
Part 4:

Regional interpretation, Dolcoath Granite

Introduction

The Dolcoath survey area covers part of the northern extent of the Cambrian Mt Read Volcanics and the outcropping Dolcoath Granite (427 000 mE, 5 406 000 mN), as well as areas of shallow granite interpreted from regional potential field data (Leaman and Richardson, 1989). The Cambrian Dove Granite crops out in the south of the survey area (around 422 000 mE, 5 397 000 mN and 426 500 mE, 5 398 000 mN). Mineralisation in the area is related to the Devonian Dolcoath Granite, and the area is prospective for tin-tungsten, lead-silver and gold (Leaman and Richardson, 1989). Regional geology is shown in Figure 4.1.

Interpretation

Apparent resistivity maps

The 980 Hz VCX apparent resistivity and HCP ternary apparent conductivity maps of the survey area are shown in Figures 4.2 and 4.3. TMI and ternary radiometric images from the WTRMP regional survey are shown in Figures 4.4 and 4.5. Quantitative interpretation of magnetic data from parts of the Dolcoath HEM survey area has been performed by Leaman (2002). A digital elevation model derived from the HEM radar and GPS altimeter data is shown in Figure 4.6.

Extra-high voltage power lines crossing the survey area are responsible for prominent artifacts in both apparent resistivity maps (fig. 4.2 and 4.3) and conductivity depth slices (fig. 4.14–4.16). Figure 4.7 shows the location of both high voltage and extra-high voltage power lines, as well as the distribution of known mineralisation.

Apparent resistivity and ternary conductivity maps are dominated by responses due to widespread Tertiary basalts, which obscure the responses of deeper conductors within the underlying Ordovician and Cambrian sequences. Although the HEM data shows good general agreement with the mapped geology, it provides relatively little new geological information. The comparatively poor quality of the data from this survey is considered to be due mainly to the difficulty of the terrain, particularly around Lake Cethana and the Dove River valley (422 000 mE–430 000 mE) where bird altitudes of >50 m are common. The 34 kHz calibration problem with Bird 2 (see *Data Processing* section, Part 1) affected all flights in the Dolcoath survey, and may have adversely affected the results of conductivity-depth processing of the data.

Major features of the HEM apparent resistivity map are marked by the letters A–I on Figure 4.8. These are discussed individually below.

- A. Northwest-trending linears north and east of the Dolcoath granite show a strong correspondence with topography. Most of the conductive trends are presumably due to alluvium within modern drainages.
- B. A local conductor at 426 800 mE, 5 407 050 mN occurs close to the end of a pipeline or tunnel supplying power generation facilities at Lake Cethana (the linear drainage extending from 423 400 mE, 5 407 800 mN to 426 750 mE, 5 407 000 mN on fig. 4.6), and is most likely to be of cultural origin.
- C. An arcuate conductive trend, extending from 426 600 mE, 5 408 000 mN to 424 100 mE, 5 409 000 mN, corresponds closely with the mapped position of a major fault, where it juxtaposes Moina Sandstone to the south and Cambrian porphyry and volcanoclastic rocks to the north (McClenaghan *et al.*, 2002).
- D. The Dolcoath granite, which crops out around 426 950 mE, 5 405 750 mN, is resistive, but cannot be distinguished from the surrounding resistive Cambrian country rocks.
- E. The HEM survey has identified a number of areas where resistive Cambrian and Ordovician basement is either exposed or is covered by thin Tertiary basalt cover (e.g. 429 350 mE, 5 401 250 mN and 431 100 mE, 5 401 100 mN). A number of other areas of thin basalt have been identified by the survey – these mostly lie close to the edges of mapped basalts. The extent of thick basalt cover is indicated on Figure 4.9.
- F. The Cambrian Dove granite, which crops out in the south of the survey area (around 422 250 mE, 5 396 750 mN and 426 800 mE, 5 398 050 mN), is electrically resistive. The granites have a poor resistivity contrast with the surrounding rocks, and are not well mapped by the HEM data.
- G. A conductor extending from 417 500 mE, 5 403 700 mN to 420 350 mE, 5 403 300 mN within Cambro-Ordovician rocks at Stormont is coincident in its eastern part with a modern drainage. This conductor may be due to an underlying structure which has partially controlled development of the drainage.
- H. A strong local conductor at 421 400 mE, 5 403 600 mN occurs within Quaternary alluvium in the Iris River valley. This conductor could be due to a zone of thicker alluvium, or to Tertiary

basalt or bedrock mineralisation concealed beneath the Quaternary cover.

- I. This conductive zone corresponds closely to a mapped Tertiary basalt extending from 418 000 mE–419 600 mE on the Lea 1:25 000 scale map sheet (Pemberton and McKibben, 1996). The 1:250 000 scale map coverage shown on Figures 4.2 and 4.3 inaccurately depicts the actual western extent of this basalt.

Responses of known mineralisation

None of the known mineralisation around the Dolcoath granite exhibits an EM response, although a number of known skarns have associated magnetic anomalies, e.g. Shepherd and Murphy Sn-W-Bi (423 300 mE, 5 406 400 mN; Pemberton and Vicary, 1989). Skarn mineralisation near Moina has previously been found to be non-conductive due to its relatively low sulphide content (Bishop and Lewis, 1988). Detailed HEM anomaly picking is recommended in order to identify any conductors potentially associated with mineralisation.

EMFlow and Sengpiel conductivity-depth sections

Conductivity-depth sections for four profiles within the survey area are shown in Figures 4.10 to 4.13.

Line 10211 (fig. 4.10)

The dominant surface lithology on this profile is Tertiary basalt, which crops out between 5 397 700 mN and 5 403 400 mN. A zone of much thinner basalt cover is indicated between 5 400 800 mN and 5 401 400 mN, where resistive basement is likely to be Cambrian porphyry beneath the basalt cover. Resistive basement beneath the basalt can be identified at several other places on the survey line (e.g. 5 398 000 mN, 5 402 400 mN), and denotes areas of relatively thin basalt cover (up to around 40 m thick). Basalt thicknesses on the remainder of the line exceed the depth of investigation of the Hummingbird system in areas of conductive, magnetic cover (≈ 50 m). Outcropping Cambro-Ordovician rocks north of 5 403 400 mN are highly resistive. HEM responses over these resistive areas are very low, as indicated by the lack of Sengpiel section data in the northern part of the line.

Line 10461 (fig. 4.11)

The Cambrian Dove Granite crops out south of 5 397 500 mN, and is characterised by extremely low HEM responses at all frequencies. Conductive Tertiary basalt crops out between 5 397 500 mN and

5 401 600 mN. Resistive basement is indicated in the Sengpiel section, and basalts are interpreted to be around 40 m thick. Further Tertiary basalts, which crop out between 5 406 000 mN and 5 408 000 mN, are thin (20–40 m). Resistive Ordovician sandstone and conglomerate crop out between 5 401 600 mN and 5 405 250 mN. Highly conductive features at depth in the EMFlow section (around 5 397 200 mN, 5 401 600 mN–5 402 400 mN, 5 405 050 mN and 5 405 300 mN) have no expression in the raw data, and are clearly processing artifacts.

Line 10711 (fig. 4.12)

Deep conductive processing artifacts, as described for Line 10461, are present on several sections of this survey line. All conductors on the survey line are associated with Tertiary basalts – zones of thin basalt cover are indicated around 5 402 600 mN and 5 406 800 mN.

Line 10961 (fig. 4.13)

The northern two-thirds of this survey line are highly resistive. Laterally-extensive deep conductive zones present in the EMFlow conductivity-depth image north of 5 402 100 mN are processing artifacts. Weak near-surface conductors at 5 404 400 mN and 5 405 600 mN are probably related to alluvium in modern drainages (A in fig. 4.8). Tertiary basalt outcrops south of 5 402 100 mN – thinner zones within the basalt appear less conductive in the EMFlow CDI and Sengpiel sections. Tertiary basalt cropping out at the northern end of the line (5 408 900 mN – 5 409 400 mN) has virtually no expression in the HEM data, and is clearly very thin.

EMFlow conductivity-depth slices

EMFlow conductivity-depth slices at 20 m, 70 m, and 120 m below surface are shown in Figures 4.14 to 4.16.

The 20 m depth slice (fig. 4.14) is dominated by the responses of the electrically conductive Tertiary basalts. Areas of thin basalt cover are indicated around 414 000 mE, 5 401 000 mN and 430 800 mE, 5 401 000 mN.

There is little geological detail in the 70 m and 120 m EMFlow depth slices. High conductivities in the 70 m depth slice around 428 000 mE, and in the 120 m slice between 424 000 mE and 430 000 mE are apparently EMFlow processing artifacts. Levelling errors are apparent in both the 70 m and 120 m slices around 428 800 mE and 431 000 mE, and are probably related to the severe terrain within the Lake Cethana valley. Some stratigraphic conductors are however apparent to the north and east of the Dolcoath Granite.

Figure 4.1 Dolcoath 1:250,000 geology with EM survey boundary

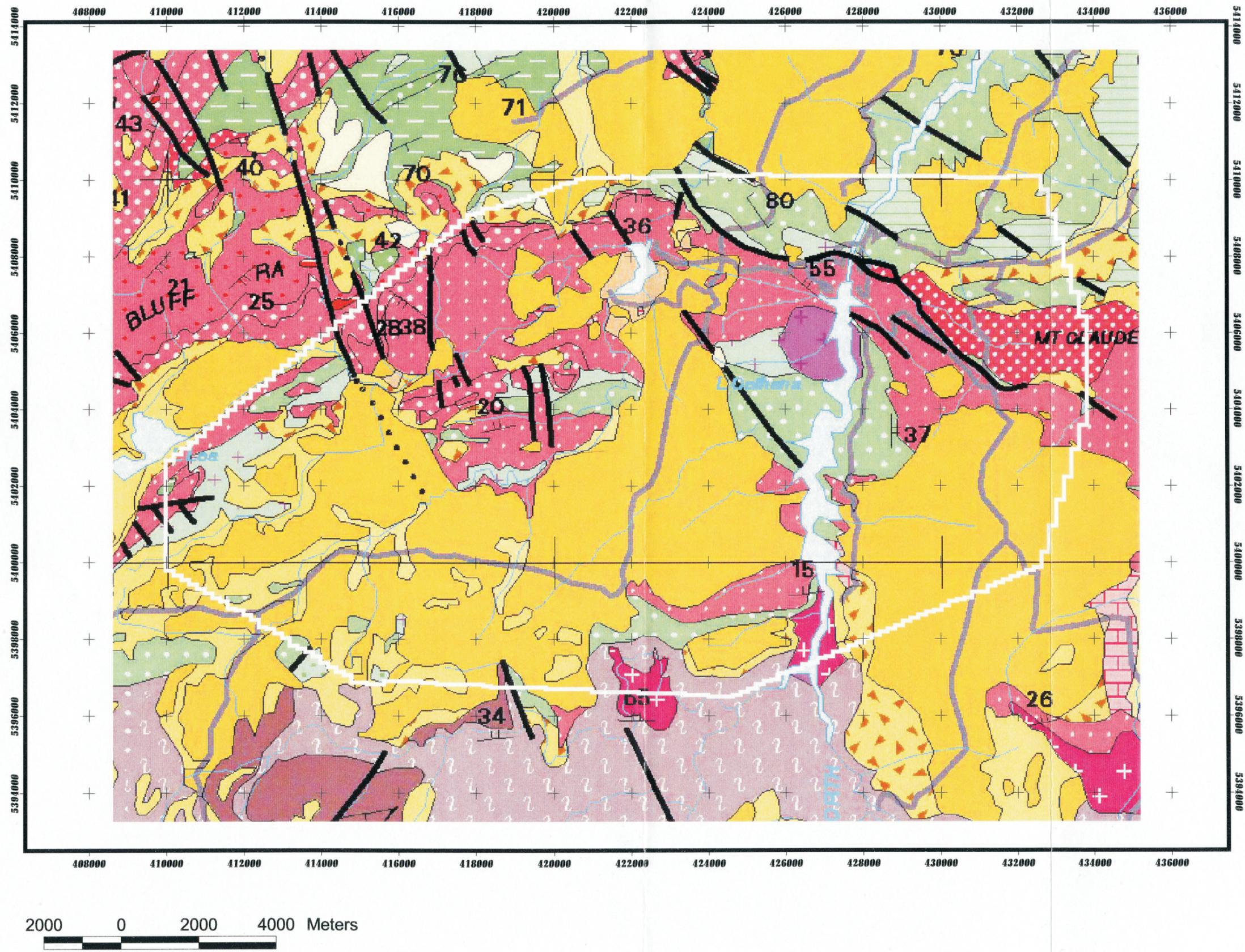


Figure 4.2 Dolcoath 980 Hz apparent resistivity
with 1:250,000 geology

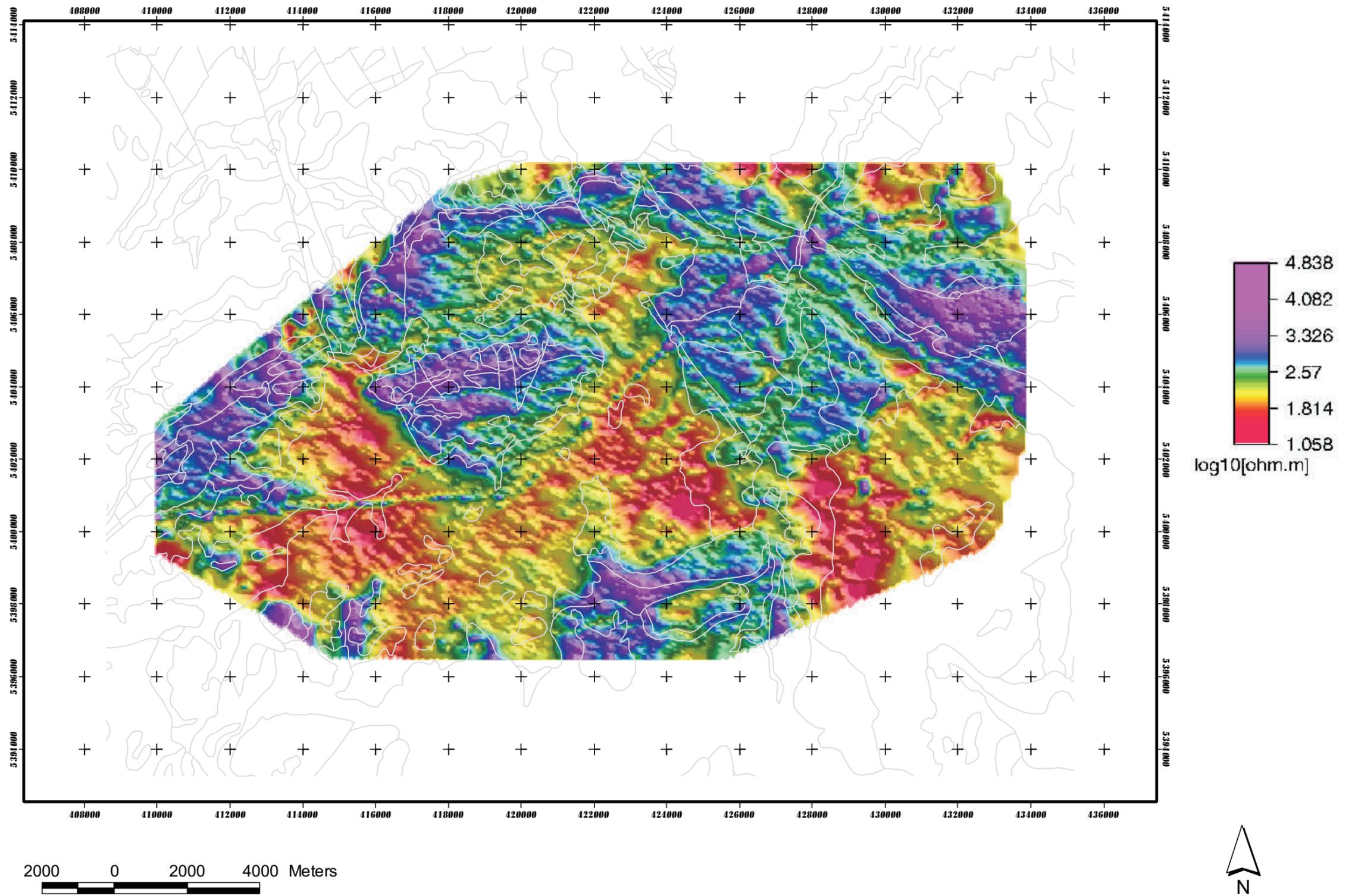


Figure 4.3 Dolcoath HCP ternary conductivity
with 1:250,000 geology

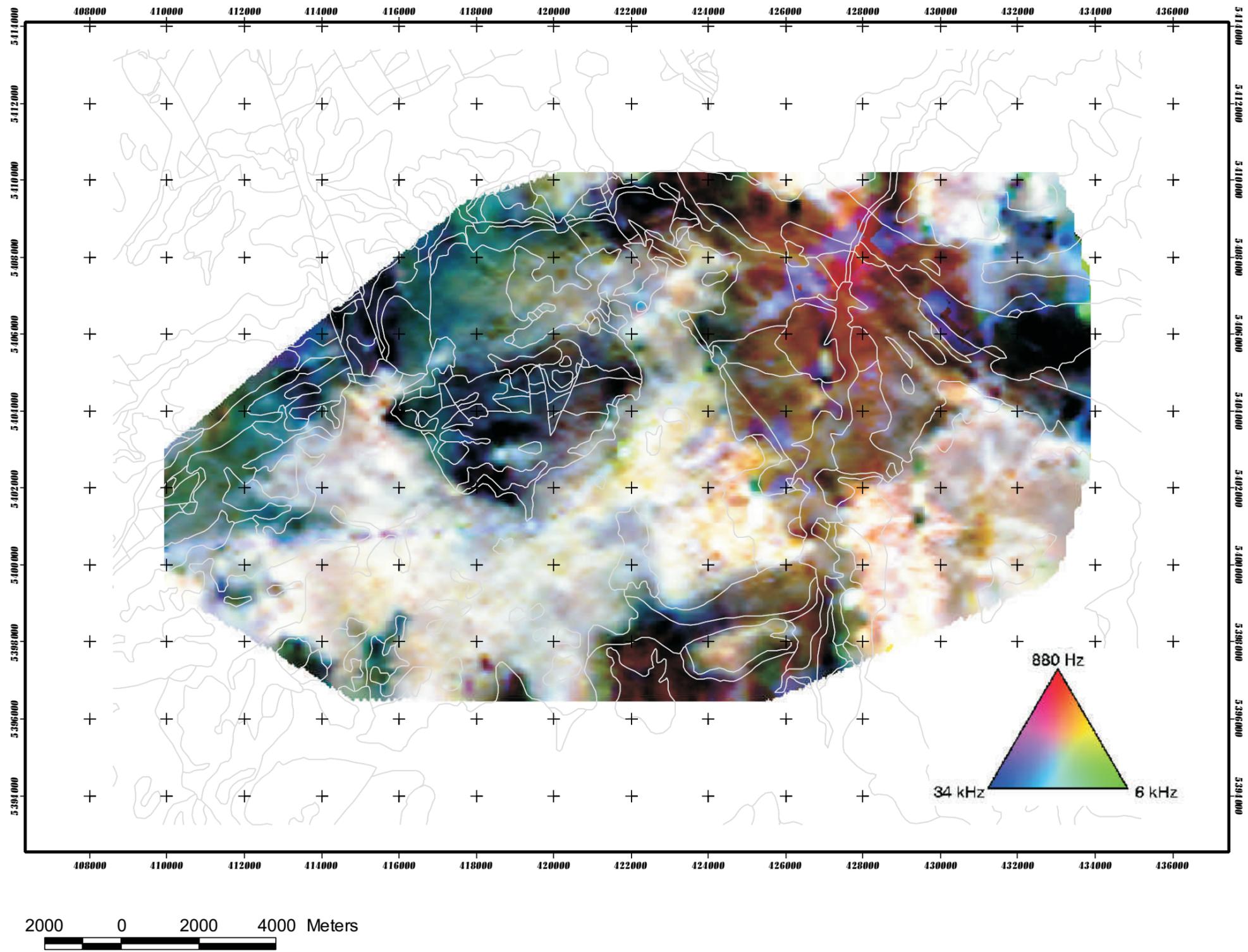


Figure 4.4 Dolcoath WTRMP TMI with 1VD enhancement, EM survey boundary and 1:250,000 geology

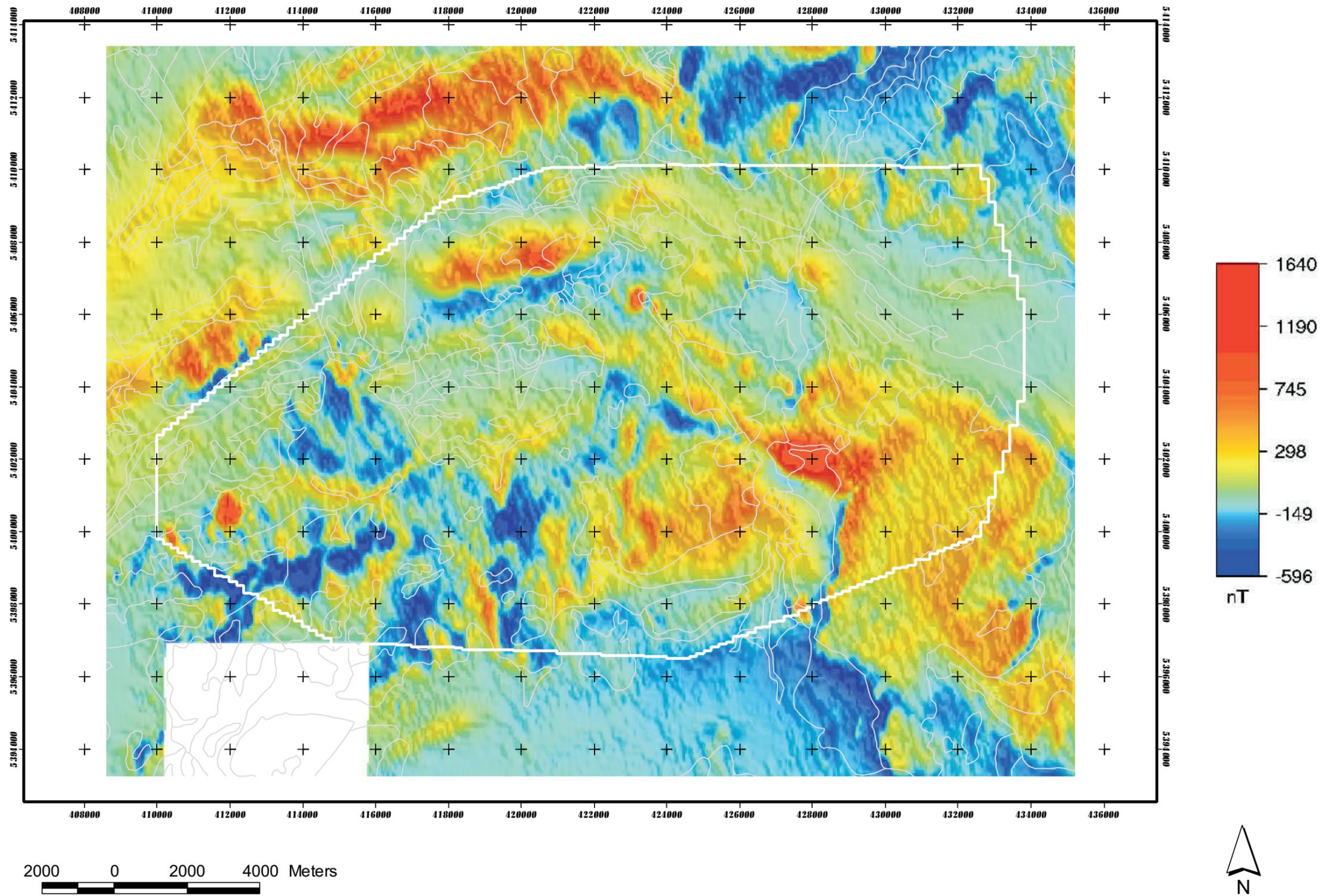


Figure 4.5 Dolcoath WTRMP ternary radiometrics with EM survey boundary and 1:250,000 geology

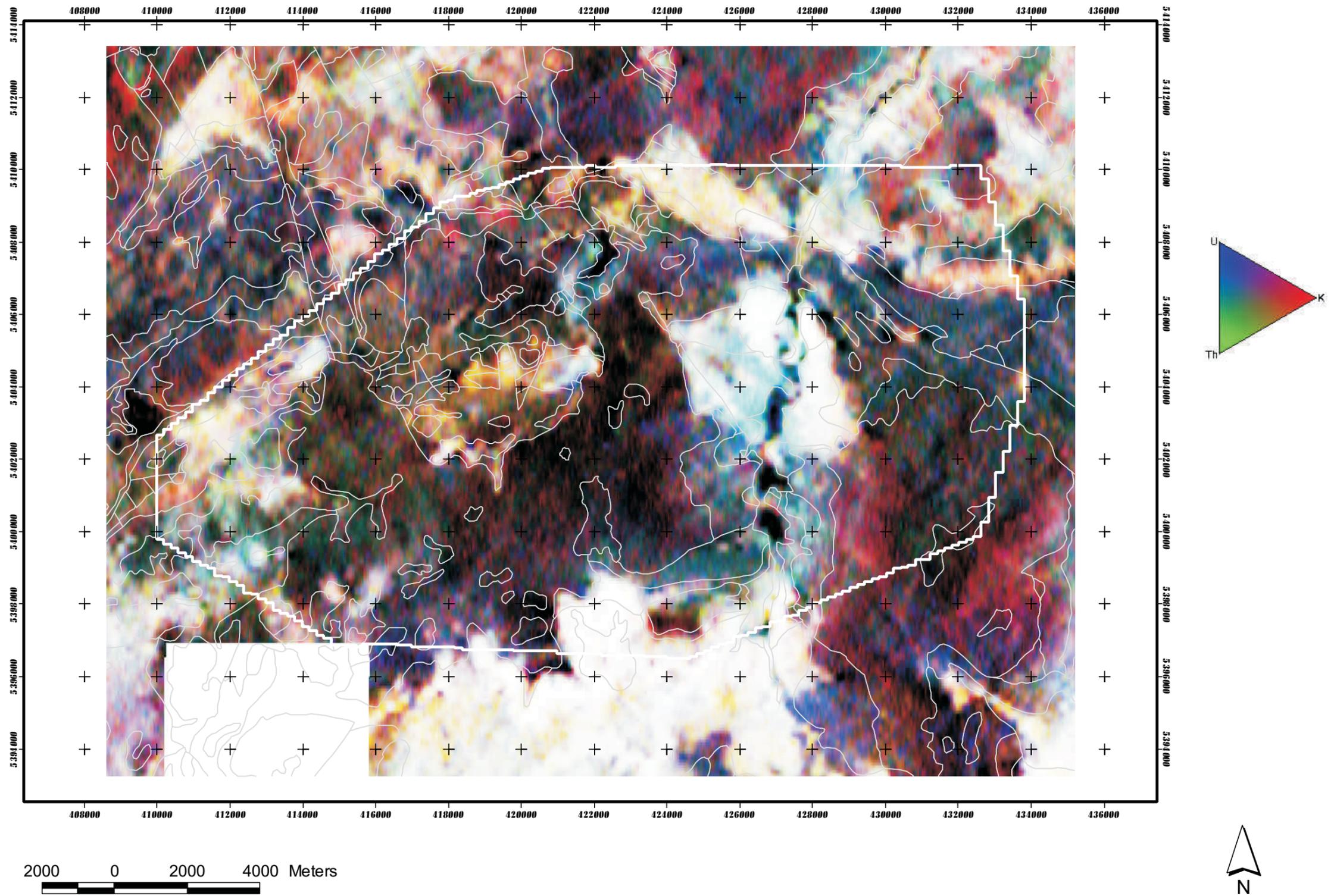


Figure 4.6 Dolcoath digital elevation model with drainage and 1:250,000 geology

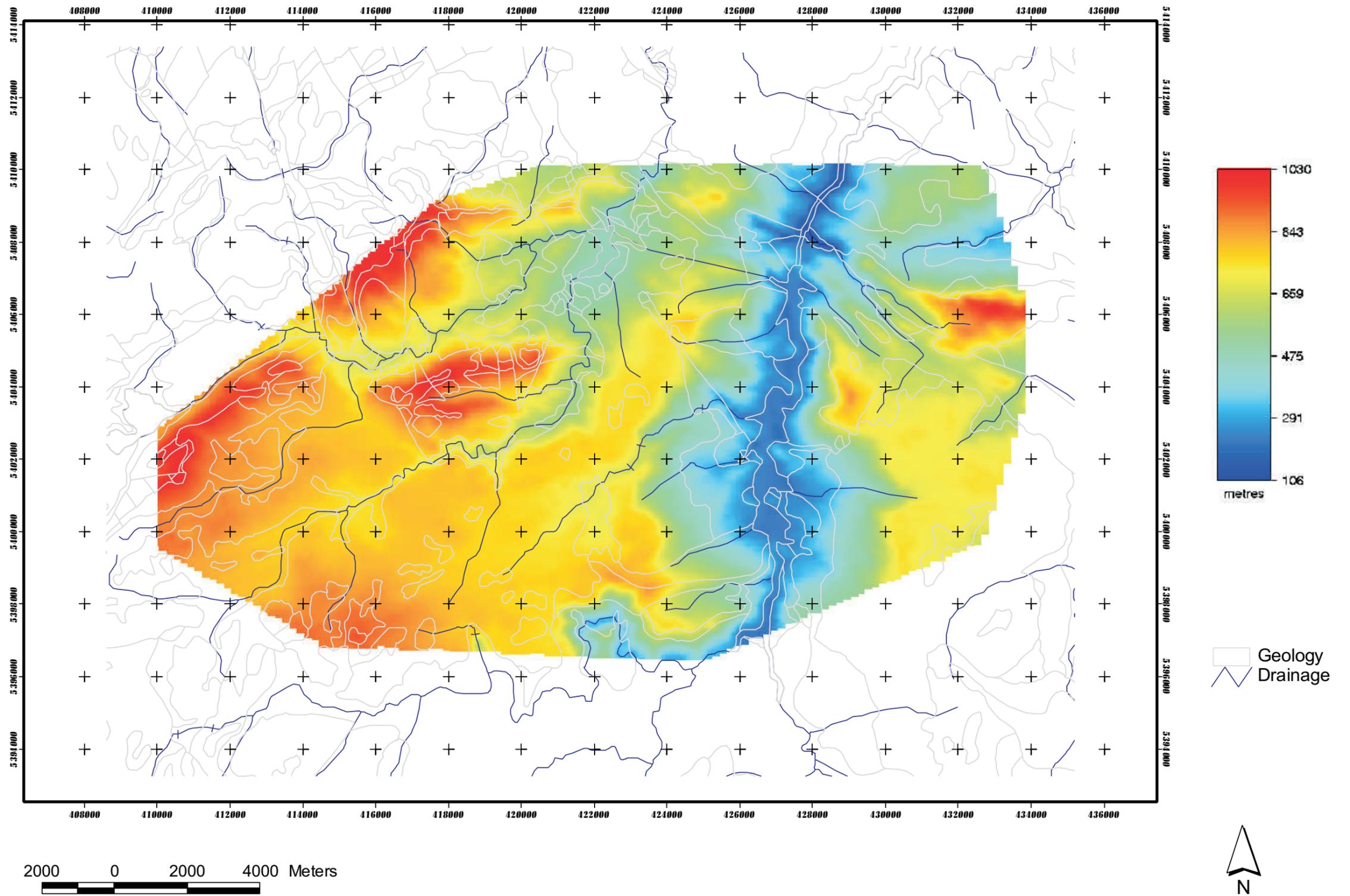
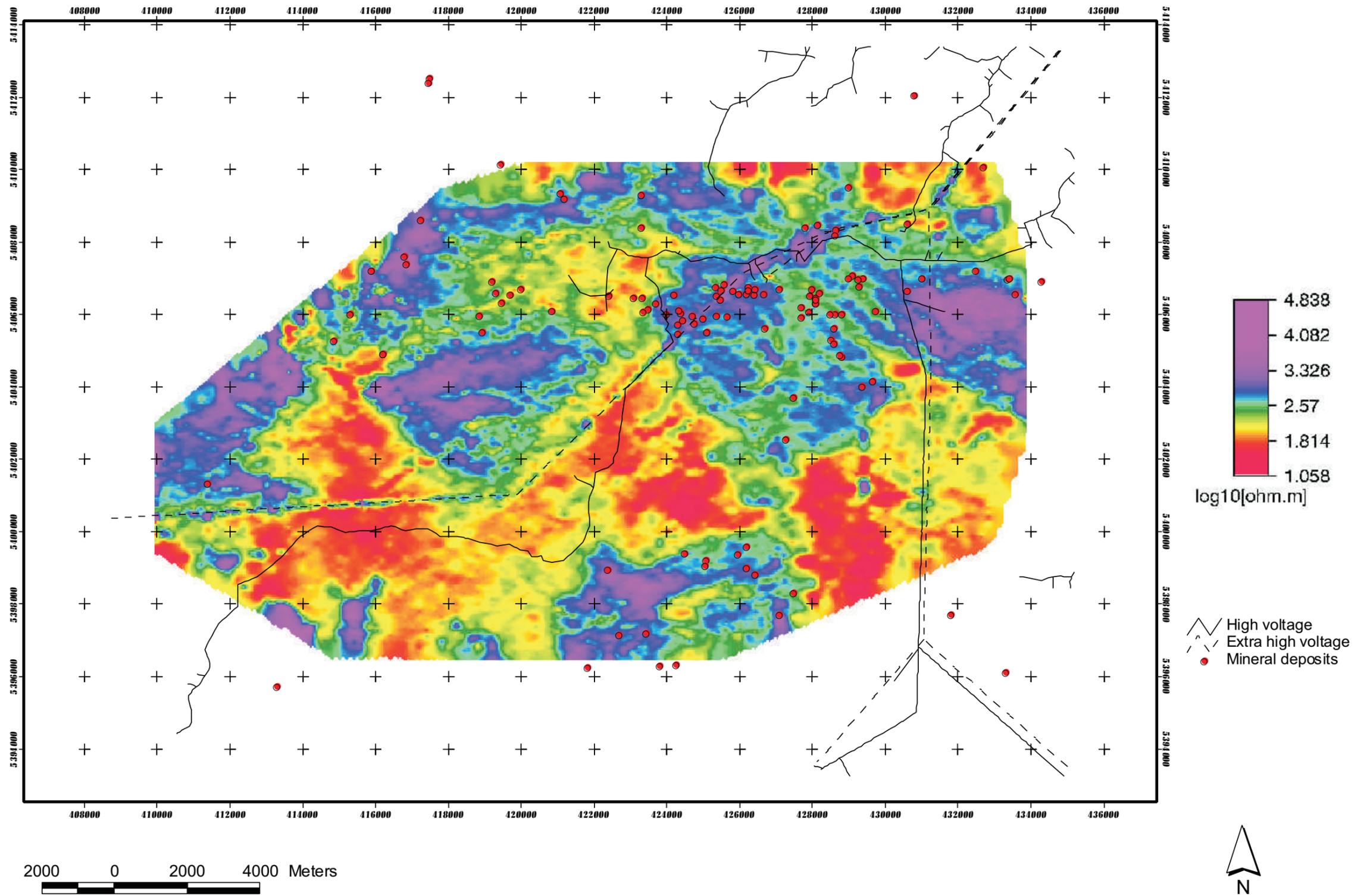


Figure 4.7 Dolcoath 980 Hz apparent resistivity with transmission lines and mineral deposits



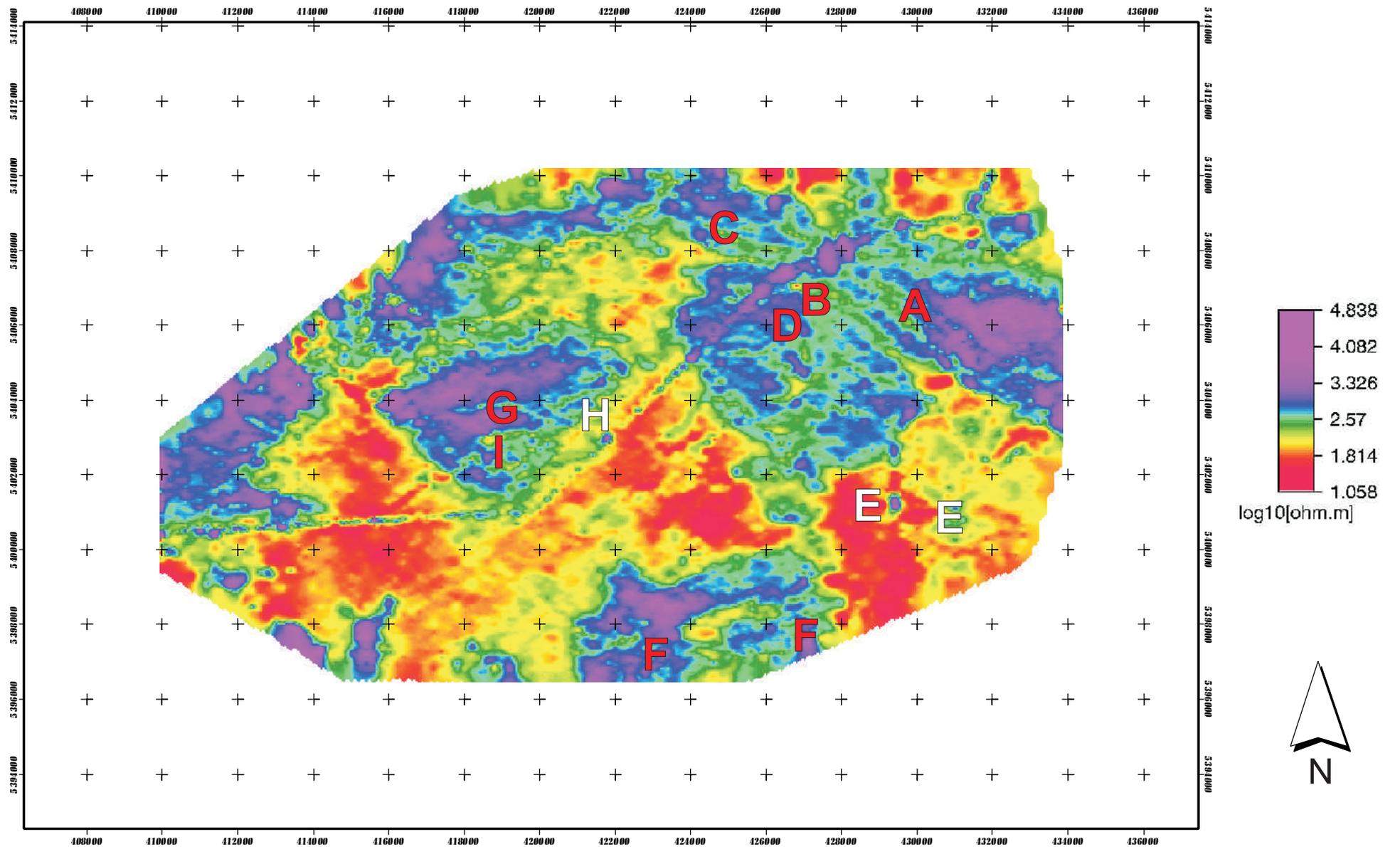
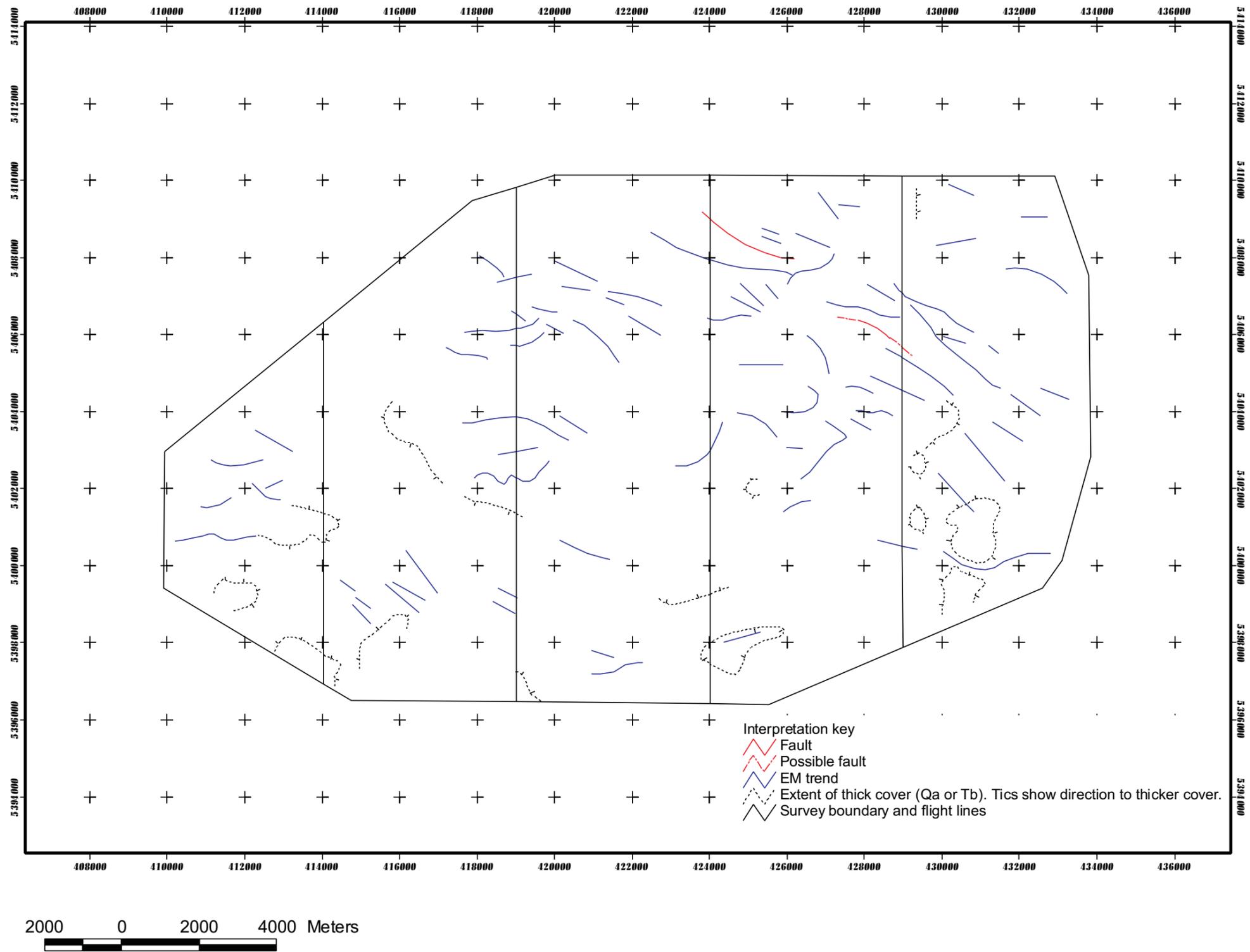


Figure 4.8
Dolcoath 980 Hz apparent resistivity with interpretation key

2000 0 2000 4000 Meters

Figure 4.9 Dolcoath HEM interpretation



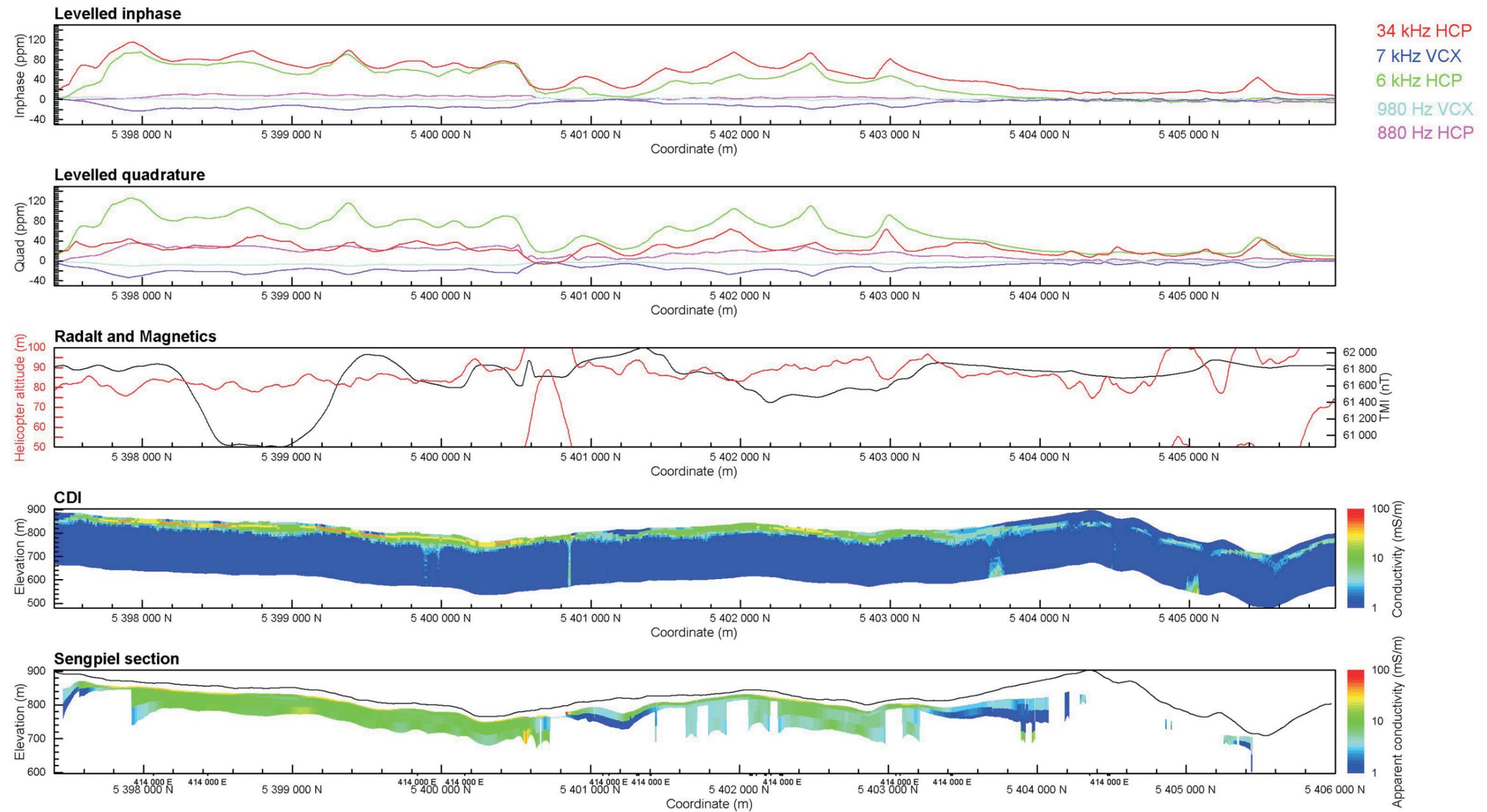


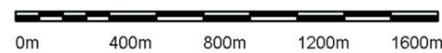
Figure 4.10
Dolcoath Granite, W Tasmania
Line D10211

Levelled inphase and quadrature data
Radalt altimeter and TMI
EMFlow v3.2 conductivity-depth image
Sengpiel section

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Coordinates: AGD66/TMAMG 55



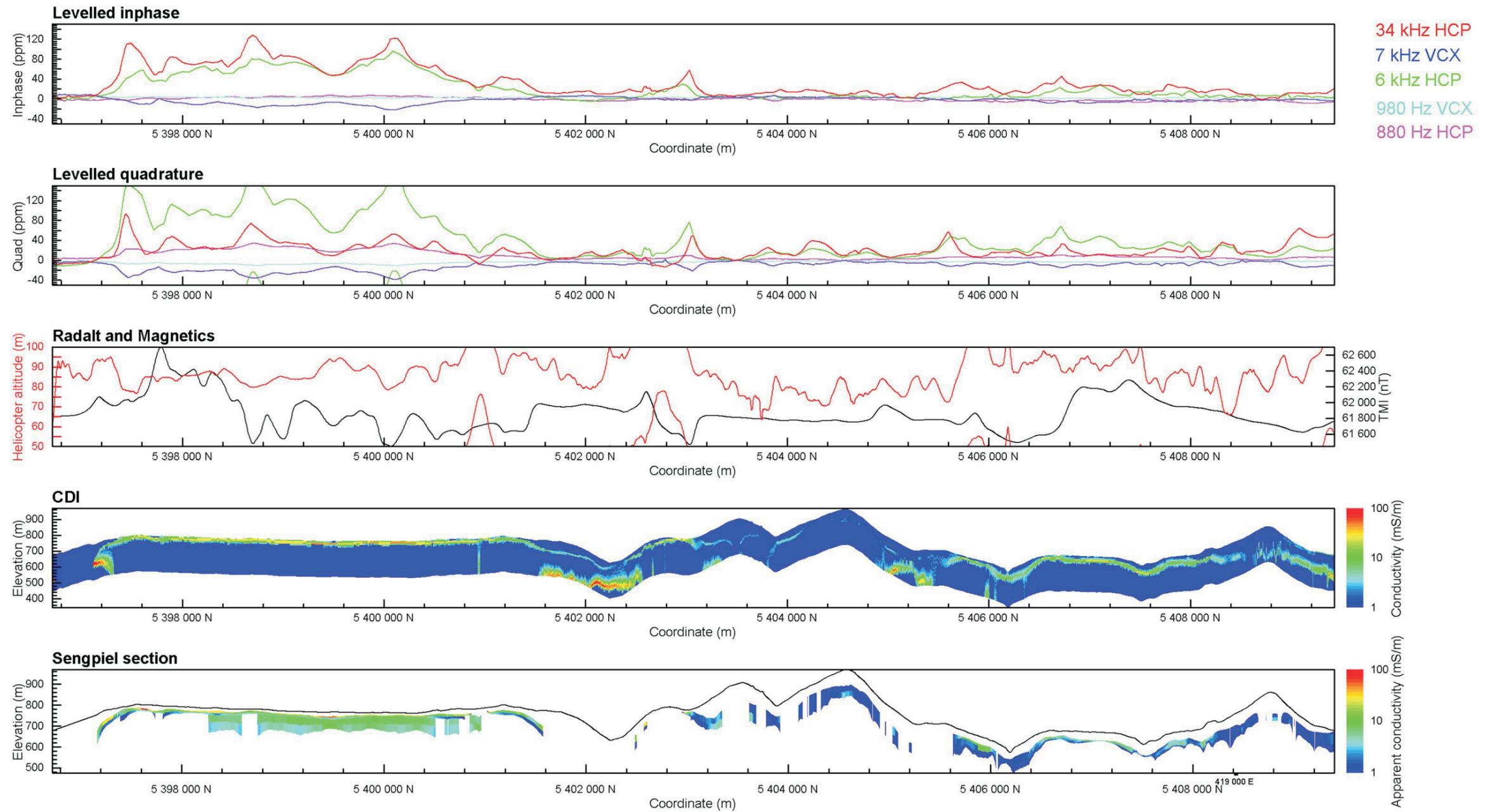


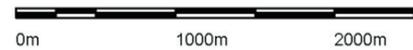
Figure 4.11
Dolcoath Granite, W Tasmania
Line D10461

Levelled inphase and quadrature data
Radalt altimeter and TMI
EMFlow v3.2 conductivity-depth image
Sengpiel section

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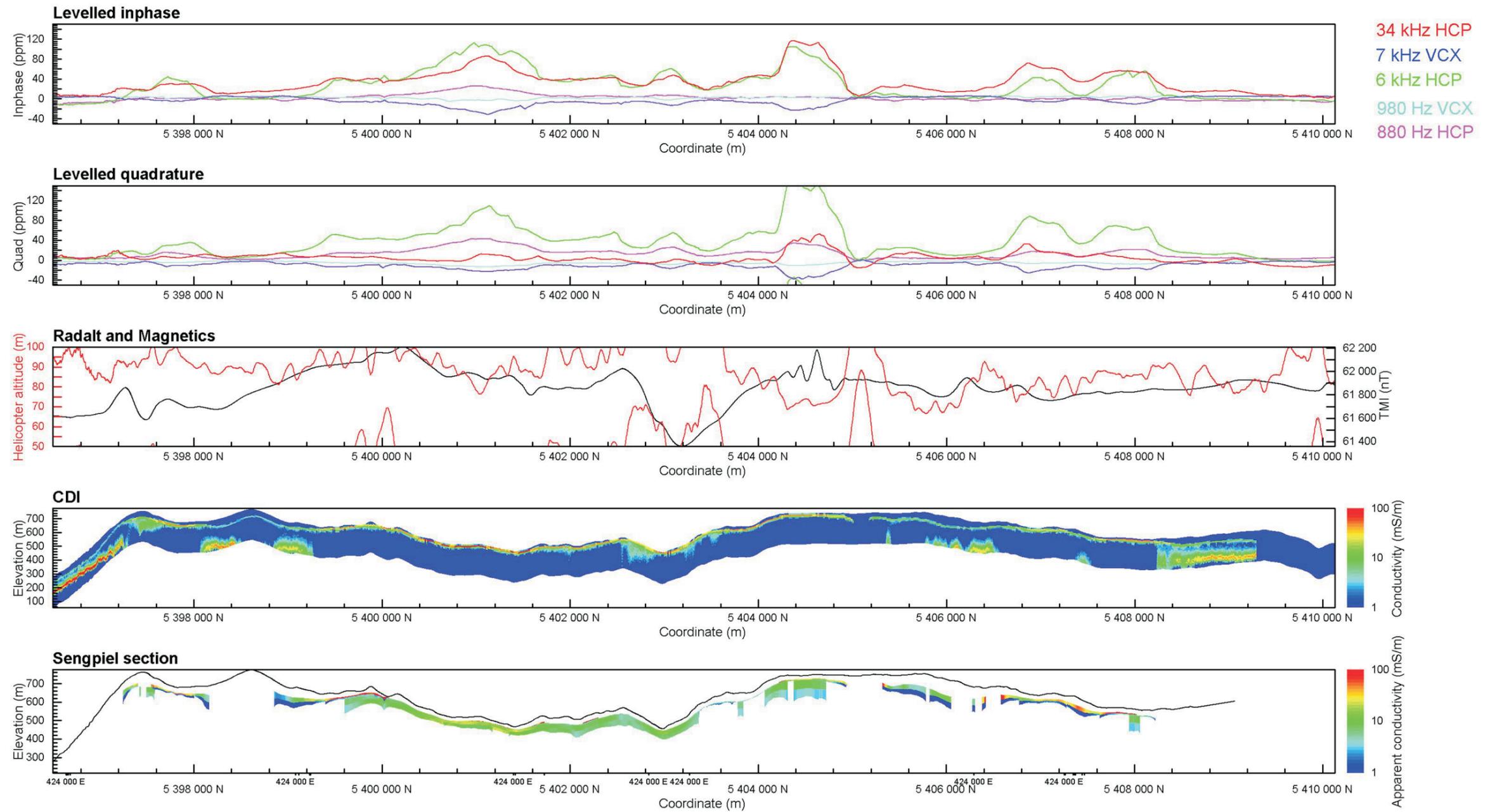


Figure 4.12
Dolcoath Granite, W Tasmania
Line D10711

Levelled inphase and quadrature data
Radalt altimeter and TMI
EMFlow v3.2 conductivity-depth image
Sengpiel section

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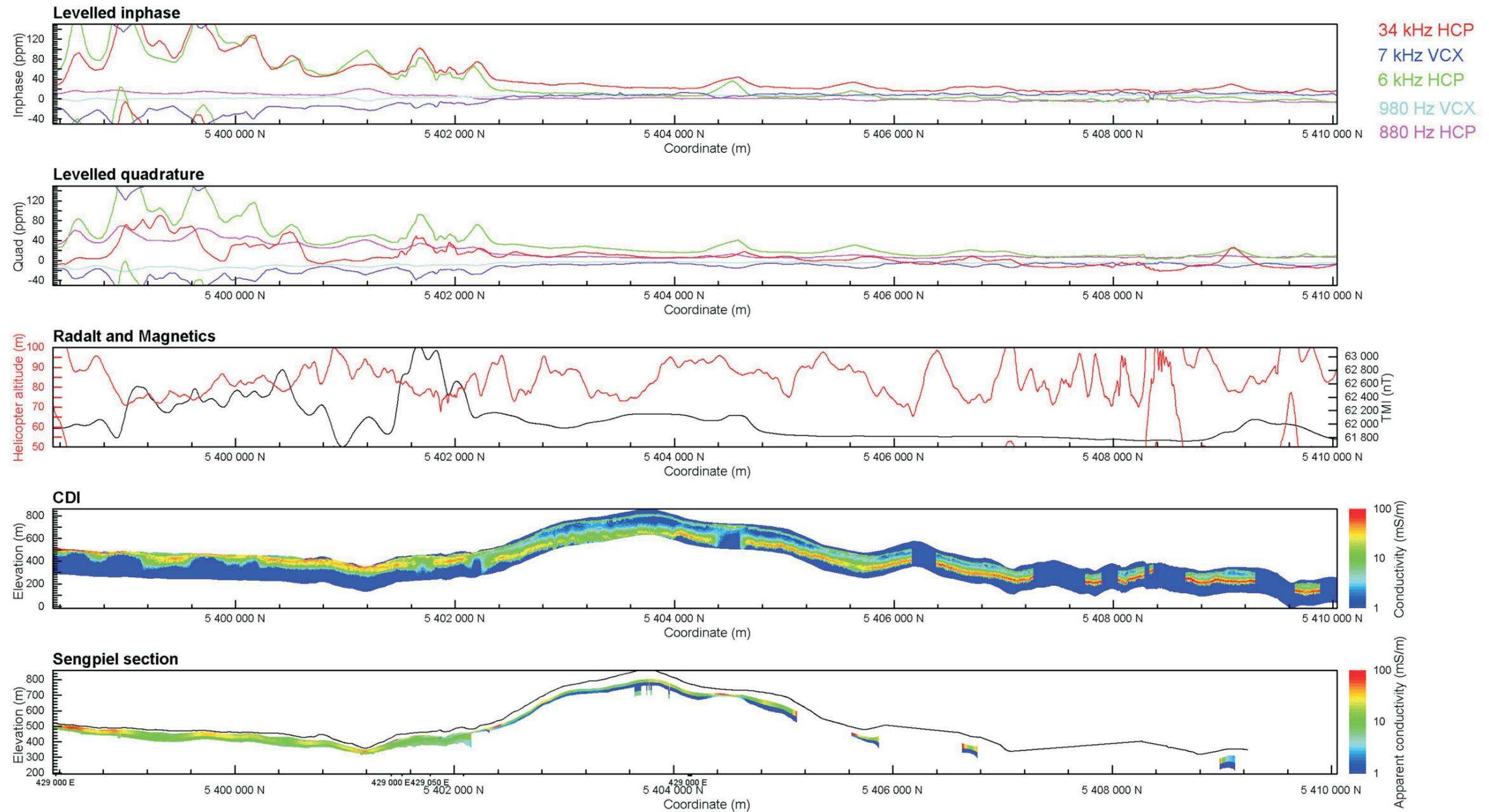


Figure 4.13
Dolcoath Granite, W Tasmania
Line D10961

Levelled inphase and quadrature data
Radalt altimeter and TMI
EMFlow v3.2 conductivity-depth image
Sengpiel section

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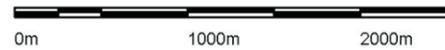


Figure 4.14 Dolcoath EMFlow 20 m depth slice
with 1:250,000 geology

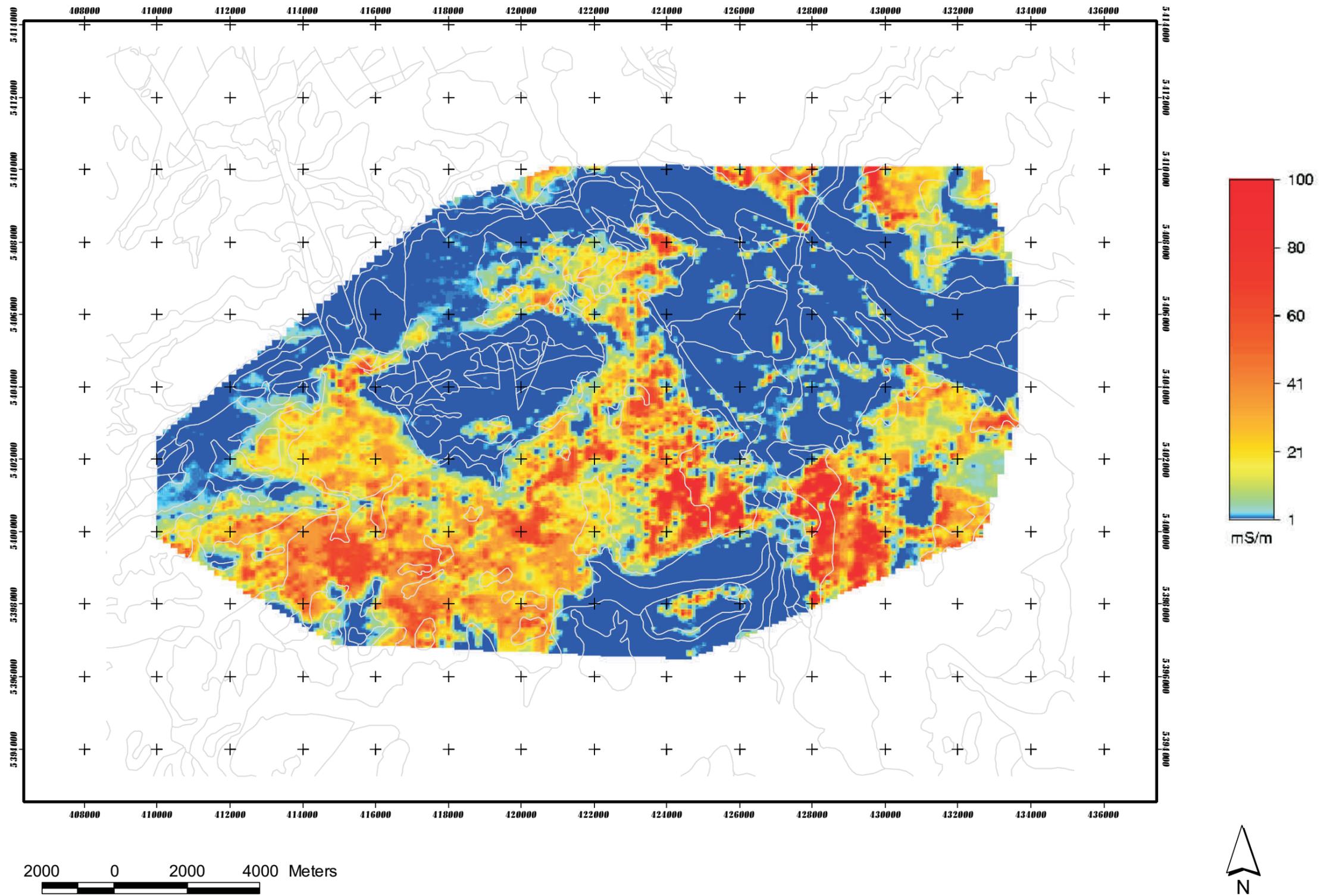


Figure 4.15 Dolcoath EMFlow 70 m depth slice
with 1:250,000 geology

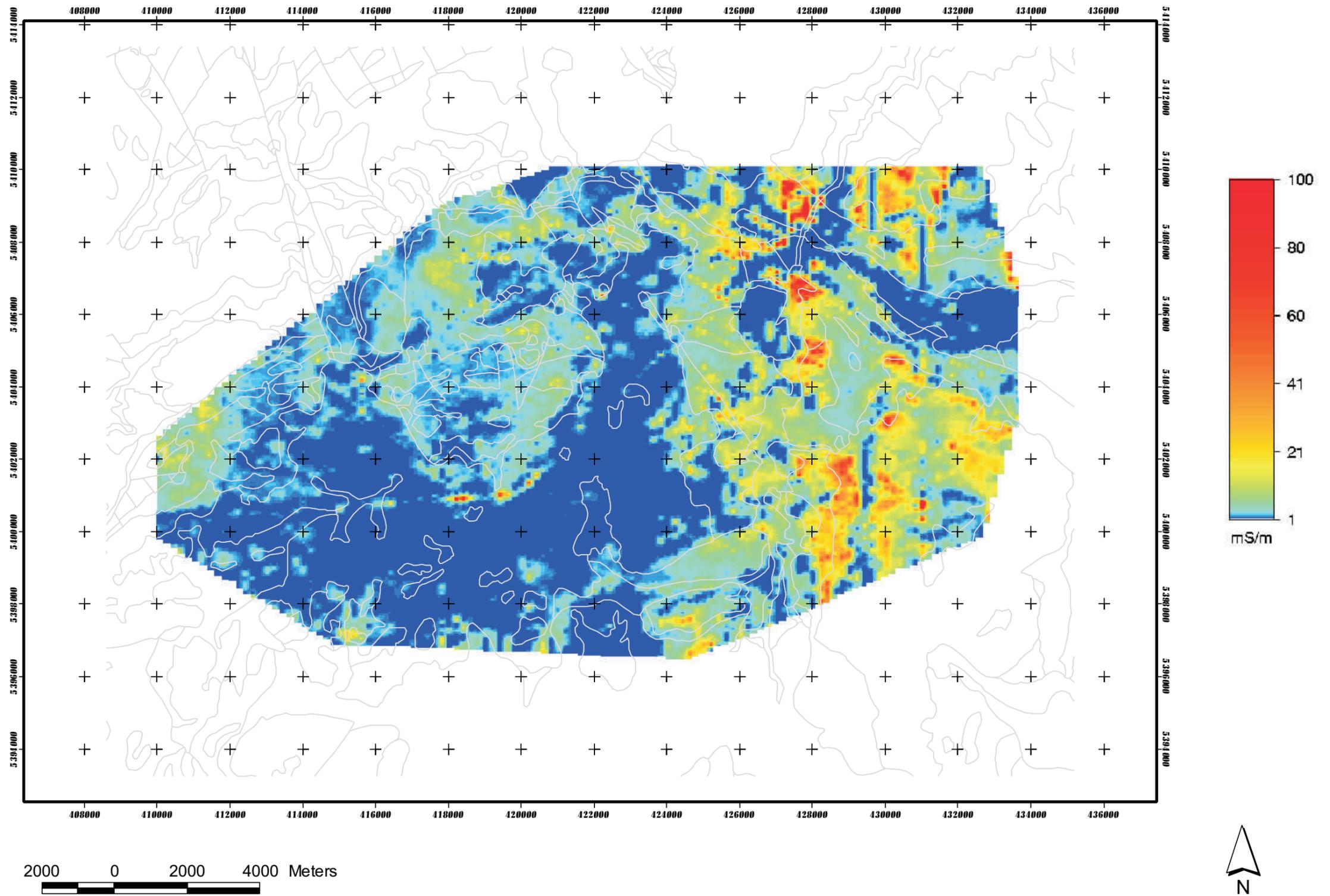


Figure 4.16 Dolcoath EMFlow 120 m depth slice
with 1:250,000 geology

