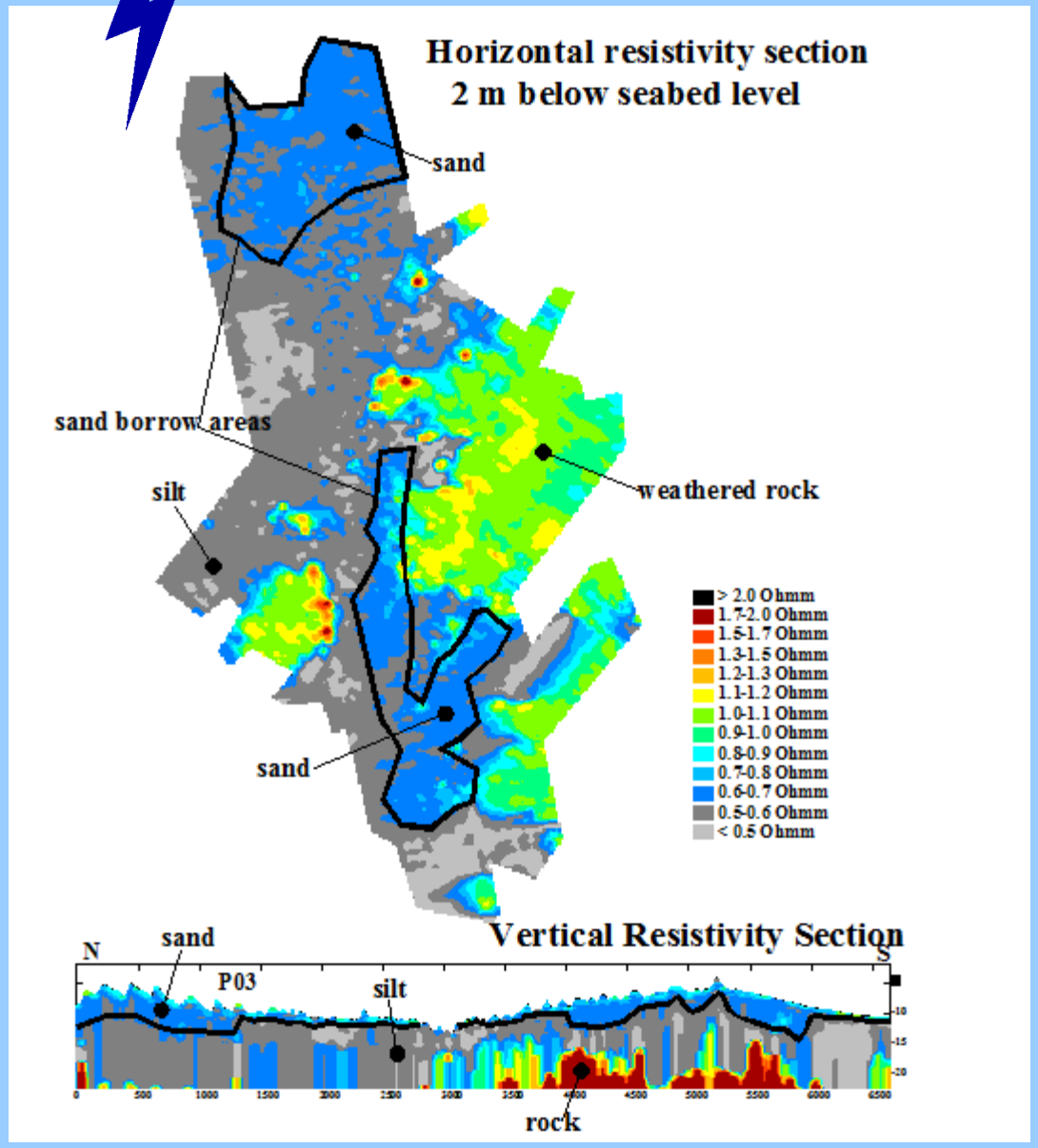
Importance of geophysics versus boreholes

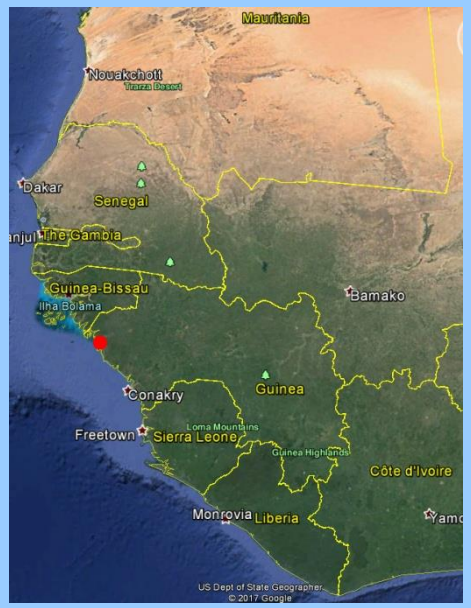
Hawar sand search



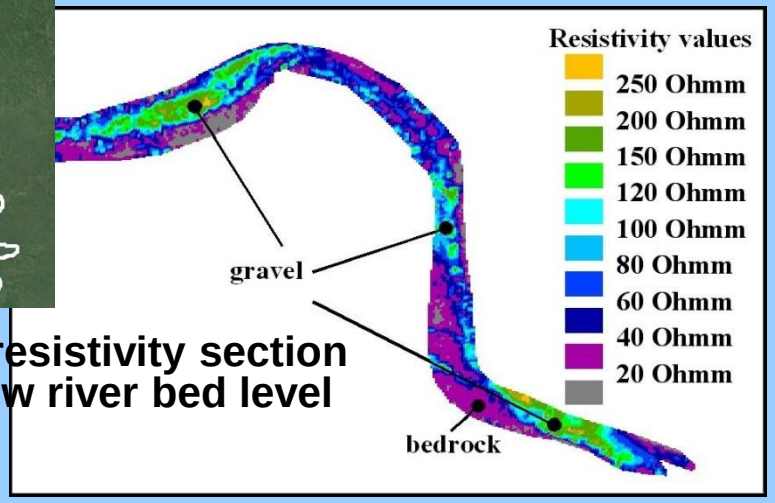
Resistivity Sand Search

Kamsar – Guinea Conakry

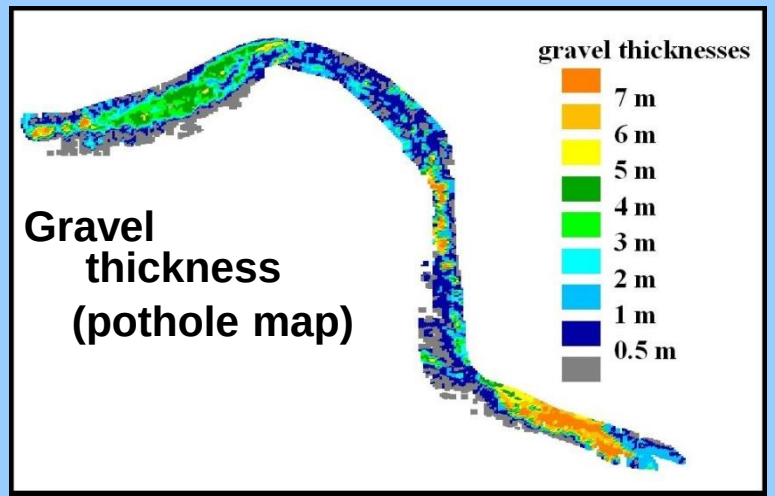




Sankuru River Resistivity Survey

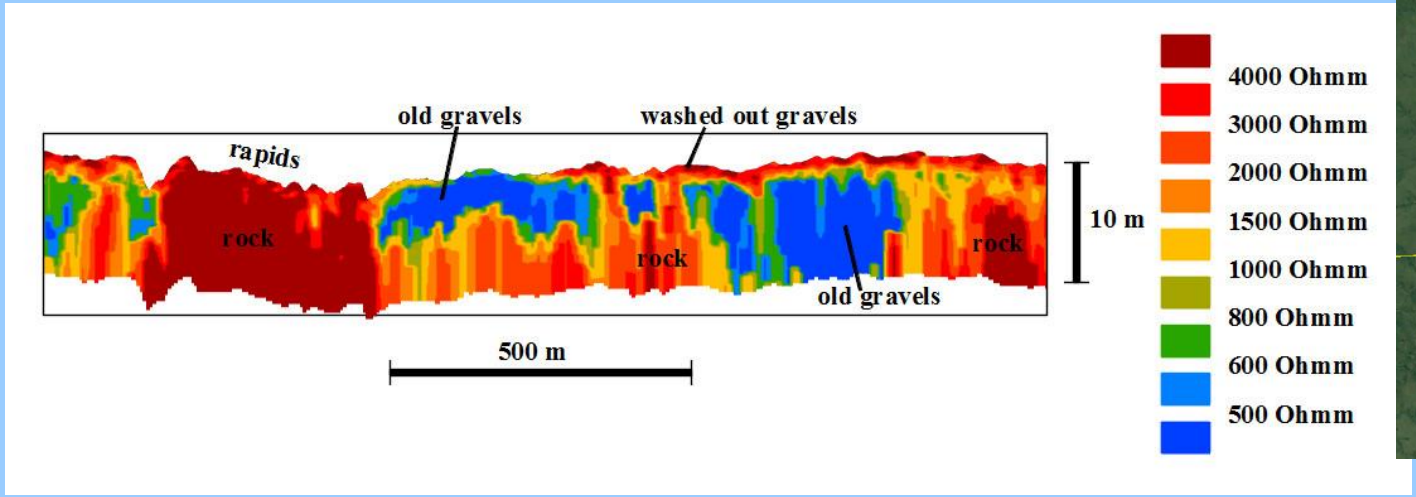


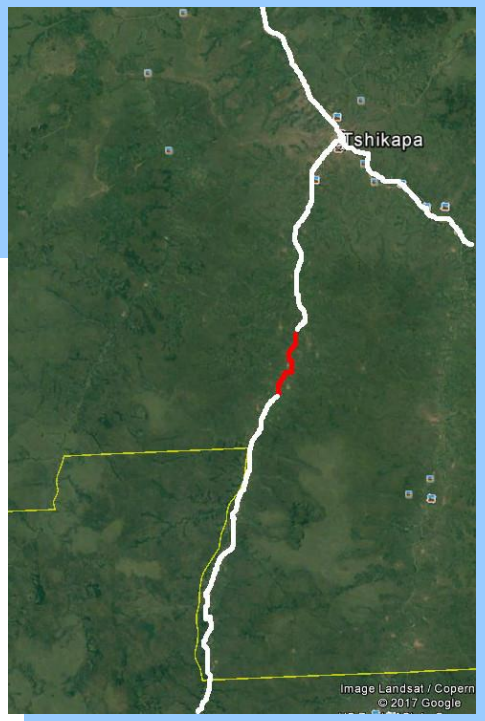
Horizontal resistivity section 2 m below river bed level



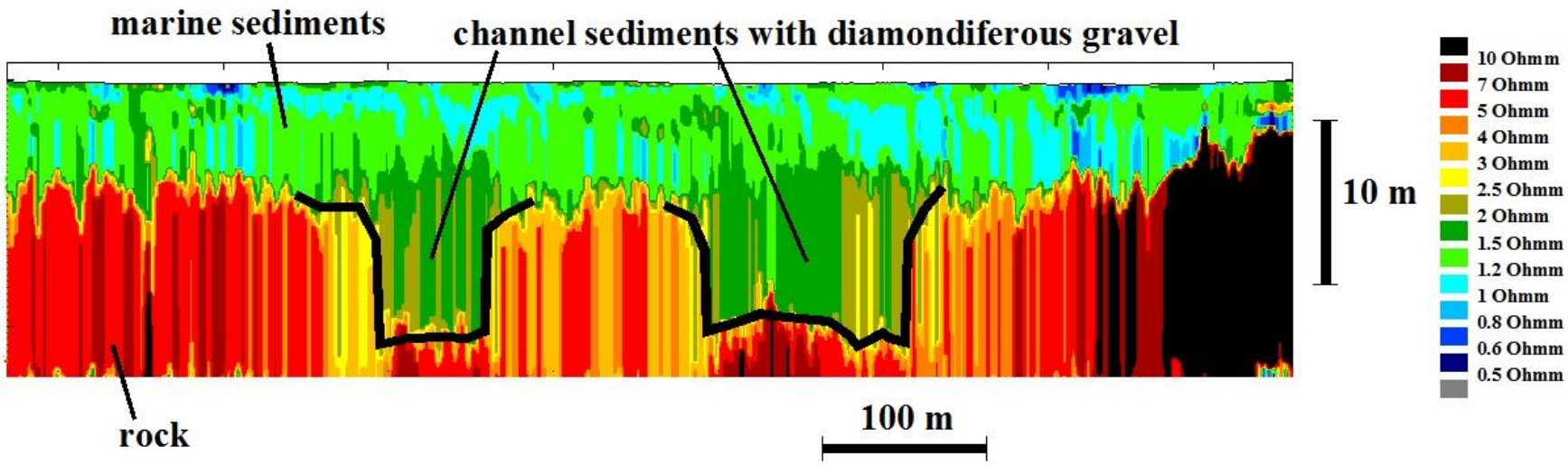
Gravel thickness (pothole map)

Tshikapa River Resistivity Survey





Tractor Resistivity Survey
Noordkaap, South-Africa



Conclusion

Aquares resistivity alluvial exploration:

- Marine applications
- Land applications
- Beach applications
- High resolution 4D Modelling

“We are finally done with the guess work!”

(US Army Corps of Engineers 2004 - Duval County beach renourishment sand search)