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3D Conceptual Site Model Development using Electrical Resistivity Tomography (ERT) for Optimisation of Remedial Design

Steve Hardy - 2011 Remediation Technologies Symposium

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Presentation Outline

Case Study of Petroleum Hydrocarbon Impacted Site

- Site Overview
- Improved understanding of Site Conceptual Model using Electrical Resistivity Tomography (ERT)
- Application for remedial design and optimization

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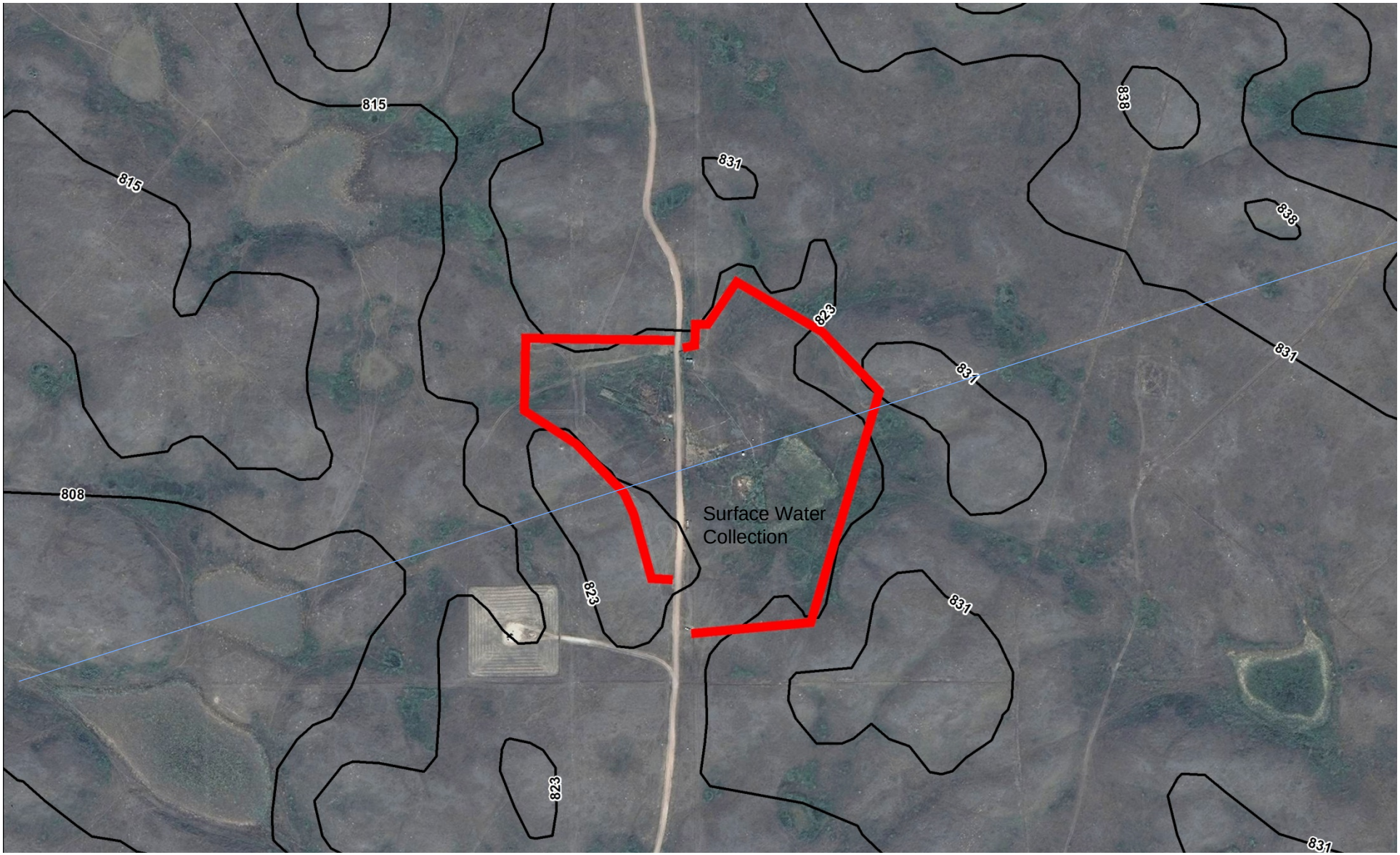
Site Topography



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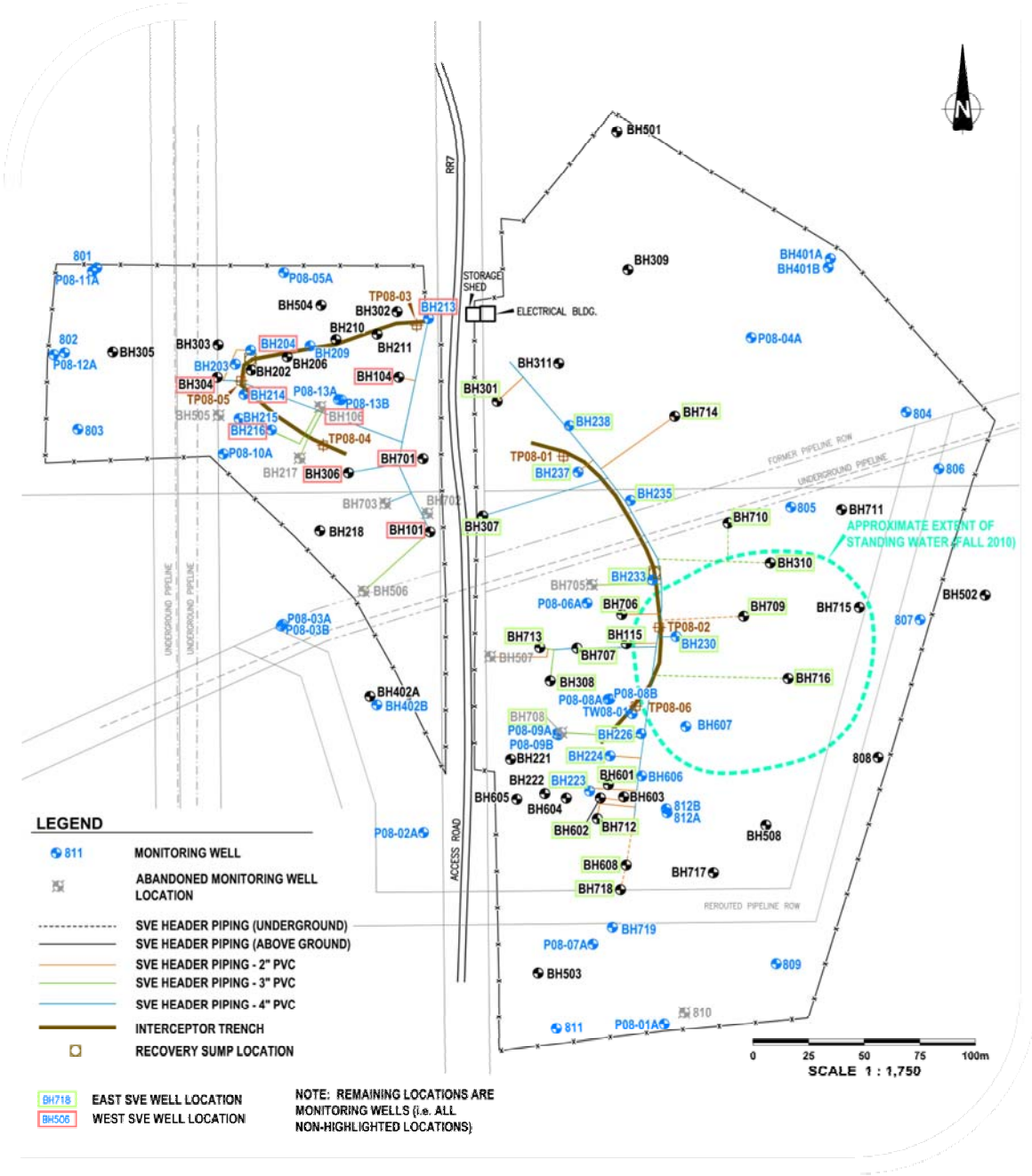
- 1998 Condensate Pipeline Release
- Initial Remediation:
  - groundwater recovery,
  - product recovery,
  - soil vapour recovery.



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Groundwater Controls

Occurrence and Flow Controlled by:

- Local topography
- Interconnectivity of sand layers
- Groundwater fluctuations

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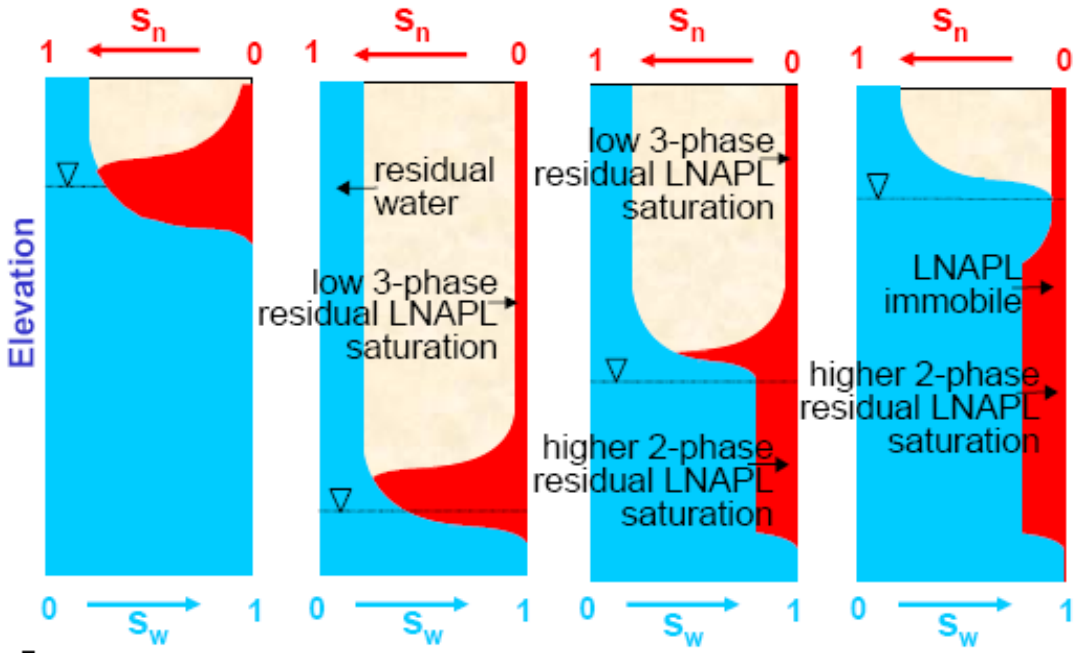
LNAPL

- Groundwater elevations have increased at the site since initial remedial
- LNAPL likely entrapped below the groundwater surface



Interstate Technology Regulatory Council, 2010. LNAPL Training Part 1:An Improved Understanding of LNAPL Behaviour in the Subsurface

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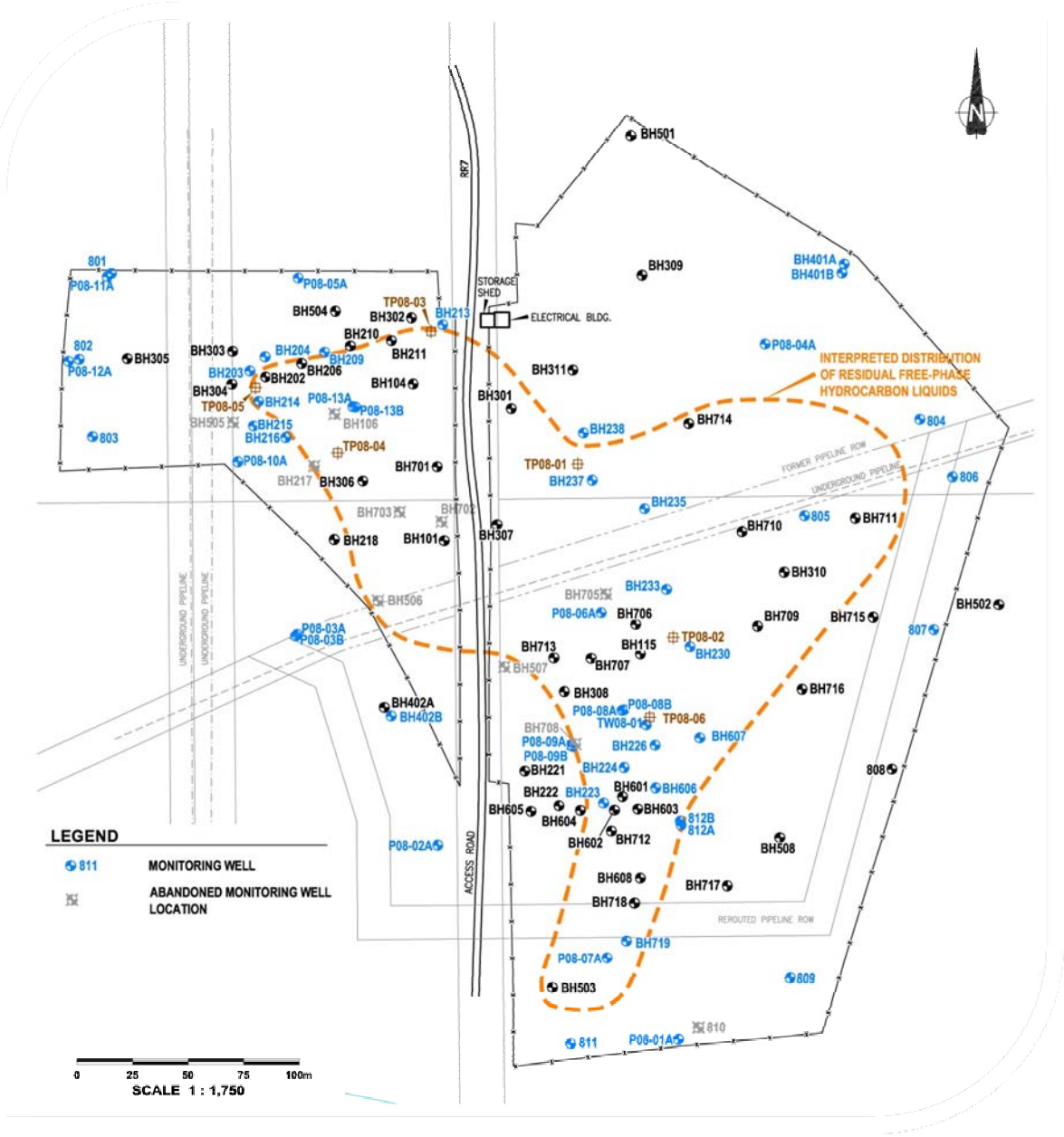
- Interpreted foot print of residual free-phase hydrocarbon liquids
- Dissolved and potentially free-phase product moving to south



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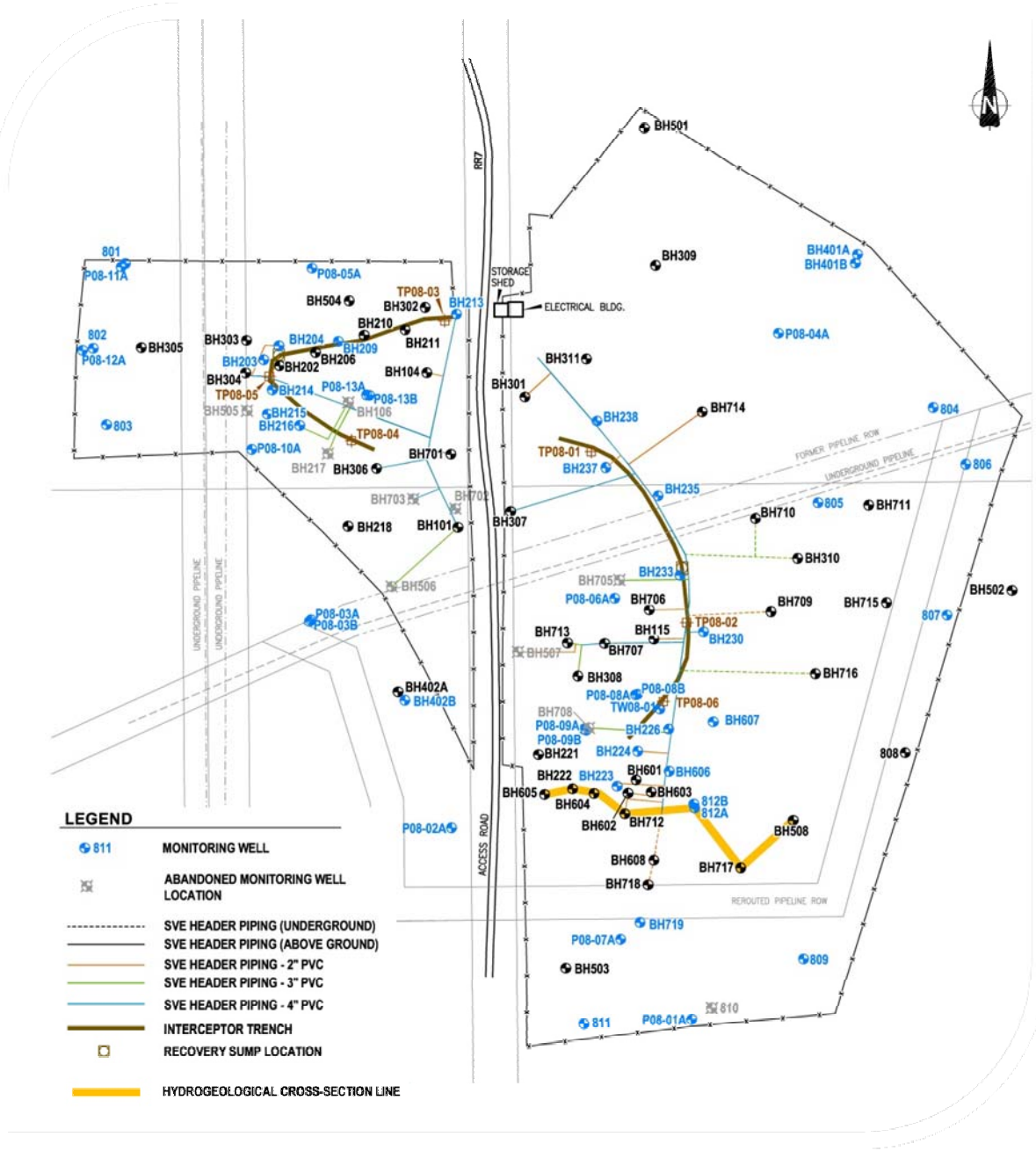
- Hydrogeological Cross Section



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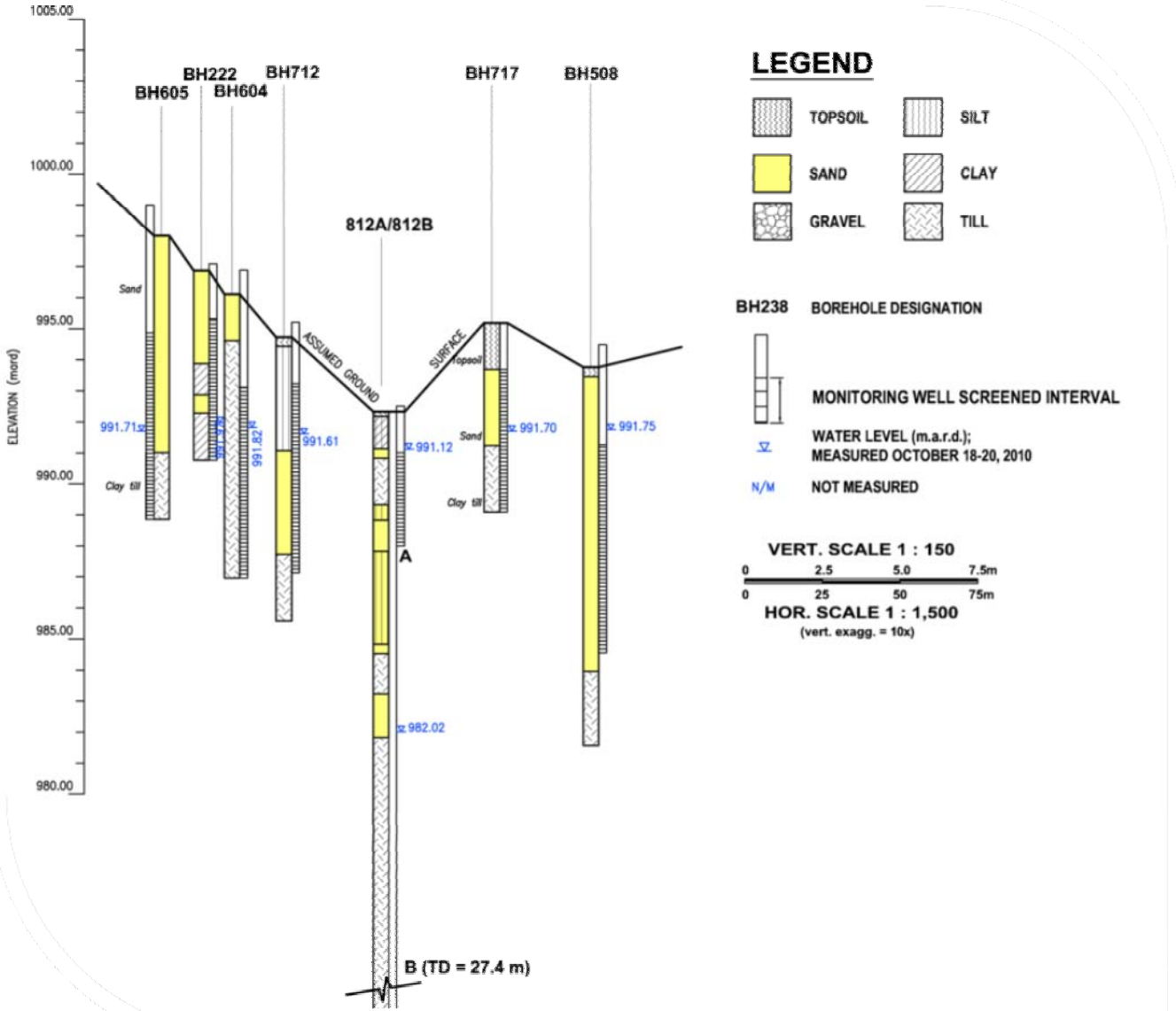
- Sand Content Variable
- How are units connected?



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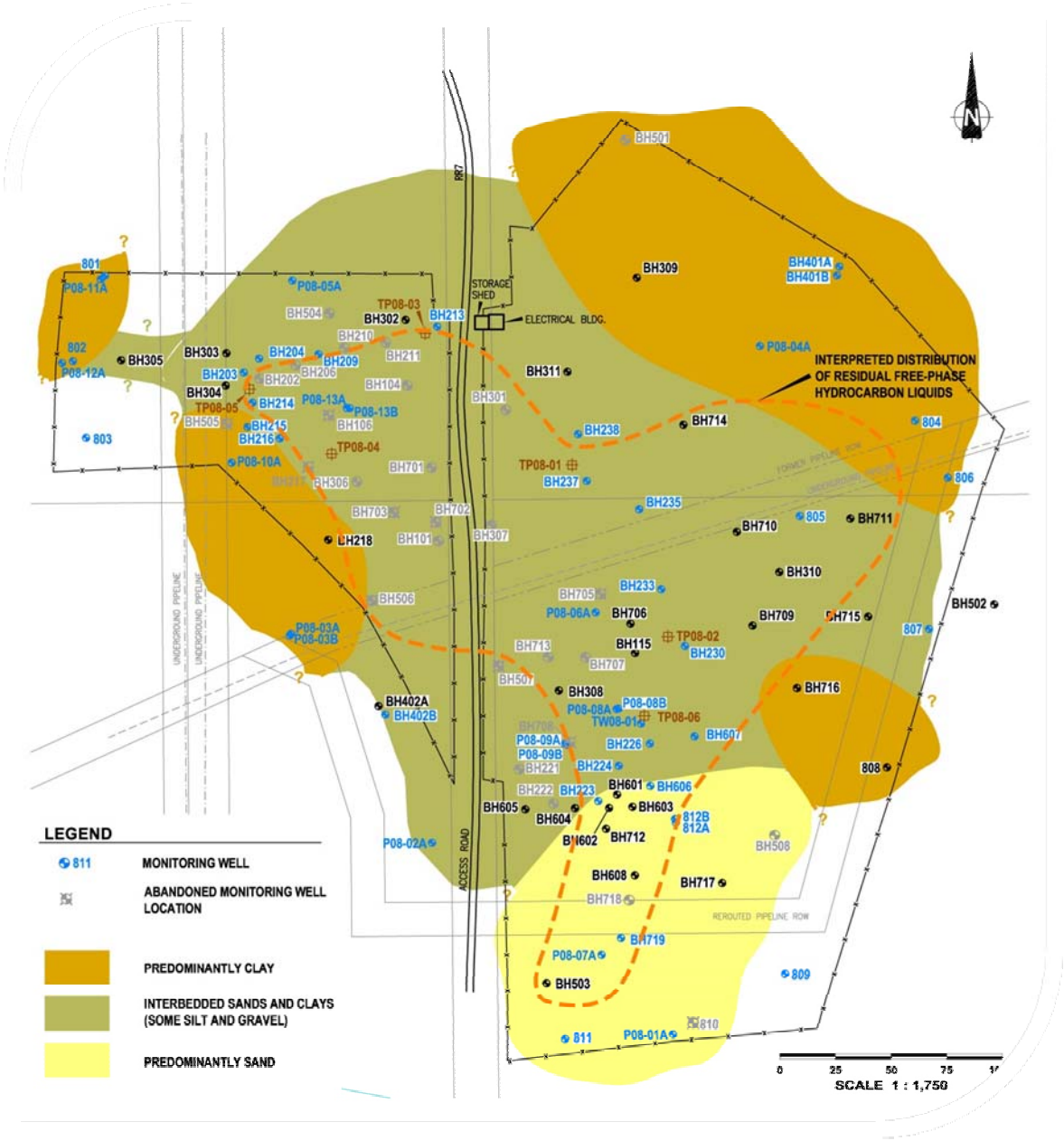
- Distribution of:
  - Sand;
  - Clay; and,
  - Interbedded sands and clay



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Mapping Stratigraphy with Geophysics

- Many geophysical techniques used in environmental investigations are focused on mapping salt impacts based on variations in conductivity
- Clay has a higher conductivity than sand
- Electrical Resistivity Tomography (ERT) selected to map subsurface geology

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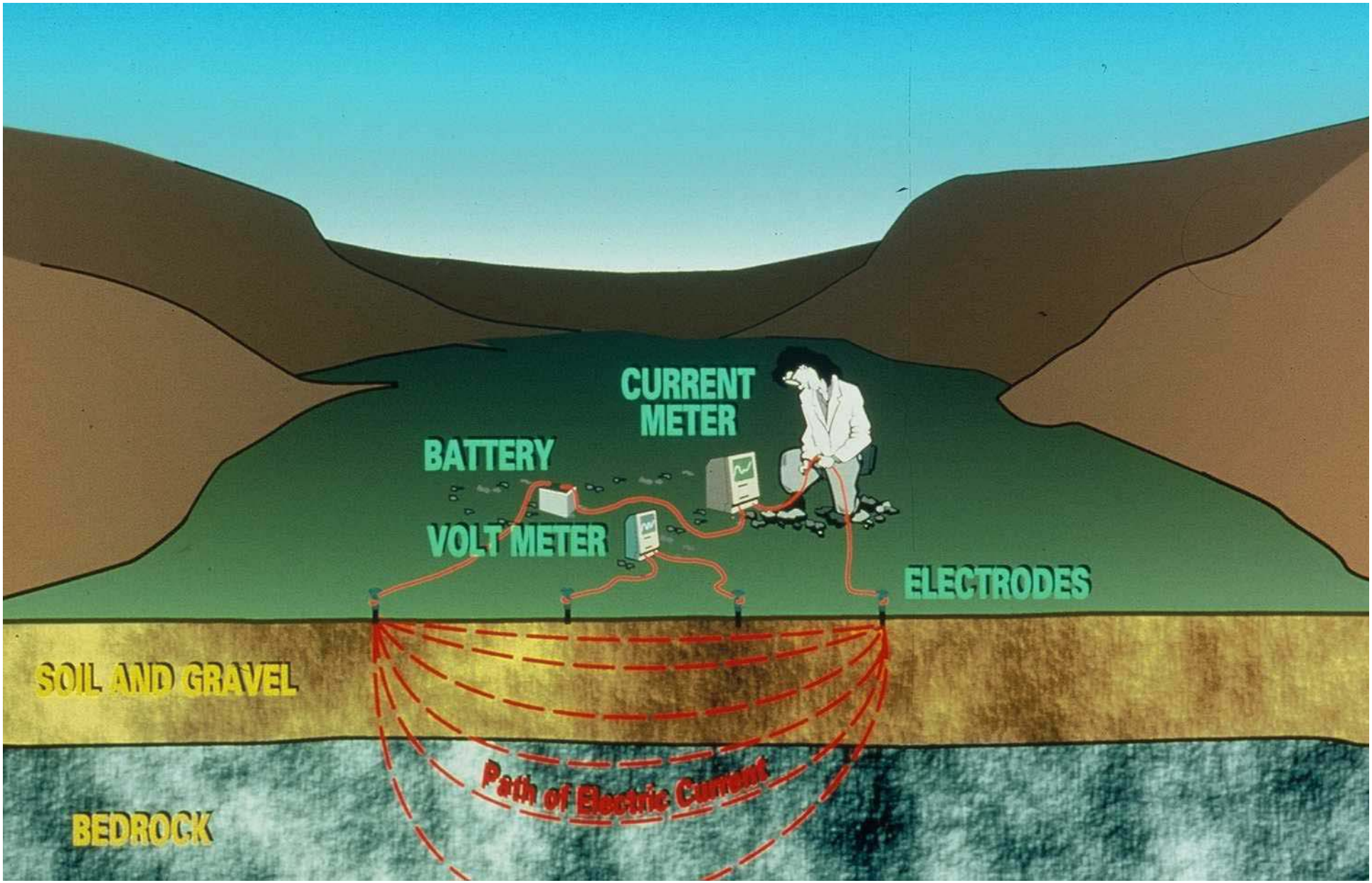
ERT Set Up



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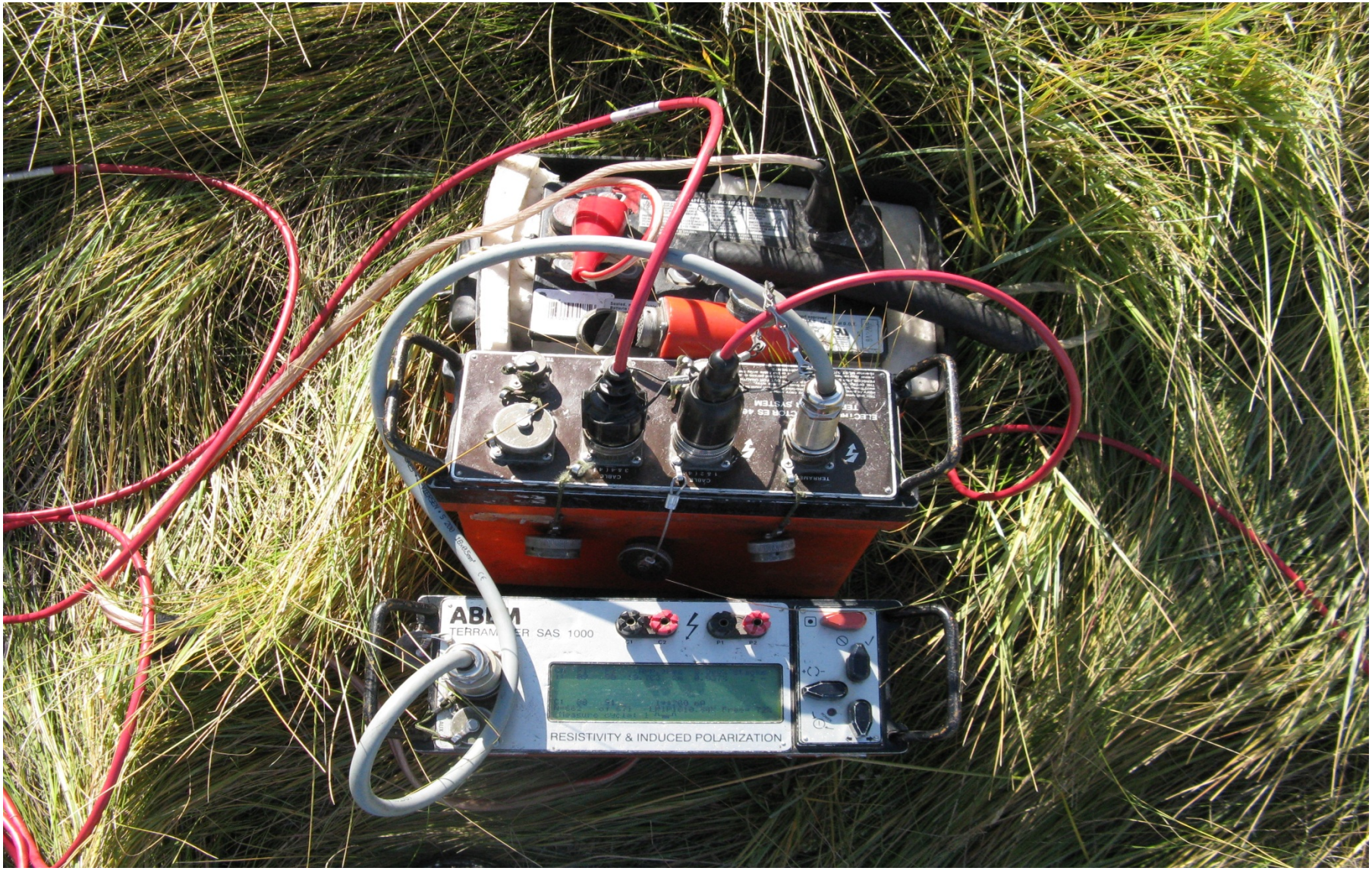
ERT Instrumentation



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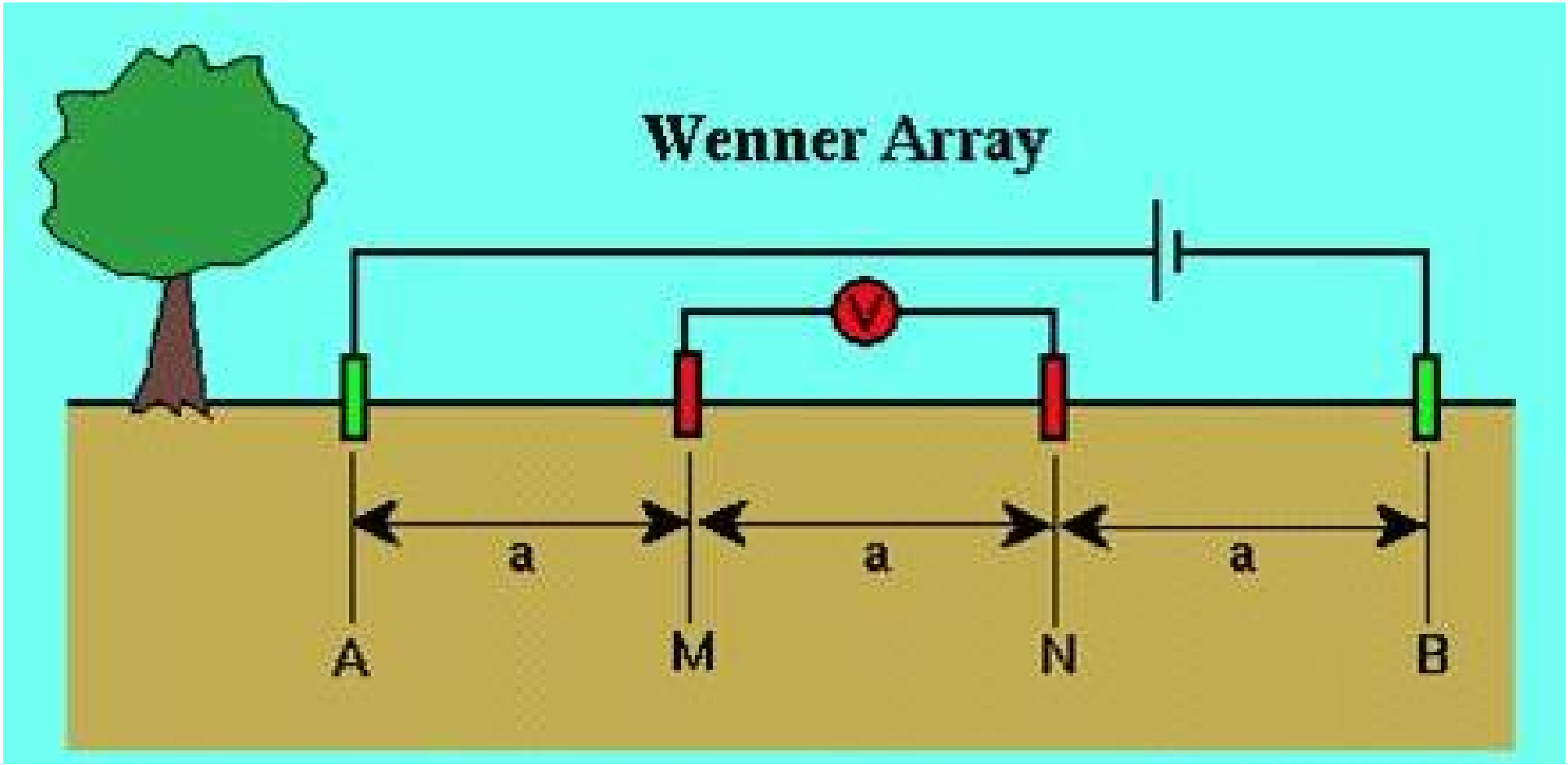
Wenner Array



Data Distribution in ERT Survey

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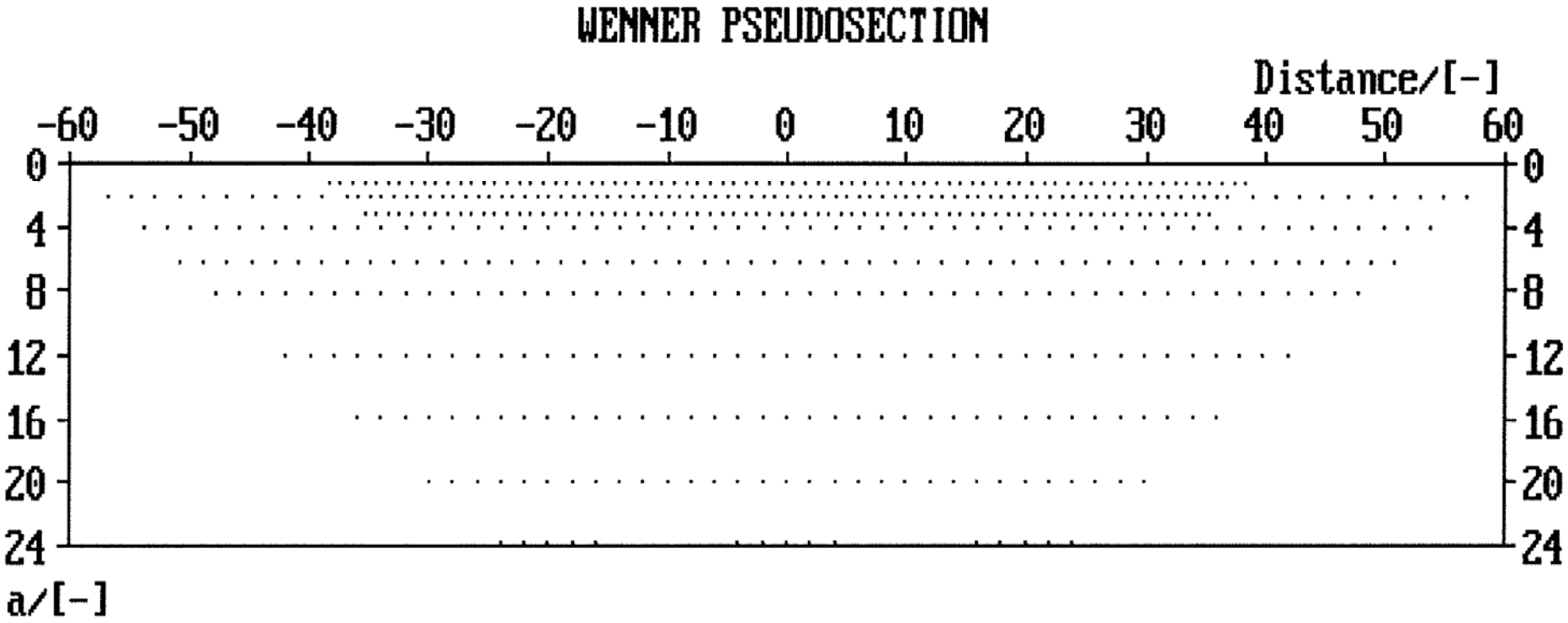
Protocol	Array Type	Address File	Size .ORG	Size .UP/.DWN
WENNER_L	Wenner-α	LONG	258	113
WENNER_S	Wenner-α	SHORT	87	50
Sum			345	163



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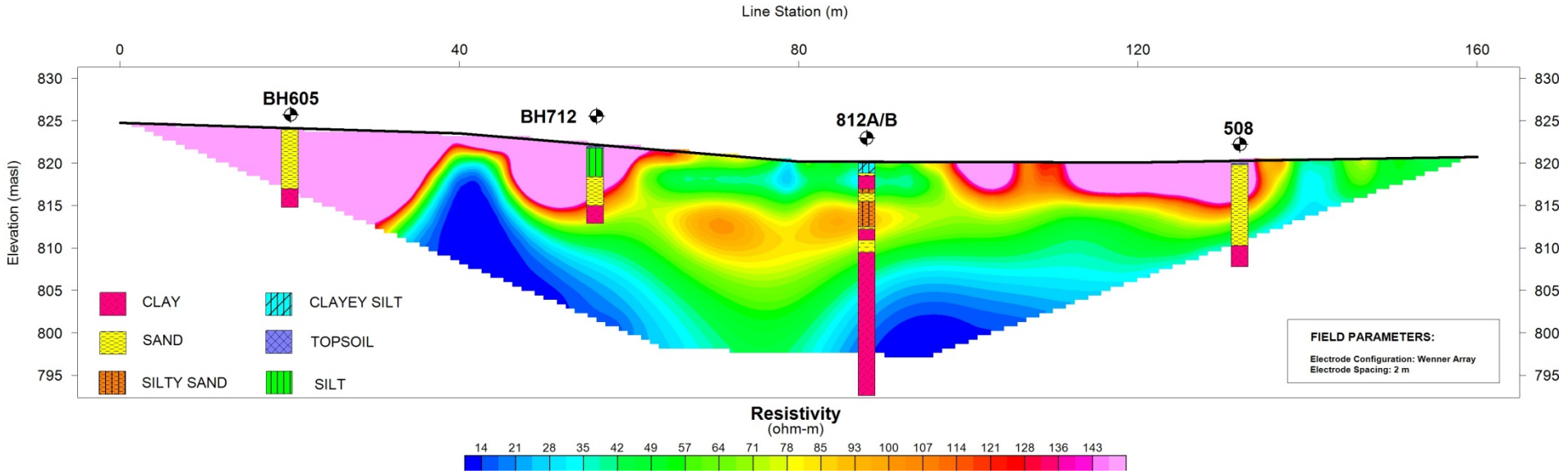
ERT Line IP0903

- Subsurface Resistivity at Line IP0903
- Warmer colours (i.e. red and pink) indicate areas of higher resistivity
- Cooler colours (i.e. blue) indicate low resistivity



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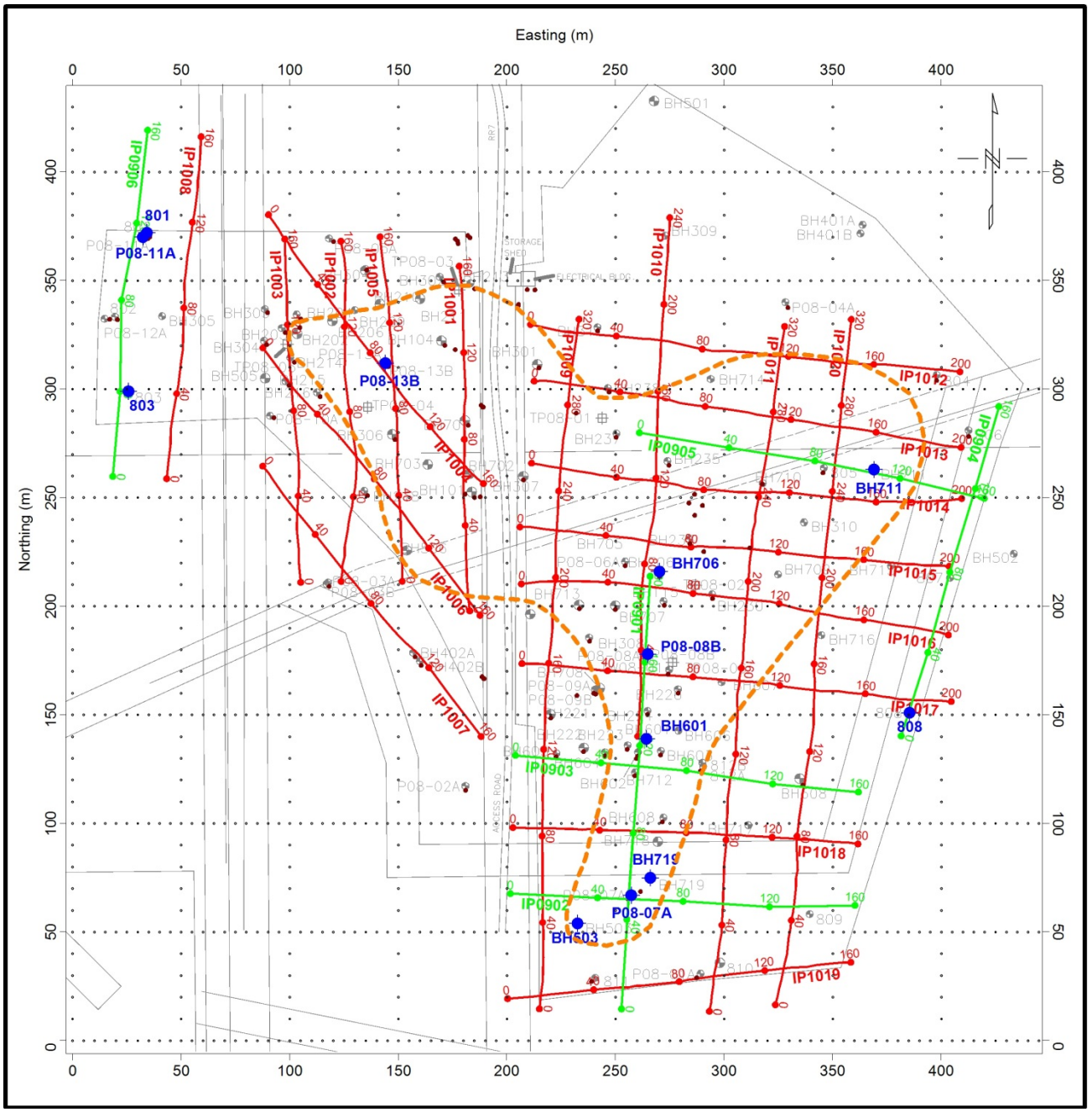
- Twenty-six ERT survey lines
- Lines range from 160 to 320 m in length



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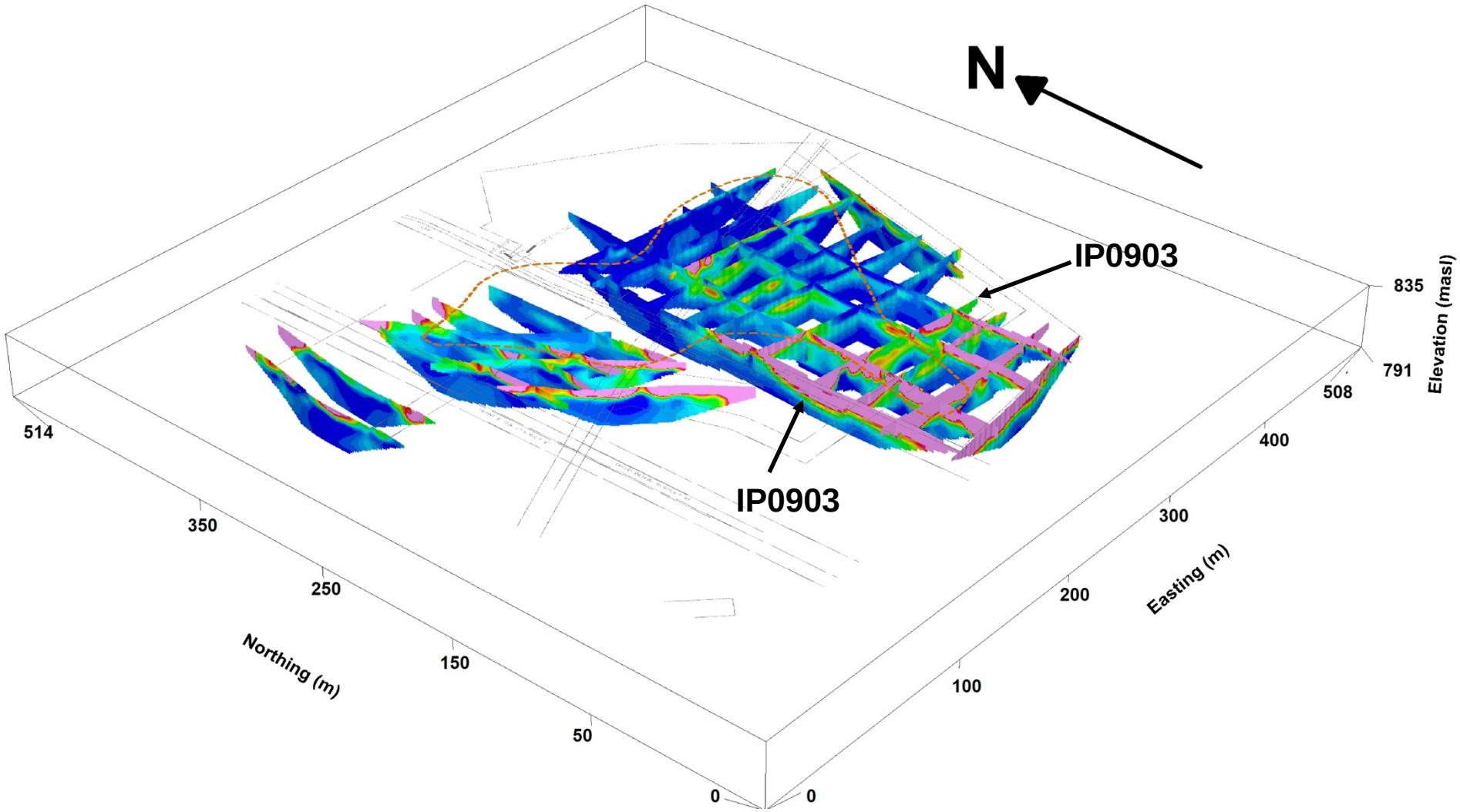
3-D Model View



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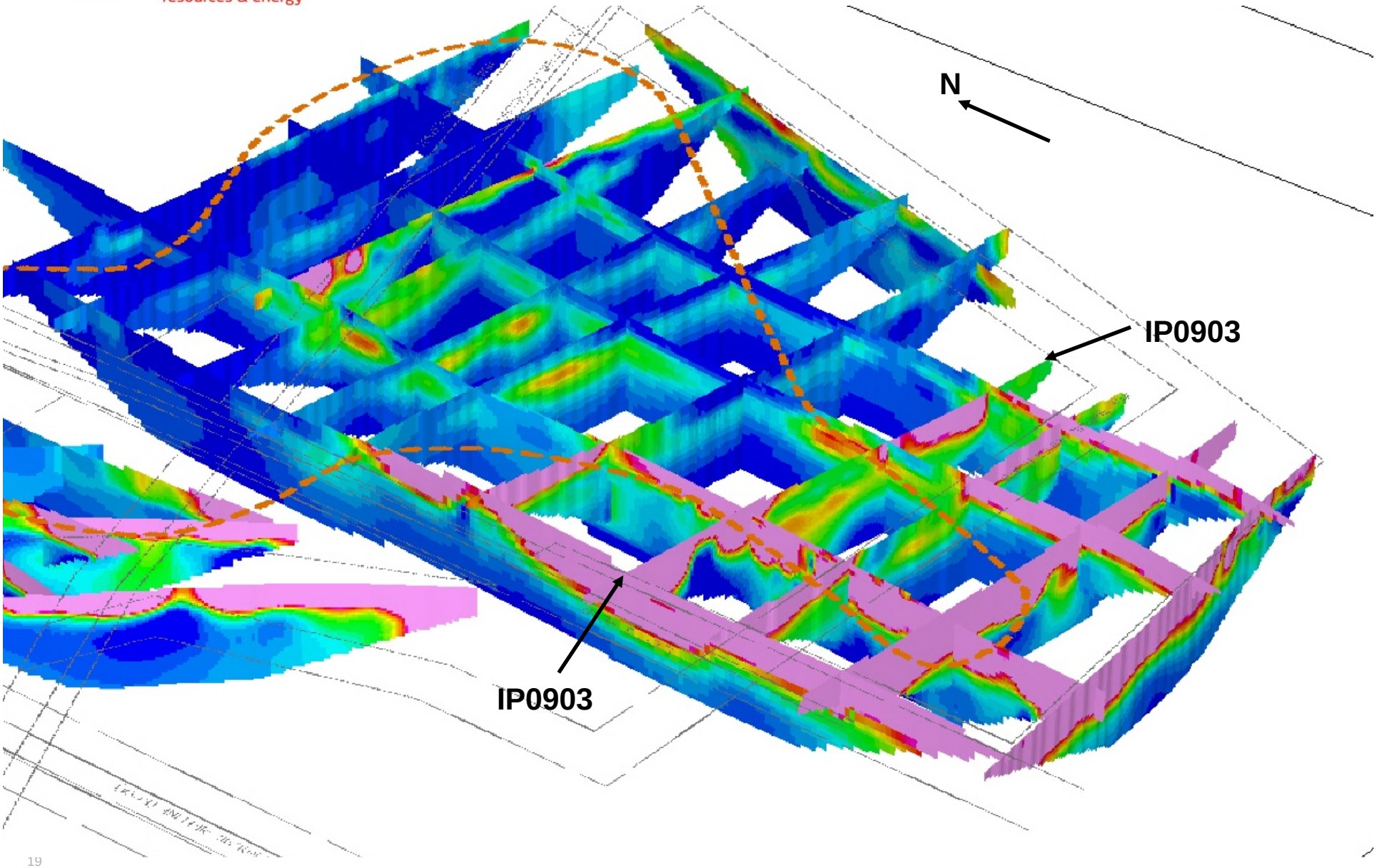
3-D Model View



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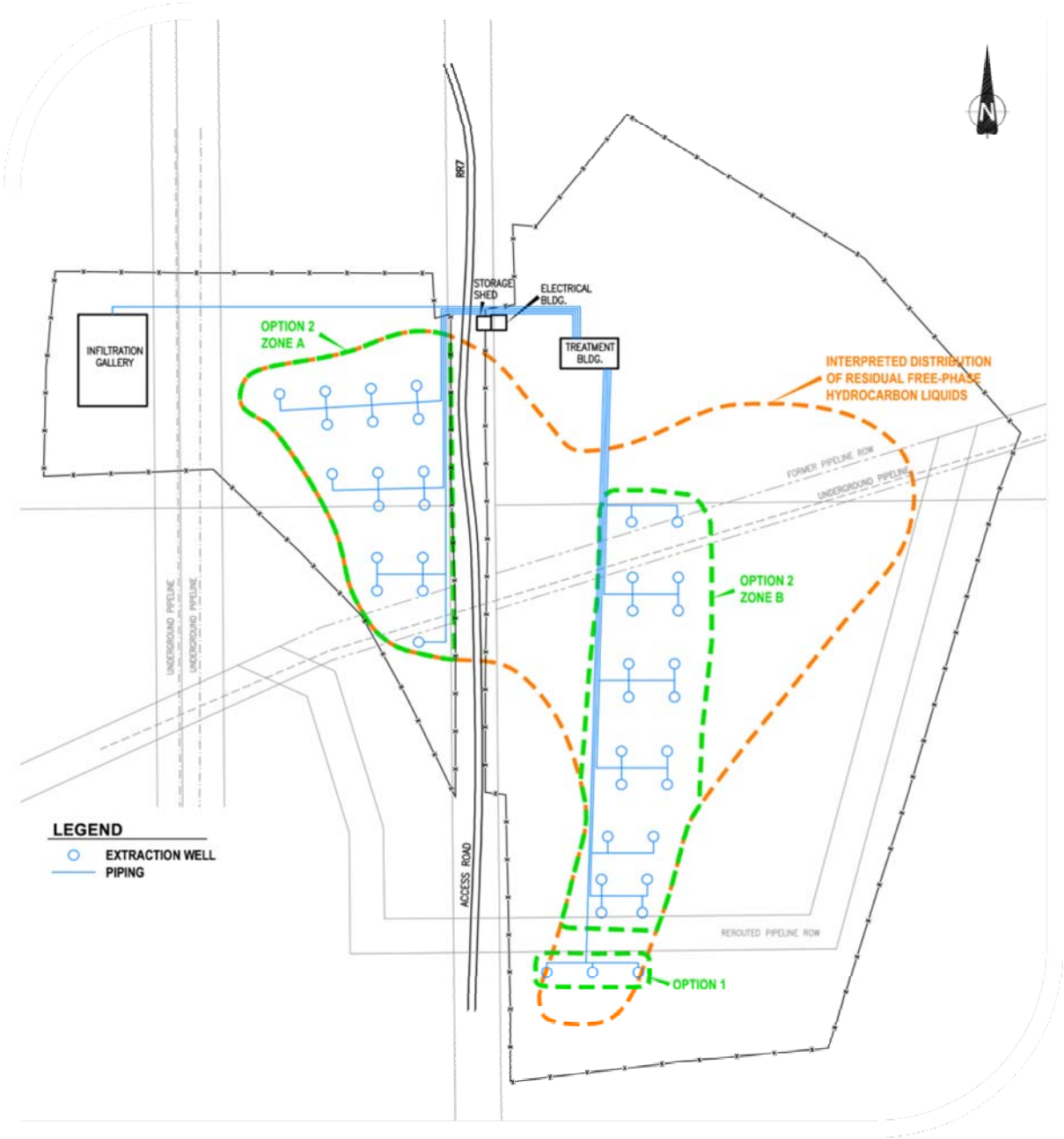
- Conceptual Design
  - Remediation Targets



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Thank You