CASE STUDY:

MT. MAJOR AQUIFER MAPPING USING BOTH COINCIDENT AND IN LOOP CONFIGURATIONS

This report describes results obtained from a field survey conducted in central Victoria, Australia. An 875 m profile was completed along the western margin of Mt Major (Figure 1). The survey area was open farmland. The objective was to accurately map the lateral extent and provide depth and dip information for a fault confined aquifer system.

FIGURE 1: Survey Location. Transmission tower is evident in the skyline above the TRC-1.

While the site was clear from any substantial artefacts, a transmission tower was located at the top of Mt Major (Figure 1b) and was expected to contribute significant ambient noise levels.

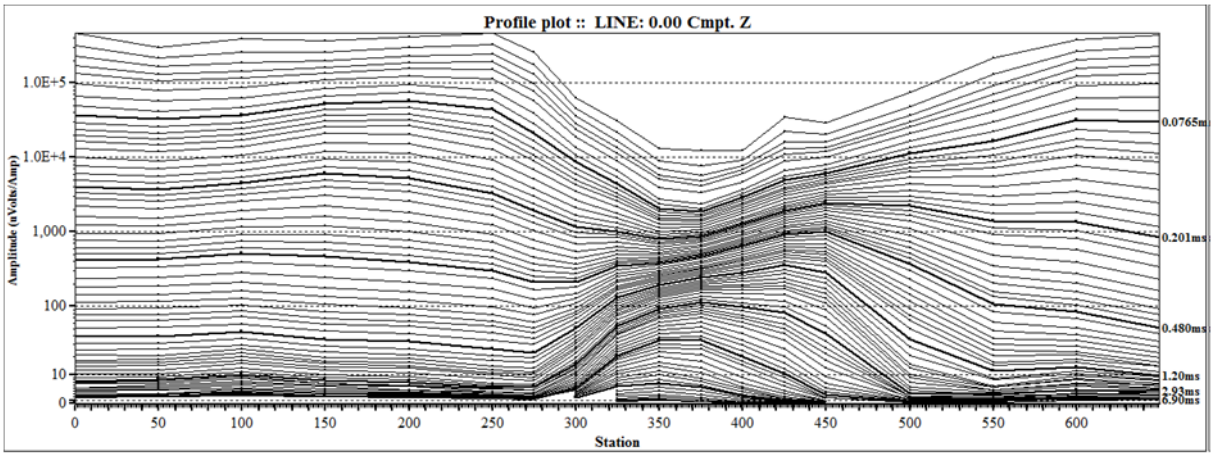
Soundings were obtained using both a 50 m x 50 m Coincident Loop configuration and an In Loop configuration using the TRC-1 coil. While both configurations were not strictly required, this survey did represent an ideal opportunity to compare and contrast the benefits of the TRC-1 over the logistically more involved Coincident Loop setup. A single channel terraTEM system (Figure 2) was utilised to obtain the Time Domain response soundings curves.

As standard in good survey practice, multiple readings were completed at each site. This allowed qualitative information regarding individual sounding repeatability to be obtained. This is in addition to the Standard Deviation information provided as standard by the terraTEM.

Stacks were 256 and 1,024 for Coincident and In-Loop configurations, respectively. Transmitter current was 6.7 Amps and the ramp was 26.6 µs. The TRC-1 coil has an effective area of 1,000m^2 and a 60 kHz bandwidth. For the small moving loop, particularly in open terrain, a cable was used to link the TRC-1 to the terraTEM located in the corner of the transmitter loop. As the terraTEM contains both a 10 Amp Transmitter and the Receiver within the same package it is extremely portable and the survey was readily completed by two people. A single ± 12 Volt battery pack was sufficient for completion of this profile.

Figure 2: Field photograph of the terraTEM

Data presented in Figure 3 and Figure 4 were generated using the inbuilt data reduction and processing package available as an option to be installed on either the terraTEM and/or personal computer. This provides the field operator with a rapid and easy method of assessing data quality whilst in the field and also refine the survey configuration when in close proximity to an anomalous zone. The sounding separation was changed from 50m centres to 25m centres over the area of interest. In addition the period was also increased over the conductive anomaly to better resolve its structure at depth.



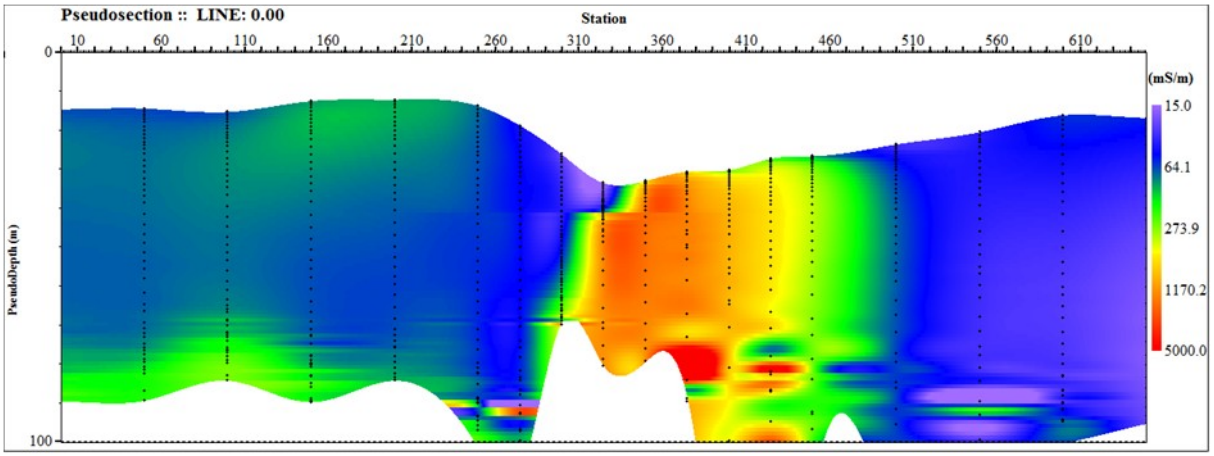


FIGURE 3: Profile plot and Apparent Conductivity Pseudosection of data from a 50m Coincident Loop configuration

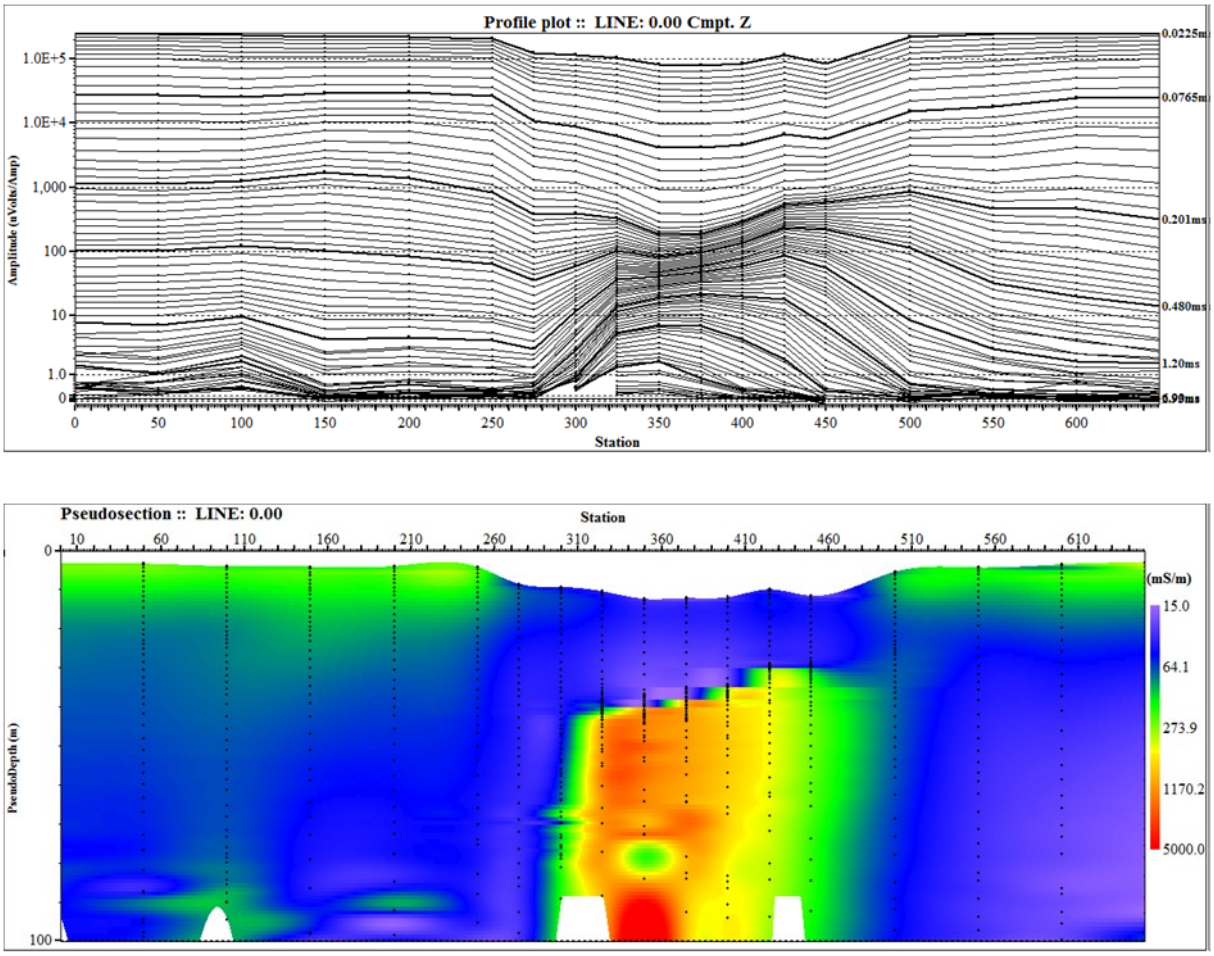


FIGURE 4: Profile plot and Apparent Conductivity Pseudosection of data from a 50m In Loop configuration. The sharp upper boundary of the conductive zone is a consequence of the marked difference in conductivity at the transition from the resistive near-surface response to the confined conductor response. This can create a minor undershoot in depth estimates derived from transformation.

Clearly evident in both Profile plots is the conductive feature extending from 275m to 450m. This corresponded with the location of a large-scale fracture containing potable water that is currently being used for both human and livestock purposes. Transforming the data into an Apparent Conductivity Pseudosection allows a geo-electric section to be created that conveys more geological information. In particular, estimates of apparent conductivity and depth can be obtained. As expected, there is no significant difference in response from the Coincident and In Loop configurations. There is slightly more definition of near-surface (<15m) information from the In Loop configuration due primarily to the reduced amplitude of the centrally located TRC-1 receiver. The larger physical area of the Coincident Loop configuration does provide higher signal to noise levels at late-times translating to a more reliable estimation of apparent conductivity at depth.

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