SOUTHERN GEOSCIENCE CONSULTANTS

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# MEMORANDUM

| | |
|---|---|
| **TO** | Bill Guy<br>Bligh Resources Ltd. |
| **FROM** | Bruce Craven, David Mackay |
| **DATE** | February 5th, 2013 |
| **REPORT NO.** | SGC2563 |
| **RE** | Bootu VTEM Modelling and Interpretation |

This is a summary of the depth interpretation and modelling of anomalies VC-5, VC-8, VC-9 and VC10 from the 2012 Bootu VTEM survey. The objective of this interpretation exercise was to confirm the location and depth of the conductors. Bligh requested this information to help design trenching and or drilling as an initial test of the shallow manganese potential of the various anomalies.

A more in-depth discussion can be provided if required.

The methodology used for interpreting the anomalies included:

- Visual interpretation of key profiles and CDI sections across each anomaly.
- Quantitative modelling (using the Maxwell EM modelling software) of the key profiles across each anomaly.

The quantitative modelling proved difficult for a variety of reasons, mainly the complexity of the EM data and the low conductivity contrasts between the near surface, regolith / oxidized material and the deeper, bedrock conductivity. The modelling seems to overestimate the depths of the conductive bedrock material relative to the CDIs.

The shallow to moderate dipping geometry of the prospective units and the weathering /oxidation overprint means that the surface projections of most of the conductive zones are quite large. This, combined with the differences between the modelling and the visual interpretation means that the near surface target zones are broader than is desirable. On the up side, the flat / shallow dipping geometry is good if the conductors are mapping significant mineralization.

All geographic coordinates are MGA Zone 53 GDA94 projection.

## 1 BCRK_VC-5

The visual interpretation of the CDIs and profiles indicates that the ***VC-5*** conductor / target is the near surface part of a broad synformal horizon (Figure 2; attached). This east dipping conductive unit appears to be beneath 30-50m of weakly to moderately conductive cover ± oxidation.

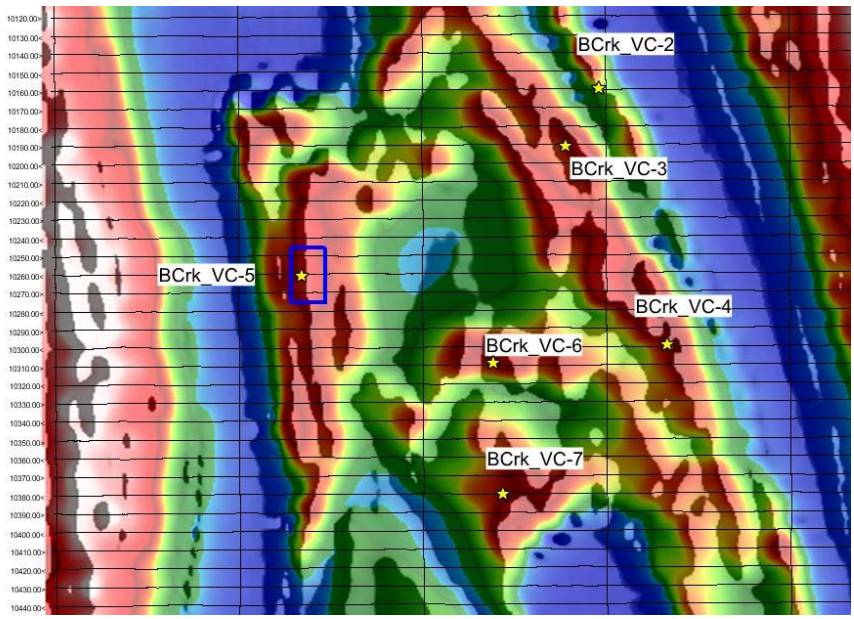



**Figure 1: BCrk_VC-5 location**

The Maxwell modelling results are summarized below and shown in Figure 3. The visual profile /CDI interpretation is basically in agreement with the modelling, indicating that the stronger (later time, bedrock) part of the conductor is located at about 397900E to 397950E on line 10260, offset a little to the east of the modelled conductor location.

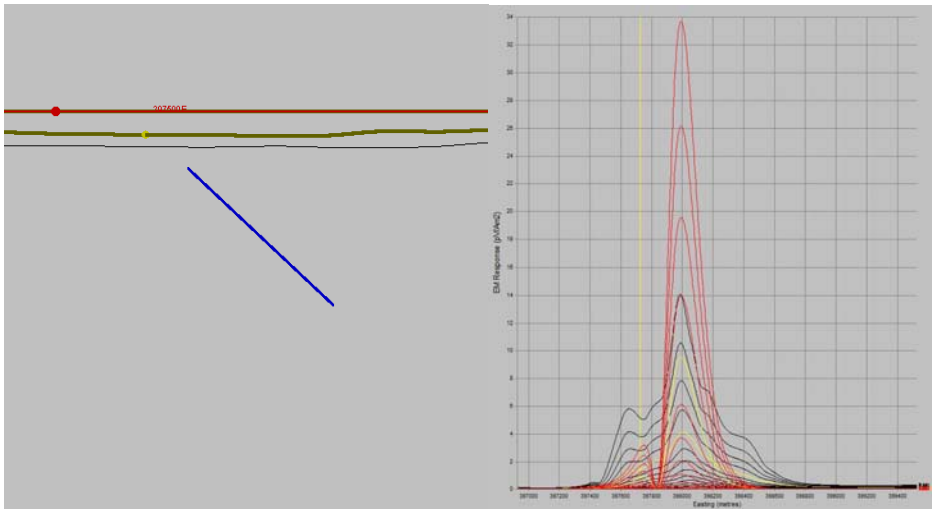


**Figure 3 (left): VC-5 Modelled Conductor (looking north)**

**Figure 3 (right): VC-5 Line 10260 Mid time channel modelling (ch13 to 25) of dB/dt profiles (model profiles in red)**

For initial evaluation of the shallower part of this conductor, trenching or shallow drilling from about 397800E to 398000E on flight line 10260 (~7888300N) is recommended. This should cover the possible surface projections of the conductive horizon interpreted from both the modelling and the CDI inversions.

- Modelling based predominantly on the VTEM line 10260 mid to early time data to best fit the dominant shape.
- Top of conductor: 7888295mN 397830mE, at 50m depth below surface .
- Conductor dips 40°-45° to the east.

- Length: 600m, depth extent: 500m
- Conductivity-thickness: 5S

## 2 BCRK_VC-8

Visual interpretation of the ***VC-8*** CDIs and profiles indicates that the conductor / target corresponds to the eastern edge of a synformal horizon (Figure 5, attached). This ~45° west dipping conductive bedrock unit appears to be beneath weakly conductive cover and may be oxidized to about 50m depth.

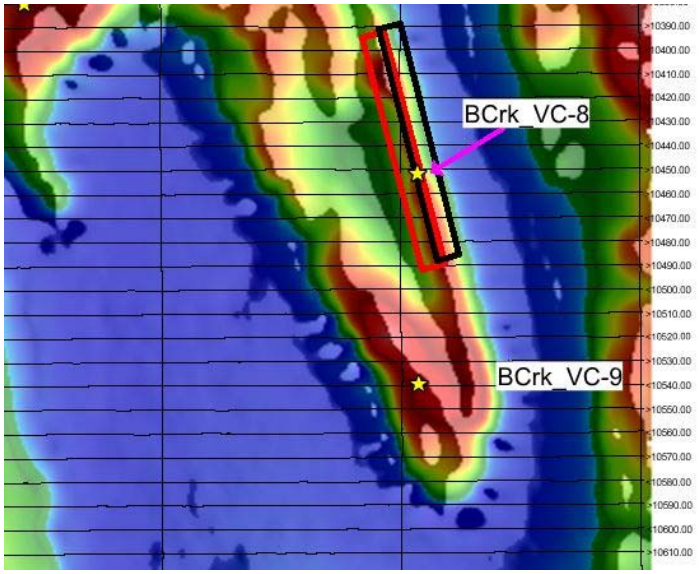



**Figure 4: BCrk_VC-8 location**

The Maxwell modelling results are summarized below and shown in Figure 6. The modelling (and profiles) suggest that the dip of the conductive unit is considerably shallower (10-15°W) than indicated by the CDIs. This may reflect the influence of the near surface conductive cover on the modelling. The interpreted / modelled eastern (subcropping) edge of the stronger (later time, bedrock) part of the conductor is located at about 403550 on line 10450.

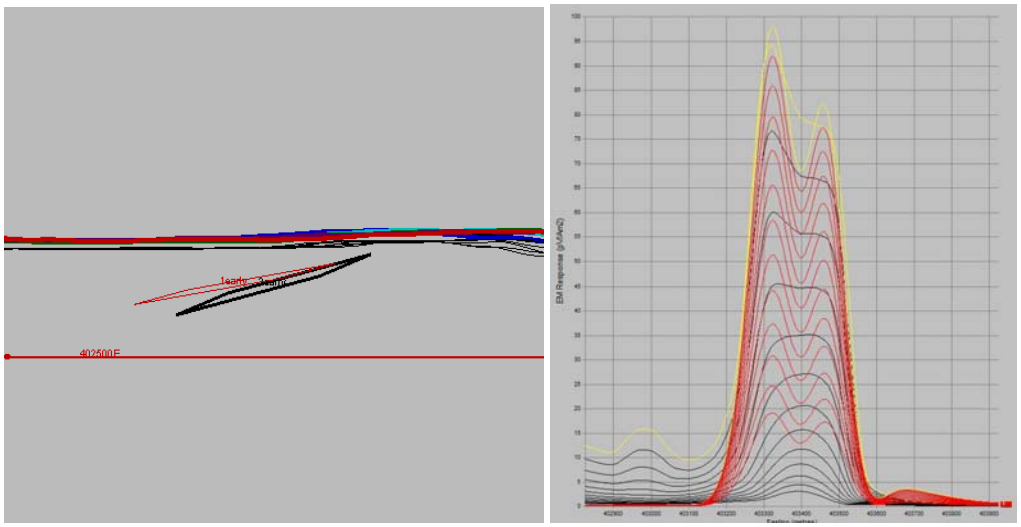


**Figure 6 (left): VC-8 Modelled Conductor Plates (looking north)**

**Figure 6 (right): VC-8 Line 10450 Early time channel modelling (ch1 to 13) of dB/dt profiles (model profiles in red)**

This should cover the possible surface projections of the conductive horizon interpreted from both the modelling and the CDI inversions.

- Modelling predominantly on the VTEM line 10450 mid to early time data to best fit the dominant shape.
- Two sub-parallel conductive plates used for modelling; ***1early*** and ***2early***.

- Top of conductor ***1early***: 7884525mN 403420mE, at ~90m depth below surface.
- Conductor dips 15° to the west. Plunge 10° to south
- ***1early*** length: 2000m, depth extent: 200m. Conductance 9Ωm

- Top of conductor ***2early***: 7884525mN 403570mE, at ~57m depth below surface.
- Conductor dips ~22° to the west. Plunge 10° to south
- ***2early*** length: 2000m, depth extent: 200m. Conductance 9Ωm

## 3 BCRK_VC-9

From the CDIs, depth slices and profiles, the complex ***VC-9*** anomaly / target seems to correspond to a relatively tight, plunging fold and overlaps with the southern extension of the conductive horizon that contains the ***VC-8*** anomaly. The modelling of this anomaly proved difficult, reflecting the complex geometry and the overlapping responses. The CDI sections through the target zone seem to give a clearer, though qualitative picture of the underlying geology, showing that ***VC-9*** is the complex, shallow dipping western side of a relatively tight and shallow synform, with the southern continuation of the **VC-8** horizon forming the eastern limb of the fold (Figure 8; attached). The folded ***VC-9*** conductive unit is overlain by weakly conductive alluvial cover and may be oxidized to about 50m depth.

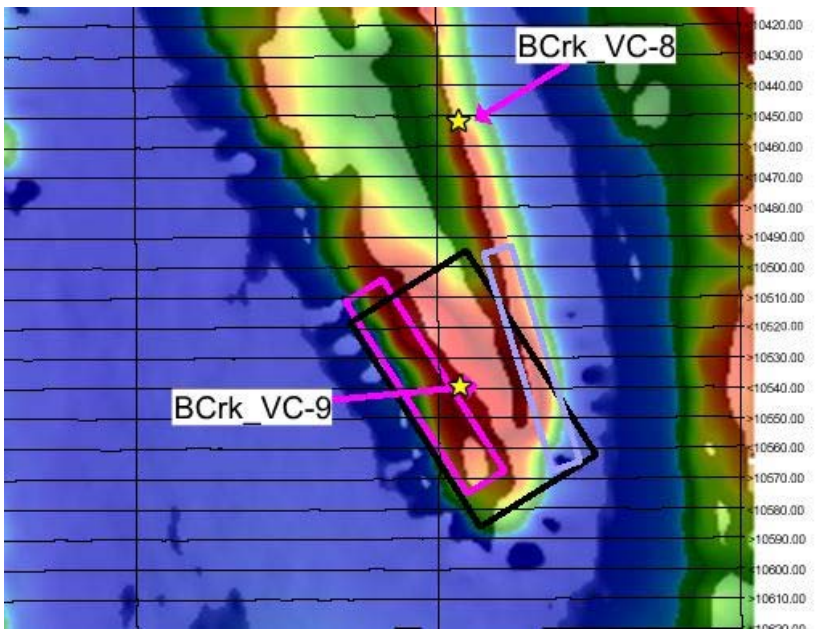



**Figure 7: BCrk_VC-9 location**

The Maxwell modelling results are summarized below and shown in Figures 9 and 10. The relatively deep ***Plate 1*** is a coarse representation of the sub-horizontal folded conductive unit at depth, with ***Plates 2*** and ***3*** approximating the nearer surface limbs of the overall fold, including the ***VC-8*** continuation and probably some of the relatively conductive regolith.

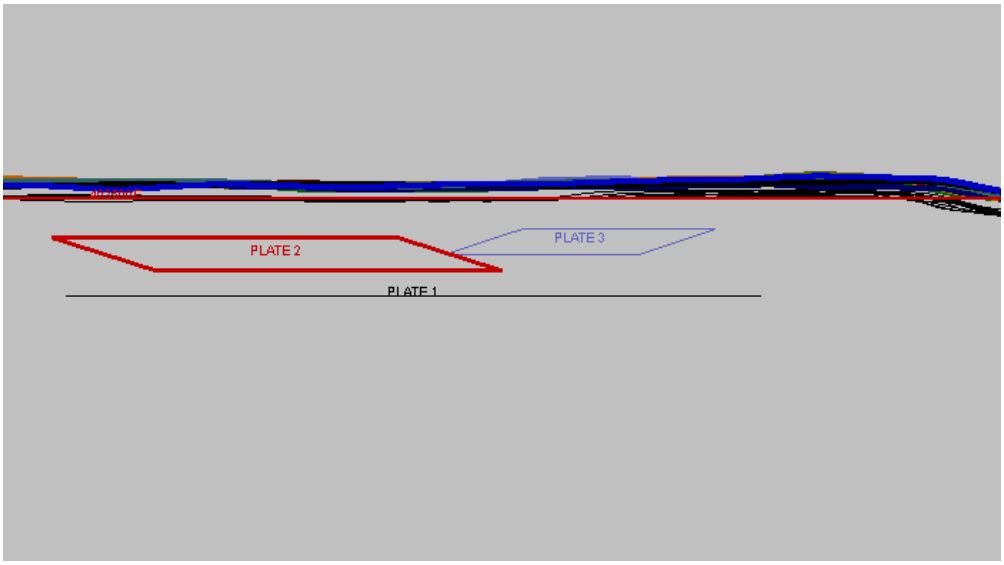



**Figure 9: VC-9 Modelled Conductor Plates (looking north)**

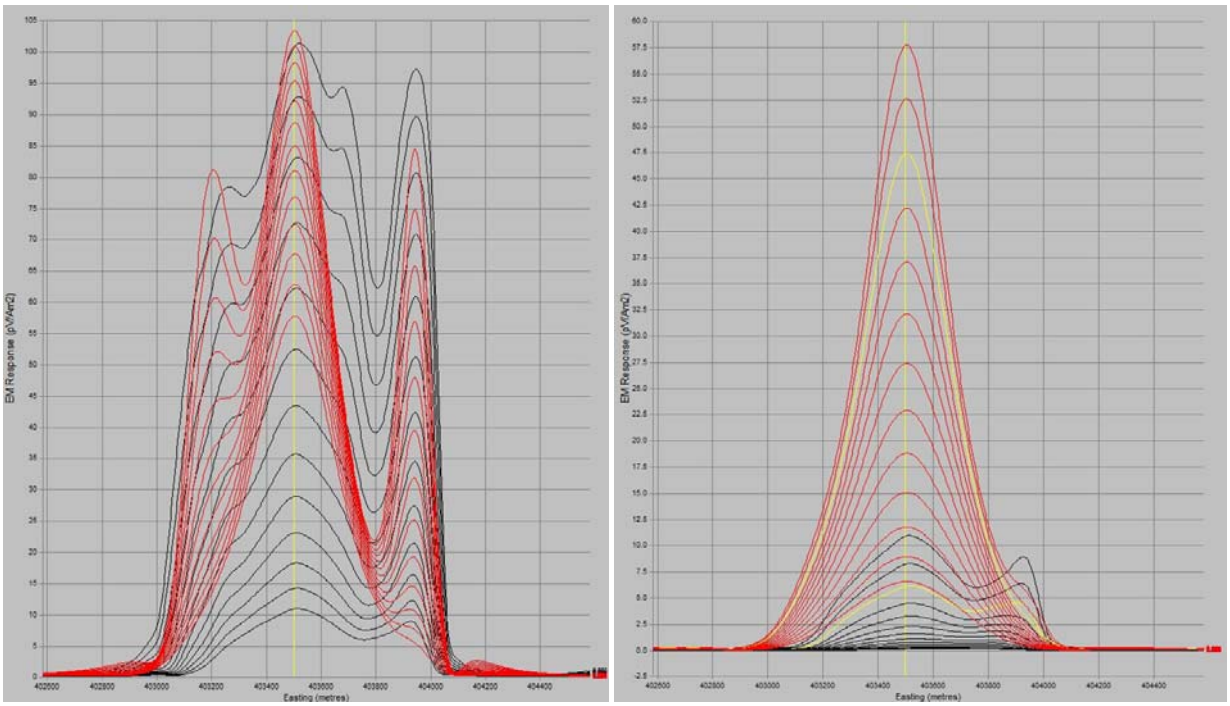



**Figure 10 (left): VC-9 Line 10540 Early time channel modelling (ch1 to 13) of dB/dt profiles (model profiles in red)**

**Figure 10 (right): VC-9 Line 10540 Mid time channel modelling (ch13 to 25) of dB/dt profiles (model profiles in red)**

For initial evaluation of the shallower part of this target, trenching or shallow drilling from about 403050E to 403250E and 403400E to 403600E on flight line 10540 (~7882720N) should be considered. This should cover the likely surface projections of the folded, shallow dipping conductive horizon, based mainly on the CDI inversions.

- Modelling predominantly on the VTEM line 10540 mid to early time data to best fit the dominant shape.
- Three weakly conductive plates (***Plates 1, 2*** and ***3***) used for modelling, with ***Plate 1*** being the dominant source. ***Plate 3*** is the southern continuation of the VC-8 conductor / target.
- Centre of ***Plate 1*** conductor: 7882747mN 403408mE, at ~225m depth below surface.
- Conductor is sub-horizontal.
- ***Plate 1*** length: 1600m, width: 900m. Conductance 10Ωm.

- Top of ***Plate 2*** conductor: 7884525mN 403194mE, at ~87m depth below surface.
- Conductor dips ~15° to the northeast (057°).
- ***Plate 2*** length: 1500m, depth extent: 300m. Conductance 2Ωm

- Top of ***Plate 3*** conductor: 7884525mN 404050mE, at ~70m depth below surface.
- Conductor dips ~17° to the southwest (~252°).
- ***Plate 2*** length: 1500m, depth extent: 200m. Conductance 4Ωm

# 4 BCRK_VC-10

VC-10 is also complex and difficult to model well. The CDIs and profiles indicate that the main conductor has a shallow to moderate westerly dip, with the weakly conductive unit being overlain by 50m or more of conductive regolith, including the oxidized part of the bedrock conductor (Figure 12, attached).

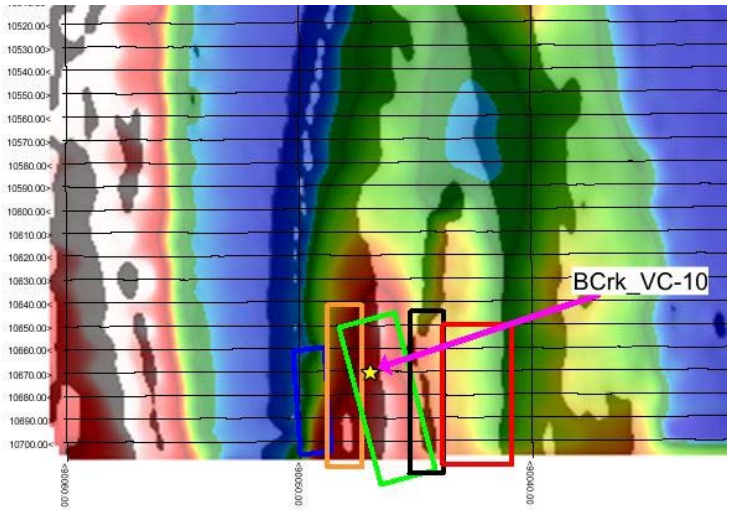



**Figure 11: BCrk_VC-10 location**

The Maxwell modelling results are summarized below and shown in Figures 13 and 14. The westerly dip is consistent with the profiles and CDIs. The modelled depth is somewhat deeper than anticipated from the CDIs.

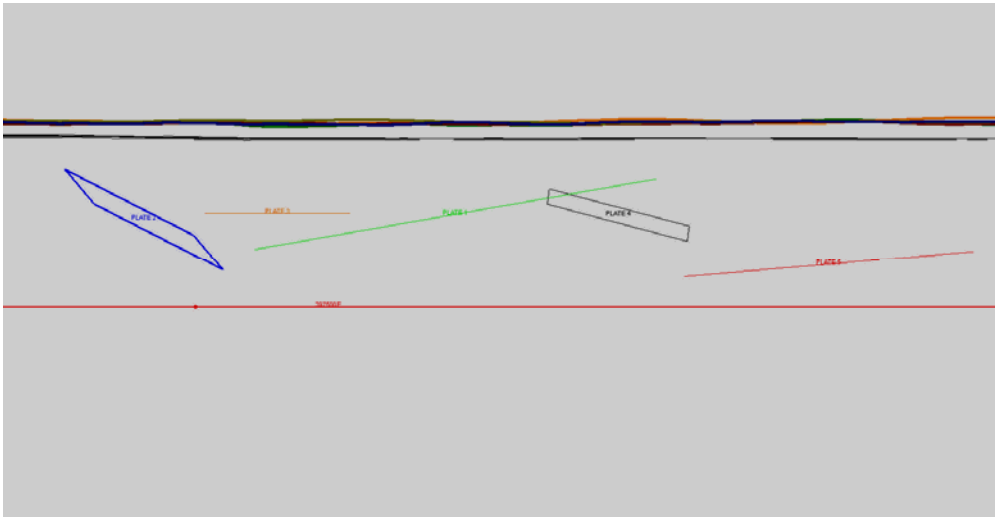


**Figure 13: VC-10 Modelled Conductor Plates (looking north)**

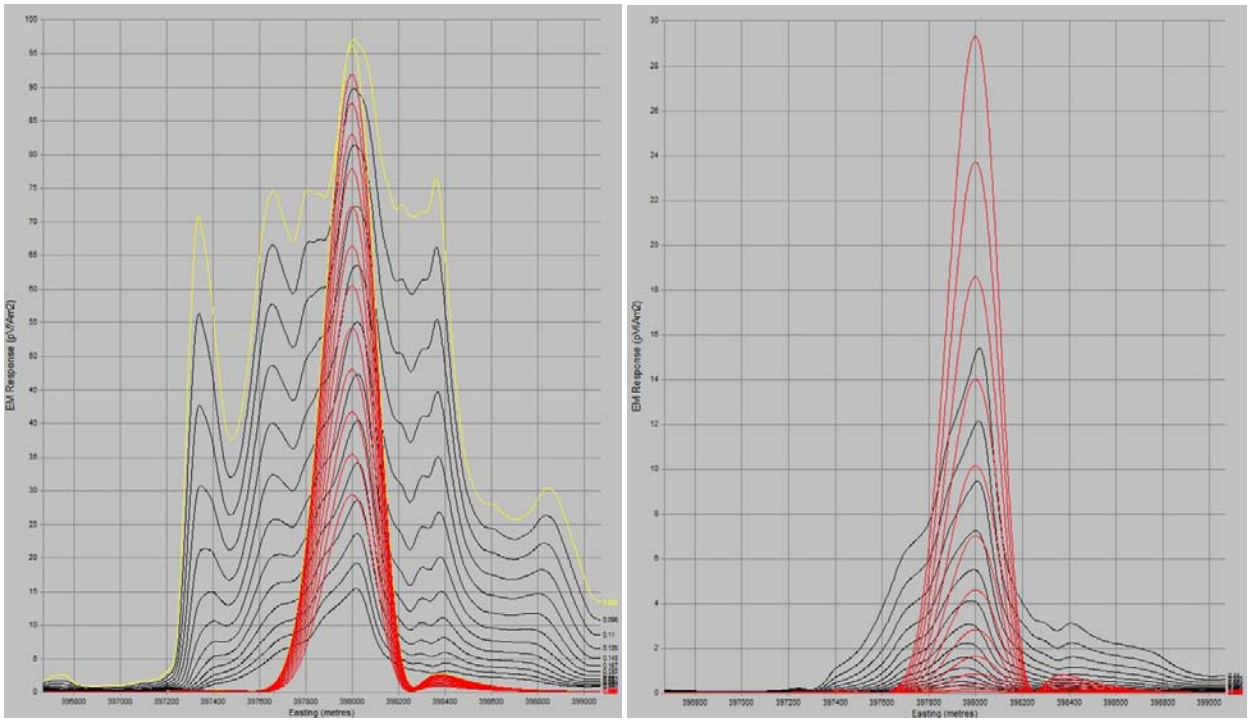
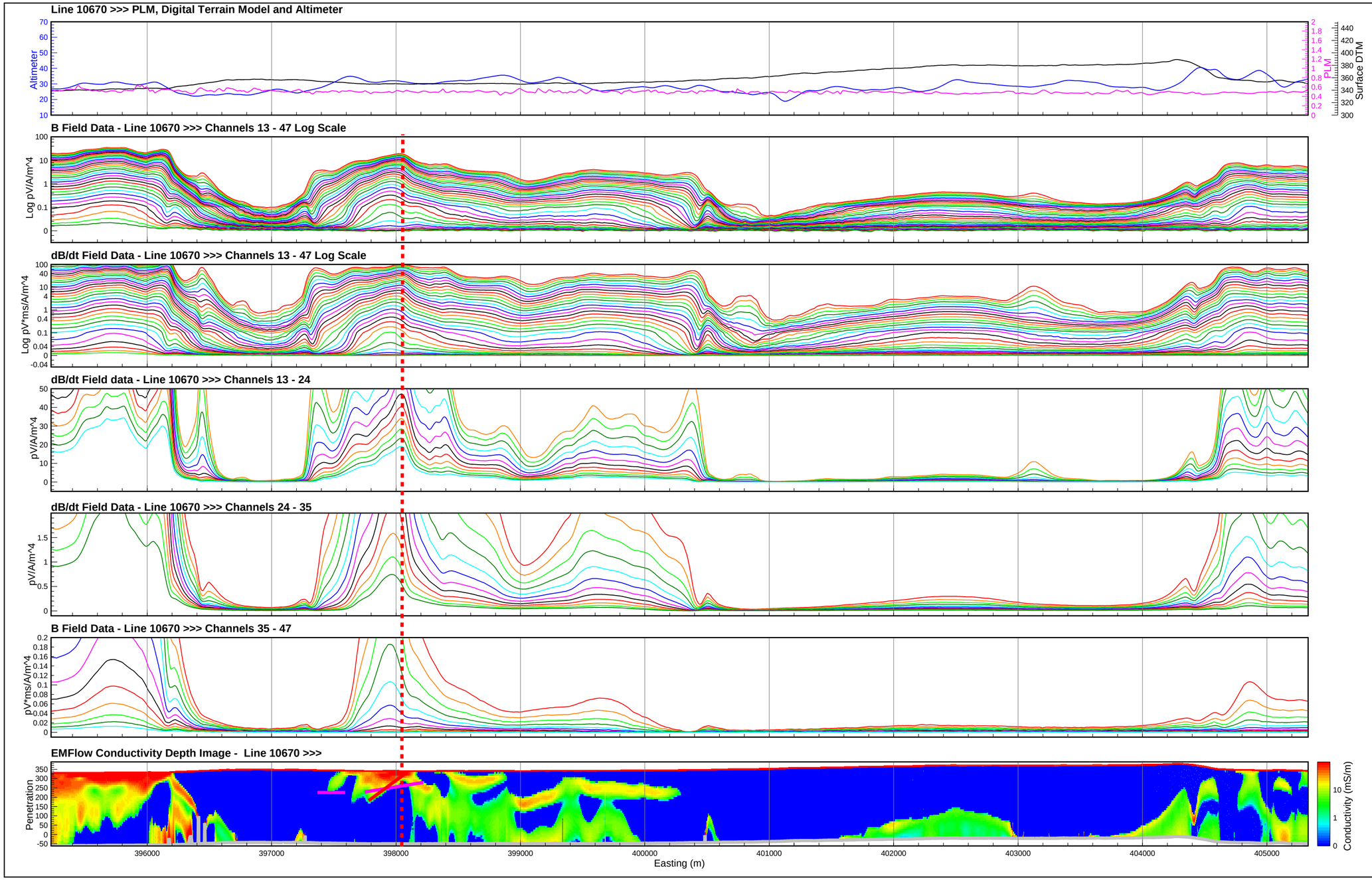


**Figure 14 (left): VC-10 Line 10670 Early time channel modelling (ch1 to 13) of dB/dt profiles (model profiles in red)**

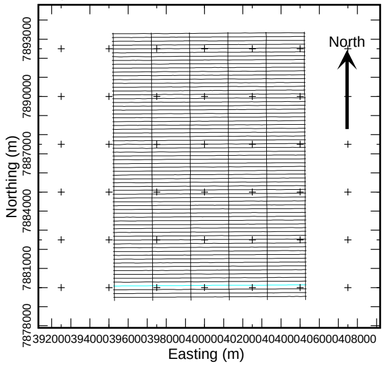
**Figure 14 (right): VC-10 Line 10670 Mid time channel modelling (ch13 to 25) of dB/dt profiles (model profiles in red)**

For initial evaluation of the shallower part of this target, trenching or shallow drilling from about 397900E to 388100E on flight line 10670 (~7880100N) should be considered. This should cover the likely surface projection of the westerly dipping conductive horizon and its overlying oxidized equivalents.

- Top of conductor: 7880102mN 398225mE, at 123m depth below surface.
- Conductor dips ~10° to the west and plunges ~15° to the south.
- Length: 1400m, depth extent: 500m
- Conductivity-thickness: 5S




## Flight Path




## Channel Centre Times (ms)

| | | | | | |
|---|---|---|---|---|---|
| Ch13: | 0.083 | Ch25: | 0.440 | Ch37: | 2.323 |
| Ch14: | 0.096 | Ch26: | 0.505 | Ch38: | 2.667 |
| Ch15: | 0.110 | Ch27: | 0.580 | Ch39: | 3.063 |
| Ch16: | 0.126 | Ch28: | 0.667 | Ch40: | 3.521 |
| Ch17: | 0.145 | Ch29: | 0.776 | Ch41: | 4.042 |
| Ch18: | 0.167 | Ch30: | 0.880 | Ch42: | 4.641 |
| Ch19: | 0.192 | Ch31: | 1.010 | Ch43: | 5.333 |
| Ch20: | 0.220 | Ch32: | 1.161 | Ch44: | 6.125 |
| Ch21: | 0.253 | Ch33: | 1.333 | Ch45: | 7.036 |
| Ch22: | 0.290 | Ch34: | 1.531 | Ch46: | 8.083 |
| Ch23: | 0.333 | Ch35: | 1.760 | Ch47: | 9.286 |
| Ch24: | 0.383 | Ch36: | 2.021 | | |

## Survey Specifications

| | |
|---|---|
| Contractor | : Geotech Airborne Ltd |
| Date flown | : May 2012 |
| EM System | : Time Domain EM (VTEM) |
| Base Frequency | : 25 Hz |
| Aircraft | : Astar 350 B2 helicopter |
| Flight Line Spacing | : 200m |

**Scale 1 : 25000**

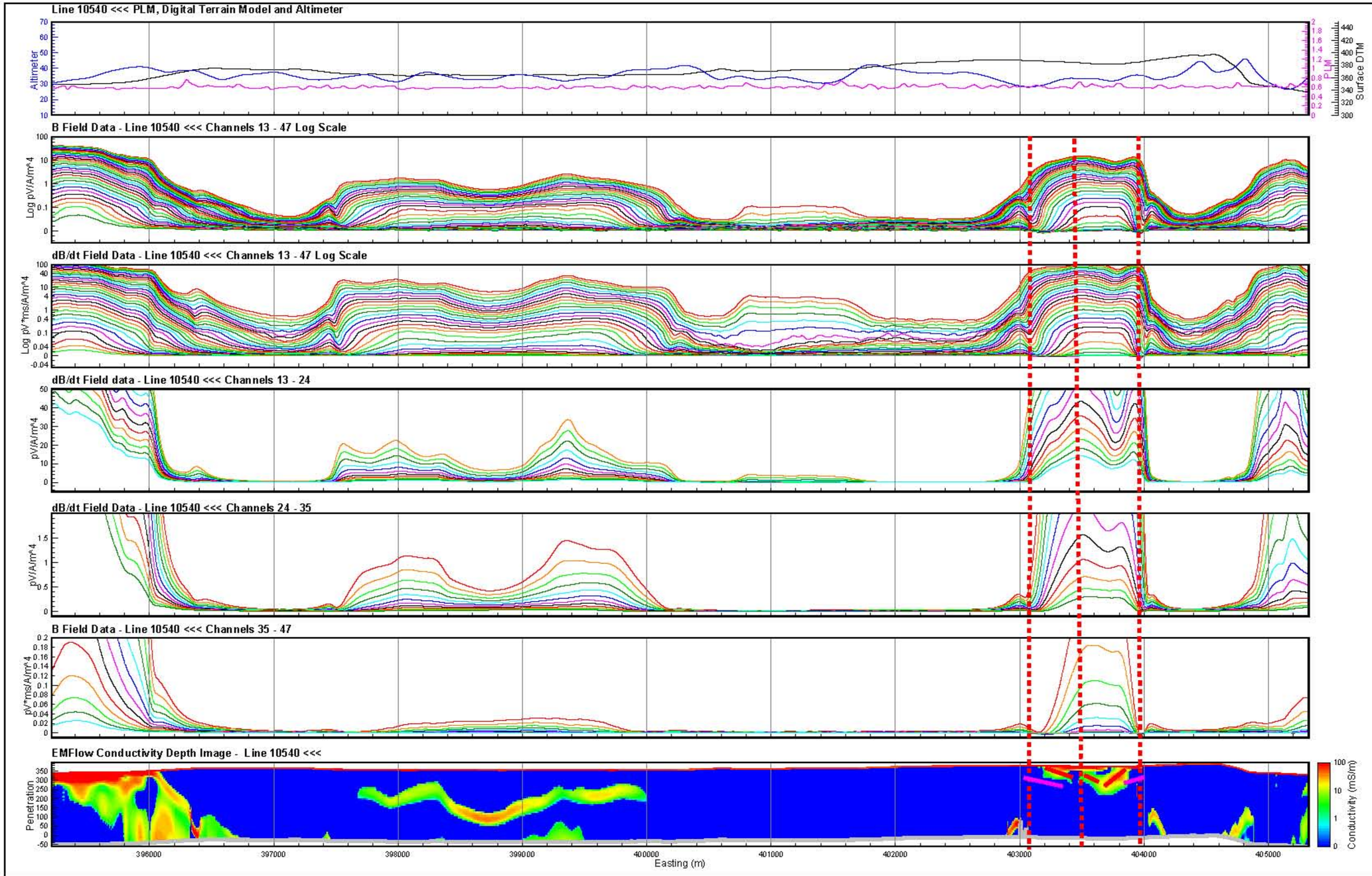
0m 500m 1000m 1500m

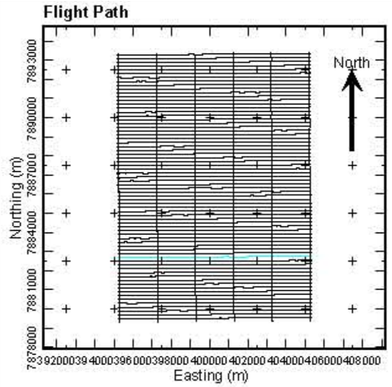
Datum: WGS84
Grid: SUTM Zone 53

SOUTHERN GEOSCIENCE CONSULTANTS

# BLIGH RESOURCES LTD
# BOOTU CREEK PROJECT
# PRELIMINARY VTEM PROFILES
# LINE 10670

| | |
|---|---|
| Scale: 1 : 25000 | B. R. Morgan |
| Date: 30/05/2012 | Figure: |

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### Survey Specifications

| | |
|---|---|
| Contractor | : Geotech Airborne Ltd |
| Date flown | : May 2012 |
| EM System | : Time Domain EM (VTEM) |
| Base Frequency | : 25 Hz |
| Aircraft | : Astar 350 B2 helicopter |
| Flight Line Spacing | : 200m |

**Scale 1 : 25000**

0m 500m 1000m 1500m

Datum: WGS84
Grid: SUTM Zone 53

# BLIGH RESOURCES LTD
# BOOTU CREEK PROJECT
# PRELIMINARY VTEM PROFILES
# LINE 10540

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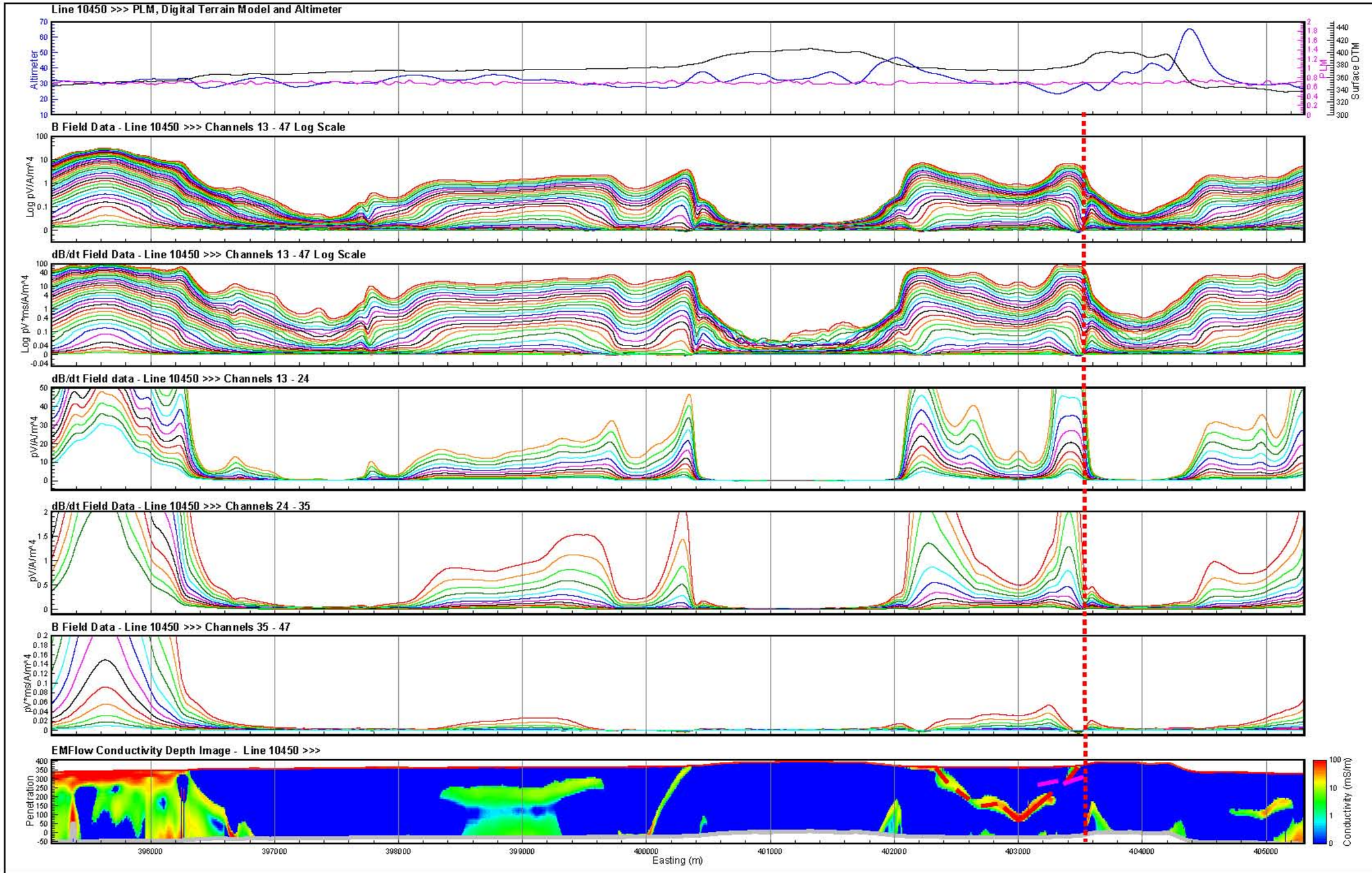
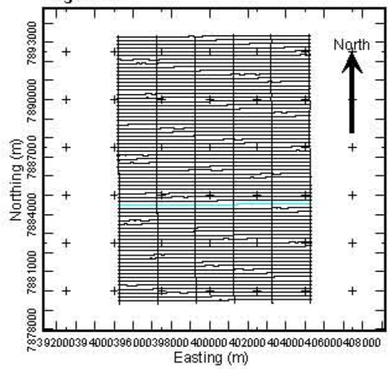
|---|---|
| Scale: 1 : 25000 | B. R. Morgan |
| Date: 30/05/2012 | Figure: |




## Flight Path

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## Survey Specifications

| | |
|---|---|
| Contractor | : Geotech Airborne Ltd |
| Date flown | : May 2012 |
| EM System | : Time Domain EM (VTEM) |
| Base Frequency | : 25 Hz |
| Aircraft | : Astar 350 B2 helicopter |
| Flight Line Spacing | : 200m |

**Scale 1 : 25000**

0m 500m 1000m 1500m

Datum: WGS84
Grid: SUTM Zone 53

# BLIGH RESOURCES LTD
# BOOTU CREEK PROJECT
# PRELIMINARY VTEM PROFILES
# LINE 10450

| | |
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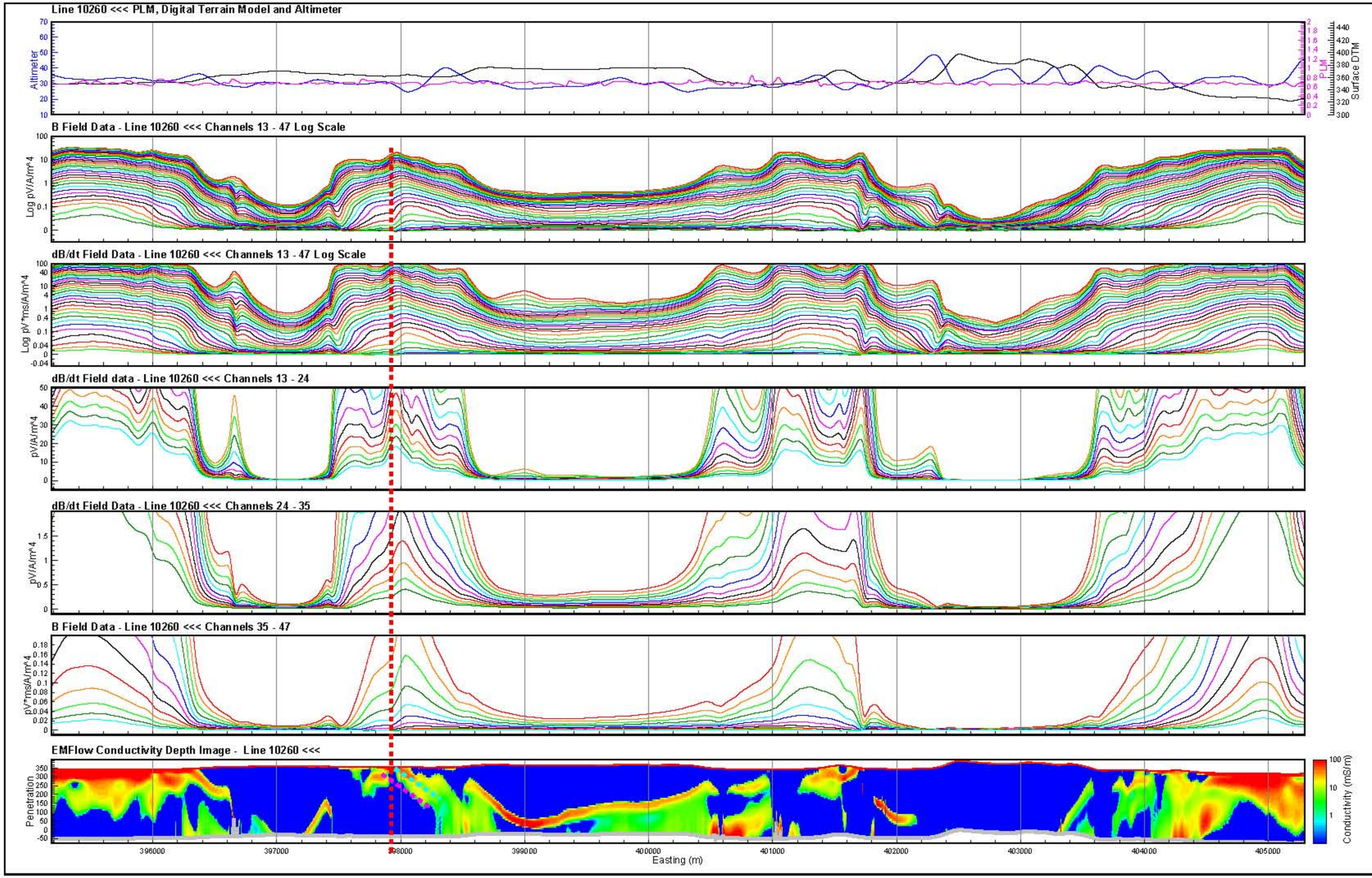
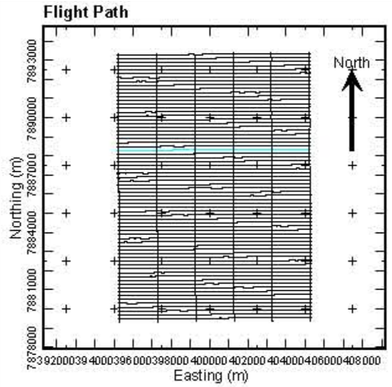
| Scale: 1 : 25000 | B. R. Morgan |
| Date: 30/05/2012 | Figure: |

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**Survey Specifications**

| | |
|---|---|
| Contractor | : Geotech Airborne Ltd |
| Date flown | : May 2012 |
| EM System | : Time Domain EM (VTEM) |
| Base Frequency | : 25 Hz |
| Aircraft | : Astar 350 B2 helicopter |
| Flight Line Spacing | : 200m |

**Scale 1 : 25000**

0m 500m 1000m 1500m

Datum: WGS84
Grid: SUTM Zone 53

# BLIGH RESOURCES LTD
# BOOTU CREEK PROJECT
# PRELIMINARY VTEM PROFILES
# LINE 10260

| | |
|---|---|
| Scale: 1 : 25000 | B. R. Morgan |
| Date: 30/05/2012 | Figure: |