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Report on
Down Hole IP/Resistivity Surveys
Drill Holes GL-06-01 and GL-06-02
Fawcett Township
Shining Tree Area, Ontario

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JVX Ref: 6-05 and 6-06
March 2006

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Table of Contents

Figures

Attachments

Profile Plots

The results of the surveys are presented on a series of page size stacked profiles. There is one set of stacked profiles for each of the 2 holes surveyed. Each set includes the apparent resistivity and chargeability results, detection and direction logs, for that hole. Each set includes 3 panels. Contents of each panel are

Panel 1. log(apparent resistivity), detection logs, 10 and 20 m dipoles

Panel 2. Mx chargeability, detection logs, pole-dipole 10 and 20 m, pole-pole 20 and 40 m.

Panel 3. Corrected Mx chargeability, direction logs, 10 and 20 m dipoles.

Down Hole IP/Resistivity Surveys, Detection and Direction Logs Drill Holes GL-06-01 and GL-06-02, Fawcett Township, Ontario
Goldeye Explorations Ltd.

Detection and direction down hole IP/resistivity (DHIP) surveys were run on 2 drill holes on the Fawcett Township property of Goldeye Explorations Ltd. The work was done for Goldeye Explorations by JVX Ltd under JVX job numbers 6-05 and 6-06. The field work was done in January, 2006.

6-05 applies to hole GL-06-01 on the Grouse grid. It is also called Little Grouse and Grouse Lake grid. 6-06 applies to hole GL-06-02 on grid 3600. Both grids were surveyed with IP/resistivity in late 2005 for Goldeye Explorations by JVX (JVX job number 5-33,57). GL-06-01 and GL-06-02 were designed to test IP anomalies from this earlier survey. GL-06-01 is on claim number 1246451. GL-06-02 is on claim number1246468.

The regional setting of the project area is shown in figure 1. The position of the two drill holes relative to mineral claims is shown in figure 2. The 2 holes surveyed are listed in table 1. Shown are the collar coordinates (NAD83, Z17N), hole inclination, azimuth (relative to UTM north) and length.

Hole #	UTM e	UTM n	Elevation	inclination	azimuth	length
GL-06-01	488635	5267231	400	-50°	225°	191
GL-06-02	493323	5261102	400	-50°	270°	249

Table 1. Holes Surveyed, Collar Locations, Inclination, Azimuth and Length

A production summary, survey methods, instrumentation, data processing, presentation and archives are described in Appendix 1. A short note on DHIP model results and instrument specification sheets are attached. Highlights of the processing and presentation are discussed below.

1. Drill Targets

Two drill targets were taken from an IP/resistivity survey done in late 2005 (see JVX project number 5-33,57). One was on Grouse grid and one on grid 3600. Reading from the 5-33,57 report for Goldeye Explorations Ltd. (with the addition of UTM coordinates – NAD83, Z17N)

T1 : Grouse Grid : Line 10700E at 10350N : 488480, 5267260
Line 10800E at 10350N : 488570, 5267220

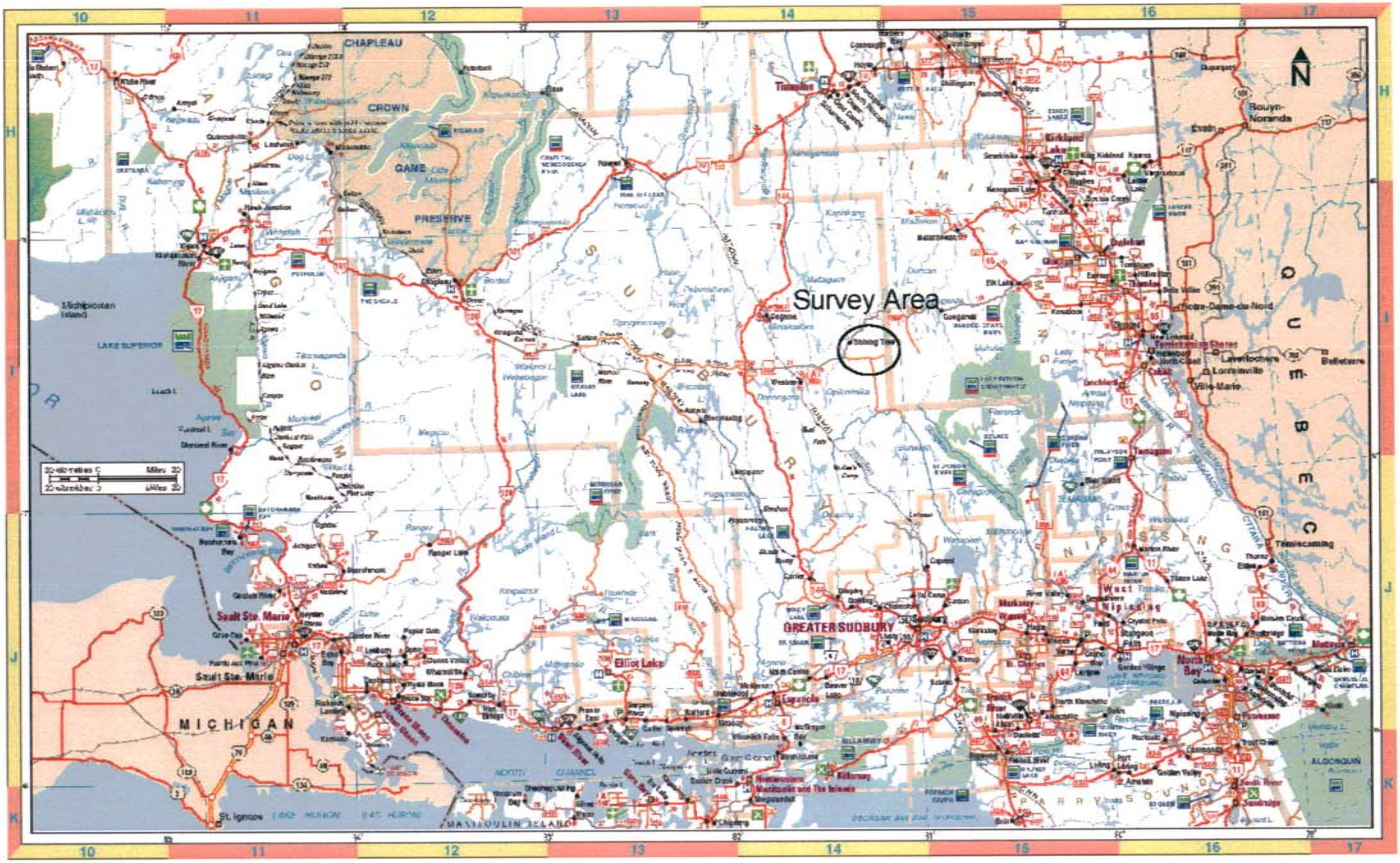


FIGURE 1

Surveyed by: JVX LTD.
January - February 2006
Ref no. 6-05 & 6-06

LOCATION MAP

GOLDEYE EXPLORATIONS LTD.
FAWCETT TWP. - SHINING TREE
NTS: 41 P/11
BOREHOLE IP / RESISTIVITY SURVEY

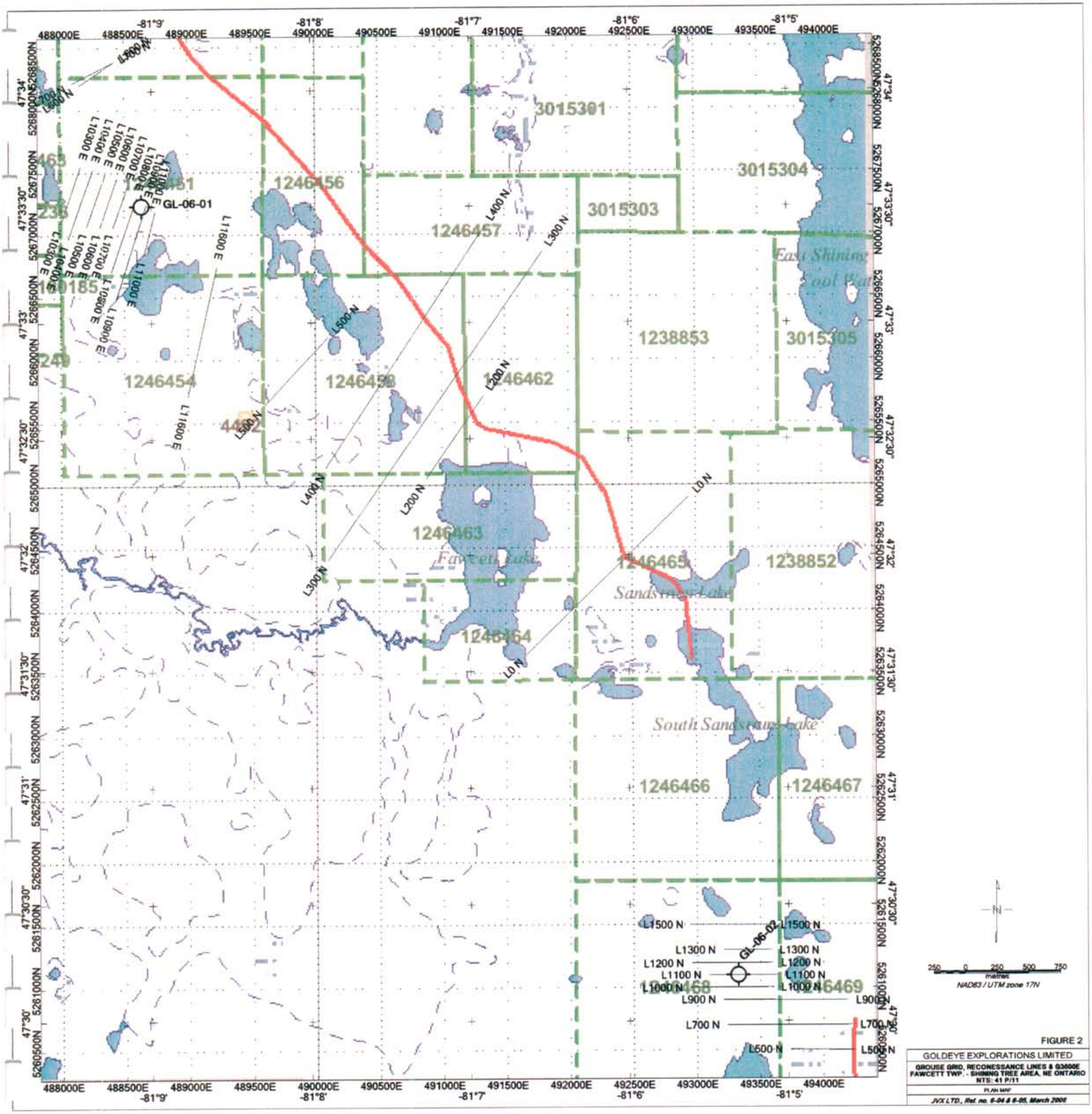


FIGURE 2

GOLDEYE EXPLORATIONS LIMITED

GROUSE GRID, RECONESSANCE LINES & G3600E
FAWCETT TWP. - SHINING TREE AREA, NE ONTARIO
NTS: 41 P/11

PLAN MAP

JVX LTD., Ref. no. 6-04 & 6-05, March 2006

These locations define the center point of the two strong IP anomalies in the middle of a 500 m long IP zone that trends northwest - southeast. Mx peak amplitudes are just over 20 mV/V or at least 4 times background levels. The IP anomalies at these locations are clear and well formed with shallow, sharply defined tops. Both IP anomalies are on a resistivity contact that may reflect a change in bedrock porosity. If the IP zone has a magnetic response, it is less than 100 nT.

There is little to choose between these two IP anomalies. Moderately higher surficial resistivities over the IP anomaly on Line 10800E suggests thinner overburden.

T2 : Grid 3600 : Line 1100N at 3250E : 493250, 5261100

This is the best IP anomaly on the grid; peak Mx amplitudes are over 15 mV/V. The IP anomaly is clear and well-formed with a shallow top. There is some support for a dip to the east. The target is in the center of an IP zone that is 400 m long. Low surficial resistivities over and east of the target add value but may confuse the interpretation.

2. Drill Logs

Target T1 on Grouse grid was drilled from northeast. The collar was about 50 m northeast of the probable trace of the target center (30 m southeast of line 10800E). If the target is vertical and if it continues southeast of line 10800E, it should be intersected at a down hole depth of 78 m. If the target dips 45° to the northeast (i.e. towards the drill hole), it should be intersected at a down hole length of 39.6 m. The target will not be intersected for dips to the southwest at a dip less than 63.6°.

T2 on Grid 3600 was drilled from the east. The collar was 73 m east of the target. If the target is vertical, it should be intercepted at a down hole length of 112 m. If the target dips 45° to the east, it should be intersected at a down hole length of 57 m. The target will not be intersected if it dips to the west at a dip less than 65.2°.

Goldeye has provided copies of the drill logs. These are dated January 18, 2006 (GL-06-01) and January 23, 2006 (GL-06-02). Section plots are reproduced here as figure 3 (GL-06-01) and figure 4 (GL-06-02).

GL-06-01

Below the 8.5 m of overburden, most of this hole passes through mafic and felsic volcanics (80 %). There are two intersections of intrusives (total 13 %) and one of metasediments (7 %). Geophysical features of note include

77.4 to 78.75 : 1 – 2 % pyrite in volcanics
141.5 to 151.35 : 1 – 2 % pyrite in volcanics
162.8 to 170.6 : 1 to 4 % pyrite in volcanics
170.6 to 182.6 : graphitic metasediments

If the target is combination of 1 to 4 % pyrite + graphitic sediments over 20 m centered around 172 m down hole, the target dips at 65° to the southwest. In this case, the target was drilled down dip.

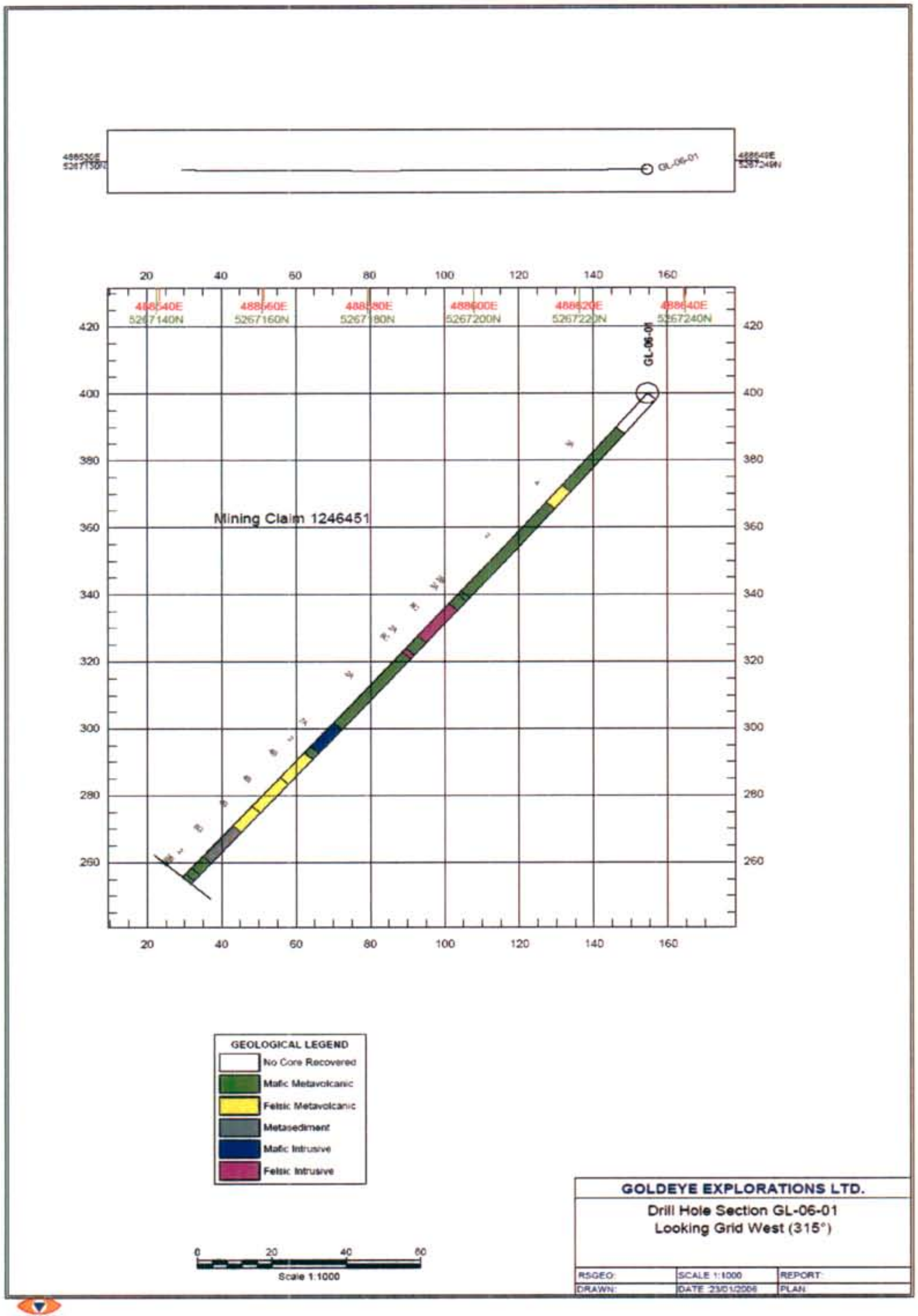


Figure 3

GL-06-02

Below the 12 m of overburden, most of this hole passes through mafic and felsic volcanics (99 %). There are three small intersections of intrusives (total 1 %). The log shows no significant intersections of massive or disseminated metallic sulphides.

There is nothing in the log to explain the surface IP anomaly. Presumably, the target was not intersected. It must dip at 65° or less to the west. The target appears to have been drilled down dip.

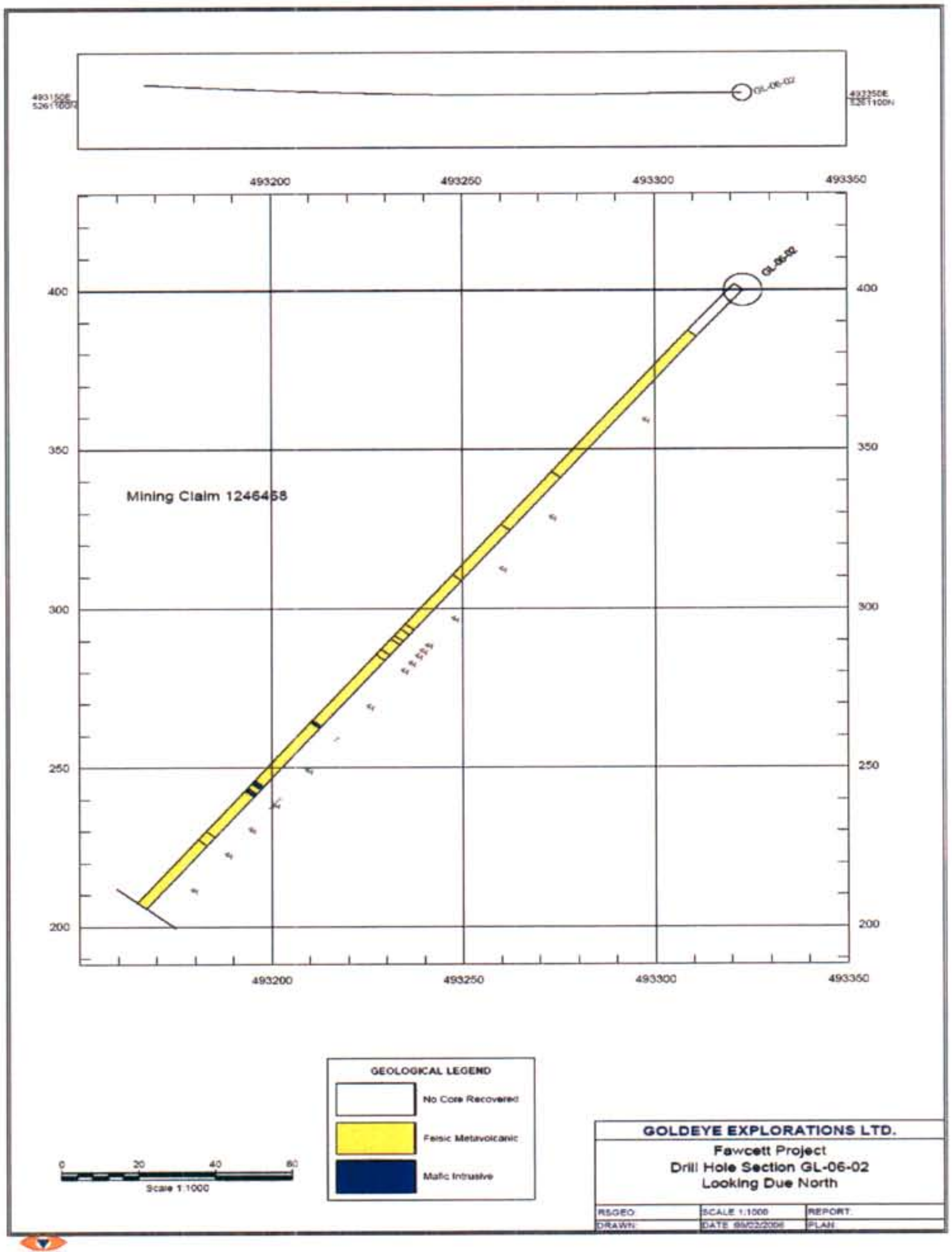


Figure 4

3. DHIP : Introduction

When operating below the range of surface IP, DHIP is the only geophysical method capable of locating bodies of disseminated sulphides that are some distance from the hole. Historically, results from DHIP surveys have been mixed and this has been due in part to the lack of qualitative modeling tools. Commercial grade software for DHIP forward modeling and 3D inversion has been recently introduced and this has added value and interest to DHIP.

DHIP usually consists of two logs: a detection log to map chargeable bodies around the drill hole and a direction log to give the probable azimuth to these chargeable bodies.

The pole-dipole array is commonly used for the detection log. Anomaly shapes are similar to those seen at surface (see attachment). Chargeability anomaly amplitudes are half those seen at surface for the same buried / off hole body. The off-hole distance of exploration is about half that assumed in surface IP. The detection logs used here collect apparent chargeability and resistivity data for

Pole-dipole survey: a=10 m, n=1
Pole-dipole survey: a=20 m, n=1
Pole-pole survey: a=20 m
Pole-pole survey: a=40 m

With good quality data, the radius of exploration of the pole-dipole logs is around 5 m (a=10 m, n=1) and 10 m (a=20 m, n=1).

Direction logs use large, fixed current bipoles placed on surface or in drill holes. For deep holes, currents must be placed in nearby drill holes. The logic of direction logs is relatively simple. Current bipoles at different locations favour one side or another of the drill hole. A chargeable body between the drill hole and the current bipole will generate a larger DHIP anomaly than one that is on the other side of the drill hole.

The direction logs used here are based on current bipoles set up east and west or north and south of the hole. For each current bipole, primary and secondary potentials are read for 10 and 20 m potential electrode pairs.

DHIP results are processed and plotted in MS Excel. The raw data are listed and plotted in one set of Excel files. The processed data as shown in stacked profile plots in this report are in another set of Excel files. The presentation used here involves stacked profiles, each of 3 panels.

Panel 1. log(apparent resistivity), detection logs (2 traces)
Panel 2. Mx chargeabilty, detection logs (4 traces)
Panel 3. Corrected Mx chargeability, direction logs (4 traces)

4. DHIP : Interpretation

Interpretation may be based on a combination of forward and inverse modeling. Results from a limited number of forward models are attached. Inverse modeling may be based on DCIP3D, a program library for the inversion of DC resistivity and IP data over 3D structures. DCIP3D is from the UBC-Geophysical Inversion Facility.

An early priority is separating signal from noise, particularly in chargeability. Potential electrodes are at the ends of long cables subject to breaks and other leaks. Potential electrodes are inaccessible and their positions must be assumed. There are some redundancies in the measured chargeabilities however and these may be used to separate good data from bad.

Having decided what DHIP anomalies represent chargeable bodies, a qualitative interpretation of the cause may be possible using forward modeling results. Under favourable conditions, it may be possible to answer the following questions

- Does a chargeable body intersect the drill hole. If yes, what are its width, orientation and off-hole extent ?
- Is there a chargeable body off-hole. If yes, how far off-hole and how big?

Qualitative interpretation using forward models may be enough where there is one isolated drill hole. With multiple holes, each with its own detection and direction logs, more interpretive power is needed and this is the role of 3D inversion programs like DCIP3D.

GL-06-01 and GL-06-02 are isolated drill holes and the DHIP results from each hole have not been inverted.

5. Presentation

The attached profile plots show three panels. Panel 1 shows log(apparent resistivity) from the detection logs. Panel 2 shows Mx chargeabilities from the detection logs. Panel 3 shows corrected Mx chargeabilities from the direction logs. Contents for GL-06-01 are

Panel 1
  PD10 – apparent resistivity in ohm.m, detection log, pole-dipole a=10 m
  PD20 – apparent resistivity in ohm.m, detection log, pole-dipole a=20 m
Panel 2
  PD10 – Mx chargeability in mV/V, detection log, pole-dipole a=10 m
  PD20 – Mx chargeability in mV/V, detection log, pole-dipole a=20 m
  PP20 – Mx chargeability in mV/V, detection log, pole-pole a=20 m
  PP40 – Mx chargeability in mV/V, detection log, pole-pole a=40 m

Panel 3

GE10 – Mx" chargeability in mV/V, direction log, east bipole, a=10 m
GE20 – Mx" chargeability in mV/V, direction log, east bipole, a=20 m
GW10 – Mx" chargeability in mV/V, direction log, west bipole, a=10 m
GW20 – Mx" chargeability in mV/V, direction log, west bipole, a=20 m

A gap in a profile indicates data that has been ignored. Common causes are very large or erratic values and negative measured Vp in the detection logs.

There are a number of features in these profiles that may be used for quality control.

1. The PD10 and PD20 apparent resistivities in the detection logs should track each other. The PD10 trace may show small short period variations away from the PD20 trace. Large differences add suspicion.

2. The PD20, PP20 and PP40 Mx chargeabilities from the detection logs are linked. In theory, it would be possible to build Mx PD20 from PP20 and PP40 results. Where the current is fixed and the measured Vp does not change, Mx(PD20) ≈ 2Mx(PP20) – Mx(PP40).

3. PD10 Mx chargeabilities from the detection logs are independent of PD20, PP20 and PP40. For large targets, Mx(PD10) is commonly equal to or greater than Mx(PD20). Larger ratios will apply to smaller bodies.

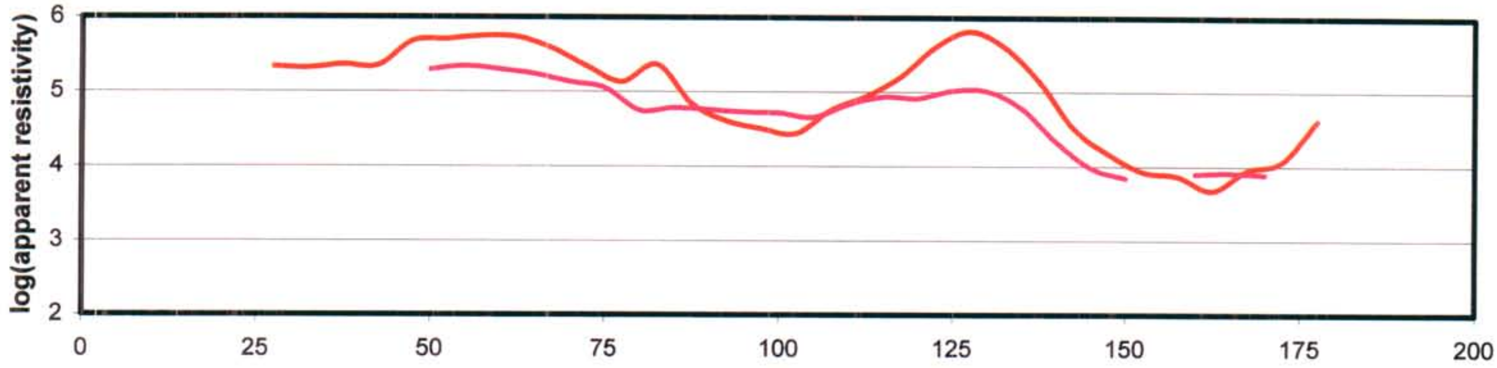
4. In the direction logs, GE10 should track GE20 and GW10 should track GW20. For any current bipole, these are not independent quantities but for usually minor issues of sampling and aliasing. If they do not track, there may be something wrong with the measurement or data processing.

5. In the direction logs, the GE10/GE20 profiles should be the same shape (same or opposite polarity) as the GW10/GW20 profiles. Any difference in amplitude is a measure of any asymmetry in the position of chargeable bodies relative to the two current bipoles.

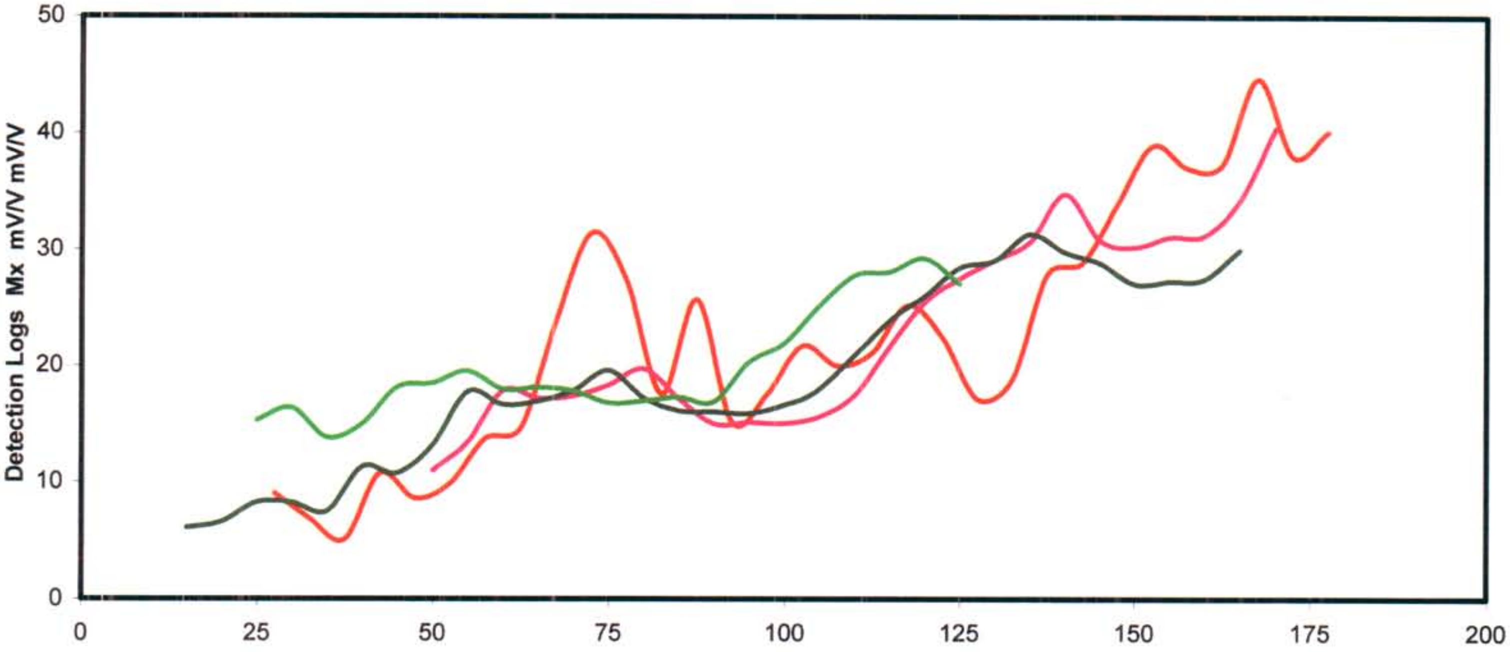
6. Discussion

GL-06-01

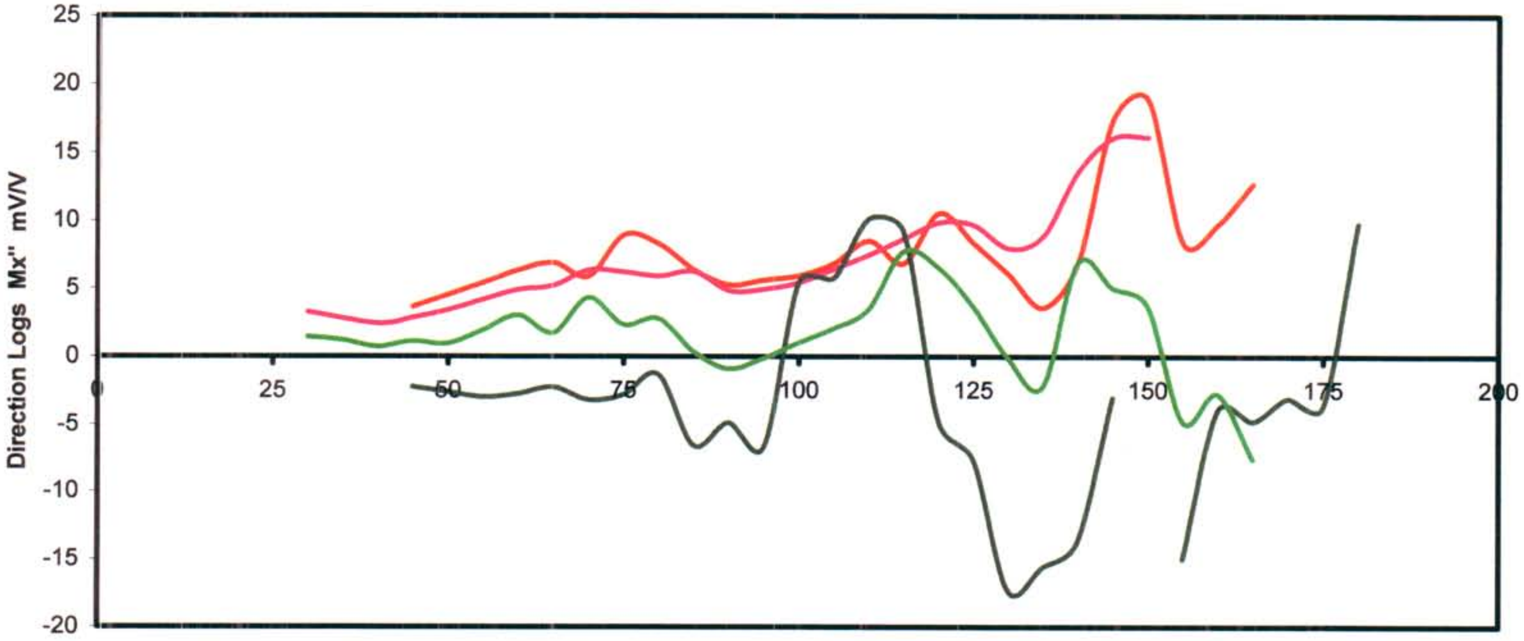
Apparent resistivities down to 135 m are around 100,000 ohm.m. These are normal DHIP values for crystalline rock without bedrock conductors. Resistivities thereafter go down to lows of 4716 ohm.m (PD10 at 162.5 m) and 7700 ohm.m (PD20 at 170 m). These values are thought to represent the graphitic sediments. The shape of the resistivity low is consistent with a



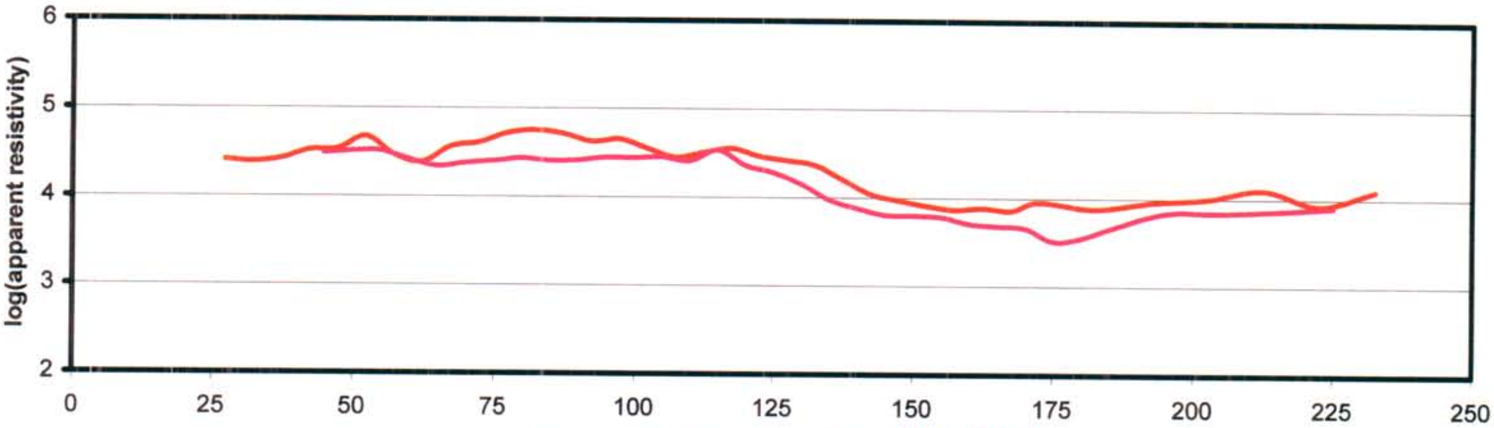
Goldeye Fawcett GL-06-01(Grouse) PD10, PD20



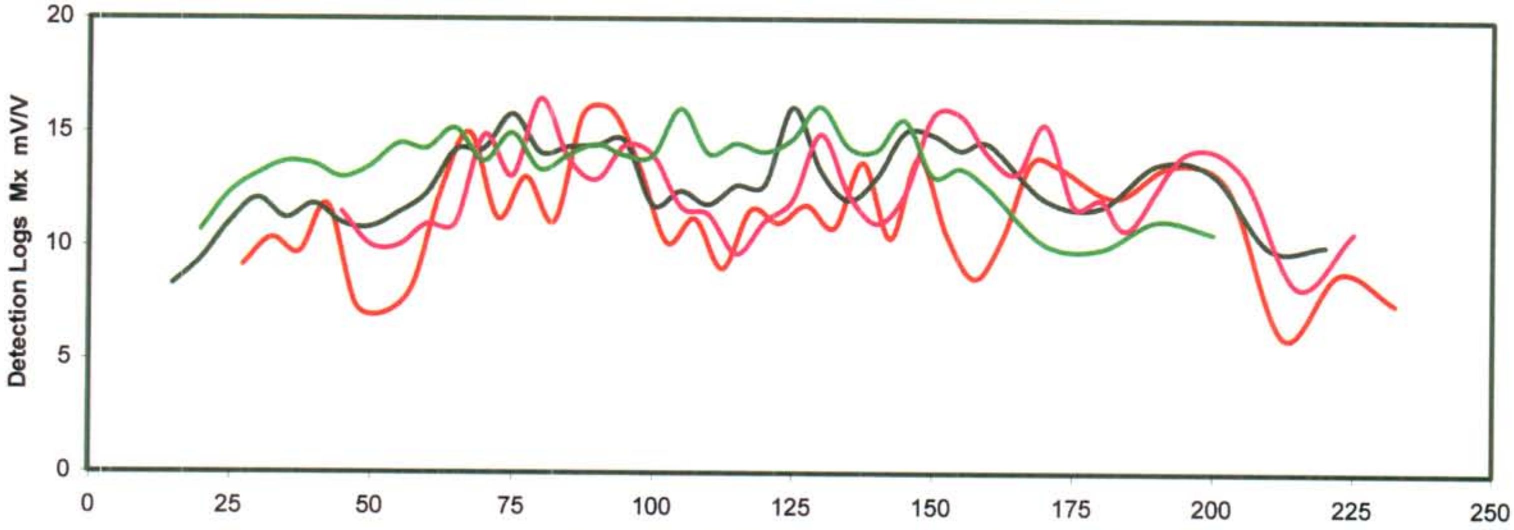
Goldeye Fawcett GL-06-01(Grouse) PD10, PD20, PP20, PP40



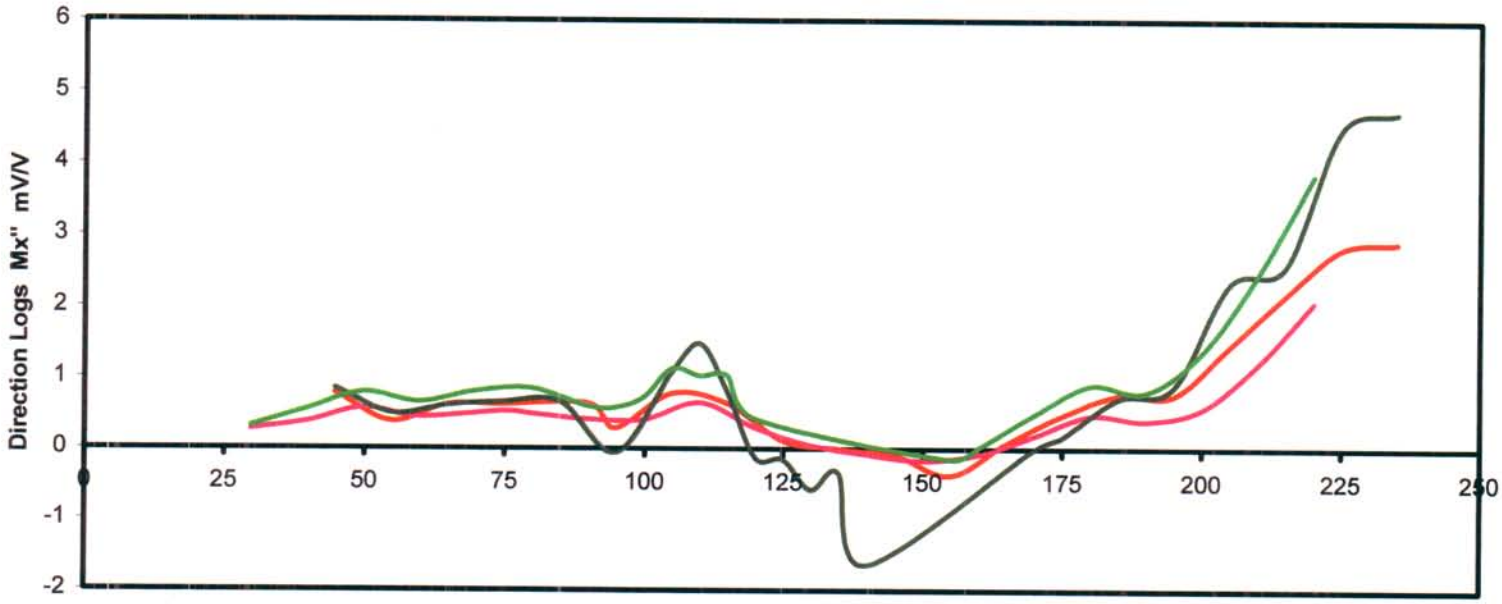
Goldeye Fawcett GL-06-01 GE10, GE20, GW10, GW20



Goldeye Fawcett GL-06-02 (3600) PD10, PD20



Goldeye Fawcett GL-06-02 (3600) PD10, PD20, PP20, PP40



Goldeye Fawcett GL-06-02 (3600) GS10, GS20, GN10, GN20 conductor that approaches the hole at a shallow angle. The graphitic sediments are intersected at hole lengths 171 to 183 m.

Note that PD20 resistivity at 155 m has been dropped. At this point, the apparent resistivity is 69,366 ohm.m. The current is listed as 1 mA (the lowest non-zero integer value permitted by the IPR12). A current of 10 mA would be more believable.

In the pseudosection from 5-33,57 of line 10800E, there is no resistivity anomaly (high or low) associated with the target. And therefore no evidence of a bedrock conductor.

The detection log chargeabilities track well and show a linear increase with depth reaching 40 mV/V at 170 m. There are no clear short-period Mx anomalies that might represent a chargeable body crossing normal to the drill hole. High chargeabilities above 135 m are probably from the graphitic sediments.

The direction log chargeabilities from the east bipole are of reasonable quality. Background values are around 5 mV/V. An Mx" high at 150 m coincides with detection log resistivity lows and chargeability highs. The direction log Mx" anomaly is probably due to the graphitic sediments that should be about 8 m from the hole at this depth.

The direction log chargeabilities from the west bipole are of uncertain quality. The two profiles (GW10 and GW20) do not track and the GW10 profile has some extreme Mx" values.

GL-06-02

The detection log apparent resistivities show a similar pattern to that seen in GL-06-01. Apparent resistivities down to 125 m are around 30,000 ohm.m. They fall thereafter reaching lows of 7571 ohm.m (PD10 at 182.5 m) and 3270 ohm.m (PD20 at 175 m). The explanation is presumed to be the same – a conductor that is near parallel with the drill hole. The drill hole is within 5 m of the conductor that may have caused the surface IP anomaly.

The resistivity pseudosection from 5-33,57 of line 1100N shows a band of lower resistivities coincident with the IP anomaly. The change is slight however – n=1 values across the target are 2699, 1137 and 1591 ohm.m. This would not normally be picked as a bedrock conductor.

Detection log chargeabilities are 10 to 12 mV/V over most of the hole. All channels follow the same overall trend but the results look noisy. There is no break in the trend at 125 m. Chargeabilities decrease near the bottom of the hole. The detection log chargeabilities are an uncertain match with the detection log resistivities.

But for GN10 from 125 to 165 m, the direction log chargeabilities are of very good quality. Background values over most of the hole are less than 1 mV/V, a value that raises more doubts about the detection log chargeabilities. All direction log chargeabilities increase at the bottom of the hole (peak 5 mV/V in GN10). The partial IP anomaly here is consistent with an off-hole chargeable body. The body has a north bias.

The combination of the detection log resistivities and direction log chargeabilities suggest the target is a bedrock conductor just west of the drill hole at all depths.

7. Conclusions

Detection and direction DHIP logs have been run in 2 drill holes on the Fawcett Township property of Goldeye Explorations Ltd. The holes are labeled GL-06-01 (Grouse grid) and GL-06-02 (Grid 3600). The results have been presented in stacked profiles of apparent resistivity (2 channels), detection log chargeability (4 channels) and direction log corrected chargeability (4 channels).

The drill holes were designed to test IP anomalies from a late 2005 survey. The drill log for GL-06-01 shows graphitic metasediments from 171 to 183 m. This implies the target dips at 65° to the southwest. The drill log for GL-06-02 show nothing of geophysical interest. It appears as if the targets have been drilled down dip. Target dip on Grouse Grid (GL-06-01) is 65° southwest. On Grid 3600 (GL-06-02), the DHIP results suggest the near miss of a conductor. In this case, the target dips at less than 65° to the west.

Some method to better determine target dip is needed. Using the IP anomaly form alone did not work. As both targets appear to be bedrock conductors, HLEM might have helped. In 5-33,57, HLEM surveys stopped short of the Grouse grid target. HLEM surveys were not done over grid 3600.

per BW
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Appendix 1
Surveys, Data Processing, Presentation and Archives

DHIP surveys were run on 2 drill holes on the Fawcett Township property of Goldeye Explorations Ltd. The field work was done in January, 2006 (see Table 1). The work was done for Goldeye Explorations Ltd. by JVX Ltd. under JVX job numbers 6-05 and 6-06.

The two drill holes are labeled GL-06-01 and GL-06-02. JVX job number 6-05 applies to GL-06-01. JVX job number 6-06 applies to GL-06-02. Both drill holes were follow up to an IP/resistivity survey done in late 2005 for Goldeye Explorations by JVX (JVX job number 5-33,57). GL-06-01 is on the Grouse (or Little Grouse or Grouse Lake) grid. GL-06-02 is on grid 3600 (or 307).

Date	Hole #	Work
January 23	GL-06-01	GE, GW
January 24	GL-06-01	PD10, PD20
January 28	GL-06-02	PD10, PD20
January 29	GL-06-02	PD10, GN
January 30	GL-06-02	GS

Table 1. Production Summary

Work abbreviations are

PDP10 – detection log, pole-dipole with a=10 n, n=1,
PDP20 – detection log, pole-dipole with a=20 m, n=1
GS, GN, GE, GW – direction logs, current bipole South, North, East or West of the hole

Holes

The 2 holes surveyed are listed in table 2. Shown are the collar coordinates (NAD83, Z17N). Locations are as surveyed with a Garmin Etrex Legend GPS receiver. This unit is equipped with WAAS – Wide Area Augmentation System. At any control point, readings were averaged over 30 seconds for a positional accuracy of around ± 5 m, better on open ground.

Hole #	UTM e	UTM n	Elevation	inclination	azimuth	length
GL-06-01	488634	5267230	384	-50°	225°	191
GL-06-02	493322	5261104	396	-50°	270°	249

Table 2. Holes Surveyed, Collar Locations, Inclination, Azimuth and Length

Current locations for the direction logs are listed in Table 3. As a general rule, currents are labeled C1 to C4 with C1 northeast of the hole and numbers increasing clockwise.

Hole	Current	UTM e	UTM n	elevation
GL-06-01	C1	488800	5267270	391
	C2	488702	5266950	389
	C3	488324	5267170	399
	C4	488504	5267400	386
GL-06-02	C1	493525	5261266	389
	C2	493499	5260935	388
	C3	492965	5260932	398
	C4	493006	5261284	403

Table 3. Current Electrode Locations.

Current bipoles are defined as follows

GL-06-01 (Grouse) East bipole = C1 and C2
GL-06-01 (Grouse) West bipole = C3 and C4

GL-06-02 (3600) North bipole = C1 and C4
GL-06-02 (3600) South bipole = C2 and C3

Survey Procedures

Each hole is surveyed with detection and direction arrays. Two detection logs are run, each with different electrode spreads;

PDP10 – pole-dipole, a=10 m, n=1. Current below potentials
PDP20 – pole-dipole, a=20 m, n=1. Current below potentials

Sampling is every 5 m (detection logs) and 10 m (direction logs).

In the detection logs, IP/resistivity measurements are made for a potential electrode pair down hole and for a pair made up of the uppermost potential electrode down hole and a potential electrode at the collar. The second set of measurements is labeled 'surface' and yields pole-pole chargeability values at a=20 m (PD10) and a=40 m (PD20). Two passes are needed as the system is limited by 3 wires down hole. Each wire has its own counter at surface. Minor differences between passes in electrode positions are possible.

The direction logs are based on IP/resistivity readings down hole with two current bipoles at surface. The two current bipoles are set up on either side of and at some distance from the hole. All other things being equal, changes in a DHIP anomaly from the two current bipoles may indicate the direction to off hole chargeable bodies.

The current bipoles are normally set out as follows. The current bipoles are oriented parallel to the hole azimuth. The centers of the current bipoles are normal to the hole azimuth. The distance from the collar to the centers of the current bipoles is about three quarters of the hole length. The length of the current bipoles is about twice the hole length. Actual current locations are listed in Table 3 (above).

For each current bipole, measurements are made for 10 m and 20 m dipoles down hole and from one of the down hole potential electrodes to surface.

Personnel

Tim Charlebois from JVX, acted as party chief. He operated the IP receiver and was responsible for all technical aspects of the field survey. Wayne Durling was his assistant. Data processing and presentation was handled Lily Manoukian of JVX at the JVX office in Toronto, Canada.

Instrumentation

Scintrex IPR12 time domain receiver.

For each potential electrode pair, the IPR12 measures the primary voltage (Vp) and the ratio of secondary to primary voltages (Vs/Vp) at 11 points on the IP decay (2 second current pulse). These 11 points (slices or windows) are labeled M4 to M14. There is the option for an additional user defined slice (Mx). Units of measurement are millivolts for Vp and milliVolts/Volt (mV/V) for M4 to M14 and Mx. Time settings are

Vp : 200 to 1600 msec
M4 centered at 60 msec (50 to 70)
M5 centered at 90 msec (70 to 110)
M6 centered at 130 msec (110 to 150)
M7 centered at 190 msec (150 to 230)
M8 centered at 270 msec (230 to 310)
M9 centered at 380 msec (310 to 450)
M10 centered at 520 msec (450 to 590)
M11 centered at 705 msec (590 to 820)
M12 centered at 935 msec (820 to 1050)
M13 centered at 1230 msec (1050 to 1410)
M14 centered at 1590 msec (1410 to 1770)
Mx centered at 870 msec (690 to 1050)

The apparent resistivity is calculated from Vp, the transmitted current and the appropriate geometric or K factors. M0 to M10 define the IP decay curve. The M8 or Mx slice is commonly presented in contoured pseudosections.

JVX has chosen the above settings for Mx in order to better reflect an IP measurement (M7) from the older Scintrex IPR11 time domain receiver. In IPR11 surveys from the 1980s, this chargeability window was most often plotted and experience gained is based in part on this measurement.

The IPR12 also calculates the theoretical decay that best fits the measured decay. The theoretical decay is based on the Cole-Cole impedance model developed in the 1970s. The fit is based on a set of theoretical master curves using a fixed 'c' value. This restriction limits the value of the calculation.

Scintrex IPC-7 2.5 kW time domain transmitter

This transmitter is powered by an 8 hp motor generator and produces a commutated square wave current output with current on times of 2, 4, 8, or 16 seconds. A 2 second current pulse was used (base frequency of .125 Hz). Output current is stabilized to within ±0.1% for up to 50% external load or ± 10% input voltage variations. Voltage, current and circuit resistance are displayed in analog and digital form.

A dummy load is used to reduce output current during the detection logs.

Data Processing and Presentation

At the end of every survey day, the IP/resistivity data are dumped to a PC. The data are checked for quality and quantity. The data are archived for transfer to JVX Ltd. in Toronto.

The results of the surveys are moved with some editing and reorganization from raw IPR12 dump files (.i12) into MS Excel files (.xls). For each drill hole, there are commonly 4 separate Excel files; one each for the two detection logs (PD10 and PD20) and one each for the two current bipole direction log sets. Extreme values may be edited and this is usually indicated by colour fill. Preliminary plots of resistivity as Vp/I and Mx chargeability are included. Excel file contents are as follows.

Excel Files

C1[1]	Depth to the current electrode
P1[2]	Depth to the potential electrode nearest the current electrode
depth(m)	Depth to the potential electrode nearest the current electrode
P2[2]	Depth to the potential electrode furthest from the current electrode
N[3]	Dipole number
Mx	Chargeability in mV/V for the Mx slice (690 to 1050 msec.)
Vp/I	Ratio of primary voltage (mV) to transmitter current (mA)
I(ma)	Transmitter current (mA)
Vp	Primary voltage as measured between P1 and P2 (mV)
Sp	Self potential as measured between P1 and P2 (mV)
Std_Dev	Standard deviation
Con_Res	Contact resistance (kohm)
Rho[4]	Apparent resistivity
Mx	Chargeability in mV/V for the Mx slice (690 to 1050 msec.)
M4 to M14	11 chargeability values that define the IP decay curve
Mtrue	True chargeability as calculated by the IPR12 using fixed 'c' value
Tau	Time constant as calculated by the IPR12 using a fixed 'c' value
RMS	Root mean square difference between measured and fitted decay
Wi	Weighting factor for the Mtrue / Tau calculation

Notes.

1. C1 is shown as 999 for all gradient array (direction) surveys.
2. P2 is zero when the potential electrode is at surface (at the collar)

3. For the detection logs, there are 3 potential electrodes and 2 electrode pairs. The n=1 pair is made up of the two down hole potential electrodes. The n=2 pair is made up of the topmost of the down hole electrode pair and a potential electrode at surface. For direction logs, there are 4 potential electrodes and 3 electrode pairs. The n=1 potential electrode pair is the lowest pair, separated by 10 m. The n=2 pair is just above the 10 m pair and is separated by 20 m. The n=3 pair is from the topmost down hole potential to an electrode at the collar.

4. The apparent resistivity (Rho) in these .i12 and .xls files should be ignored. These values are as calculated by the IPR12 using K factors that are incorrect or inappropriate.

Data Processing

Apparent resistivities for the detection logs are calculated from Vp and I. For the pole-dipole DHIP surveys, the relationship between apparent resistivity and Vp/I is

$$\rho_a = 8\pi a \, Vp/I \quad \text{ohm.m}$$

where a is the 'a' spacing in metres, Vp is the primary voltage in mV and I is the current in mA. K factors are 251 (a=10 m, n=1) and 502 (a=20 m, n =1). K factors for the 'surface' detection and direction logs change as the potential electrodes are moved down hole. Apparent resistivities from the surface detection logs are an integrated value from collar to down hole electrode and are of limited interest. Apparent resistivities from the direction logs have not been calculated.

Mx chargeabilities from the detection logs are scanned for very large, erratic values. These values are ignored and will show up in profile plots (see below) as gaps in the profile. Mx values in the detection logs where Vp is negative may also be ignored.

Mx chargeabilities from the direction logs are converted into chargeabilities corrected for distances to the current bipoles and transmitter current. The axial (or measured) Vp is removed and substituted with the theoretical axial Vp at that location. The theoretical Vp is based on the current / potential electrode geometry, a homogeneous earth of 25,000 ohm.m and a Tx current of 1 Amp.

The corrected Mx chargeability for the direction logs is

$$Mx'' = Mx * Vp * 1000 / (I * Vp')$$

Where Mx = measured chargeability in mV/V
Vp = measured (axial) primary voltage in mV
I = transmitter current in mA
Vp' = theoretical axial Vp as calculated for this location

For any current bipole, Mx" from the 10 m and 20 m dipoles should be about equal. Any direction log section that shows serious differences between these two Mx" values suggests one, other or both of the Mx" traces from that current bipole over that section are invalid.

For any pair of direction logs, Mx" from the north and south (or east and west) bipoles should be of similar form when viewed in a profile plot. They may differ in polarity and amplitude. Amplitude differences in Mx" suggest chageability bodies are located closer to one current bipole or the other.

Direction Logs – Primary Voltages

To set up the current bipoles to best advantage and to correct results from the direction logs, some understanding of the primary current distribution from the current bipoles is needed. This means understanding both the axial primary voltage as measured by the IPR12 and the total primary voltage in the area of the IPR12 measurement. The total primary voltage reflects the current passing through any nearby chargeable body. The measured (or axial) Vp normally does not. The measured Vp is also smaller and subject to noise. In a poorly designed survey, it may go through zero.

The total primary voltage is not a measured quantity but may be calculated given the current and potential electrode positions and assuming a homogeneous earth (resistivity = 25,000 ohm.m). Relative primary voltages for a homogeneous half space are shown in Figure 1. In this model, the hole is assumed to have a 0° azimuth. Inclination varies from 45° to 75°. The current bipoles are 600 m long, are oriented north/south and are centered 200 m east and west of the hole.

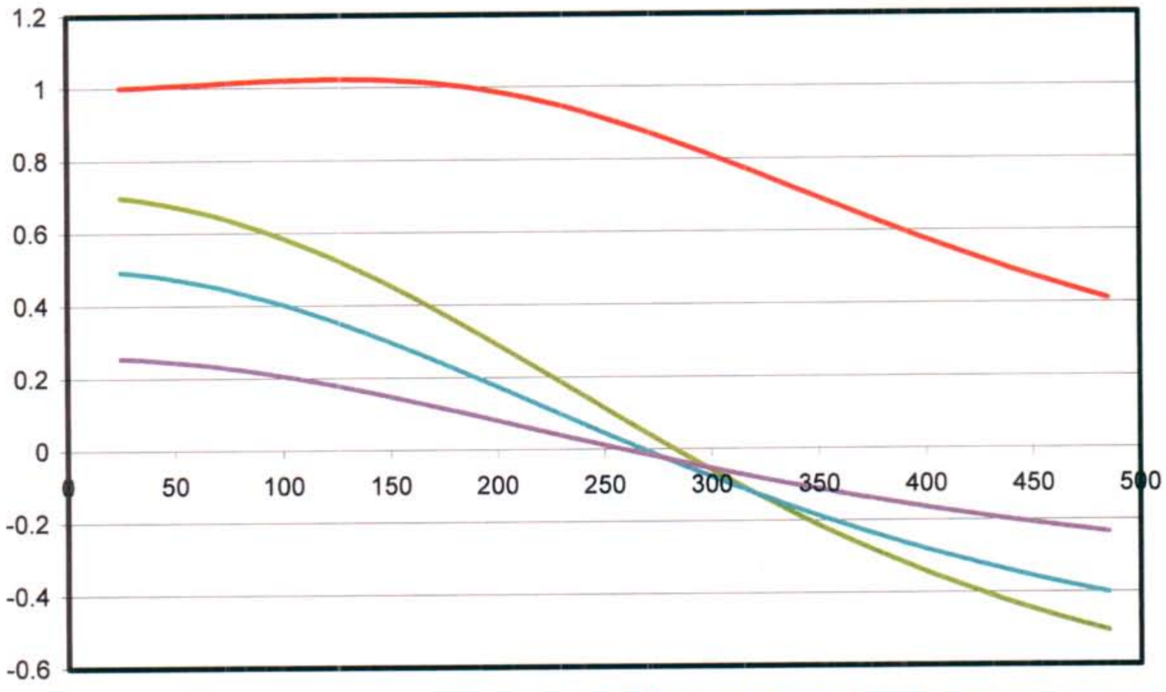

Figure 1 . DHIP Direction Logs - Theoretical Vp VT', Vpax/VT (45), Vpax/VT (60), Vpax/VT (75)

Traces shown in figure 1 are

VT' – the total primary voltage normalized by its value at surface. This represents the primary current available to energize any nearby chargeable body at the depth indicated.

Vpax/VT(xx) – the ratio of the axial (or measured) primary voltage to the total primary voltage for hole inclinations of 45°, 60° and 75°.

The total primary voltage is essentially constant for the recommended hole length range of 0 to 200 m. Thereafter it falls off to 40% of its value at surface.

The measured (axial) Vp is a poor substitute for the total primary voltage and the problem gets worse as the hole dip increases to vertical. In the extreme case of a vertical hole, there is no axial Vp. If an IP measurement was even possible in this situation, the chargeability readings would be unreliable. This is because the chargeability is the ratio of the axial secondary voltage to the axial primary voltage. If only because of background effects, the axial secondary voltage is usually non zero. Where the axial primary voltage approaches zero, the chargeability becomes very large. The resulting DHIP anomaly is probably false.

For holes of intermediate to steep inclinations, the measured (axial) Vp is reasonably well behaved up to the recommended length range of 0 to 200 m. If measurements are much further down hole, they will run into trouble around 275 m where the axial Vp goes through zero. The chargeability as Vs/Vp will become very large at and near this point even when the chargeability as Vs (secondary voltage) is not anomalous.

Not shown in Figure 1 is the change in total primary voltages when moving off-hole. Imagine a chargeable body that is centered either 50 m east or 50 m west of the bore hole. For this model, the total primary voltage from either current bipole is about 60% larger when the body is on that side of the hole closest to the bipole than when it is on the other side. This is a measure of the relationship between off-hole position and the change in chargeability anomaly amplitude when changing from east to west current bipoles.

Data Plotting

The results of the survey are shown in page size plots, one per hole. Each plot shows three panels. Plot points are 3a/4 m up from the current electrode (detection logs, apparent resistivity and pole-dipole chargeability), at the potential electrode (detection logs, pole-pole chargeability) and mid way between potential electrodes (direction logs). From top to bottom, the panels and their contents (for GL-06-01) are as follows. For GL-06-02 direction logs are run with bipoles to the north and south of the hole.

Log(apparent resistivity)
    PD10 – from the detection log, pole-dipole array, a = 10 m, n=1
    PD20 – from the detection log, pole-dipole array, a = 20 m, n=1
Detection Logs Mx mV/V
    PD10 – pole dipole array, a=10 m, n=1
    PD20 – pole dipole array, a= 20 m, n=1
    PP20 – pole pole array (surface), current – pole separation = 20 m
    PP40 – pole pole array (surface), current – pole separation = 40 m

Direction Logs Mx" mV/V

GE10 – corrected chargeability from the East bipole, a = 10 m
GE20 – corrected chargeability from the East bipole, a = 20 m
GW10 – corrected chargeability from the West bipole, a= 10 m
GW20 – corrected chargeability form the West bipole, a = 20 m

Apparent resistivities or chargeabilities from the detection logs derived from negative primary voltages may be ignored. If so, they will show up as a break in the profile. The same applies to very large, erratic chargeability values (detection and direction logs).

Archives

The results of the survey are archived on CD. Included on the CD is the Oasis Montaj viewer. File types include

.i12 – IPR12 dump files (raw data)
.xls – Microsoft Excel Worksheets (edited and reformatted data, collar locations)
.doc – Microsoft Word (this report)
.jpg – figures in the report

Down Hole IP; Some Basic Model Results

For more than 40 years, induced polarization has been used in the search for disseminated metallic sulphides (+ gold). Borehole or down hole IP, the extension of the method to off-hole exploration, has always been available but rarely used. This should be compared to down hole EM, a method that is often used to map off-hole conductors and direct further drilling.

Reluctance to use DHIP can be traced to a number of factors including a mixed record in a limited number of surveys and the lack of even the simplest model results to direct survey design and to form the basis for the interpretation. Commercial grade DHIP software for full 3D simulations is now available and results from some simple models should help with a broader understanding of how and where DHIP should be used.

Areas of interest include electrode arrays and sampling, the exploration radius of detection logs and the best current layout for effective direction logs.

1. Detection Survey

DHIP profiles for what may be the simplest case are shown in figure 1. An inclined borehole runs through the center of a 5 m wide chargeable body at a down hole distance of 318 m. The plane of the body is normal to the borehole. The pole-dipole array with a=25 m and n=1,4 has been used. The potential electrodes lead the current electrode down hole. Modeling methods and parameters are outlined in the attached notes.

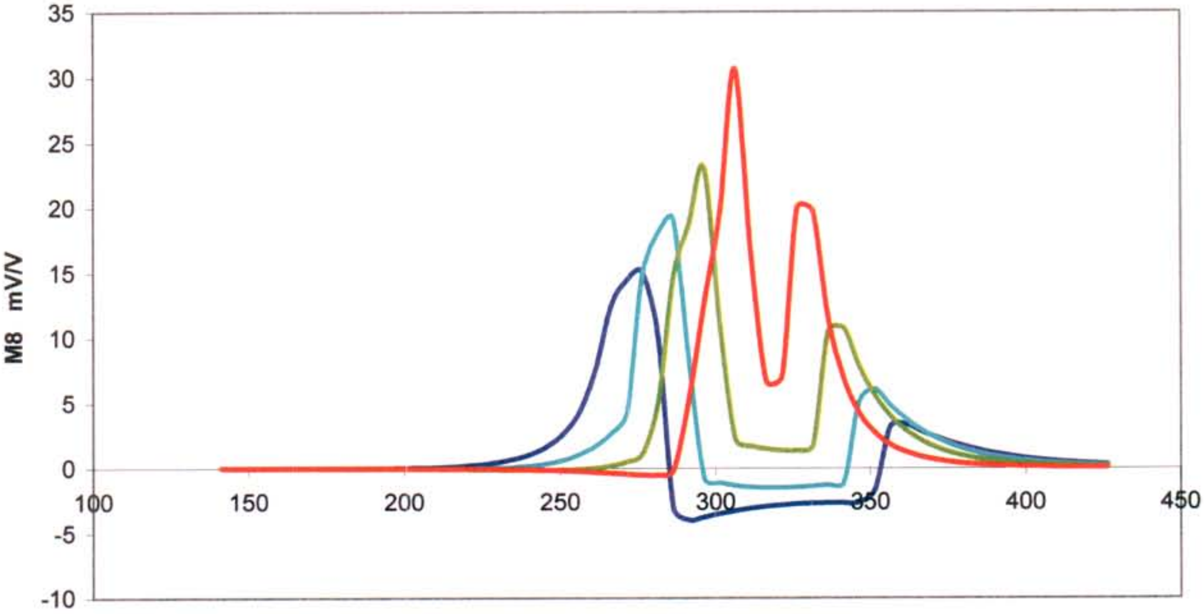

Figure 1. DHIP profiles for IPR12 M8 (935 msec) in mV/V. n=1 (red), n=2 (green) n=3 (light blue) and n=4 (dark blue). See explanatory notes for details.

As might be expected, the profiles are similar in form to those seen for surface surveys over a shallow tabular body. Gradients are, at times, very steep and this suggests tight sampling to fully define (and subsequently interpret) response profiles. Over anomalous sections, the sampling interval should be no more than half the 'a' spacing; one quarter would be best.

DHIP profiles for chargeable bodies of different sizes are shown in figure 2. The target is still centered on the hole. Borehole, target and array are otherwise as in figure 1.

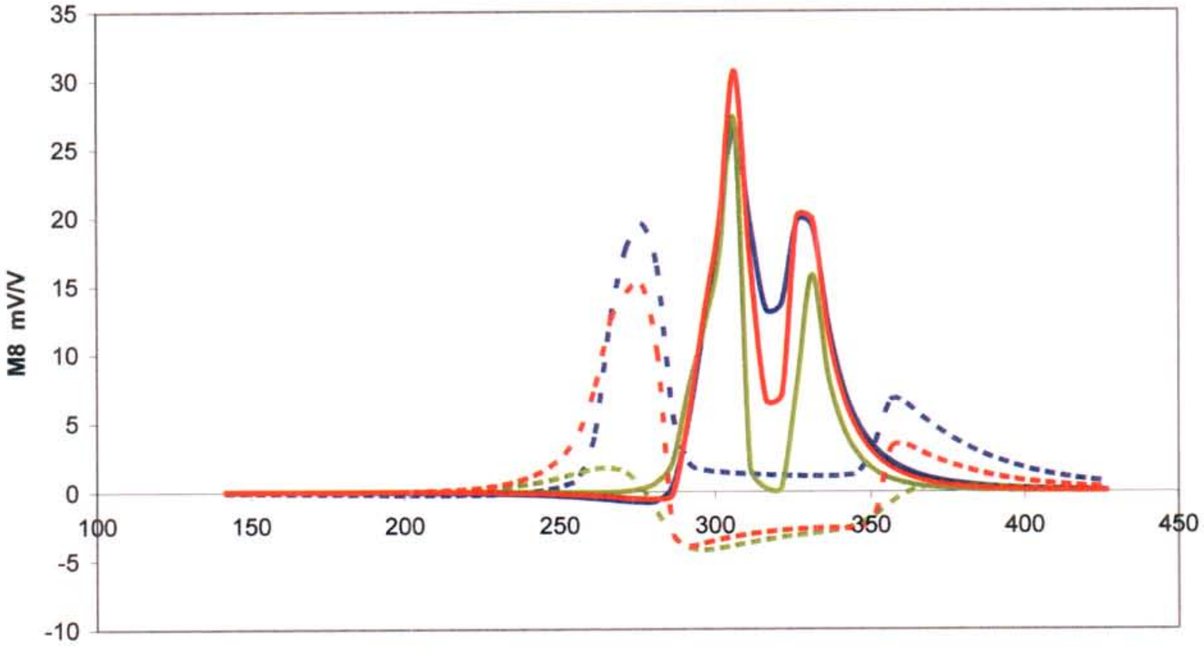

Figure 2. DHIP profiles (n=1 solid, n=4 dashed) for targets of different sizes. Red (100x100x5 m), blue (200x200x5 m) and green (50x50x5 m).

IP anomaly forms are similar to those seen in surface surveys over shallow, depth limited tabular bodies. Responses from the early dipoles are largely unaffected by target size over this range. Response amplitudes for the later dipoles reflect target size.

Off-Hole Targets

DHIP response profiles for bodies that are 5, 25 and 50 m from the bore hole (at closest approach) are shown in figure 3. This is equivalent to moving the center of the 100x100x5 m target 55, 75 and 100 m from the survey hole. Borehole, array and target are as in figure 1.

As expected, peak response amplitudes fall off quickly for increasing off-hole separation. The rate of fall-off is similar to what would be seen in a surface survey with the same array, target and target separations but overall chargeability amplitudes are about half for the down hole survey. This is related to the primary current distribution in a full versus a half space.

Note that the response profiles for the target that is very close to the hole are similar in shape to those for a target that is intersected (figures 1 and 2). The main difference is the depths of the central IP low for the n=1 dipole. Response profiles for targets that are more distant from the bore hole are distinct from those from holes that intersect or come very close to the target.

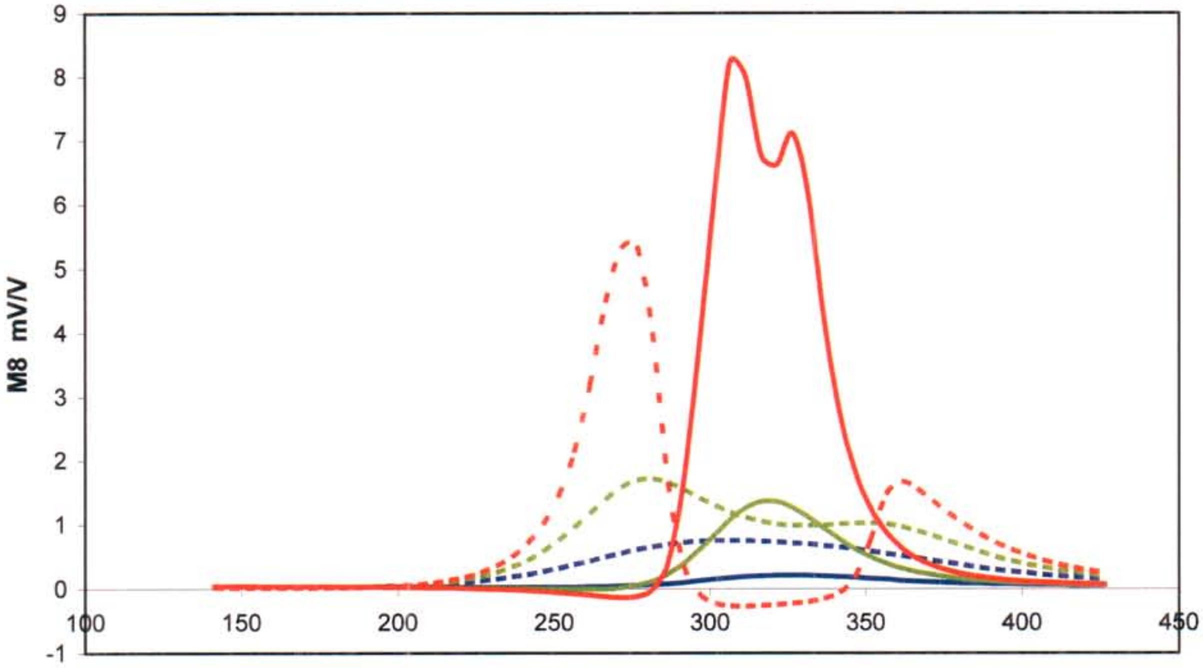

Figure 3. DHIP profiles (n=1 solid, n=4 dashed) for off-hole targets. Target off-hole distances (at closest approach) are 5 m (red), 25 m (light blue) and 50 m (dark blue).

These results suggest the radius of detection for off-hole targets is about half that of the depth of exploration for surface IP surveys of the same style. For the pole-dipole array with a=25 m, n=1,4, the radius of detection appears around 25. Larger values would apply to simple targets, little geologic noise and high quality DHIP data. High quality can be taken to include the appropriate array, a sufficiently small measurement interval and stacking for measurements to 0.01 mV/V.

Direction Surveys

A detection survey may reveal chargeable bodies off-hole. If the IP data is of good quality, it may be possible to estimate the off-hole distance to the chargeable body. The direction to the target however, is unknown.

Current electrode arrays that have been used in direction surveys include azimuth, gradient and cross-hole. In an azimuth survey, one current electrode is placed near the collar and another some distance from the collar. This distance is of the same order as the hole length. DHIP data are collected for the distant current set out at four cardinal directions.

In one form of a gradient survey, both current electrodes are placed at equal distance from the collar; the normal to the current bipole is directed at the collar and is set out at four cardinal directions. The length of the current bipole and the distance from the current bipole to the collar are of the same order as the hole depth. Designers have to guard against current bipole layouts that produce very low primary voltages anywhere along the axis of the borehole.

In cross-hole surveys, the current bipole is placed in a neighbouring drill hole. For targets at extreme depths, this may be the only direction survey option.

DHIP profiles for the azimuth survey are shown in figure 4. The target 100x100x5 m target is 25 m west of the hole at closest approach (318 m down hole). The potential electrode separation is 25 m.

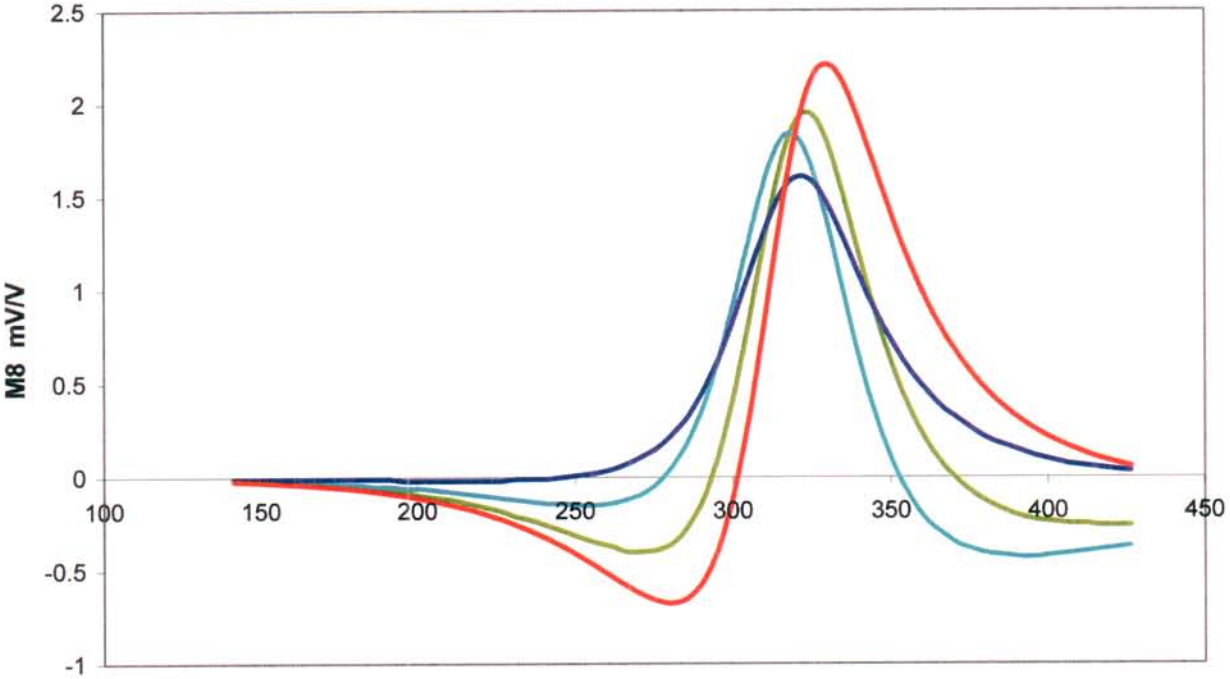

Figure 4. DHIP profiles, direction (azimuth) survey. Current bipole is west (red), north (dark blue), east (light blue) and south (green) of the collar.

The current bipole west of the drill hole and over the target gives the strongest IP anomaly with a peak amplitude of 2.20 mV/V. Peak amplitudes for the other three current bipoles are 1.61 (north), 1.83 (east) and 1.94 (south). The relative difference in peak amplitudes is from 1.13 to 1.37.

As with most active geophysical methods, the relative change in peak amplitude is, to a first approximation, explained by differences in the distances from current bipole to potential dipole and from current bipole to the target. These differences are less for a smaller, more concentrated target. The ratio of peak IP anomalies, west and east bipoles, is only 1.07 for a 25x25x25 m block 25 m west of the survey hole (at closest approach). Such small differences would probably be lost in a survey burdened with any amount of measurement and geologic noise.

Note that anomaly shape is similar to the n=1 detection profile (see figure 3) but overall amplitudes in the direction survey are about 50% larger. Overall amplitudes are about equal to the n=2 detection response (not shown). Differences in anomaly shape are largely due to differences in coupling between the primary field and the target, differences that disappear for a small, circular target.

DHIP profiles for a gradient array are shown in figure 5. The current bipole is 500 m long and its center point is 500 m east and west of the collar. The north and south arrays cannot be used because primary voltages along the hole axis is near zero.

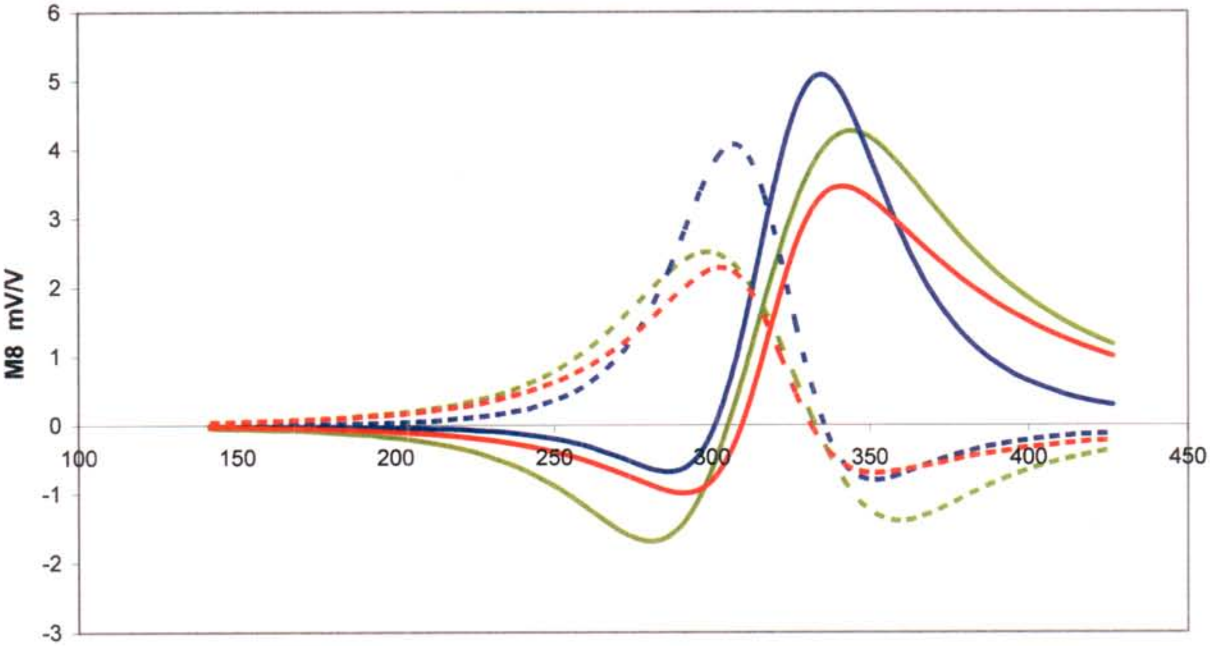

Figure 5. DHIP profiles, direction (gradient) survey. Solid for array west of collar (over target), dashed for array east of collar. Red for 100x100x5 m prism, plane normal to hole, 25 m west of hole (at 318 m) at closest approach. Green is for a vertical prism, plane 45° to hole. Blue is for a 25x25x25 m prism, 25 m west of hole at closest approach.

Absolute and relative amplitudes are higher than for the azimuth array. The ratios of peak amplitudes from the west and east arrays are 1.52 for the 100x100x5 m target normal to the hole and 1.24 for the cubic target. These factors make the gradient array the better choice. The change in polarity is a bonus. The smaller ratio of west to east peak amplitudes (1.24) for the smaller target is because of smaller differences in the relative geometry of current bipole / potential dipole / effective target center.

The gradient array appears to work better than the azimuth array but the current bipoles must be set out for a reasonable Vp profile. Reasonable means of sufficient amplitude, uniform or slowly varying and of one sign (no zero crossings).

Given limits on relative geometric differences, azimuth and gradient arrays are restricted to 'shallow' targets. Cross-hole direction surveys may be the only option for 'deep' targets. Given enough cross-hole options, it should also be possible to insure a well behaved Vp profile. DHIP profiles for a direction (cross-hole) survey are shown in figure 6. Parallel drill holes with collars 500 m west, north, east and south are assumed. In each case, the current electrodes are at the collar and 500 m down hole. The target is a 100x100x5 m prism, 25 m west of the survey hole.

Peak responses are 2.79 mV/V (west), 1.50 mV/V (north), 1.75 mV/V (east) and 1.70 mV/V (south). The ratio of west to east peaks is 1.59 which is better than gradient (1.52) or azimuth (1.20). The distinctive polarity reversal of the gradient array is not seen.

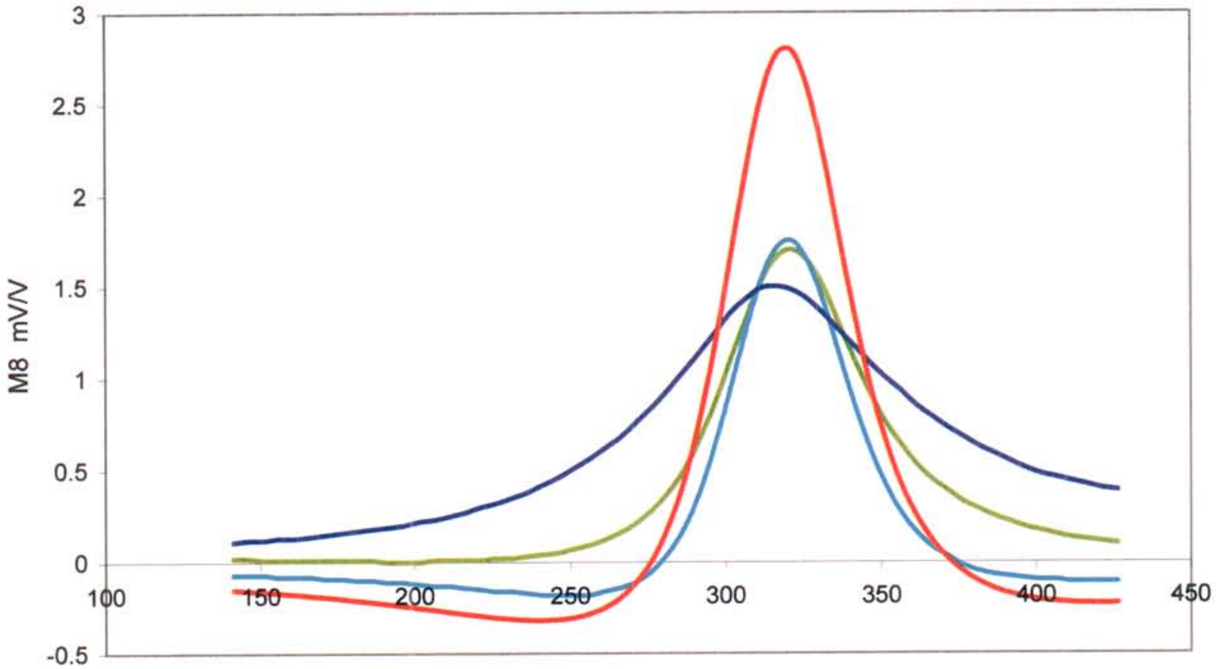

Figure 6. DHIP profiles, direction (cross-hole) surveys. 500 m current bipole, 500 m from survey hole. Current bipoles are west (red), north (dark blue), east (light blue) and south (green) of survey hole.

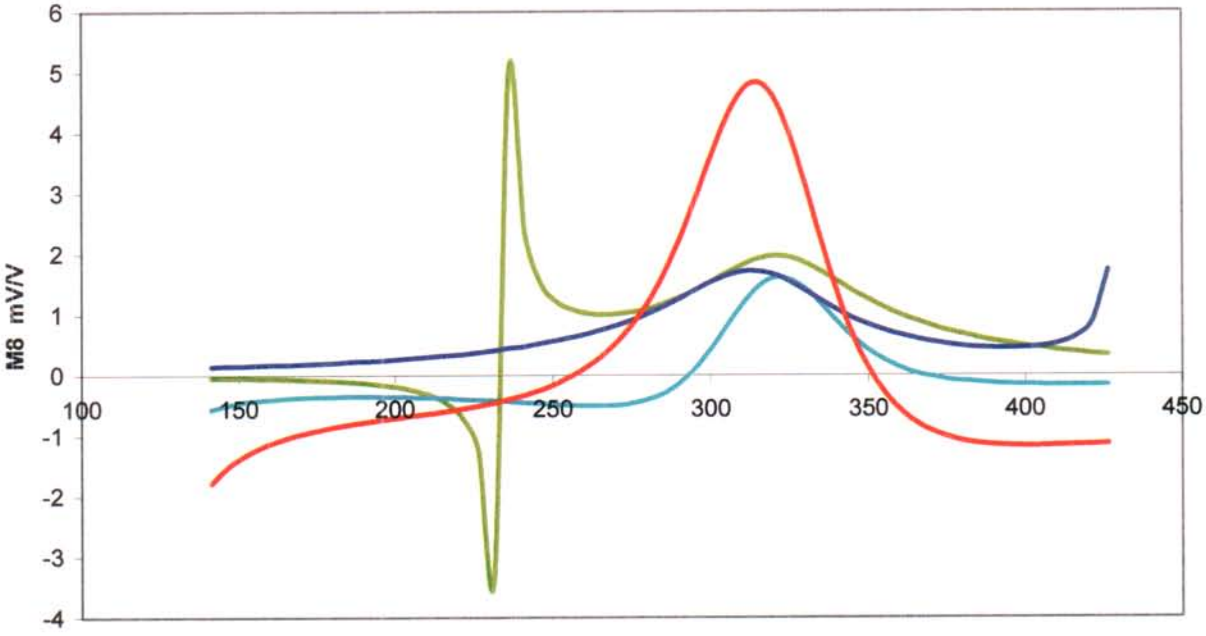

Figure 7. DHIP profiles, cross-hole survey. 250 m current bipole, 250 from survey hole. Current bipoles are west (red), north (dark blue), east (light blue) and south (green) of the survey hole.

Relative IP amplitudes are primarily a function of the relative distances – current electrodes to potential electrodes and current electrodes to the target. The dependence on the distances to the current electrodes may be increased by making the transmitter act more as a current dipole by reducing the current electrode separation.

Figure 7 shows the cross-hole DHIP profiles for parallel holes that are 250 m west, north, east and south of the survey hole. The current bipole is 250 m long and is centered at the depth of the target. The current bipole is deliberately set opposite a target that would have been found in an earlier detection survey.

The ratio of peak amplitudes for the 250 m current bipole, west and east surveys, is 2.98 and the best of all direction survey methods considered here. The high chargeability values at the bottom of the hole for the northern current bipole are because Vp is approaching zero. Secondary voltages from the target, although getting smaller, are not approaching zero at the same rate and this gives a false DHIP anomaly.

The spike at 230 m from the south current bipole is because the primary voltage goes through zero (i.e. changes polarity) at this point. Secondary voltages from the target, although small, do not go through zero and this produces another false DHIP anomaly. The anomaly shape would suggest this but recognition depends on adequate sampling.

These results show why it is so important that the current bipoles must be set so that the down hole Vp profile is well behaved. Current arrays that give a poorly behaved Vp profile may produce false DHIP anomalies and should be avoided.

Summary

1. General Conditions. For detection surveys, sample at 1/2 the potential electrode spacing; increase to 1/4 in anomalous regions. Some relaxation of these rules may be possible for direction surveys. During each measurement cycle, monitor M0 and M8 (or equivalent) for convergence to .01 mV/V. Model everything. For detection surveys, this includes forward modeling to simulate response profiles for possible or probable targets. Adjust detection array and sampling as needed. For direction surveys, model the Vp profile and adjust current bipoles accordingly. Forward and/or inverse modeling for interpretation of the survey results.

2. Detection survey. The standard pole-dipole array is preferred. Pole-dipole arrays with multiple 'a' spacing electrode strings suffer from inadequate sampling (short 'a') and/or over sampling (long 'a'). For all DHIP anomalous zones, determine grain size. Scale anomaly amplitudes accordingly.

3. Direction survey. Where there are neighbouring drill holes in appropriate locations, cross-hole is the preferred method. Detection and direction surveys in a 250 to 500 m mesh of drill holes would constitute the most complete survey for disseminated sulphides below the limits of surface surveys. Without neighbouring drill holes, direction (gradient array) surveys are the best option.

Ian Johnson
March 1, 2004

Explanatory Notes

1. All simulations are based on results from GeoTutor III V6.4 from PetRos EiKon Inc. See www.PetRosEiKon.com.

2. For the results show here, the borehole is directed to the north, is inclined 45° below horizontal and is 500 m long. The chargeable body is a prism. The width of the prism is normally 5 m. The strike length and depth extent are normally 100 m. Other models considered are 50x50x5 m, 200x200x5 m and 25x25x25 m. The center of the prism is 225 m below grade. The center is either at the drill hole (318 m mark) or west of the drill hole (off-hole targets). The plane of the prism is commonly normal to the axis of the drill hole (i.e. dips at 135°).

3. The chargeable body has been assigned the following electrical properties (Cole-Cole impedance model).

DC resistivity : 10,000 ohm.m
true chargeability : 0.5 V/V
time constant : 1 second
c value : .5

The host rock has a resistivity of 10,000 ohm.m.

4. The IP measurement is assumed to be M8 from the Scintrex IPR12 time domain IP receiver. The primary voltage is measured from 0.2 to 1.6 seconds of the current on time. The M8 slice is centered at 935 msec after shut-off of a 2 second transmitter current pulse. The time constant used (1 second) insures a relatively high response in the M8 slice. Much shorter or longer time constants would result in M8 anomaly amplitudes less than shown.

5. It has been assumed that Vp is positive when P_i is at a higher potential than P_{i+1} and that this holds true for all potential electrodes in the order that they are connected to the receiver. Chargeabilities are positive if Vp and Vs are of the same sign, negative if of opposite sign. In modeling chargeabilities therefore, the sign (or polarity) of Vp and Vs may be changed without changing the simulated chargeability.

SCINTREX

IPR-12 Time Domain Induced Polarization/Resistivity Receiver

Brief Description

The IPR-12 Time Domain IP/Resistivity Receiver is principally used in exploration for precious and base metal mineral deposits. In addition, it is used in geoelectrical surveying for groundwater or geothermal resources, often to great depths. For these latter targets, the induced polarization measurements may be as useful as the high accuracy resistivity results since it often happens that geological materials have IP contrasts when resistivity differences are absent.

Due to its integrated, lightweight, microprocessor based design and its large, 16 line display screen, the IPR-12 is a remarkably powerful, yet easy to use instrument. A wide variety of alphanumeric and graphical information can be viewed by the operator during and after the taking of readings. Signals from up to eight potential dipoles can be measured simultaneously and recorded in solid-state memory along with automatically calculated parameters. Later, data can be output to a printer or a PC (direct or via modem) for processing into profiles and maps.

The IPR-12 is compatible with Scintrex IPC and TSQ Transmitters, or others which output square waves with equal on and off periods and polarity changes each half cycle. The IPR-12 measures the primary voltage (Vp), self potential (SP) and time domain induced polarization (Mi) characteristics of the received waveform. Resistivity, statistical and Cole-Cole parameters are calculated and recorded in memory with the measured data and time.

Scintrex has been active in induced polarization research, development, manufacturing, consulting and surveying for over thirty years. We offer a full range of instrumentation, accessories and training.

The IPR-12 Receiver measures spectral IP signals from eight dipoles simultaneously then records measured and calculated parameters in memory.

Benefits

Speed Up Surveys

The IPR-12 saves you time and money in carrying out field surveys. Its capacity to measure up to eight dipoles simultaneously is far more efficient than older receivers measuring a single dipole. This advantage is particularly valuable in drillhole logging where electrode movement time is minimal.

The built-in, solid-state memory records all information associated with a reading, dispensing with the need for any hand written notes. PC compatibility means rapid electronic transfer of data from the receiver to a computer for rapid data processing.

Taking a reading is simple and fast. Only a few keystrokes are virtually needed since the IPR-12 features automatic circuit resistance checks, SP buckout and gain setting.

High Quality Data

One of the most important features of the IPR-12 in permitting high quality data to be acquired, is the large display screen which allows the operator easy real time access to graphic and alphanumeric displays of instrument status and measured data. The IPR-12 ensures that the operator obtains accurate data from field work.

The number and relative widths of the IP decay curve windows have been carefully chosen to yield the transient information required for proper interpretation of spectral IP data. Timings are selectable to permit a very wide range of responses to be measured.

Specifications

Inputs
1 to 8 dipoles are measured simultaneously.

Input Impedance
16 Megohms

SP Bucking
±10 volt range. Automatic linear correction operating on a cycle by cycle basis.

Input Voltage (Vp) Range
50 µvolt to 14 volt

Chargeability (M) Range
0 to 300millivolt

Tau Range
1 millisecond to 1000 seconds

Reading Resolution of Vp, SP and M
Vp, 10 microvolt; SP, 1 millivolt; M, 0.01 millivolt/volt

Absolute Accuracy of Vp, SP and M
Better than 1%

Common Mode Rejection
At input more than 100db

Vp Integration Time
10% to 80% of the current on time.

IP Transient Program
Total measuring time keyboard selectable at 1, 2, 4, 8, 16 or 32 seconds. Normally 14 windows except that the first four are not measured on the 1 second timing, the first three are not measured on the 2 second timing and the first is not measured on the 4 second timing. (See diagram on page 2.) An additional transient slice of minimum 10 ms width, and 10ms steps, with delay of at least 40 ms is keyboard selectable.

Transmitter Timing
Equal on and off times with polarity change each half cycle. On/off times of 1, 2, 4, 8, 16 or 32 seconds. Timing accuracy of ±100 ppm or better is required.

External Circuit Test
All dipoles are measured individually in sequence, using a 10 Hz square wave. The range is 0 to 2 Mohm with 0.1kohm resolution. Circuit resistances are displayed and recorded.

Synchronization
Self synchronization on the signal received at a keyboard selectable dipole. Limited to avoid mistriggering.

Filtering
RF filter, 10 Hz 6 pole low pass filter, statistical noise spike removal.

Internal Test Generator
1200 mV of SP; 807 mV of Vp and 30.28 mV/V of M.

Analog Meter
For monitoring input signals; switchable to any dipole via keyboard.

Keyboard
17 key keypad with direct one key access to the most frequently used functions.

Display
16 lines by 42 characters, 128 x 256 dots, Backlit Liquid Crystal Display. Displays instrument status and data during and after reading. Alphanumeric and graphic displays.

Display Heater
Available for below -15°C operation.

Memory Capacity
Stores approximately 400 dipoles of information when 8 dipoles are measured simultaneously.

Real Time Clock
Data is recorded with year, month, day, hour, minute and second.

Digital Data Output
Formatted serial data output for printer and PC etc. Data output in 7 or 8 bit ASCII, one start, one stop bit, no parity format. Baud rate is keyboard selectable for standard rates between 300 baud and 51.6 kBaud. Selectable carriage return delay to accommodate slow peripherals. Handshaking is done by X-on/X-off.

Standard Rechargeable Batteries
Eight rechargeable Ni-Cad D cells. Supplied with a charger, suitable for 110/230V, 50 to 60 Hz, 10W. More than 20 hours service at +25°C, more than 8 hours at -30°C.

Ancillary Rechargeable Batteries
An additional eight rechargeable Ni-Cad D cells may be installed in the console along with the Standard Rechargeable Batteries. Used to power the Display Heater or as back up power. Supplied with a second charger. More than 6 hours service at -30°C.

Use of Non-Rechargeable Batteries
Can be powered by D size Alkaline batteries, but rechargeable batteries are recommended for longer life and lower cost over time.

Operating Temperature Range
-30°C to +50°C

Storage Temperature Range
-30°C to +50°C

Dimensions
Console: 355 x 270 x 165 mm
Charger: 120 x 95 x 55mm

Weights
Console: 5.8 kg
Standard or Ancillary Rechargeable Batteries: 1.3 kg
Charger: 1.1 kg

Transmitters available

IPC-9	200 W
TSQ-2E	750 W
TSQ-3	3 kW
TSQ-4	10 kW

SCINTREX

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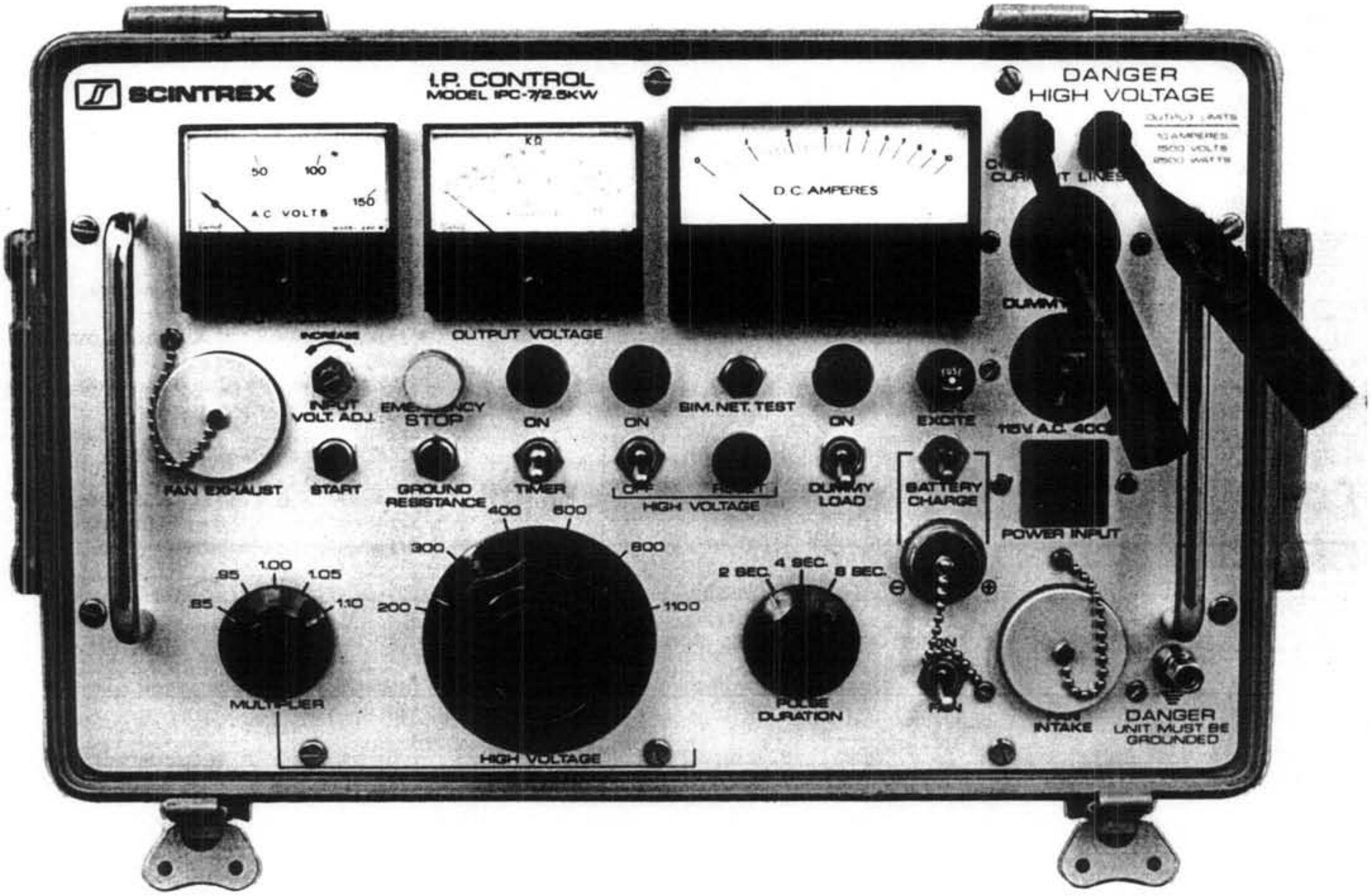
IPR-12/94

SCINTREX IPC-7/2.5kW Induced Polarization and Commutated DC Resistivity Transmitter System



Function

The IPC-7/2.5 kW is a medium power transmitter system designed for time domain induced polarization or commutated DC resistivity work. It is the standard power transmitting system used on most surveys under a wide variety of geophysical, topographical and climatic conditions.

The system consists of three modules: A Transmitter Console containing a transformer and electronics, a Motor Generator and a Dummy Load mounted in the Transmitter Console cover. The purpose of the Dummy Load is to accept the Motor Generator output during those parts of the cycle when current is not transmitted into the ground, in order to improve power output and prolong engine life.

The favourable power-weight ratio and compact design of this system make it portable and highly versatile for use with a wide variety of electrode arrays.

Features

Maximum motor generator output, 2.5 kW; maximum power output, 1.85 kW; maximum current output, 10 amperes; maximum voltage output, 1210 volts DC.

Removable circuit boards for ease in servicing.

Automatic on-off and polarity cycling with selectable cycling rates so that the optimum pulse time (frequency) can be selected for each survey.

The overload protection circuit protects the instrument from damage in case of an overload or short in the current dipole circuit.

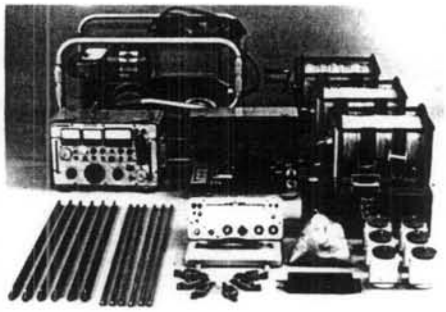
The open loop circuit protects workers by automatically cutting off the high voltage in case of a break in the current dipole circuit.

Both the primary and secondary of the transformer are switch selectable for power matching to the ground load. This ensures maximum power efficiency.

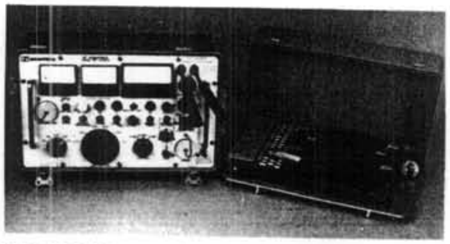
The built-in ohmmeter is used for checking the external circuit resistance to ensure that the current dipole circuit is grounded properly before the high voltage is turned on. This is a safety feature and also allows the operator to select the proper output voltage required to give an adequate current for a proper signal at the receiver.

The programmer is crystal controlled for the very high stability required for broadband (spectral) induced polarization measurements using the Scintrex IPR-11 Broadband Time Domain Receiver.

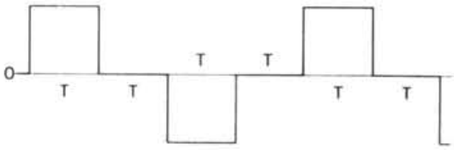
Technical Description of IPC-7/2.5 kW Transmitter System



Complete 2.5kW induced polarization system including motor-generator, reels with wire, tool kit, porous pots, simulator circuit, copper sulphate. IPR-8 receiver, dummy load, transmitter, electrodes and clips.



IPC-7 / 2.5kW transmitter console with lid and dummy load.



Time Domain Waveform

Transmitter Console	
Maximum Output Power	1.85 kW maximum, defined as VI when current is on, into a resistive load
Output Current	10 amperes maximum
Output Voltage	Switch selectable up to 1210 volts DC
Automatic Cycle Timing	T:T:T:T; on:off:on:off
Automatic Polarity Change	Each 2T
Pulse Durations	Standard: T = 2,4 or 8 seconds, switch selectable Optional: T = 1,2,4 or 8 seconds, switch selectable Optional: T = 8,16,32 or 64 seconds, switch selectable
Voltage Meter	1500 volts full scale logarithmic
Current Meter	Standard: 10.0 A full scale logarithmic Optional: 0.3, 1.0, 3.0 or 10.0 A full scale linear, switch selectable
Period Time Stability	Crystal controlled to better than .01%
Operating Temperature Range	-30°C to +55°C
Overload Protection	Automatic shut-off at output current above 10.0 A
Open Loop Protection	Automatic shut-off at current below 100 mA
Undervoltage Protection	Automatic shut-off at output voltage less than 95 V
Dimensions	280 mm x 460 mm x 310 mm
Weight	30 kg
Shipping Weight	41 kg includes reusable wooden crate
Motor Generator	
Maximum Output Power	2.5 kVA, single phase
Output Voltage	110 V AC
Output Frequency	400 Hz
Motor	4 stroke, 8 HP Briggs & Stratton
Weight	59 kg
Shipping Weight	90 kg includes reusable wooden crate

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