

GEOPHYSICAL SURVEYS AND CONSULTING

Report on IP/Resistivity, Magnetic and TerraTEM Surveys St. Paul Bay Project, Red Lake, Ontario Rainbow Resources Inc.



Ref. 10-07 May, 2010

Report on IP/resistivity, Magnetic and TerraTEM Surveys St. Paul Bay Project, Red Lake, Ontario

For : Rainbow Resources Inc.

330 Bay Street, Suite 1120 Toronto, ON M5H 2S8

Contact: G. Harron (Harron and Associates) Tel: 416.865.1060 gaharron@bellnet.ca

By : JVX Ltd.

60 West Wilmot Street, Unit 22 Richmond Hill, Ontario L4B 1M6 Tel: 905.731.0972 Fax: 905.731.9312 www.jvx.ca

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Summary

Pole-dipole IP/resistivity, magnetic and moving loop TDEM (terraTEM) surveys were done on the St. Paul Bay property, Red Lake area, Ontario. Total production was 20,175 m IP/resistivity, 23,050 m magnetics and 2,800 m or 65 coincident loop soundings terraTEM. Water depths were recorded over 6,375 m. The results have been presented on 7 maps at 1:5000 and 25 stacked pseudosections at 1:2500 or 1:5000. The results have been compared against the exploration record, including drilling from 1972, 1991 and 2003. Two geophysical targets are suggested.

Cover page : Photograph courtesy Dennis Palos, JVX

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Maps

The results of the surveys are presented on 7 plan maps at 1:5,000 and 25 stacked pseudosections at 1: 2,500 or 1:5,000. Maps are

- 1. bathymetry
- 2. total magnetic intensity
- 3. IP : 'a' = 25 m, n=2 and 'a' = 50 m, n=1 chargeability
- 4. IP : a' = 25 m, n=2 and a' = 50 m, n=1 apparent resistivity
- 5. TerraTEM : channel 12 at 0.197 msec
- 6. TerraTEM : channel 26 at 1.1997 msec
- 7. compilation

IP/Resistivity, Magnetic and TerraTEM Surveys St. Paul Bay Project, Red Lake, Ontario Rainbow Resources Inc.

Pole-dipole IP/resistivity, magnetic and moving loop TDEM (terraTEM) surveys were done on the St. Paul Bay property, Fairlie, Baird and Heyson Townships, Red Lake area, Ontario. The work was done for Rainbow Resources Inc. by JVX Ltd. under JVX job number 10-07. The field work was done from February 24 to March 13, 2010. Total production was 20,175 m IP/resistivity, 23,050 m magnetics and 2,800 m or 65 coincident loop soundings terraTEM. Water depths were recorded over 6,375 m.

The St. Paul Bay property consists of 12 contiguous mining claims (775725 – 775728, 775731, 963597 – 963600, 1235866, 1143079 and 1143080) covering St. Paul Bay on the south side of Red Lake. All claims are registered to David Meunier. The property is centered 6 km west of the town of Red Lake, Ontario.



Figure 1. Regional location map

The grid layout is shown in figure 2. Lines are numbered 100W to 2300W and are oriented north 20° east. The maximum station range is 950S to 550N. There is a base line at 00 and tie lines at 275S, 400S and 550S.

Most of the grid was surveyed with pole-dipole IP ('a' = 50 m, n=1,6). Three lines were done with 'a' = 25 m, n=1,6. Over water parts of the grid were surveyed by augering through the ice and dropping stainless steel electrodes into the lake bottom sediment. Water depths were recorded on 8 lines. The whole grid was surveyed with magnetics at 12.5 m. Moving 50 m coincident loop TDEM surveys (terraTEM) were done on 4 lines.

Production summaries, GPS control points, instrumentation, data processing and archives are described in appendix 1. Weekly field production reports are in appendix 2. IP anomaly listings are in appendix 3. Map images are in appendix 4. Instrument specification sheets are attached. Paper copies of plan maps and stacked pseudosections are folded and bound with this report.





Figure 2. Grid layout, IP survey

1. Presentation

The results of the surveys are presented on 7 plan maps at 1:5,000 and 25 stacked pseudosections at 1: 2,500 or 1:5,000. All maps show land tenure from the MNDM claimap3 website. All maps show the outline of St. Paul Bay taken from Natural Resources Canada (geogratis.ca). All maps show latitude / longitude marks and a UTM grid (NAD83, Z15N). Maps are

- 1. bathymetry
- 2. total magnetic intensity
- 3. IP : n=2 ('a' = 25 m) and n=1 ('a' = 50 m) chargeability
- 4. IP : n=2 ('a' = 25 m) and n=1 ('a' = 50 m) apparent resistivity
- 5. terraTEM : channel 12 at 0.197 msec
- 6. terraTEM : channel 26 at 1.1997 msec
- 7. compilation

Paper copies of all maps and pseudosections are folded and bound with this report. Images of all maps are included in appendix 4. All but the terraTEM Z26 map are reproduced below.

All maps are provided in *.pdf format. All but the compilation map are also provided in Geosoft *.map format. In addition to the lake outline, coordinate, land tenure, grid plan, colour grid and line contour layers, all Geosoft *.maps include the following layers, some of which may be turned off for printing.

AGG_claim_75topography and claim fabric from MNDM claimap3teckcominco.pltTeck Cominco drill holes SPB-03-01 to SPG-03-05POST_DDH_TecC_nameall other diamond drill holesPOST_DDH_DD_nameoverburden drill holesPOST_DDH_OD_nameFormer and the second seco



Stacked pseudosections show colour contoured pseudosections of M13 chargeability, apparent resistivity, spectral chargeability amplitude (MIP) and spectral IP time constant (tau). Scale is 1:2,500 for the 3 lines surveyed with 'a' = 25 m (100W, 200W, 1500W) and 1:5,000 for the 21 lines surveyed with 'a' = 50 m (300W to 2300W). There is 1 stacked pseudosection at 1:2,500 showing both 'a' = 25 and 'a' = 50 m results for line 1500W.

Digital results (this report, raw and processed ASCII data files, Geosoft database and map and AutoCAD map or drawing files) are archived on CD.

2. Background

The geology of the St. Paul Bay area as taken from GSC Open File 4594 is shown in figure 3. Gold producers, prospects and occurrences are shown as yellow dots. Major units are

Intermediate to Felsic Plutonic Rocks

14c : granodiorite 14a : diorite Balmer Plutonic Suite 2b : gabbro / diorite 2a : serpentinite, serpentinized peridotite, pyroxenite Balmer Assemblage 1i : siltstone, wacke, argillite, locally pyritiferous 1h : felsic volcanic rocks 1g : dacitic volcanic rocks 1a : middle the defitie flavor and econsisted and

1e : middle tholeiitic basaltic flows and associated gabbroic rocks

1d : intermediate flows

1b : lower komatiite flows



Figure 3. Geology from Sanborn-Barrie et al, 2004

Deposit # 13 – Buffalo Red Lake Mine (MDI52N04SW0009) is at the contact of the Dome stock and mafic volcanic rocks. Exploration and development was at various times from 1925 to 1982. Diamond drilling by Willanour Resources in 1981 indicated 200,000 tons at 0.15 oz/ton Au. Reading from the MDI – 'At this location the contact consists of a broad zone 60 to 100 m wide which



contains numerous large and small dikes of granodiorite with intervening rafts and slivers of mafic volcanic rocks. A contact zone strikes roughly E-W and dips 80° south. Auriferous rocks are located in a broad zone of shearing which cuts across the contact area at 30°. Pyrite is the main sulphide, although chalcopyrite is also present.

Gold prospect # 73 – Humlin Red Lake Mines (MDI52N04SW00035), west of St. Paul Bay, is associated with unit 1i. It was trenched and drilled in the early 1940s. Reading from the MDI – 'The prospect is underlain primarily by basalts. Iron formation occurs between some lava flows. Gold bearing siliceous lenses with arsenopyrite occur in a shear zone over 100 m in width.

The area was flown with INPUT in 1978 (north/south lines at 200 m). The results were reprocessed in 2003 and released as OGS GDS1028. Magnetic contours with moderate and strong EM anomaly centers from this survey are shown with land tenure in figure 4. There are 8 EM anomalies within the claim block (table 1), 2 of which have been classed as moderate to strong. UTMs are NAD83. Most are overburden anomalies. It is difficult to judge quality of the two EM anomalies with conductance estimates as EM profiles are not part of GDS1028.



Figure 4. Magnetics + EM anomaly centers, 1978 INPUT (GDS1028)

| Line | Cond. | Nchan | UTM e | UTM n | claim |
|-------|-------|-------|--------|---------|---------|
| 21520 | 18 | 4 | 435419 | 5652460 | 775727 |
| 21530 | 0 | 2 | 435548 | 5652401 | 775727 |
| 21540 | 0 | 2 | 435760 | 5652429 | 775726 |
| 21550 | 0 | 1 | 436013 | 5652199 | 1143080 |
| 21560 | 0 | 1 | 436227 | 5652477 | 775731 |
| 21570 | 0 | 1 | 436450 | 5652161 | 963597 |
| 21590 | 12 | 3 | 436877 | 5652174 | 963597 |
| 21600 | 0 | 1 | 437120 | 5652244 | 963597 |

Table 1. INPUT EM anomalies from GDS1028

Reading from a 1980 report on magnetometer and HLEM (1777 Hz at 400') surveys over St. Paul Bay for Selco Mining Corp. (AFRI # 52N04SW8990) -

The claim block lies along the contact of the Dome Stock with metavolcanics which comprise mafic to intermediate flows and pyroclastics. The metavolcanic sequence in turn has been intruded by a series of mafic to untramafic sills and dikes. These are exposed along the south



shore of St. Paul Bay and are inferred from magnetic data to also occupy the major portion of the bay.

A sulphide occurrence is located on a point of rock on the south shore of St. Paul Bay. Pyrrhotite and minor chalcopyrite occur within a rhyolitic breccia. Values in nickel are reported to be associated with the sulphides and were the subject of exploration by Chochenour Willans (1972) and A. Kostynuk (1973).

Reading from a 1991 report on magnetometer and HLEM (440 and 1760 Hz at 400') surveys and drilling over St. Paul Bay for Aur Resources (AFRI # 52N04SW0007) –

During January and February of 1991, Aur Resources carried out magnetometer and HLEM surveys over 17 claims in the St. Paul Bay area. The geophysical surveys were followed by a 3 hole diamond drill program totalling 681 m. This program, designed to evaluate the economic potential of the St. Paul Bay deformation zone, outlined several long and weak HLEM conductors, most of which are likely due to overburden. The most significant result from the drilling was the intersection of a 55 foot wide talc-chlorite schist deformation zone including an 8 foot silicified section averaging 0.024 oz Au/ton.

The results of the program confirm the presence of a major ductile shear zone in St. Paul Bay, containing significant anomalous gold mineralization, that remains essentially untested along strike and to depth. However, the assays obtained in the winter drill program are too low grade to be of immediate interest and no further work is recommended for the resent time.

Results from 2001 magnetic and VLF surveys over St. Paul Bay for Freewest Resources Canada are reported in Boniwell, 2001 (AFRI #52N04SW2022). Results from a 2003 magnetic survey over St. Paul Bay for Teck Cominco are reported in Campbell, 2003 (AFRI # 52N04SW2052). The results are shown in figure 5. The minimum contour interval is 200 nT. Reading from Campbell, 2003 -

The geological model used for exploration on this property has mineralized rocks along the contact between the ultramafic rocks and bounding mafic rocks, in areas of structural complexity. The syn-mineralized structures are thought to destroy magnetite in the ultramafic rocks through hydrothermal alteration, therefore areas of magnetite destruction in close relationship with the mafic-ultramafic contact are considered to be prospective.



Figure 5. Magnetic contours from Campbell, 2003



The Teck Cominco report highlights corridors of lower magnetic amplitudes crossing the western and central parts of the ultramafics. These were drill tested by Teck Cominco with SPB-03-01 to SPB-03-03 (see below).

There is one occurrence within the claim block listed in the Ontario Mineral Deposit Inventory. It is a Ni-Cu occurrence taken from OGS P.1053 (1971) and is at 436106 e, 5652217 n (NAD83). This is at the point of land on the south side of St. Paul Bay and in claim 1148080. The occurrence is from grab samples assaying up to 0.58% Ni and 0.41% Cu with traces of gold and silver.

There are 62 drill holes within or just outside the claim block listed in the Ontario Drill Hole Database. 14 are diamond drill holes and 48 are overburden drill holes. The 14 diamond drill holes are listed in table 2. The years for C0-72-1, C0-72-2 and K-1 have been changed from 1991. C0-72-1 may be the same as K-72-1 and C0-72-2 may be the same as K-72-1. UTM coordinates are NAD83. Location and geometry of the early holes are estimates taken from compilation maps. Collar coordinates for the 5 drill holes by Teck Cominco are taken from the drill logs (Baxter, 2003). The 5 Teck Cominco holes are shown in figure 6. The average difference in collar location from the drill logs and from the Ontario Drill Hole Database is 36.8 m. Range is 12.7 to 54.4 m.

| Hole ID | MNDM | year | company | UTM e | UTM n | az | dip | length | casing |
|----------|--------|------|-------------------|--------|---------|-----|-----|--------|--------|
| K-72-1 | 115850 | 1972 | COCHENOUR WILLANS | 437194 | 5652028 | 207 | -50 | 120.73 | 47 |
| K-72-2 | 115784 | 1972 | COCHENOUR WILLANS | 436141 | 5652310 | 27 | -50 | 74.7 | 6.3 |
| 1 | 115785 | 1973 | COCHENOUR WILLANS | 436150 | 5652239 | 360 | -40 | 32.0 | 0 |
| CO-72-1 | 145779 | 1972 | COCHENOUR | 437244 | 5652022 | 195 | | | |
| CO-72-2 | 145778 | 1972 | COCHENOUR | 436137 | 5652251 | 15 | | | |
| K-1 | 145781 | 1973 | KOSTYNUK | 436153 | 5652184 | 5 | | | |
| 25202-1 | 138140 | 1991 | AUR RESOURCES | 435991 | 5652480 | 1 | -55 | 153.6 | 30.9 |
| 25202-2 | 145776 | 1991 | AUR RESOURCES | 436305 | 5652428 | 179 | -55 | 321.0 | 30.8 |
| 25202-3 | 138142 | 1991 | AUR RESOURCES | 436130 | 5652319 | 180 | -47 | 203.5 | 30.6 |
| SPB-03-1 | 216414 | 2003 | TECK COMINCO | 436565 | 5652348 | 240 | -45 | 342.3 | 38 |
| SPB-03-2 | 216413 | 2003 | TECK COMINCO | 436335 | 5652458 | 25 | -45 | 177 | 23 |
| SPB-03-3 | 216412 | 2003 | TECK COMINCO | 435520 | 5652066 | 0 | -45 | 206 | 8.4 |
| SPB-03-4 | 216415 | 2003 | TECK COMINCO | 437095 | 5652203 | 215 | -45 | 221 | 37.2 |
| SPB-03-5 | 216416 | 2003 | TECK COMINCO | 437237 | 5651981 | 30 | -45 | 179 | 47.5 |

Table 2. Diamond drill holes from Ontario DHD



Figure 6. Teck Cominco drill holes from Baxter, 2003



Water depths, till thickness, line/station of the collar and UTM coordinates from the Ontario Drill Hole Database (DHD) for the Teck Cominco holes are listed in table 3.

| Hole ID | total | water | till | line | station | UTM e | UTM n | DHD e | DHD n |
|-----------|-------|-------|------|-------|---------|--------|---------|--------|---------|
| SPB-03-01 | 27 | 11.7 | 15.3 | 855W | 320S | 436565 | 5652348 | 436521 | 5652353 |
| SPB-03-02 | 16.3 | 7.1 | 9.2 | 1110W | 280S | 436335 | 5652458 | 436346 | 5652505 |
| SPB-03-03 | 6 | - | 6 | 1725W | 930S | 435520 | 5652066 | 435474 | 5652095 |
| SPB-03-04 | 26.4 | 14.9 | 11.5 | 310W | 290S | 437095 | 5652203 | 437079 | 5652221 |
| SPB-03-05 | 33.7 | 13 | 20.7 | 105W | 460S | 437237 | 5651981 | 537228 | 5651972 |

Table 3. Depths to bedrock, line/stations and DHD UTMs

The Teck Cominco drill logs show undifferentiated ultramafics, mafic and felsic volcanics, talc chlorite schist, mafic dykes and diorite. In SPB-03-02, a graphitic talc schist was encountered from 65.5 to 82.5 m. The highest gold assay was 6800 ppb over 0.3 m at 244.8 m in ultramafics in SPB-03-01.

Most ultramafics are described in the drill logs as strongly magnetic. The talc chlorite schists are commonly moderately magnetic. The mafic volcanics and mafic dykes are non-magnetic. Narrow, scattered intersections of disseminated sulphides are common. Most are less than 1% sulphides. The highest might be 10% sulphides over 5 cm at 45.5 m in SPB-03-01.

The 48 overburden drill holes are over St. Paul Bay (figure 7), where they are shown within claims 1234557 and 1247953, immediately north and east of claim 963597. They were drilled by Skyharbour Resources in early 2003 and numbered SPB-1 to SPB-51. The highest gold value (30 ppb) was from SPB-40. The average hole length (water depth + overburden) was 11.1 m. Range was 4.1 to 21.1 m. Hole locations as listed in the Drill Hole Database are not always those listed in Busch, 2003. Overburden drill holes as described in the Drill Hole Database plot as in figure 8.



Figure 7. Bubble plot of gold in base of till in St. Paul Bay (figure 15 from D.J. Busch, 2003)



Figure 8. Overburden drill holes from the Ontario Drill Hole Database

References

Paul Baxter, 2003, Diamond drilling results, holes SPB-03-01 to SPB-03-05, for Teck Cominco Ltd. AFRI # 52N04SW2069

John B. Boniwell, 2001, Results of geophysical surveying, St. Paul Bay, Red Lake, Ontario, for Freewest Resources Canada Ltd. AFRI #52N04SW2022

David J. Busch, 2003, Report on diamond drilling and overburden drilling, McKenzie Island Project, Red Lake, Ontario, for Skyharbour Resources Ltd., Orko Gold Corp. and Cypress Development Co. AFRI # 52N04SW2068.

Tracy Campbell, 2003, Ground magnetic geophysical survey, St. Paul Bay Property, Dome, Fairlie, Baird and Heyson Townships, Red Lake, Ontario, for Teck Cominco Ltd. AFRI # 52N04SW2052.

Craig Cooke, 1991, Report on the 1991 winter work program, Meunier property, Project 25202, Aur Resources. AFRI # 52N04SW0007.

Ontario Geological Survey 2004. Mineral Deposit Inventory Version 2 (MDI2), October 2004 Release.

Ontario Geological Survey 2009. Ontario Drill Hole Database: Ontario Geological Survey

A.P. Pryslak and D.A. Hutton, 1980, Report on magnetic and electromagnetic surveys, St. Paul Bay area, Red Lake Mining Division, for Selco Mining Corp. Ltd. AFRI # 52N04SW8990.

M. Sanborn-Barrie, T. Skulski and J. Parker, 2004, Geology, Red Lake greenstone belt, western Superior Province, Ontario, Geological Survey of Canada Open File 4594, scale 1:50,000.

3. Survey Results : General Comments

3.1 Bathymetry

Water depths are shown in figure 9. The average of the 159 measured water depths is 20.4 m. Range is 1 to 35.7 m. Teck Cominco drill hole SPG-03-02 at 1110W, 280S encountered 7.1 m water and muck. The water depth at 1100W, 275S was measured at 5.8 m. The deep area south of Burnt Island is also a resistivity low (figure 10).





Figure 9. Water depths



Figure 10. Apparent resistivity ('a' = 25 m, n=2 and 'a' = 50 m, n=1)

3.2 Magnetics

Magnetic contours are shown in figure 11. The average of all 1908 TMI readings is 58,865 nT. Excluding some outliers, range is 56,803 to 62,349 nT. 32% of the readings are within \pm 500 nT of the mean. 79% are within \pm 1000 nT of the mean. For this location (51.0° n, 93.9° w, 360 m amsl), the reference magnetic field is defined by amplitude 58,128 nT, declination 0.4° east of north and inclination 76° (March 1, 2010).





Figure 11. Magnetics

3.3 IP/resistivity

The plan map of 'a' = 25 m, n=2 and 'a' = 50 m, n=1 chargeability is shown in figure 12. The average, minimum and maximum values for M13 chargeability and apparent resistivity are listed in table 4. Chargeability and resistivity pseudosections for line 1100W are shown in figure 13.



Figure 12. Chargeability ('a' = 25 m, n=2 and 'a' = 50 m, n=1)



| Quantity | Array | # | Mean | Min | Max |
|--------------------------|-------------------|------|------|------|-------|
| M13 chargeability (mV/V) | 'a' = 25 m, all n | 355 | 12.4 | -2.2 | 35.3 |
| | 'a' = 50 m, all n | 1575 | 10.5 | -5.1 | 40.3 |
| Resistivity (ohm.m) | 'a' = 25 m, all n | 355 | 384 | 49 | 1523 |
| | 'a' = 50 m, all n | 1575 | 1634 | 34 | 81544 |
| | 'a' = 50 m, n=1 | 300 | 1421 | 34 | 58039 |

Table 4. Average, minimum and maximum chargeability and resistivity



Figure 13. Chargeability and resistivity, line 1100W

Line 1100W is over land at its south end and from 200S to 100N and this is reflected in higher resistivities. Resistivities over St. Paul Bay of as little as 68 ohm.m reflect lake bottom sediment and till. The amplitude of any IP anomaly under the lake bottom sediments would be suppressed by overburden masking but the IP anomaly form is not affected.

Moderate to strong chargeabilities at all depths over a 250 m wide section of St. Paul Bay are a pleasant surprise. There is a strong, shallow IP anomaly near 250S. The resistivity results suggest this may also be a bedrock conductor – but the evidence is not strong. Other chargeable bodies at depth are more difficult to define. High background chargeabilities over St. Paul Bay may be due to magnetite in the ultramafics.

Of the 355 IP decays from the 'a' = 25 m survey, 79 % are of sufficient amplitude and quality to generate spectral parameters. Of the 1578 IP decays from the 'a' = 50 m survey, 70 % are of sufficient amplitude and quality to generate spectral parameters. Given the very low chargeabilities over the north ends of many lines, these are good performance numbers.

3.4 TerraTEM

Average, minimum and maximum values of Z12 at 0.197 msec (early time) and Z26 at 1.997 msec (middle to late time) for the 185 TerraTEM decays (different gain settings at 65 stations) are listed in table 5. Units are microV/A. Z12 contours are shown in figure 14. There is an early time TerraTEM high centered at 1475W, 450S that may be caused by a weak conductor with a shallow to intermediate dip. The Z12 peak at 1475W, 450S is over 1200 μ V/A. Z26 over this early time terraTEM anomaly is at back ground values (< 1 μ V/A).

| Loop | Z12 | | | Z26 | | |
|------|------|-----|------|------|-------|-----|
| | Mean | Min | Max | Mean | Min | Max |
| 50 m | 161 | -6 | 1212 | 0.1 | -10.8 | 6.0 |

Table 5. Average, minimum and maximum TerraTEM values, Z12 and Z26





Figure 14. TerraTEM, Z12

4. IP Anomalies / Possible Bedrock Conductors

IP anomalies that are thought to represent a discrete body of chargeable material have been picked from the pseudosections. The location and extent of the anomaly centre-top, IP anomaly amplitude, dipole number of the centre-top, spectral IP features and the resistivity setting and expression are taken from the stacked pseudosections. IP anomalies are classed as moderate or strong. Possible bedrock conductors are identified as a confined resistivity low with a coincident IP anomaly. The results are tabled in appendix 3.

39 IP anomalies and 8 possible bedrock conductors were identified. 6 IP anomalies are from the 'a' = 25 m survey. 33 are from the 'a' = 50 m survey. They have been classified as moderate (17) and strong (22). 16 have centre-tops in the first dipole. 12 have centre-tops in the second dipole. Pseudosection plot point depths for the 'a' = 25 m survey are 18.75 m (n=1), 31.25 m (n=2) and 43.75 m (n=3). For the 'a' = 50 m survey, they are 37.5 m (n=1), 62.5 m (n=2) and 87.5 m (n=3). 11 of the IP anomalies have an associated resistivity low. 1 has an associated resistivity high. The rest have no clear resistivity expression. All of the IP anomalies have long time constants.

5. Compilation Map

IP anomalies have been drafted onto a compilation map that shows IP anomaly centres, possible bedrock conductors and diamond drill holes over magnetic contours (figure 15). IP anomalies are shown as a thin red bar for moderate strength or a thick red bar for strong. They are annotated with a letter identifier, the peak M13 chargeability and the dipole number of the anomaly centre-top. Possible bedrock conductors are indicated by a thin black bar under the survey line.





Figure 15. Compilation

6. Discussion

ddh SPB-03-3, 2003, TECK COMINCO

This hole may have been aimed at the weak to moderate HLEM conductors in a magnetic low as shown on a compilation map from Aur Resources (AFRI 52N04SW0007). There is a 3000 nT magnetic high 110 m to the north. A weak to moderate IP axis runs along the magnetic high – peak chargeabilities are only 10.8 mV/V. The drill hole intersected strongly magnetic ultramafics from 159.3 to 206 m (eoh) and this is a good fit with the geophysics. There is no explanation for the weak IP response other than magnetite.

ddh 25202-1, 1991, AUR RESOURCES

This drill hole is on the northern flanks of the magnetic high. It was set to test a weak to moderate HLEM conductor. From the drill hole log ; 55 to 98 m, strongly altered with 1%, locally 5% pyrrhotite, graphite bands, veinlets or patches and 62 to 77 m, 5% pyrrhotite graphite material throughout. No anomalous gold values. There is a strong IP axis 50 m north of the drill hole with an interpolated centre top at around 35 m depth. The graphitic zone encountered in the drill is a good fit with the geophysics.

ddh K-72-2, 1972, COCHENOUR WILLANS ddh 1, 1973, COCHENOUR WILLANS ddh CO-72-2, 1972, COCHENOUR ddh K-1, 1973, KOSTYNUK <u>ddh 25202-3, 1991, AUR RESOURCES</u>



All of these holes were looking for VMS conductors related to the sulphide showing on the southern shore of St. Paul Bay. K-72-2 and CO-72-2 are probably one and the same. 1 may be the same as K-1. From the 1991 report for Aur Resources, this showing was described by Cochenour geologists as 'consisting of pyrrhotite with minor chalcopyrite and possible pentlandite, occurring in a rhyolitic breccia'. 25202-03 encountered intermediate volcanics from 115 to 176 m with small areas of pyrrhotite, chalcopyrite and sphalerite mineralization. The drill section shows elevated levels of arsenic, copper and zinc over at least 50 m. 25202-03 is 125 m north of a moderate IP zone.

The sulphide showing, CO-72-2 and K-1 are shown in Aur Resources drill section 82+00W (AFRI 52N04SW0007). CO-72-2 is shown collared at the lake edge, drilling to the north. Sulphides are indicated in K-1 at 10 to 20 m depth.

ddh 25202-2, 1991, AUR RESOURCES ddh SPB-03-2, 2003, TECK COMINCO

25202-2 was drilled to test a weak HLEM conductor. It intersected a 16.7 m wide deformation zone at 182 m of talc-chlorite schist with a very low sulphide content. This zone contained a silicified section with the best gold intersection of the program, 0.024 oz Au/ton over 2.4 m.

SPB-03-2 is in a similar regional geophysical setting as 25202-1, i.e. on the northern flank of the magnetic high and into a strong, shallow IP zone 35 m north (figure 13). It is in the area where the main magnetic high is crossed by a corridor of lower magnetic value and where a magnetic axis comes in from the west northwest. SPB-03-2 intersected graphitic talc carbonate schist from 65.5 to 82.5 m. This is a good fit with the IP results. The highest of 3 gold assays over this length was 96 ppb.

ddh SPB-03-1, 2003, TECK COMINCO

This hole may have been set to test the north/south corridor of lower magnetic values that crosses the main magnetic high. It intersected ultramafics (54%), talc chlorite schist (15%, 4 instances), mafic volcanics (12%) and mafic dykes (9%). The highest gold assay was 790 ppb from a talc chlorite schist.

ddh SPB-03-4, 2003, TECK COMINCO

This hole intersected ultramafics (63%) and felsic volcanics (29%). The highest gold assay was 140 ppb from a fault zone.

ddh K-72-1, 1972, COCHENOUR WILLANS ddh CO-72-1, 1972, COCHENOUR <u>ddh SPB-03-5, 2003, TECK COMINCO</u>

K-72-1 and CO-72-1 are probably the same hole taken from different sources. They may have been set to test the eastern extension of possible VMS conductors.

SPB-03-5 encountered felsic volcanics (32%) and ultramafics (61%). The highest gold assay was 304 ppb from a talc chlorite schist.

Most of the IP anomalies may be broadly grouped into two main zones that run along the north side of the magnetic high. There is occasional evidence that these IP zones are also weak bedrock conductors. The northern most of these two IP zones runs from 700W to 1500W and is made up of strong, shallow IP anomalies. IP anomalies at the north ends of 100W to 400W may be part of the same zone. This IP zone has been tested by ddh 25202-1 and SPB-03-2 and found to be a graphitic talc schist with background gold values. Overburden drilling by Skyharbour Resources over the 100W to 400W segment of this IP zone returned modest gold values.



The IP zone just to the south runs from 1100W to 1900W and is made up of strong IP anomalies with centre tops in the later dipoles. This IP zone has not been drill tested. By an easy measure the best IP/resistivity target on this IP zone is at 1500W, 450S (figure 16) – a probable bedrock conductor with a centre top at an estimated depth of 30 to 40 m. Water depth here is 11 m. 20 m, of till is possible. Dip from the IP/resistivity anomaly is within ± 45° of vertical. An early time terraTEM anomaly at the same location suggests an intermediate dip. Regional features favour an intermediate dip to the south. There is a local magnetic high at 1500W, 462.5S. The strong IP anomaly / resistivity low at depth at 37S – 350S in figure 16 is part of the northern IP zone.



Figure 16. 'a' = 25 m chargeability and resistivity, line 1500W

The sulphide showing on the south side of St. Paul Bay is at the east end of a 3 line IP zone made up moderate, shallow IP anomalies. Drilling from 1972 and 1991 confirmed intermediate volcanics with areas of pyrrhotite, chalcopyrite and sphalerite. The best of the 3 IP anomalies that make up this zone is at 1300W, 650S (figure 17), 100 m west of the area of drilling. Depth to centre top is less than 40 m. Dip is speculative.



Figure 17. 'a' = 50 m chargeability and resistivity, line 1300W

Drilling Suggestions

1. The target is the IP anomaly and probable bedrock conductor at 1500W, 450S. Drill from the south with the collar 100 m south of the target center. Collar at 435900 e, 5652340 n. Azimuth 0°. Inclination -45°. Length to 250 m.



2. The target is the IP anomaly at 1300W, 650S. Drill from the south with the collar 50 m south of the target center. Collar at 436035 e, 5652120 n. Azimuth 0°. Inclination -45°. Length to 150 m.

7. Conclusions

Pole-dipole IP/resistivity, magnetic and moving loop TDEM (terraTEM) surveys were done on the St. Paul Bay property, Red Lake area, Ontario. Total production was 20,175 m IP/resistivity, 23,050 m magnetics and 2,800 m or 65 coincident loop soundings terraTEM. Water depths were recorded over 6,375 m. Most of the results have been presented at 1:5,000. The results have been compared against the exploration record, including drilling from 1972, 1991 and 2003. Two geophysical targets are suggested.

Ian Johnson, Ph.D., P.Eng. May 3, 2010 Blaine Webster, B.Sc., P. Geo.

Certificate of Qualifications

Blaine Webster President - JVX Ltd., 60 West Wilmot Street, Unit 22 Richmond Hill, Ontario L4B 1M6 Tel : (905) 731-0972 Email : bwebster@jvx.ca

- I, Blaine Webster, B. Sc., P. Geo., do hereby certify that
 - 1. I graduated with a Bachelor of Science degree in Geophysics from the University of British Columbia in 1970.
 - 2. I am a member of the Association of Professional Geoscientists of Ontario.
 - 3. I have worked as a geophysicist for a total of 40 years since my graduation from university and have been involved in minerals exploration for base, precious and noble metals and uranium throughout much of the world.
 - 4. I am partly responsible for the preparation of this report. Most of the technical information in this report is derived from geophysical surveys conducted by JVX Ltd. for Rainbow Resources Inc. and information provided by Rainbow Resources Inc.

Blaine Webster, B. Sc., P. Geo.

Certificate of Qualifications

Ian Johnson R R 2 Aylmer, Ontario N5H 2R2 Tel : (519) 773-2932 Email : ianjohnson@amtelecom.net

- I, Ian Johnson, Ph. D., P. Eng., do hereby certify that
 - 1. I graduated with a Bachelor of Science degree in Geophysics from the University of Western Ontario in 1968 and a Doctorate degree in Geophysics from the University of British Columbia in 1972.
 - 2. I am a member of the Association of Professional Engineers of Ontario.
 - 3. I have worked as a geophysicist for a total of 35 years since my graduation from university and have been involved in minerals exploration for base, precious and noble metals and uranium throughout much of the world.
 - 4. I am partly responsible for the overall preparation of this report. Most of the technical information in this report is derived from geophysical surveys conducted by JVX Ltd. for Rainbow Resources Inc. and information provided by Rainbow Resources Inc.

Ian Johnson, Ph.D., P.Eng.

Appendix 1 Production, GPS control points, Instrumentation and Data Processing

Pole-dipole IP/resistivity, magnetic and moving loop TDEM (terraTEM) surveys were done on the St. Paul Bay property, Fairlie, Baird and Heyson Townships, Red Lake area, Ontario. The work was done for Rainbow Resources Inc. by JVX Ltd. under JVX job number 10-07. The field work was done from February 24 to March 13, 2010. Total production was 20,175 m IP/resistivity (table 1), 23,050 m magnetics (table 2) and 2,800 m or 65 coincident loop soundings terraTEM (table 3). Water depths were recorded over 6,375 m (table 4).

IP surveys on lines 100W and 200W were done with 'a' = 25 m, n=1,6. Line 1500W was done with 'a' = 25 m, n=1,8. Lines 300W to 2300W were surveyed with 'a' = 50 m, n=1,6. Total magnetic intensity readings were taken every 12.5 m. TerraTEM surveys were done with 50 m coincident loops on 50 m centres on 4 lines. Some line segments were done on 25 m centres.



Figure 1. Grid layout, magnetic survey

For the IP survey, coverage is measured from the first current electrode to the last potential electrode (ideal grid). For the magnetic survey, coverage is measured from the first to last reading (ideal grid). Table 2 also shows the number of readings and the accumulated total line length. For the terraTEM survey, coverage is measured from the first to last sounding point on any line (ideal grid). The sounding point is at the center of the Tx/Rx coincident loop pair.

| Array | Line | IP-From | IP-To | Separation | Date |
|-------------------|-------|---------|-------|------------|-------------------|
| 'a' = 25 m, n=1,6 | 100W | 525S | 250S | 275 | February 24, 2010 |
| | 200W | 550S | 150S | 400 | February 24, 2010 |
| 'a' = 25 m, n=1,8 | 1500W | 900S | 00 | 900 | March 12, 2010 |
| 'a' = 50 m, n=1,6 | 300W | 575S | 125S | 450 | February 25, 2010 |
| | 400W | 575S | 175S | 400 | February 25, 2010 |
| | 500W | 575S | 225S | 350 | February 25, 2010 |
| | 600W | 575S | 125S | 450 | February 26, 2010 |
| | 700W | 600S | 00 | 600 | February 26, 2010 |
| | 800W | 600S | 200N | 800 | February 26, 2010 |
| | 900W | 600S | 550N | 1150 | February 27, 2010 |
| | 1000W | 600S | 500N | 1100 | February 28, 2010 |

Appendix 1 : Production, GPS control points, Instrumentation and Data Processing

| Array | Line | IP-From | IP-To | Separation | Date |
|-------|-------|---------|-------|------------|----------------|
| | 1100W | 675S | 475N | 1150 | March 1, 2010 |
| | 1200W | 725S | 475N | 1200 | March 2, 2010 |
| | 1300W | 800S | 400N | 1200 | March 3, 2010 |
| | 1400W | 900S | 350N | 1250 | March 4, 2010 |
| | 1500W | 950S | 350N | 1300 | March 4, 2010 |
| | 1600W | 950S | 350N | 1300 | March 5, 2010 |
| | 1700W | 950S | 300N | 1250 | March 5, 2010 |
| | 1800W | 900S | 250N | 1150 | March 8, 2010 |
| | 1900W | 750S | 200N | 950 | March 8, 2010 |
| | 2000W | 650S | 150N | 800 | March 11, 2010 |
| | 2100W | 700S | 150N | 850 | March 11, 2010 |
| | 2200W | 500S | 100N | 600 | March 12, 2010 |
| | 2300W | 200S | 100N | 300 | March 12, 2010 |
| | | | Total | 20,175 m | |

Table 1. Production summary, pole-dipole IP/resistivity

| Line | Mag-From | Mag-To | Separation | Date | # station | length |
|-------|----------|--------|------------|------------------|-----------|----------|
| 100W | 537.5S | 275S | 262.5 | March 9, 2010 | 22 | 261 |
| 200W | 550S | 150S | 400 | March 9, 2010 | 33 | 399 |
| 300W | 587.5S | 150S | 437.5 | March 9, 2010 | 36 | 426 |
| 400W | 600S | 175S | 425 | March 9, 2010 | 35 | 422 |
| 500W | 575S | 225S | 350 | March 9, 2010 | 30 | 349 |
| 600W | 575S | 212.5S | 362.5 | March 9, 2010 | 30 | 364 |
| 700W | 600S | 00 | 600 | March 9/10, 2010 | 49 | 597 |
| 800W | 600S | 225N | 825 | March 9, 2010 | 67 | 825 |
| 850W | 650S | 250S | 400 | March 10, 2010 | 33 | 402 |
| 900W | 650S | 600N | 1250 | March 9/10, 2010 | 86 | 1250 |
| 950W | 625S | 250S | 375 | March 10, 2010 | 28 | 376 |
| 1000W | 625S | 500N | 1125 | March 9, 2010 | 79 | 1130 |
| 1050W | 600S | 350S | 250 | March 10, 2010 | 21 | 253 |
| 1100W | 675S | 475N | 1150 | March 9, 2010 | 84 | 1147 |
| 1200W | 750S | 500N | 1250 | March 9, 2010 | 104 | 1237 |
| 1300W | 800S | 400N | 1200 | March 9, 2010 | 97 | 1206 |
| 1400W | 900S | 350N | 1250 | March 9, 2010 | 103 | 1232 |
| 1500W | 900S | 350N | 1250 | March 9/10, 2010 | 102 | 1248 |
| 1600W | 950S | 350N | 1300 | March 10, 2010 | 105 | 1299 |
| 1700W | 950S | 300N | 1250 | March 10, 2010 | 101 | 1247 |
| 1800W | 900S | 250N | 1150 | Marh 10, 2010 | 93 | 1144 |
| 1900W | 700S | 225N | 925 | March 10, 2010 | 75 | 921 |
| 2000W | 650S | 175N | 825 | March 10, 2010 | 67 | 822 |
| 2100W | 700S | 150N | 850 | March 10, 2010 | 69 | 848 |
| 2200W | 500S | 100N | 600 | March 10, 2010 | 49 | 600 |
| 2300W | 200S | 100N | 300 | March 10, 2010 | 27 | 323 |
| B0 | 2300W | 712.5W | 1587.5 | March 10, 2010 | 128 | 1626 |
| T275S | 700W | 100W | 600 | March 10, 2010 | 50 | 600 |
| T400S | 1050W | 700W | 350 | March 10, 2010 | 29 | 352 |
| T550S | 1050W | 900W | 150 | March 10, 2010 | 14 | 139 |
| | | Total | 23, 050 m | | 1846 | 23,045 m |

| Table 2. Production | summary, magnetics |
|----------------------------|--------------------|
|----------------------------|--------------------|

| Line | TT-From | TT-To | Separation | # soundings | Date |
|-------|---------|--------|------------|-------------|------------------|
| 1425W | 825S | 175S | 650 | 16 | March 6/13, 2010 |
| 1475W | 825S | 175S | 650 | 18 | March 6/13, 2010 |
| 1525W | 875S | 125S | 750 | 16 | March 7, 2010 |
| 1575W | 875S | 125S | 750 | 15 | March 7, 2010 |
| | | Totals | 2.800 m | 65 | |

Table 3. Production summary, moving loop TDEM (terraTEM)

| Line | Spacing | From | То | Separation |
|-------|---------|------|-------|------------|
| 1100W | 50 m | 575S | 2225S | 350 |
| 1300W | 50 m | 600S | 250S | 350 |
| 1500W | 25 m | 825S | 00 | 825 |
| 1600W | 50 m | 950S | 350N | 1300 |
| 1700W | 50 m | 950S | 300N | 1250 |
| 1800W | 50 m | 900S | 50N | 950 |
| 2000W | 50 m | 650S | 00 | 650 |
| 2100W | 50 m | 700S | 00 | 700 |
| | | | Total | 6,375 m |

Table 4. Bathymetric soundings

1. Grid

The St. Paul Bay property consists of 12 contiguous mining claims (775725 – 775728, 775731, 963597 – 963600, 1235866, 1143079 and 1143080) covering St. Paul Bay on the south side of Red Lake. All claims are registered to David Meunier. The property is centered 6 km west of the town of Red Lake, Ontario.

Lines are numbered 100W to 2300W and are oriented north 20° east. The maximum station range is 950S to 550N. There is a base line at 00 and tie lines at 275S, 400S and 550S. UTM coordinates collected at GPS control points are listed in table 5.

| Line | Station | UTM e | UTM n | elevation |
|------|---------|--------|---------|-----------|
| 100 | 592S | 437216 | 5651900 | 359 |
| | 525S | 437223 | 5651918 | 359 |
| | 275S | 437304 | 5652156 | 358 |
| | 250S | 437307 | 5652179 | 359 |
| 200 | 150S | 437247 | 5652305 | 359 |
| | 275S | 437204 | 5652186 | 359 |
| | 550S | 437118 | 5651925 | 356 |
| | 563S | 437114 | 5651913 | 359 |
| 300 | 589S | 437015 | 5651916 | 355 |
| | 575S | 437017 | 5651933 | 357 |
| | 275S | 437109 | 5652217 | 360 |
| | 156S | 437147 | 5652331 | |
| 400 | 600S | 436917 | 5651944 | 359 |
| | 575S | 436924 | 5651965 | 357 |
| | 275S | 437016 | 5652247 | |
| | 175S | 437045 | 5652344 | 356 |
| 500 | 225S | 436936 | 5652328 | 359 |
| | 275S | 436920 | 5652278 | 350 |
| | 375S | 436889 | 5652186 | 361 |
| | 575S | 436829 | 5651998 | 361 |
| 600 | 200S | 436848 | 5652380 | |
| | 225S | 436842 | 5652360 | 362 |
| | 275S | 436825 | 5652309 | 354 |
| | 575S | 436732 | 5652025 | 357 |
| 700 | 00 | 436818 | 5652585 | |
| | 275S | 436731 | 5652343 | |
| | 600S | 436627 | 5652030 | 358 |
| 800 | 600S | 436535 | 5652060 | 360 |
| | 150S | 436666 | 5652493 | 358 |
| | 00 | 436715 | 5652622 | |
| | 275N | 436802 | 5652879 | |
| 900 | 600S | 436417 | 5652095 | 362 |
| | 400S | 436487 | 5652288 | 358 |
| | 00 | 436620 | 5652656 | |
| | 600N | 436829 | 5653221 | 368 |
| 1000 | 625S | 436324 | 5652101 | 360 |
| | 400S | 436397 | 5652318 | 358 |
| | 200S | 436460 | 5652509 | 361 |

| Line | Station | UTM e | UTM n | elevation |
|------|---------|--------|---------|-----------|
| | 50S | 436510 | 5652646 | 389 |
| | 00 | 436525 | 5652689 | 385 |
| | 298N | 436623 | 5652968 | 358 |
| | 350N | 436643 | 5653017 | 355 |
| | 500N | 436695 | 5653155 | 370 |
| 1100 | 475N | 436578 | 5653170 | 367 |
| | 125N | 436471 | 5652837 | 358 |
| | 00 | 436430 | 5652720 | 380 |
| | 175S | 436380 | 5652556 | 372 |
| | 575S | 436252 | 5652180 | 361 |
| | 675S | 436220 | 5652088 | 361 |
| 1200 | 750S | 436106 | 5652048 | |
| | 675S | 436135 | 5652117 | 366 |
| | 525S | 436180 | 5652260 | 357 |
| | 325S | 436241 | 5652452 | 360 |
| | 00 | 436346 | 5652754 | |
| | 75N | 436360 | 5652820 | 353 |
| | 500N | 436491 | 5653214 | 361 |
| 1300 | 400N | 436379 | 5653161 | 360 |
| | 00 | 436248 | 5652784 | 381 |
| | 750S | 436003 | 5652083 | 372 |
| | 800S | 435983 | 5652034 | |
| 1400 | 375N | 436294 | 5653170 | 360 |
| | 00 | 436155 | 5652820 | 373 |
| | 900S | 435858 | 5651976 | 360 |
| 1500 | 350N | 436186 | 5653185 | 363 |
| | 00 | 436064 | 5652856 | |
| | 925S | 435739 | 5651992 | 366 |
| 1600 | 350N | 436092 | 5653219 | 358 |
| | 250N | 436059 | 5653129 | 359 |
| | 0 | 435970 | 5652894 | |
| | 950S | 435637 | 5652003 | 358 |
| 1700 | 300N | 435980 | 5653207 | 358 |
| | 150N | 435929 | 5653067 | 355 |
| | 00 | 435876 | 5652929 | |
| | 750S | 435613 | 5652229 | 359 |
| | 950S | 435542 | 5652042 | 362 |
| 1800 | 250N | 435864 | 5653186 | |
| | 00 | 435784 | 5652963 | |
| | 550S | 435590 | 5652452 | 357 |
| | 900S | 435467 | 5652121 | 361 |
| 1900 | 225N | 435764 | 5653201 | |
| | 150N | 435742 | 5653135 | 376 |
| | 00 | 435688 | 5652998 | |
| | 400S | 435551 | 5652626 | 352 |
| | 700S | 435444 | 5652341 | 355 |
| 2000 | 175N | 435654 | 5653184 | 380 |
| | 00 | 435595 | 5653032 | |
| | 650S | 435368 | 5652422 | 351 |
| 2100 | 150N | 435555 | 5653206 | |
| | 00 | 435500 | 5653067 | |
| | 700S | 435263 | 5652416 | 335 |
| 2200 | 100N | 435443 | 5653194 | |
| | 00 | 435408 | 5653101 | |
| | 100S | 435373 | 5653010 | 355 |
| | 500S | 435233 | 5652635 | 326 |
| 2300 | 100N | 435349 | 5653230 | 340 |
| | 00 | 435314 | 5653136 | |
| | 200S | 435243 | 5652950 | 339 |

Table 5. GPS control points (NAD83, Z15N)

2. Personnel

Dennis Palos, senior geophysicist from JVX, was in charge of the field work. Assistants included Doug Johnson, Jarred Taman and Michael McDougall. Data processing was handled by Lily Manoukian at the JVX office in Richmond Hill, Ontario.

3. Instrumentation

Magnetometer

Gem Systems GSM-19GW, SN 6112165 (mobile) Gem Systems GSM-19 (base)

The GSM19 series of magnetometers record line, station, total magnetic intensity to 0.01 nT and time. The GSM-19GW includes a built in GPS receiver – latitude/longitude or UTM coordinates are recorded at each station. The Overhauser sensors of the GSM series magnetometers are more tolerant of high spatial gradients than earlier proton precession magnetometers. In base station mode, the GSM-19 records total magnetic intensity and time. Specification sheets are attached.

IP/resistivity

Iris Instruments Elrec Pro IP/resistivity receiver, SN 2315-3102519783-187 GDD TXII – 1800W-2400V time domain transmitter, SN TX332

The Elrec Pro time domain IP receiver can take readings with up to 10 receiver dipoles. The IP decay is measured in millivolts/volt over up to 20 programmable windows. For this survey, the IP decay was measured over 19 windows. Time settings for these 19 windows are listed in table 6. All times are in milliseconds after current shut off. A 2 second current pulse was used throughout. Specification sheets are attached.

| slice | start | end | duration | mid point |
|-------|-------|------|----------|-----------|
| M0 | 50 | 70 | 20 | 60 |
| M1 | 70 | 110 | 40 | 90 |
| M2 | 110 | 150 | 40 | 130 |
| M3 | 150 | 190 | 40 | 170 |
| M4 | 190 | 230 | 40 | 210 |
| M5 | 230 | 270 | 40 | 250 |
| M6 | 270 | 310 | 40 | 290 |
| M7 | 310 | 380 | 70 | 345 |
| M8 | 380 | 450 | 70 | 415 |
| M9 | 450 | 530 | 80 | 490 |
| M10 | 530 | 610 | 80 | 570 |
| M11 | 610 | 690 | 80 | 650 |
| M12 | 690 | 780 | 90 | 635 |
| M13 | 780 | 900 | 120 | 840 |
| M14 | 900 | 1050 | 150 | 975 |
| M15 | 1050 | 1210 | 160 | 1130 |
| M16 | 1210 | 1380 | 170 | 1295 |
| M17 | 1380 | 1570 | 190 | 1375 |
| M18 | 1570 | 1770 | 200 | 1670 |

Table 6. Elrec Pro chargeability windows

For each receiver dipole, the Elrec Pro records line/stations of the current and potential electrodes, the primary voltage (mV), self potential (mV), 19 chargeability values (mV/V) and the transmitted current (mA). The apparent resistivity is calculated from the primary voltage and transmitted current using K factors based on array geometry.

Mx chargeability, the IP slice most often presented in surveys done with the Scintrex IPR12 receiver, is centered at 870 msec (690 to 1050 msec). M13 at 840 msec (780 to 900 msec) from the

Elrec Pro is the closest IP slice to Mx. One could get closer to Mx by calculating the weighted average of M12, M13 and M14 as (0.9*M12+1.2*M13+1.5*M14)/3.6.

The Instrumentation GDD Inc. GDD TXII 1800 watt time domain IP transmitter operates off 120V output from a 2000 watt motor generator. Output is current stabilized from 150 to 2400 volt taps. The maximum current is 10 amps. Current and circuit resistance are displayed in digital form.

terraTEM

Monash Geoscope terraTEM receiver/transmitter console and battery pack.

The terraTEM console outputs a commutated square wave current and measures voltages proportional to the time rate of change of any induced magnetic field decay during the current off time. Several transmitter / receiver loop/coil arrangements are possible. Near-coincident 50 x 50 m Tx/Rx loops were used here (figure 1). System power is from a 25 pound battery pack.



Figure 1. terraTEM loop layout for each sounding (figure C.1 from the operations manual)

For any sounding, Tx and Rx loops are laid out, each as four 50 m long segments, on a 50 or 100 m grid. The results are identified by the line/station of the center point of the sounding. Soundings are usually taken every 25 or 50 m down line after moving 3 Tx/Rx loop segments. Under good conditions, 2 to 3 soundings per hour with a 4 man crew is possible.

The receiver outputs the decay current induced in the Rx loop after Tx current shut off. The decay is sampled at a number of gates or channels arranged logarithmically for a total sample window of up to 1 second. Channel timing and the number of gates used here are listed in table 7. All times are in milliseconds measured from 0.025 msec after start of the Tx current ramp shut off. The unit of measurement is microvolts per Ampere (μ V/A).

All 40 gates were recorded. Tx current on and off times are automatically matched to the number of gates recorded – switching from 40 to 35 gates halves the Tx current period and the time needed for each reading sequence.

The current turnoff ramp may last beyond the initial delay time of 0.025 msec and may therefore persist into the early gates. Readings in the first 3 or 4 gates are often corrupted by the Tx current and may be ignored.

| # | center | width | # | center | width |
|----|--------|-------|----|--------|-------|
| 1 | 0.008 | 0.006 | 21 | 0.941 | 0.186 |
| 2 | 0.014 | 0.006 | 22 | 1.133 | 0.186 |
| 3 | 0.020 | 0.006 | 23 | 1.325 | 0.186 |
| 4 | 0.026 | 0.006 | 24 | 1.517 | 0.186 |
| 5 | 0.035 | 0.006 | 25 | 1.709 | 0.186 |
| 6 | 0.047 | 0.006 | 26 | 1.997 | 0.378 |
| 7 | 0.059 | 0.006 | 27 | 2.381 | 0.378 |
| 8 | 0.071 | 0.006 | 28 | 2.765 | 0.378 |
| 9 | 0.089 | 0.018 | 29 | 3.149 | 0.378 |
| 10 | 0.113 | 0.018 | 30 | 3.533 | 0.378 |
| 11 | 0.149 | 0.042 | 31 | 4.109 | 0.762 |
| 12 | 0.197 | 0.042 | 32 | 4.877 | 0.762 |
| 13 | 0.245 | 0.042 | 33 | 5.645 | 0.762 |
| 14 | 0.293 | 0.042 | 34 | 6.413 | 0.762 |
| 15 | 0.341 | 0.042 | 35 | 7.181 | 0.762 |
| 16 | 0.413 | 0.090 | 36 | 8.333 | 1.530 |
| 17 | 0.509 | 0.090 | 37 | 9.869 | 1.530 |
| 18 | 0.605 | 0.090 | 38 | 11.405 | 1.530 |
| 19 | 0.701 | 0.090 | 39 | 12.941 | 1.530 |
| 20 | 0.797 | 0.090 | 40 | 14.477 | 1.530 |

Table 7. terraTEM channels

4. Surveys

UTM coordinates were collected at 97 GPS control points, normally at the base line, at line ends and other points in between. The average distance between GPS control points is around 250 m.

Total magnetic intensity readings were taken every 12.5 m. The magnetometer records both UTM easting and northing and line/station at each reading. The base station was set to read every 10 seconds. Recorded stations were incorrect for lines 900W, 1000W and 1100W and were re-assigned during processing.

Pole-dipole array IP/resistivity surveys with 'a = 25 m, n=1,6 were done on lines 100W, 200W and 1500W. Pole-dipole array IP/resistivity surveys with 'a = 50 m, n=1,6 were done on lines 300W to 2300W. The current electrode was always grid south of the potential electrodes. For over-water line segments, holes were drilled through the ice and stainless steel electrodes were lowered to the lake bottom sediments. Water depth readings were made every 25 or 50 m on 8 lines.

TerraTEM soundings were done at 65 centers using coincident 50 m Tx/Rx loops. Readings at any sounding were done for a number of gain settings. 40 gates were recorded with a 0.025 msec initial delay.

Data Processing and Presentation

<u>Grid</u>

GPS control points are loaded into gps.gdb. The grid for registration and presentation of the IP/resistivity and terraTEM results is drawn from these GPS control points. Line/stations away from GPS control points are interpolated or extrapolated. The magnetic data are presented as the survey trace. Stations for all but lines 900W, 1000W and 1100W are as recorded with UTMs by the receiver. For lines 900W, 1000W and 1100W, stations are assigned by interpolation from the base line and line ends where available.

Base Map

A topographic base map and land tenure have been downloaded as a *.png image from the Ontario Ministry of Northern Development, Mines and Forestry claimap3 website (copyright Queens Printer for Ontario). Land tenure (claims, dispositions, alienations) have been downloaded from the same website as *.shp files. Roads, rivers and lakes have also been downloaded from geogratis.ca of Natural Resources Canada (Copyright Department of Natural Resources Canada). There are minor differences in topographic features from Provincial and Federal sources. The topography, land tenure and all geophysical data are registered in NAD83, Z15N.

Magnetics

At the end of every survey day, data from the mobile and base station magnetometers are dumped to a PC. Output from both magnetometers are text files labelled as 'raw', 'mobile' or 'base'. Data dumps for the mobile unit show latitude, longitude, TMI (nT), time, line and station. Data dumps for the base unit contain time and TMI. Subsequent processing steps are

- 1. Apply base station corrections to the mobile data. Corrected TMI values are appended to the raw or mobile files and renamed as 'cor' files. Bad data or repeat values are removed. Recorded station numbers for lines 900W, 1000W and 1100W are replaced by numbers interpolated from stations at the base line and line ends.
- 2. Move the contents of the files containing the corrected TMI values into a Geosoft database (*.gdb).

Colour + line contour maps of the corrected total magnetic intensity are generated from the database using Geosoft Montaj. Random gridding with a 6.25 m grid cell is used.

IP/Resistivity

At the end of every survey day, the IP/resistivity data are dumped from the Elrec Pro to a PC. Output is an ASCII *.dat file with the line number as the file name. The data are checked for quality and quantity. The data are archived for transfer to JVX Ltd. in Toronto.

Office data processing is based largely on Geosoft Oasis Montaj v6.3 (www.geosoft.com). Impedance modelling software (below) is based on a suite of programs developed by JVX. Compilation maps are prepared using AutoCAD drafting software (www.autodesk.com).

The *.dat files are taken into a Geosoft database and merged with the position data in gps.gdb. The IP decays are analyzed for spectral content (see below). Stacked pseudosections (see below) and plan maps of M13 chargeability and apparent resistivity are prepared with Oasis Montaj. Random gridding is used in all cases.

Pseudosections assume an ideal survey line. Plan maps show the interpolated grid, station numbers, posted values and line + colour contours. Colour contour intervals are decided by an equal area distribution of all of the chargeability or apparent resistivity readings on any grid. These colour contour intervals are then applied to all plan maps.

Impedance Modelling

The Cole-Cole impedance model was developed in the 1970s after it became clear that chargeability is a complex property that includes amplitude (volume percent electronic conductors), grain size and grain size uniformity. In this model, the low frequency electrical impedance $Z(\omega)$ of rocks and soils is defined by 4 parameters. They are

- r₀: DC resistivity in ohm.m
- m: true chargeability amplitude in V/V (also called MIP)
- τ : tau time constant in seconds
- c: exponent

The form of the model is

 $Z(\omega) = r_0 \{1 - m [1 - (1+(i\omega\tau)^c)^{-1}]\}$ ohm.m

where ω is the angular frequency (2 π f).

The true chargeability (m or MIP) is a better measure of the volume percent electronic conductors (some metallic sulphides, magnetite, graphite). The time constant is a measure of the square of the average grain size. The exponent is a measure of the uniformity of the grain size. Common or possible ranges are 0 to 1 (MIP), .01 to 100 seconds (tau) and .1 to .5 (c).

In time domain IP surveys, impedance model parameters may be estimated using a best fit between theoretical and measured decays. The simplest approach and the one used here, is to use a set of master decay curves, pre-calculated for selected values of time constant and exponent. For a 2 second current pulse, the master curve set is for time constant values of .01, .03, .1, .3, 1, 3, 10, 30 and 100 seconds and exponent values of 0.1, 0.2, 0.3, 0.4 and 0.5. This gives a total of 45 master curves.

All decays that give an RMS fit between measured and master decay of less than 5% yield spectral parameters. Under ideal conditions, more than 90 % of the IP decays in any survey are of sufficient amplitude and quality to yield spectral parameters. 80 % is probably average for most surveys. The most common reason for the lack of spectral parameters is very low decay amplitudes often seen in areas of thick and/or conductive overburden. Instrumentation and/or noise problems can occur over long sections of outcrop or at an abrupt boundary between outcrop and conductive ground.

terraTEM

At the end of every survey day, data are dumped from the terraTEM console to a PC. Output is an ASCII *.tem file showing the line and station of the centre point of each sounding, the Tx current, the length of the current off ramp in msec, the gain setting, number of gates or channels and the relative voltage (microVolts/Amp) for these gates or channels. The data are archived for transfer to JVX Ltd. in Toronto

In the office, data are checked for quality. TerraTEM decays for all gain settings are moved into a Geosoft database. UTM coordinates from the interpolated grid are added. Selected channels were extracted from the database for presentation as contour plan maps. The random gridding process averages all channel values from different gain settings at any line/station. Sounding locations were added to plan maps.

Archives

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

ASCII *.txt or ASCII *.dmp or ASCII *.tem - text files of the original instrument dumps ASCII *.dat – Iris Elrec Pro raw data dumps *.gdb - Geosoft databases (gps, magnetics, IP/resistivity, terraTEM)

*.map – Geosoft format maps included with this report

MS WORD *.doc and Adobe Acrobat *.pdf - report,

Appendix 2 Weekly Field Production Reports

JVX Ltd. Field Production Report

| Project No: 10-07 | Client: Rainbow Resources | Area: Red Lake, ON | Week Ending: Feb. 20, 2010 |
|-------------------|---------------------------|--------------------|----------------------------|
| | | | |
| | | | |

| Day | Work Summary | Line | From | То | Length (#stations) |
|------------------------|---|------|------|----|-----------------------|
| Sun Feb | | | | | |
| 14 Mon Feb 15 | | | | | |
| Tue Feb 16 | | | | | |
| Wed Feb 17 | | | | | |
| Thu Feb 18 | Pack truck for 10-07. Mobilize from Richmond Hill to Sudbury – Gowganda – New Liskeard. | | | | |
| Fri Feb 19 | Work on 10-01. | | | | |
| Sat Feb 20 | Mobilize from New Liskeard to Longlac. | | | | |

Production : X Mobilization : M Standby : S Logistics & Preparation : L

| Name | Position | S | Μ | Τ | W | Т | F | S |
|--------------|--------------|---|---|---|---|---|---|---|
| Dennis Palos | Geophysicist | | | | | Μ | - | Μ |
| Doug Johnson | Helper | | | | | | - | М |
| Jared Taman | Helper | | | | | | - | М |

JVX Ltd. Field Production Report

| Project No: 1 | 0-07 | Client: Rainbow Resources | Area: Re | d Lake, ON | Week | Ending: Feb. 27, 2010 |
|---------------|------------------|--|----------------------|----------------------|----------------------|---|
| | Dev | Werk Summers | Line | From | Та | Longth |
| | Day | work Summary | Line | From | 10 | (#stations) |
| | Sun Feb 21 | Mobilize from Longlac to Vermilion Bay. | | | | |
| | Mon Feb 22 | Mobilize from Vermilion Bay to Red Lake. Get rooms in Red Lake. (Not so easy these days.) Check access to the grid, and meet line cutters. Do spot checks for water depth; 97 feet in open part of lake. | | | | |
| | Tue Feb 23 | Set up infinity electrode and wire. Test transmitter. OK. | | | | |
| | Wed Feb 24 | Start IP survey. Use a=25 m, n=16. The infinity was broken in the morning; it had to be fixed. The western lines are so short we could not use 50 m dipoles. Note: pot for 150S was placed at 152S in order to avoid rocks. | 100W 200W | 525S 550S | 250S 150S | 275 m 400 m |
| | Thu Feb 25 | IP survey in progress on the lake. The rewind on the ice auger broke; we had to get it fixed. We used 50 m dipoles in order to quickly cover the southern part of the lake on which the chargeability is low. | 300W 400W 500W | 575S 575S 575S | 125S 175S 225S | 450 m 400 m 350 m |
| | Fri Feb 26 | IP survey on the lake, and we just started to go over land on L7 and L8. | 600W 700W 800W | 575S 600S 600S | 225S 0N 200N | 350 m 600 m 800 m |
| | Sat Feb 27 | IP survey on L900W. Weekend: a lot of kids were snowmobiling on the lake and not paying attention to our signs. They broke the wires a few times, and this caused us to lose time. The contact resistance was so bad at C2=200N that we could not get current, so we skipped it because it was getting late. We ended at C2= 250N, and the chargeabilities were low. | 900W | 600S | 550N | 1150 metres, last reading with n=5 |

| Production : X | Mobilization : M | Standby : S | Logisti |
|----------------|------------------|-------------|---------|
|----------------|------------------|-------------|---------|

Logistics & Preparation : L

| Name | Position | S | Μ | Т | W | Т | F | S |
|-------------------|--------------|---|---|---|---|---|---|---|
| Dennis Palos | Geophysicist | Μ | Μ | Х | Х | Х | Х | Х |
| Doug Johnson | Helper | Μ | Μ | Х | Х | Х | Х | Х |
| Jared Taman | Helper | Μ | Μ | Х | Х | Х | Х | Х |
| Michael McDougall | Helper | | | | Х | Х | Х | Х |

| Project No: 10- | -07 | Client: Rainbow Resources | Area: Re | Area: Red Lake, ON Week Ending: Mar. 06, 2010 | | | 6, 2010 |
|-----------------|------------------|--|---|---|-------------------------------|---|---------|
| Γ | Day | Work Summary | Line | From | То | Length (#stations) | |
| | Sun Feb 28 | 50 m PDP-IP, n=16. There were still some punks out there ripping our IP wire. Today we lost more wire than time. The cliffs slowed us down; we are geared up for a flat lake survey. | 1000W | 600S | 500 | N 1100 m | |
| | Mon Mar 1 | 50 m PDP-IP, n=16. | 1100W | 675S | 475 | N 1150 m | |
| | Tue Mar 2 | 50 m PDP-IP, n=16. | 1200W | 725S | 475 | N 1200 m | |
| | Wed Mar 3 | 50 m PDP-IP, n=16. We went through the last tough section of peninsula. The next line will have three stations on the peninsula, and the rest will be lake. | 1300W | 800S | 400 | N 1200 m | |
| | Thu Mar 4 | 50 m PDP-IP, n=16. On L1500W, we started with P1 at 850S and C2 at 950S. The local from the crew lost a radio down an auger hole | 1400W 1500W | 900S 950S | 350 350 | N 1250 m N 1300 m | |
| | Fri Mar 5 | 50 m PDP-IP, n=16. | 1600W 1700W | 950S 950S | 350 300 | N 1300 m N 1250 m | |
| | Sat Mar 6 | 50 x 50 m loops MLEM | 1425W 1475W 1425W 1475W 1475W | 625S 625S 550S 550S 450S | 125 125 400 - 400 | S (10) S (10) S (4) (1) S (3) | |

JVX Ltd. Field Production Report

Production : X Mobilization : M Standby : S Logistics & Preparation : L

| Name | Position | S | Μ | Τ | W | Τ | F | S |
|-------------------|--------------|---|---|---|---|---|---|---|
| Dennis Palos | Geophysicist | Х | Х | Х | Х | Х | Х | Х |
| Doug Johnson | Helper | Х | Х | Х | Х | Х | Х | Х |
| Jared Taman | Helper | Х | Х | Х | Х | Х | Х | Х |
| Michael McDougall | Helper | Х | Х | Х | Х | Х | Х | Х |

| Project No: 10 | -07 | Client: Rainbow Resources | Area: Re | d Lake, ON | Week | Ending: Mar. 13, 2010 |
|----------------|------------------|--|--|--------------|--------------|-----------------------|
| _ | | | - | - | | |
| | Day | Work Summary | Line | From | То | Length (#stations) |
| | Sun Mar 7 | 50 x 50 m loops MLEM | 1525W 1575W | 875S 875S | 125S 125S | (14) (14) |
| | Mon Mar 8 | 50 m PDP IP, n=16. After the day's work, we picked up the magnetometer. We will try it out. | 1800W 1900W | 900S 750S | 250N 200N | 1250 m 950 m |
| - | Tue Mar 9 | Mag on Lines 1W to 14W complete, L1500W partial. Lines 9W, 10W and part of 11W have the wrong station numbers. In the first part of the day, the Latitudes and Longitudes had incomplete numbers – the degrees were missing. These numbers had to be edited to complete the missing digits. In the second part of the day they were OK. Details on stations to come later. | 100W 200W 300W 500W 500W 700W 800W 900W 1000W 1100W 1200W 1300W 1400W 1500W | | | |
| | Wed Mar 10 | The grid was completed by the same three operator team. We filled in some details at 850W, 905W, and 1050W. The UTM coordinates were recorded. | 1500W 1600W 1700W 1800W 2000W 2100W 2200W 2300W 0N 275S | | | |
| | Thu Mar 11 | 50 m PDP IP, n=16. | 2000W 2100W | 650S 700S | 150N 150N | 800 m 850 m |
| | Fri Mar 12 | 50 m PDP IP, n=16. | 2200W 2300W | 500S 200S | 100N 100N | 400 m 300 m |
| | | 25 m PDP, n=29 | 1500W | 900S | 0N | 900 m |
| | Sat Mar 13 | IP pick up access wire and infinity wire, and pick up infinity electrodes. MLEM extend lines 1425W and 1475W, 50m loops and 50 m moves. | 1425W 1475W | 675S 675S | 825S 825S | (4) (4) |

JVX Ltd. **Field Production Report**

Production : X Mobilization : M Standby : S

Logistics & Preparation : L

| Name | Position | S | Μ | Г | W | Г | F | S |
|-------------------|--------------|---|---|---|---|---|---|---|
| Dennis Palos | Geophysicist | Х | Х | Х | Х | Х | Х | Х |
| Doug Johnson | Helper | Х | Х | Х | Х | Х | Х | Х |
| Jared Taman | Helper | Х | Х | Х | Х | Х | Х | Х |
| Michael McDougall | Helper | Х | Х | | | Х | Х | Х |

| Project No: 10-07 | | Client: Rainbow Resources | | ed Lake, ON | W | Week Ending: Mar. 20, 2010 | | |
|-------------------|-------|-------------------------------------|------|-------------|----|----------------------------|--|--|
| | | | | | | | | |
| | Day | Work Summary | Line | From | То | Length (#stations) | | |
| | Sun | Demobilize from Red Lake to job 10- | | | | | | |
| | Mar | 14. | | | | | | |
| | 14 | | | | | | | |
| | Mon | | | | | | | |
| | Mar | | | | | | | |
| | 15 | | | | | | | |
| | Tue | | | | | | | |
| | Mar | | | | | | | |
| | 16 | | | | | | | |
| | Wed | | | | | | | |
| | Mar | | | | | | | |
| | 17 | | | | | | | |
| | Thu | | | | | | | |
| | Mar | | | | | | | |
| | 18 | | - | | | | | |
| | Fri | | | | | | | |
| | Mar | | | | | | | |
| | 19 | | | | | | | |
| | Sat | | | | | | | |
| | iviar | | | | | | | |
| | 20 | | | | | | | |

JVX Ltd. Field Production Report

Production : X Mobilization : M Standby : S Logistics & Preparation : L

| Name | Position | S | Μ | Т | W | Т | F | S |
|-------------------|--------------|---|---|---|---|---|---|---|
| Dennis Palos | Geophysicist | Μ | | | | | | |
| Doug Johnson | Helper | Μ | | | | | | |
| Jared Taman | Helper | Μ | | | | | | |
| Michael McDougall | Helper | | | | | | | |

Appendix 3 IP Anomalies and Possible Bedrock Conductors

IP anomalies have been picked from pseudosections of M13 chargeability. The spectral chargeability amplitude MIP may be consulted where the anomaly is poorly defined or unclear. IP anomalies are identified by the line and station of the centre top of the IP anomaly. Additions are an identifying letter, the chargeability peak amplitude in mV/V (M13), the class (C : moderate or Strong), the dipole number of the anomaly centre-top (n), the spectral IP amplitude (MIP) n mV/V, the time constant (TC), the n=1 resistivity at or over the centre top (rho1) and the resistivity expression, if any, of the IP anomaly (resis). The time constant is shown as short (< 0.1 sec), moderate or mixed (0.1 to 10 seconds) and long (> 10 seconds). IP anomalies from the 'a' = 25 m survey area shown in red. IP anomalies from the 'a' = 50 m survey are in black.

Possible bedrock conductors are confined resistivity lows with the same shape as a coincident IP anomaly.

| Line | ID | Centre-Top | M13 | С | n | MIP | TC | rho1 | resis |
|-------|----|-------------|-------------|---|---|-----|----|-----------|-------|
| | | | | | | | | | |
| 100W | Α | 250S | 12.0 | m | - | 420 | Μ | - | - |
| | | | | | | | | | |
| 200W | Α | 225S | 23.8 | S | 1 | 731 | L | 189 | low |
| | | | | | | | | | |
| 1500W | Α | 600S | 11.5 | m | 3 | 307 | L | 98 | - |
| | В | 450S – 475S | 22.7 – 22.8 | S | 3 | 372 | L | 112 | low |
| | С | 400S | 11.9 | m | 1 | 212 | L | 185 | - |
| | D | 350S | 22.6 – 24.8 | S | 3 | 519 | L | 343 | low |
| | | | | | | | | | |
| | | | | | | | | | |
| 300W | Α | 250S | 20.2 - 22.8 | S | - | 609 | L | 122 | - |
| | | | | | | | | | |
| 400W | Α | 250S | 17.6 | m | - | 507 | L | - | - |
| | | | | | | | | | |
| 500W | | | | | | | | | |
| | | | | | | | | | |
| 600W | | | | | | | | | |
| | | | | | | | | | |
| 700W | Α | 250S | 14.0 | m | 1 | 431 | L | 138 | low |
| | В | 150S | 12.4 | m | 1 | 431 | L | 407 | - |
| | | | | | | | | | |
| | | | | | | | | | |
| 800W | Α | 200S | 28.7 | S | 1 | 455 | L | 34 | low |
| | В | 50S – 100S | 14.3 – 16.3 | m | 1 | 480 | L | 63 – 133 | - |
| | | | | | | | | | |
| 900W | Α | 150S – 200S | 16.4 – 16.9 | S | 1 | 280 | L | 101 – 247 | low |
| | | | | | | | | | |
| 1000W | А | 200S – 250S | 19.8 | S | 2 | 549 | L | 256 – 360 | - |
| | | | | | | | | | |
| 1100W | A | 400S – 450S | 16.0 | m | 2 | 476 | L | 68 - 85 | - |
| | В | 250S | 24.9 | S | 1 | 638 | L | 327 | - |
| | | - | | | | | | | |
| 1200W | Α | 600S | 13.4 | m | 1 | 242 | L | 2048 | high |
| | В | 400S | 20.3 | S | 2 | 340 | L | 56 | - |
| | С | 250S | 21.4 | S | 1 | 590 | L | 235 | - |
| | _ | | | | | | | | |
| 1300W | Α | 650S | 18.6 | m | 1 | 309 | L | 1392 | - |
| | В | 400S – 450S | 21.2 – 25.1 | S | 3 | 401 | L | 78 – 79 | - |
| | С | 250S | 24.0 | S | 1 | 623 | L | 455 | - |
| | | | | | | | | | |
| Line | ID | Centre-Top | M13 | С | n | MIP | тс | rho1 | resis |
|-------|----|-------------|-------------|---|---|------|----|------------|-------|
| 1400W | Α | 700S | 14.6 | m | 1 | 443 | L | 422 | - |
| | В | 600S | 19.3 – 20.5 | S | 3 | 320 | L | 79 | - |
| | С | 400S-450S | 18.4 | m | 2 | 307 | L | 239 | - |
| | D | 300S | 27.2 | S | 1 | 672 | | 767 | - |
| | | | | | | | | | |
| 1500W | Α | 600S | 14.8 | m | 2 | 447 | L | 188 | - |
| | В | 450S – 500S | 25.9 | S | 2 | 408 | L | 18 – 115 | low |
| | С | 350S | 22.7 – 23.6 | S | 2 | 604 | L | 328 | low |
| | D | 150S – 200S | 12.3 | m | 2 | 394 | L | 556 – 1039 | - |
| | | | | | | | | | |
| 1600W | Α | 650S | 17.2 – 18.4 | m | 2 | 524 | L | 172 | - |
| | В | 450S – 550S | 24.0 – 28.8 | S | 2 | 4140 | L | 120 – 165 | low |
| | | | | | | | | | |
| 1700W | Α | 850S | 10.8 | m | 1 | 355 | L | 219 | - |
| | В | 450S – 550S | 21.2 – 25.2 | S | 3 | 501 | L | 117 – 173 | low |
| | | | | | | | | | |
| 1800W | Α | 850S | 10.8 | m | 1 | 352 | L | 180 | - |
| | В | 550S | 20.7 – 21.0 | S | 2 | 345 | L | 79 | low |
| | | | | | | | | | |
| 1900W | Α | 600S – 700S | 18.5 – 22.8 | S | 2 | 370 | L | 75 – 94 | - |
| | | | | | | | | | |
| 2000W | Α | 600S | 16.4 | m | - | 291 | L | - | - |
| | | | | | | | | | |
| 2100W | Α | 650S | 14.7 | m | - | 251 | L | - | - |
| | | | | | | | | | |
| 2200W | | | | | | | | | |
| | | | | | | | | | |
| 2300W | | | | | | | | | |
| | | | | | | | | | |

Appendix 3 : IP Anomalies and Possible Bedrock Conductors

Table 1. IP anomalies

| Line | Station |
|-------|-------------|
| 200W | 225S |
| | |
| 1500W | 450S |
| | |
| 800W | 200S |
| | 50S |
| | |
| 900W | 150S |
| | |
| 1500W | 450S |
| | |
| 1600W | 500S |
| | |
| 1800W | 500S - 550S |

Table 2. Possible bedrock conductors

Appendix 4 Map Images

Images of all paper maps bound with the report are below. The legend, title block, surrounds and coordinate layers are not shown here. Posted values are not shown here for maps 2 to 6. Map types are

- 1. bathymetry
- 2. total magnetic intensity
- 3. IP : 'a' = 25 m, n=2 and 'a' = 50 m, n=1 chargeability
- 4. IP : 'a' = 25 m, n=2 and 'a' = 50 m, n=1 apparent resistivity
- 5. terraTEM : channel 12 at 0.197 msec
- 6. terraTEM : channel 26 at 1.1997 msec
- 7. compilation

The electronic versions of all Geosoft *.maps include the following layers that are not shown here or in paper maps 1 to 6. The Teck Cominco and other diamond drill holes are shown in the compilation map. AGG_claim topography and claim fabric from MNDM claimap3

| AGG_claim | topography and claim fabric from MNDM claimap |
|--------------------|---|
| teckcominco.plt | Teck Cominco drill holes SPB-03-01 to SPG-03-05 |
| POST_DDH_TecC_name | Teck Cominco drill hole numbers |
| dd.plt | all other diamond drill holes |
| POST_DDH_DD_name | all other ddh numbers |
| od.plt | overburden drill holes |
| POST_DDH_OD_name | overburden hole numbers |
| | |



Figure 1. Bathymetry



Figure 2. Magnetics



Figure 3. Chargeability ('a' = 25 m, n=2 and 'a' = 50 m, n=1)

Appendix 4 : Map Images



Figure 4. Apparent resistivity ('a' = 25 m, n=2 and 'a' = 50 m, n=1)



Figure 5. terraTEM, channel 12

Appendix 4 : Map Images



Figure 6. terraTEM, channel 26



Figure 7. Compilation



Overhauser

Magnetometer / Gradiometer / VLF (GSM-19 v7.0)

GEM's unique Overhauser system combines data quality, survey efficiency and options into an instrument that matches costlier optically pumped Caesium devices.

And the latest v7.0 technology upgrades provide even more value:

Data export in standard XYZ (i.e. line-oriented) format for easy use in standard commercial software programs

Programmable export format for full control over output

GPS elevation values provide input for geophysical modeling

Enhanced GPS positioning resolution <1.5m standard GPS for high resolution surveying <1.0m OmniStar GPS <0.7m for newly introduced CDGPS

Multi-sensor capability for advanced surveys to resolve target geometry

Picket marketing / annotation for capturing related surveying information on-the-go

And all of these technologies come complete with the most attractive savings and warranty in the business!



Overhauser (GSM-19) console with sensor and cable. Can also be configured with additional sensor for gradiometer (simultaneous) readings.

The GSM-19 v7.0 Overhauser instrument is the total field magnetometer / gradiometer of choice in today's earth science environment -- representing a unique blend of physics, data quality, operational efficiency, system design and options that clearly differentiate it from other quantum magnetometers.

With data quality exceeding standard proton precession and comparable to costlier optically pumped cesium units, the GSM-19 is a standard (or emerging standard) in many fields, including:

- o Mineral exploration (ground and airborne base station)
- o Environmental and engineering
- o Pipeline mapping
- o Unexploded Ordnance Detection
- o Archeology
- o Magnetic observatory measurements
- o Volcanology and earthquake prediction

Taking Advantage of the Overhauser Effect

Overhauser effect magnetometers are essentially proton precession devices -except that they produce an order-ofmagnitude greater sensitivity. These "supercharged" quantum magnetometers also deliver high absolute accuracy, rapid cycling (up to 5 readings / second), and exceptionally low power consumption.

The Overhauser effect occurs when a special liquid (with unpaired electrons) is combined with hydrogen atoms and then exposed to secondary polarization from a radio frequency (RF) magnetic field.

The unpaired electrons transfer their stronger polarization to hydrogen atoms, thereby generating a strong precession signal -- that is ideal for very highsensitivity total field measurements.

In comparison with proton precession methods, RF signal generation also keeps power consumption to an absolute minimum and eliminates noise (i.e. generating RF frequencies are well out of the bandwidth of the precession signal).

In addition, polarization and signal measurement can occur simultaneously -which enables faster, sequential measurements. This, in turn, facilitates advanced statistical averaging over the sampling period and/or increased cycling rates (i.e. sampling speeds).

Other advantages are described in the section called, "GEM's Commercial Overhauser System" that appears later in this brochure.

Key System Components

Key components that differentiate the GSM-19 from other systems on the market include the sensor and data acquisition console. Specifications for components are provided on the right side of this page.

Sensor Technology

GEM's sensors represent a proprietary innovation that combines advances in electronics design and quantum magnetometer chemistry.

Electronically, the detection assembly includes dual pick-up coils connected in series opposition to suppress far-source electrical interference, such as atmospheric noise. Chemically, the sensor head houses a proprietary hydrogen-rich

About GEM Advanced Magnetometers

GEM Systems, Inc. delivers the world's only magnetometers and gradiometers with built-in GPS for accuratelypositioned ground, airborne and stationary data acquisition. The company serves customers in many fields including mineral exploration, hydrocarbon exploration, environmental and engineering, Unexploded Ordnance Detection, archeology, earthquake hazard prediction and observatory research.

Key products include the QuickTrackerTM Proton Precession, Overhauser and SuperSenserTM Optically-Pumped Potassium instruments. Each system offers unique benefits in terms of sensitivity, sampling, and acquisition of high-quality data. These core benefits are complemented by GPS technologies that provide metre to sub-metre positioning.

With customers in more than 50 countries globally and more than 20 years of continuous technology R&D, GEM is known as the only geophysical instrument manufacturer that focuses exclusively on magnetic technology advancement.

"Our World is Magnetic"



liquid solvent with free electrons (free radicals) added to increase the signal intensity under RF polarization.

From a physical perspective, the sensor is a small size, light-weight assembly that houses the Overhauser detection system and fluid. A rugged plastic housing protects the internal components during operation and transport.

All sensor components are designed from carefully screened non-magnetic materials to assist in maximization of signal-tonoise. Heading errors are also minimized by ensuring that there are no magnetic inclusions or other defects that could result in variable readings for different orientations of the sensor.

Optional omni-directional sensors are available for operating in regions where the magnetic field is near-horizontal (i.e. equatorial regions). These sensors maximize signal strength regardless of field direction.

Data Acquisition Console Technology

Console technology comprises an external keypad / display interface with internal firmware for frequency counting, system control and data storage / retrieval. For operator convenience, the display provides both monochrome text as well as real-time profile data with an easyto-use interactive menu for performing all survey functions.

The firmware provides the convenience of upgrades over the Internet via the GEMLinkW software. The benefit is that instrumentation can be enhanced with the latest technology without returning the system to GEM -- resulting in both timely implementation of updates and reduced shipping / servicing costs.



GEM Systems, Inc. 52 West Beaver Creek Road, 14 Richmond Hill, ON Canada L4B 1L9 Email: info@gemsys.on.ca Web: www.gemsys.ca

Specifications

Performance

| Sensitivity: | < 0.015 | nT / √Hz @ 1 Hz |
|-----------------|--------------|--------------------|
| Resolution: | | 0.01 nT |
| Absolute Accur | acy: | +/- 0.1 nT |
| Range: | 10,0 | 00 to 120,000 nT |
| Gradient Tolera | ince: | > 10,000 nT/m |
| Samples at: | 60+, 5, 3, 2 | 2, 1, 0.5, 0.2 sec |
| Operating Tem | perature: | -40C to +55C |

Operating Modes

Manual: Coordinates, time, date and reading stored automatically at minimum 3 second interval.

Base Station: Time, date and reading stored at 3 to 60 second intervals.

Remote Control: Optional remote control using RS-232 interface.

Input / Output: RS-232 or analog (optional) output using 6-pin weatherproof connector.

Storage - 16 MB (# of Readings)

| /lobile: | 838,860 |
|-------------------|-------------------|
| Base Station: | 2,796,202 |
| Gradiometer: | 699,050 |
| Valking Mag: | 1,677,721 |
| <u>Dimensions</u> | |
| onsole: | 223 x 69 x 240 mm |

| 50113010. | |
|-----------|------------------------------|
| Sensor: | 175 x 75mm diameter cylinder |

Weights

| Console with Belt: | 2.1 kg |
|----------------------------|--------|
| Sensor and Staff Assembly: | 1.0 kg |

Standard Components

GSM-19 console, GEMLinkW software, batteries, harness, charger, sensor with cable, RS-232 cable, staff, instruction manual and shipping case.

Optional VLF

Frequency Range: Up to 3 stations between 15 to 30.0 kHz

Parameters: Vertical in-phase and out-of-phase components as % of total field. 2 components of horizontal field amplitude and total field strength in pT.

Resolution:

0.1% of total field

Represented By:

IRIS INSTRUMENTS

ELREC Pro



ELREC Pro unit with its graphic LCD screen

10 CHANNELS

IP RECEIVER FOR

MINERAL EXPLORATION

- 10 simultaneous dipoles
- 20 programmable chargeability windows
- High accuracy and sensitivity

ELREC Pro: this new receiver is a new compact and low consumption unit designed for high productivity Resistivity and Induced Polarization measurements. It features some high capabilities allowing to work in any field conditions.

Reception dipoles: the ten dipoles of the ELREC Pro offer an high productivity in the field for dipole-dipole, gradient or extended poly-pole arrays.

Programmable windows: beside classical arithmetic and logarithmic modes, ELREC Pro also offers a Cole-Cole mode and a twenty fully programmable windows for a higher flexibility in the definition of the IP decay curve.

IP display: chargeability values and IP decay curves can be displayed in real time thanks to the large graphic LCD screen. Before data acquisition, the ELREC Pro can be used as a one channel graphic display, for monitoring the noise level and checking the primary voltage waveform, through a continuous display process.

Internal memory: the memory can store up to 21 000 readings, each reading including the full set of parameters characterizing the measurements. The data are stored in flash memories not requiring any lithium battery for safeguard.

Switching capability: thanks to extension *Switch* Pro box(es) connected to the ELREC Pro unit, the 10 reception electrodes can be automatically switched to increase the productivity in-the-field.



Rho= 100.560 MP= 29.348 Q= 0.04 UP= 854.786 In= 100.000 SP= 0.4 #2 \x|M| 25

Channel: < 1 > / 10

Monitoring of the Primary voltage waveform before acquisition

Display of numeric values and IP decay curve during acquisition

Rs=

0.64

ELREC Pro

FIELD LAY-OUT OF AN ELREC PRO UNIT

The ELREC Pro unit has to be used with an external transmitter, such as a VIP transmitter.

The automatic synchronization (and re-synchronization at each new pulse) with the transmission signal, through a waveform recognition process, gives an high reliability of the measurement.

Before starting the measurement, a grounding resistance measuring process is automatically run; this allows to check that all the electrodes are properly connected to the receiver.

Extension *Switch* Pro box(es), with specific cables, can be connected to the ELREC Pro unit for an automatic switching of the reception electrodes according to preset sequence of measurements; these sequences have to be created and uploaded to the unit from the ELECTRE II software.



Extension Switch Pro box able to drive 24 - 48 - 72 or 96 electrodes

The use of such boxes allows to save time in case of the user needs to measure more than 10 levels of investigation or in case of large 2D or 3D acquisition.

DATA MANAGING

PROSYS software allows to download data from the unit. From this software, one has the opportunity to visualize graphically the apparent resistivity and the chargeability sections together with the IP decay curve of each data point. Then, one can process the data (filter, insert topography, merge data files...) before exporting them to "txt" file or to interpretation software: RES2DINV or RESIX software for pseudo-section inversion to true resistivity (and IP) 2D section.

RES3DINV software, for inversion to true resistivity (and IP) 3D data.

FEATURES

TECHNICAL SPECIFICATIONS

- Input voltage: Max. input voltage: 15 V Protection: up to 800V
- Voltage measurement: Accuracy: 0.2 % typical Resolution: 1 μV Minimum value: 1 μV
- Chargeability measurement: Accuracy: 0.6 % typical
- Induced Polarization (chargeability) measured over to 20 automatic or user defined windows
- Input impedance: $100 \text{ M}\Omega$
- Signal waveform: Time domain (ON+,OFF,ON-,OFF) with a pulse duration of 500 ms 1 s 2 s 4 s 8 s
- Automatic synchronization and re-synchronization process on primary voltage signals
- Computation of apparent resistivity, average chargeability and standard deviation
- Noise reduction: automatic stacking number in relation with a given standard deviation value
- SP compensation through automatic linear drift correction
- 50 to 60Hz power line rejection
- Battery test

GENERAL SPECIFICATIONS.

- Data flash memory: more than 21 000 readings
- Serial link RS-232 for data download
- Power supply: internal rechargeable 12V, 7.2 Ah battery ; optional external 12V standard car battery can be also used
- Weather proof
- Shock resistant fiber-glass case
- Operating temperature: -20 °C to +70 °C
- Dimensions: 31 x 21 x 21 cm
- Weight: 6 kg



IRIS INSTRUMENTS - 1, avenue Buffon, B.P. 6007 - 45060 Orléans Cedex 2, France Phone: +33 (0)2 38 63 81 00 - Fax: +33 (0)2 38 63 81 82 E-mail: info@iris-instruments.com - Web site: www.iris-instruments.com

TerraTEM System Specifications

Note: Specifications may be subject to change without notice

1. Main console:

| <u>Mechanical</u> | |
|------------------------|------------------------------------|
| Dimensions (external): | 530×350×160 mm |
| Weight: | 12 kgs |
| Protection rating: | IP66 (lid closed), IP54 (lid open) |
| CPU: | Intel Celeron-M, 400 MHz |
| Memory: | 1 GByte Flash RAM |
| Display: | 15" SVGA (800×600) TFT LCD |
| User Interface: | Capacitive touchscreen |

<u>Environmental</u>

| Operating temperature range (ambient): | -10 to +40 deg.C |
|--|-----------------------------|
| (+45 deg. C if console is kept out of direct | sunlight) |
| Non-operating temperature range: | -20 to +65 deg.C |
| Relative humidity: | 10% to 90% (non-condensing) |

TBA (>10 mH)

Electrical

Max. Load inductance:

| Input voltage range: | 22-28 Volts |
|--------------------------|--|
| Power consumption: | |
| Console: | 24 V @ 2 A (max), 1 A (display off), 0.1 A (standby) |
| Transmitter: | 24 V @ 10 A (max) |
| Fuses: | |
| Main Console | 2×15 A (Fast acting Glass tube 5 mm \times 20 mm, GMA Series) |
| Receiver | $2\times 160~mA$ (Fast acting, Low breaking capacity 5 $mm\times 20~mm)$ |
| Transmitter | |
| Repetition Rate: | 8.33/10 ms1 sec |
| Waveform: | 50% duty cycle bipolar square wave |
| Minimum load resistance: | 2 Ohms |

| Receiver | | | |
|---|---|--|--|
| Bandwidth (-3dB): | 170 kHz , 85 kHz with Nyquist filter selected | | |
| Gain: | 1,2,4,8,16,32,64,100,1000,8000 | | |
| Number of simultaneous channels: 1 | (standard), 3 (maximum) | | |
| Internal calibration: | Offset, gain, noise | | |
| Minimum Loop resistance: | 2 Ohms | | |
| Maximum continuous input voltage: ±40 V | | | |
| | | | |

| <u>A/D</u> | |
|-----------------------------------|-----------------|
| Sampling frequency: | 500 kHz (fixed) |
| Resolution: | 16 bits |
| Base frequency of time reference: | 40 Mhz |

External interface:

| USB version: | USB 1.1 |
|--------------------------------------|--------------------------------------|
| RS-232: | output for data transfers - standard |
| Input for GPS or external triggering | – optional. |

| In-built GPS (optional | <u>l):</u> | |
|------------------------|----------------|--|
| Chipset | | SIRF STAR II |
| Data output | | NMEA0183 |
| Number of channels | | 12 |
| Sensitivity | | -170 dBW |
| Accuracy (absolute) | 10 metres (2 s | d confidence limit, WAAS enabled, SA off |
| Acquisition rate | | |
| | Cold start | 50 sec |
| | Warm start | 40 sec |
| | Hot start | 10 sec |

2. Battery pack:

| Dimensions (external): | 280×250×180 mm |
|------------------------|---|
| Voltage: | 24 VDC (nominal) (2 \times 17 Ah <u>sealed</u> , <u>gelled</u> lead-acid batteries) |
| Fuses: | 2×15 A (Fast acting Glass tube 5 mm \times 20 mm, GMA Series) |

3. Battery charger:

Output:29.5 V, 2 A (max)Type:3-step, automatic with standby functionInput:100-240 V AC, 50-60 Hz, 1.2 A maximumApproved for indoor use only.



terraTEM Operations Manual



Revision 3.14






















































