

FROM “IMPLEMENTATION” TO “FULL INTEGRATION”:

Development of Geophysics Use at the Minnesota Department of Transportation



TRB Workshop 105: Geophysics: Help Us to Help You

*Sponsored by Committee on Exploration and Classification of Earth Materials (AFP20);
Committee on Soils and Rock Instrumentation (AFS20)*

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Derrick Dasenbrock P.E., Foundations Geomechanics Engineer, Mn/DOT



Geophysics' Role at Mn/DOT:

1.) Pre-Design/Scoping

- *Reconnaissance*
- *To prevent construction cost overruns*

2.) Preliminary Design Phase

- *Complement drilling/CPT data; fill in 'gaps'*
- *Give guidance to additional site investigation*

3.) Failures

- *Roadway settlement, sinkholes in ROW*

4.) 'Rescue' Operations

- *Acquire info where drill rigs are not allowed or cannot be deployed (resistance from property owners, environmental constraints, hazardous waste, power lines, boulder fields, thick forests, water)*



Geophysical Applications at Mn/DOT:

- 1.) General Soil/Rock Stratigraphy & Site Characterization
- 2.) Location/Dimensions of Organic Deposits
- 3.) Bedrock Assessment
- 4.) Buried Structures
- 5.) Cavity Detection
- 6.) *Pollutant Detection*





Electrical Resistivity



Two 8-channel resistivity/IP meters (*AGI SuperSting R8/IP*)

A large number of electrodes (up to 168 at Mn/DOT) to acquire 2D/3D profiles

Use land cables, underwater cables, infinity cables or combinations

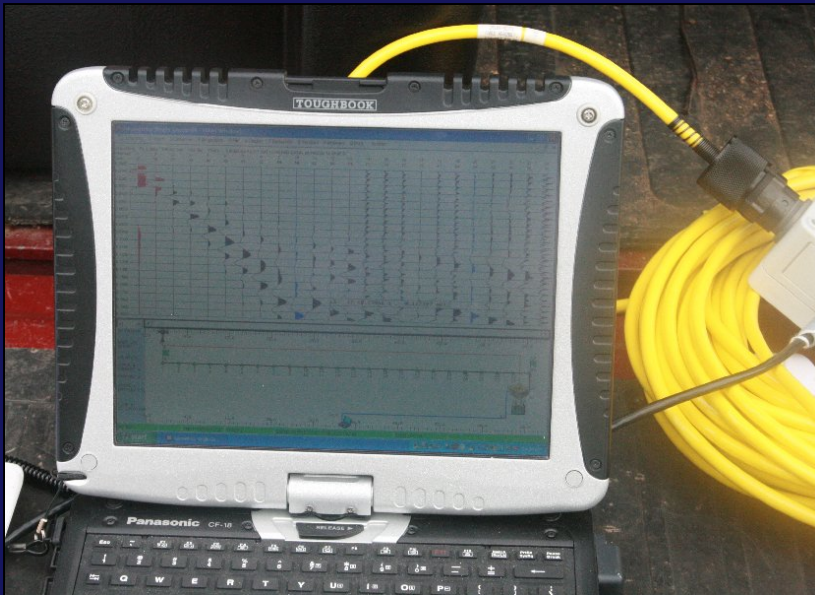
Can perform 'roll-along' surveys

Can perform Induced Polarization surveys

Processing software for inversion of 2D and 3D data sets with terrain correction, roll-along or both



Seismic Geophysical Methods



Refraction and Surface Wave Capabilities

24-Channel Geode by Geometrics

14 Hz Geophones (refraction)

4.5 Hz Geophones (surface wave)

Hammer Source

Field Laptop Computer

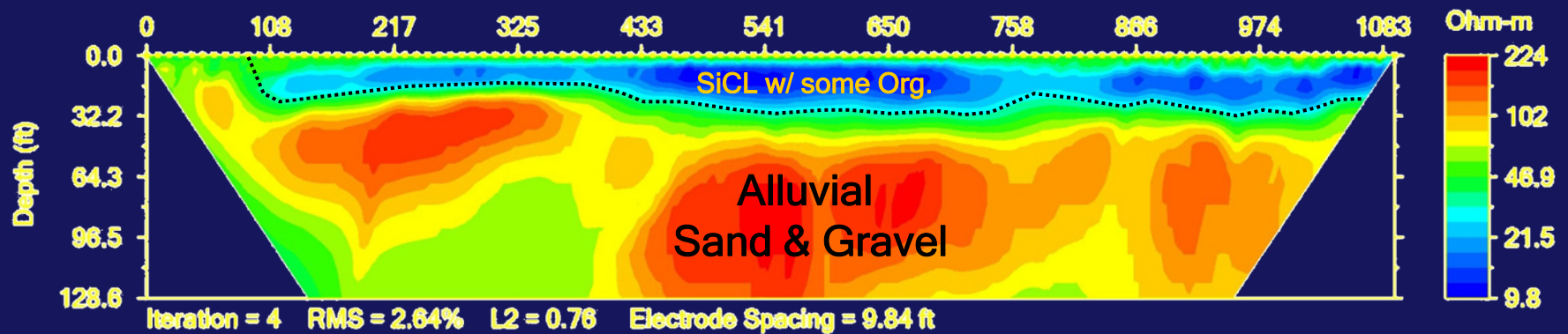
12 Volt Battery





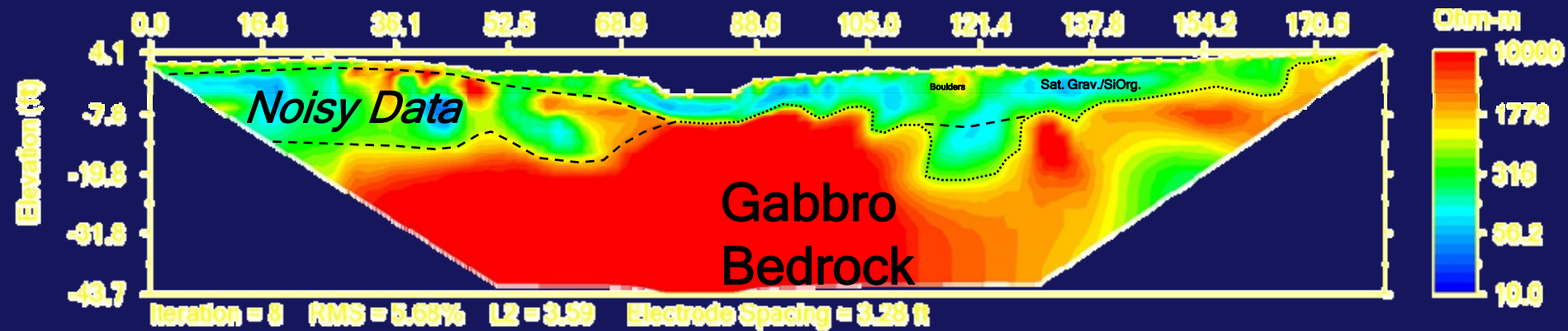
I-90 Dresbach Bridge

Dresbach, MN/ Onalaska, WI



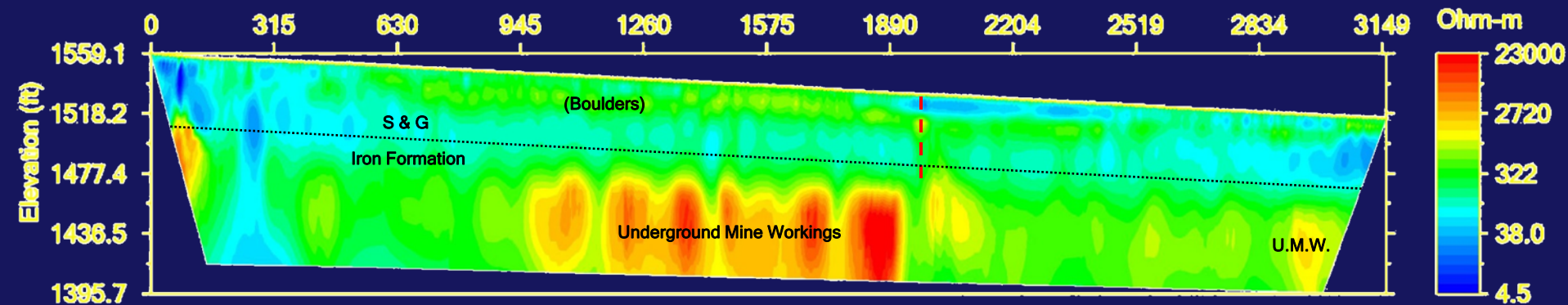
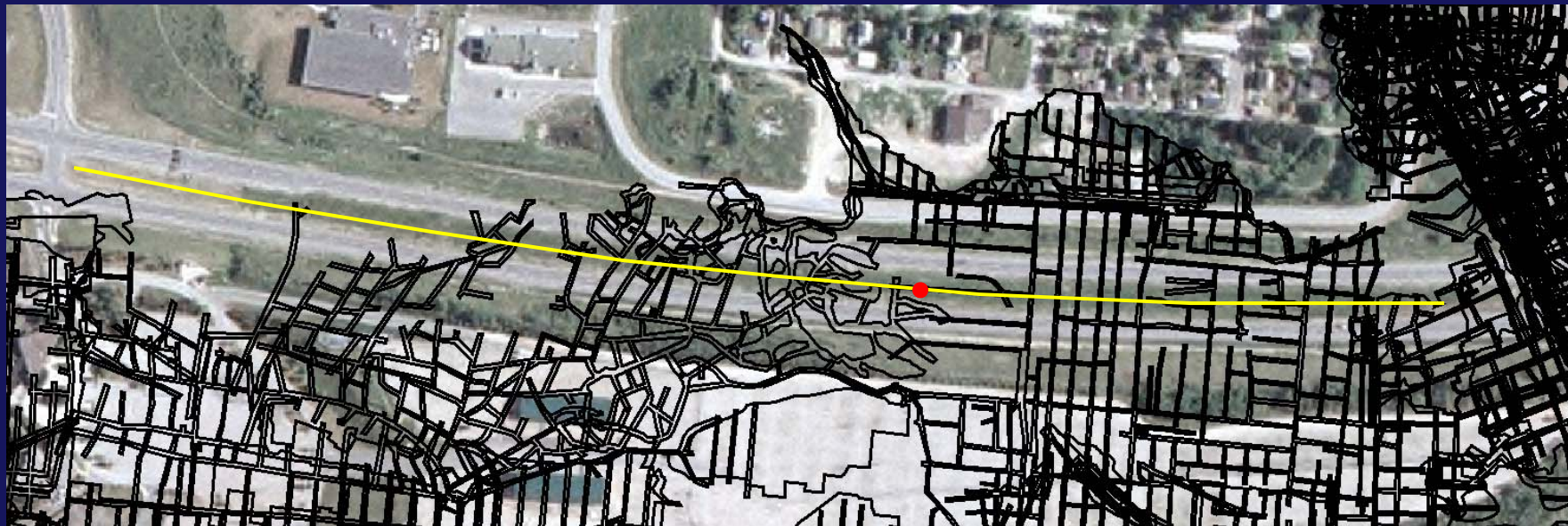
TH53 "Kohl's" Bridge

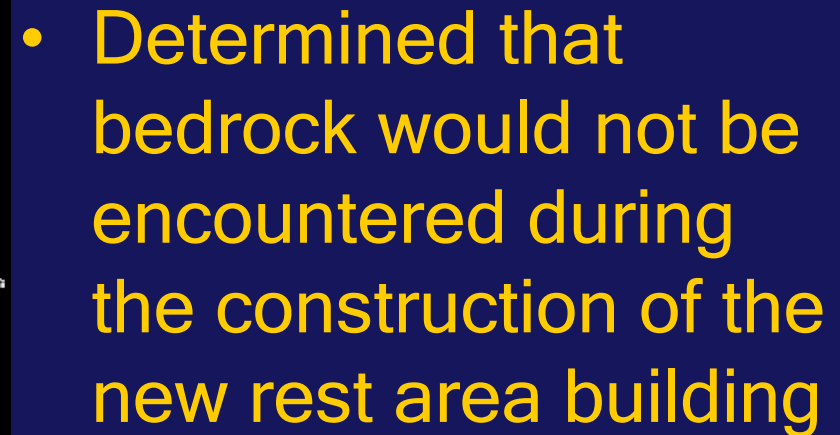
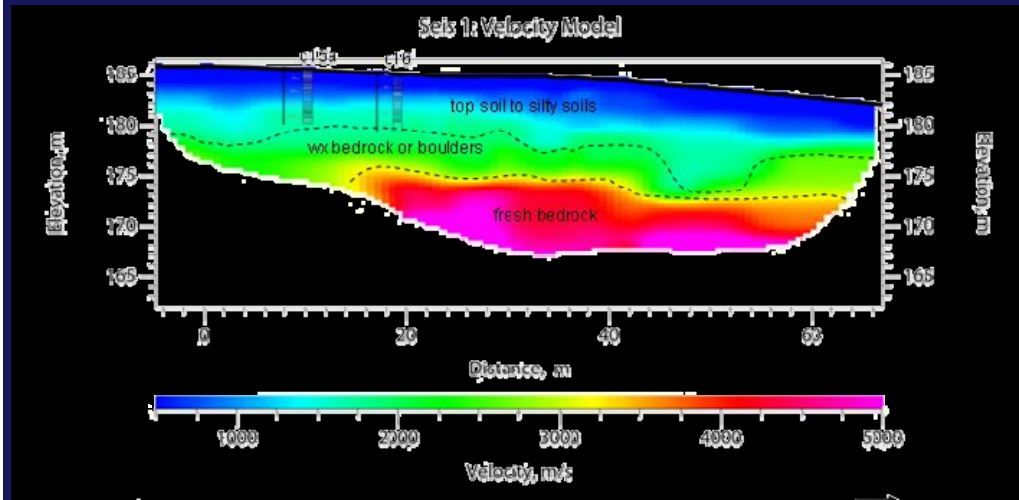
Duluth, MN





TH 169 Underground Mine Working Study Chisholm, MN





QUESTIONS?

With thanks to my geology colleagues for their assistance in preparing this presentation



MN/DOT "TEAM GEOTECH"