## AGNEW LAKE PROJECT <br> GRIDS B, D \& H OPTION \& C BALDWIN \& PORTER TWPS., ONTARIO REPORT ON <br> TIME DOMAIN ELECTROMAGNETIC, MAGNETIC AND VLF-EM SURVEYS OCTOBER 2003 <br> URSA MAJOR MINERALS INC.



## JVX Ltd.

REPORT
ON
MAGNETOMETER, TIME-DOMAIN ELECTROMAGNETIC And VLF-EM SURVEYS
CONDUCTED ON THE
AGNEW LAKE PROJECT
BALDWIN And PORTER TOWNSHIPS
SUDBURY MINING DIVISION
NE ONTARIO
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JVX Ref: 3-38 -Ursa October 2003

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## 1. INTRODUCTION

JVX Ltd. conducted Time-Domain Electromagnetic Surveys (hereafter TDEM), Magnetometer and VLF-EM surveys between September 8 to 20, and September 22, 2003 on behalf of Ursa Major Minerals Inc.

Grids B, D\&H Option and C of the Agnew Lake project were surveyed. The Agnew Lake Project is Icated in Baldwin and Porter Townships, approximately 50 kilometres west of Sudbury in Northern Ontario, NTS 41 I/5. Access to the project area is boat from Agnew Lake. Agnew Lake is accessible either from McKerrow or Webbwood located on Highway 17. The survey location is shown in Figure 1 and the survey grid with claims is shown in Figure 2.

The Magnetometer surveys were conducted on the D\&H Option Grid to evaluate a prominent northeast trending airborne magnetic anomaly. This magnetic anomaly was also the focus of magnetometer surveys completed earlier this year on Grids B and C. It is believed that this magnetic anomaly could be associated with mafic intrusive rocks that could be host to Ni-Cu-PGM mineralization. VLF-EM surveys were also completed on the D\&H Option grid to identify conductors that could be associated with the targeted mineralization. VLF-EM and TDEM surveys were completed on selected areas of Grids B and C as follow-up to earlier magnetometer and IP/Resistivity surveys.

Grids B, D\&H Option and C covered the following claims:

| 3001690 | 3001691 | 3001693 | 1197772 | 1248608 |
| :--- | :--- | :--- | :--- | :--- |
| 3001694 | 3001695 | 1248655 | 1242362 | 1242363 |
| 1248654 |  |  |  |  |

## 2. SURVEY SPECIFICATION and PRODUCTION SUMMARY

The following tables contain the specifications and production summary for the TDEM surveys:


## LOCATION MAP URSA MAJOR MINERALS INC.

AGNEW LAKE PROJECT
Grids B, D \& H Option \& C
Baldwin \& Porter Twps., Ontario


| TDFM Survevs |  |
| :--- | :--- |
| Transmitter | GFONICS TFM57-MK2 |
| Receiver | GEONICS PROTEM |
| Array Type | Fixed Loop - Moving Receiver |
| Transmitter Loop Size (Loop 1) | 400 mx 250 m |
| Transmitter Loop Size (Loop 2) | 475 m x 300 m |
| Components Measured | $\mathrm{X}, \mathrm{Y} \& \mathrm{Z}$ |
| Base Frequency | 30 Hz |
| Station Spacing | 25 m |
| Number of Loops Surveyed | 2 |
| Number of Lines Surveyed (30 Hz) | 6 |
| Survey Coverage (30 Hz) | 4090 m |

Table 1: Specifications for the TDEM Surveys

| Line | From <br> Station | To <br> Station | Distance <br> (m) | No. of <br> Readings |
| :---: | :---: | :---: | :---: | :---: |
| 1200 E | 125 S | 425 N | 550 | 23 |
| 1400 E | 375 S | 400 N | 775 | 31 |
| 1600 E | 125 S | 400 N | 525 | 22 |
| Total |  |  | $\mathbf{1 8 5 0}$ | 76 |

Table 2: Production Summary for the Loop 1 TDEM Survey

| Line | From <br> Station | To <br> Station | Distance <br> $(\mathbf{m})$ | No. of <br> Readings |
| :---: | :---: | :---: | :---: | :---: |
| 5400 E | 525 S | 210 S | 315 | 19 |
| 5600 E | 475 S | 400 N | 875 | 34 |
| 5800 E | 175 S | 400 N | 575 | 23 |
| 6000 E | 100 S | 375 N | 475 | 20 |
| Total |  |  | $\mathbf{2 2 4 0}$ | $\mathbf{9 6}$ |

Table 3: Production Summary for the Loop 2 TDEM Survey
The following tables contain the specifications and production summaries for the Magnetics and VLF-EM surveys:

| Instrument | Scintrex FNVI MAG/VI,F |
| :--- | :--- |
| Sensor Type | Proton Precession |
| VLF stations | 25.2 (LeMoure) \& 24.8 (Seattle) kHzz |
| Station Spacing | 12.5 m |
| Number of Lines Surveyed | 26 lines and 1 baseline |
| Survey Coverage | 24.6875 km |

Table 4: Survey Specifications for the Magnetics and VLF-EM Surveys

| Line | From <br> Station | To <br> Station | Distance <br> $(\mathbf{m})$ | No. of <br> Readings |
| ---: | ---: | ---: | ---: | ---: |
| 1000 E | 700 | -12.5 | 712.5 | 59 |
| 1200 E | 687.5 | 0 | 687.5 | 56 |
| 1400 E | 450 | 0 | 450 | 37 |
| 1600 E | 412.5 | 0 | 412.5 | 34 |
| 1800 E | 475 | 0 | 475 | 39 |
| 2000 E | 437.5 | 0 | 437.5 | 37 |
| 2200 E | 400 | -437.5 | 837.5 | 69 |
| 2400 E | 400 | -562.5 | 962.5 | 79 |
| 2600 E | 400 | -437.5 | 837.5 | 68 |
| 2800 E | 400 | -587.5 | 987.5 | 80 |
| 3000 E | 350 | -700 | 1050 | 85 |
| 3200 E | 375 | -700 | 1075 | 88 |
| 3400 E | 262.5 | -1012.5 | 1275 | 103 |
| 3600 E | 300 | -1000 | 1300 | 105 |
| 3800 E | 400 | -1000 | 1400 | 113 |
| 4000 E | 400 | -675 | 1075 | 89 |
| 4200 E | 400 | -1012.5 | 1412.5 | 115 |
| 4400 E | 400 | -700 | 1100 | 118 |
| 4600 E | 412.5 | -700 | 1112.5 | 90 |
| 4800 E | 400 | -687.5 | 1087.5 | 89 |
| 5000 E | 412.5 | 0 | 412.5 | 36 |
| 5200 E | 375 | 0 | 375 | 31 |
| 5400 E | 400 | -512.5 | 912.5 | 74 |
| 5600 E | 400 | 0 | 400 | 35 |
| 5800 E | 400 | 0 | 400 | 33 |
| 6000 E | 400 | -100 | 500 | 42 |
| BL0N | 2000 | 5000 | 200 | 241 |
| Total |  |  | 24687.5 | 2045 |

Table 5: Production Summary for the Magnetics and VLF-EM Surveys

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## 3. PERSONNEL

John Marsh (Senior Geophysical Technician):
Mr. Marsh operated the Protem Receiver for the TDEM surveys and was responsible for day-to-day field operations and overall data quality.

Alex Jelenic (Geophysicist):
Mr. Jelenic assisted Mr. Marsh with the TDEM surveys. He also processed and plotted the results of the TDEM, Magnetics and VLF-EM surveys.

## Tim Charlebois (Geophysical Technician):

Mr. Charlebois performed the Magnetics/VLF-EM surveys. He also assisted Mr. Marsh with moving the TDEM field equipment in and out of the survey area

Rob St-Michel (Field Assistant):
Mr. Michel assisted Mr. Marsh with the TDEM surveys. He also collected UTM data along the baseline.

John Gilliatt (Senior Geophysicist):
Mr. Gilliatt prepared this report. Mr. Gilliatt assisted Mr. Jelenic in preparing the final maps for the report.

Ms.Dagmar Piska (Draftsperson):
Ms. Piska carried out the AUTOCAD drafting on the figures/plates and assembled this report.

Blaine Webster (President):
Mr. Webster provided overall supervision of the survey.

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## 4. FIELD INSTRUMENTATION

JVX supplied the geophysical instruments specified in Appendix A.

### 4.1 TDEM

The time domain electromagnetics method measures transient fields in and over the earth. The Geonics Protem Digital Receiver was employed and measure Z, X and Y components simultaneously using the Geonics 3D-3 3-component coil. The integration time for each measurement was selected at 15 seconds.

A 1.0 kW motor generator powered the Geonics TEM57-MK2 transmitter. The transmitter can supply upwards of 30 amps through the transmitter loop of wire. The transmitter current waveform consists of a series of alternating bipolar current pulses with slow exponential turn-on and a rapid linear turn-off. The base frequency of operation is switch selectable. For this particular survey, the repetition rate (base frequency) of 30 Hz was used.

### 4.2 MAGNETICS And VLF-EM

Scintrex ENVIMAG/VLF integrated geophysical system was used to measure the Total Magnetic Field and the vertical in-phase and quadrature (out-of-phase) components of the secondary magnetic field derived from VLF transmitters located in Le Moure, North Dakota (transmitting frequency 25.2 kHz ) and Seattle, Washington (NLK 24.8 kHz ). The Total VLF Field strength component was also recorded.

The ENVIMAG magnetometer uses a proton sensor providing an absolute measuring accuracy of $+/-1 \mathrm{nT}$. The VLF sensor consists of three orthogonal coils (two horizontal and one vertical) mounted in a cylindrical housing. The coils consist of copper wire wound on a non-ferrous frame.

A GEM systems GSM-19 base station was used to correct for diurnal variations in the geomagnetic field.

## 5. DATA PROCESSING

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After being transferred to a field computer at the end of each survey day, the data were examined, corrected, and organized by the instrument operator. The corrected data was sent by e-mail to the Richmond Hill, Ontario head office.

### 5.1 TDEM

The final digital data have been converted from the edited Geonics instrument dump files into Gesoft format *.xyz files for plotting.

GEOSOFT software were used to prepare final plots of the TDEM profiles of the $\mathrm{Z}, \mathrm{X}$ and Y components on a line-by-line basis. All 20 measured channels were normalized and divided into the following four groups for plotting purposes:

- Channels (1 to 5)
- Channels (6 to 10)
- Channels (11 to 15 )
- Channels (16 to 20)

Within each set of channels a common vertical plotting scale was employed for all lines and components surveys.

### 5.2 MAGNETICS And VLF-EM

GEOSOFT software was also used to generate the contour map of the Total Field Magnetics. This software was also used to plot the VLF-EM profiles (vertical in-phase and quadrature secondary field components and the Total VLF field strength). A "Fraser Filter" was applied to the vertical in-phase VLF component data. The Fraser filter acts as a smoothing effect and converts "positive crossovers" into peak positive readings (and "reverse crossovers" into peak negative readings). A contour map of the results has been produced.

A hand-held GPS receiver was used to collect data points along the baseline. These points were then use to transformed the grids to UTM coordinates (NAD83, Zone 17 datum).

The magnetometer data collected on the D\&H Option Grid was levelled to the magnetometer data collected earlier on the Grids B and C . The data were then merged to produce one map at a scale of 1:10000. This map was used as the base for the VLF-EM Profiles and Fraser Filter Maps.

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## 6. DISCUSSION OF RESULTS

Profile maps of the TDEM and VLF-EM survey results and plan maps of the Total Field Magnetics and Fraser Filter VLF-EM have been plotted as outlined in section 5 above. Conductor axes were interpreted from the VLF-EM profile map and then transferred to a compilation map (Plate 1, Appendix B). Magnetic high zones and lineaments were also identified. The Hunter Lake fault and the location of the "C-D" structural section were transferred from the geology map of Porter Township (Ginn, 1961) to the compilation map.

The dominant magnetic feature observed on the Total Field Magnetics is the strong northeast-southwest trending magnetic high extending along the baseline. Four main zones have been identified. Magnetic highs within the zones are variable in strength and are difficult to correlate from line-to-line. This would suggest the sources are at or near the surface. This magnetic high trend is the focus of the exploration program and could be host to Ni-Cu-PGM mineralization similar to the Shakespeare deposit southwest of the survey area.

Numerous conductors have been interpreted from the VLF-EM in-phase and quadrature profiles. Many of the conductors occur near the north edge of the grids with some of them extending for hundred's of metres. Very few conductors coincide with the dominant magnetic high trend. The most prominent VLF anomalies have been labeled " A " through "I" and are discussed in detail below:

## Conductor "A"

This is a two-line conductor located on lines 1000 and 1200E on Grid C. The conductor does not coincide to magnetic high, however there is a strong, narrow magnetic high centered 50 to 75 metres south of the conductor on line 1000 E . On this line, the conductor is strong and correlates with a strong resistivity low outlined by earlier IP/Resistivity surveys.

## Conductor "B"

This is a weak but well-defined conductor located south of Hunter Lake. It extends from 3200 E southwestwards to line 1600 E . It may extend to the southwest boundary on line 1000 E . The trend is parallel to the baseline and located in the vicinity of 200 N on all the lines. On lines 1000,1800 and 2000E the conductor coincides with chargeability highs and weak resistivity lows. On lines 2000 E the conductor exhibits a strong correlation to a magnetic high lineament.

## Conductor "C"

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This is conductor is not fully defined as it occurs along the north edge of lines 2200 to 2800 E . The conductor exhibits a strong correlation to a magnetic high lineament and to the Hunter Lake Fault. The Hunter Lake Fault is part of an extensive northeast-southwest fault system extending southwest into Baldwin and Shakespeare townships. In the Shakespeare township this fault is likely the main structural feature bounding the Shakespeare deposit. A conductor has been interpreted at the north edge of lines 3200 and 3800E near the shoreline of Hunter Lake. These conductors could represent the northeast extension of this trend.

## Conductors "D" and "E"

"D" and "E" represent two very weak, parallel conductive trends. They are not well defined on the VLF Profile map but are easily observed on the Fraser Filter plan map. They occur along the north flank of a broad magnetic high zone and also exhibit a moderate to strong correlation with the Hunter Lake Fault. They may represent the northeast extension of the " $\mathbf{B}$ " and/or " $\mathbf{C}$ ".

## Conductors " $F$ "

This weak to very weak conductor extends from the northwest edge of line 5600 eastnortheastward to line 6000 E on Grid B. It remains open to the southwest and northeast. The trend displays a strong correlation to Hunter Lake Fault and to an IP chargeability high zone. On line 5800E the conductor coincides with an IP resistivity low and a magnetic high lineament.

## Conductors "G"

This conductor is observed on lines 4400 to 4800 E along the south flank of a broad magnetic high. . This is a fairly weak anomaly that does strengthen to the northeast. The conductor may extend northeast of line 4800 E .

## Conductors "H" and "I"

These conductors are moderate to strong and are located in the southeast section of the D\&H Option Grid south of the broad magnetic highs. They could be associated with a known copper deposit.

In addition to these conductors, there are few one-line responses that could have some significance. This would include the conductor on line 4200E at 50 S and conductors located at 300 and 400 S on line 5400 E . The conductors on line 5400 E are located to the southwest of a recent discovery of sulphide mineralization hosted in quartz diorite at 250S.

The TDEM surveys were designed to follow-up previous IP surveys on Grids B and C. Sections of line 1200 through 1600 E and lines 5400E through 6000E were surveyed on Grids C and B respectively. No apparent bedrock conductors were identified.

## 7. SUMMARY And RECOMMENDATIONS

Magnetometer surveys were completed on the D\&H Option Grid and the data merged with the existing data from Grids B and C . The surveys have outlined a strong, broad northeast-southwest high trend centered along the baseline. VLF-EM surveys were conducted simultaneously with the magnetics to identify conductive zones that could be host to the targeted $\mathrm{Ni}-\mathrm{Cu}-\mathrm{PGM}$ mineralization. The VLF-EM surveys were also extended to cover selected areas of Grids B and C. The results of the VLF-EM surveys indicate that the majority of the conductive trends are located outside the dominant magnetic high trend. A number of the VLF trends correlate to magnetic high lineaments and to the Hunter Lake Fault system located at or near the northwest edge of the survey lines. TDEM surveys completed on Grids B and C to follow-up IP chargeability zones failed to detect any bedrock conductors.

The VLF trends that correlate with magnetic high lineaments, IP chargeability highs and the Hunter Lake Fault should be prospected to determine the causative source. The dominant magnetic high trend should also be investigated on the ground as previous mapping indicates the underlying rock unit is quartzite. Some preliminary drilling on line 1200 E intersected mostly quartzite and likely did not explain the magnetic anomaly. Modeling of the magnetics data could be considered should ground follow-up fail to identify the source.

Follow-up IP and/or TDEM surveys could be considered if prospecting of the VLF anomalies produce favourable results.

## 8. REFERENCES

Ginn, R.M.
1961: Geology of Porter Township; Ontario Dept. of Mines, GR5, 36p, Accompanied by Map 2011, Scale 1:12000

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If there are questions with regard to the survey or its interpretation please call the undersigned.

Respectfully submitted,
JVX Ltd.
An A.llitt.
John Gilliatt
Senior Geophysicist

## APPENDIX A

# GEONICS EM PROTEM EM SYSTEM <br> TEM57-MK2 TRANSMITTER 

| ELECTRICAL |  |  |
| :---: | :---: | :---: |
| Current Waveform | : | Bipolar rectangular current with $50 \%$ duty cycle. |
| Repetition Rate | : | $3 \mathrm{~Hz}, 7.5 \mathrm{~Hz}$ or 30 Hz (powerline frequency 60 Hz ) |
|  | : | $2.5 \mathrm{~Hz}, 6.25 \mathrm{~Hz}$ or 25 Hz (powerline frequency 50 Hz ) |
|  | : | Rates below 1 Hz available from PROTEM receiver through reference cable |
| Turn-Off Time | . | 20 to $150 \mu \mathrm{~s}$, depending on size, current and number of turns in transmitter loop |
| Transmitter Loop |  | Single turn: Any dimension; minimum resistance 0.7 ohms Up to $300 \times 600 \mathrm{~m}, 8$-turn; $5 \times 5$ or $10 \times 10 \mathrm{~m}$ |
| Output Current | : | 25 A maximum; ( 50 A pp ). |
| Output Voltages | . | 18 V to 60 V continuous control, with motor generator, up to $3,800 \mathrm{~W}$ with external battery supply |
| Power Supply | : | $1,800 \mathrm{~W}, 110 / 220 \mathrm{~V}, 50 / 60 \mathrm{~Hz}$ single-phase motor-generator or, optionally multiple 12 V batteries (up to eight) |
| Synchronization Mode | : | Reference cable or optional quartz crystal |
| Transmitter Protection | : | Electronic and electromechanical protection against short circuit |
| ENVIRONMENTAL |  |  |
| Operating Temperature | : | $-35^{\circ} \mathrm{C}$ to $+50^{\circ} \mathrm{C}$ |
| MECHANICAL |  |  |
| Transmitter Size | : | $43 \times 25 \times 25 \mathrm{~cm}$ |
| Transmitter Weight | . | 15 kg |
| Motor Generator Size (EZ 1800XKIC) |  | $51 \times 43 \times 41 \mathrm{~cm}$ |
| Motor Generator Weight (EZ 1800XKIC) |  | 31 kg |

September 1999

## ENVI GEOPHYSICA

Total Field Operating Range
20,000 to $100,000 \mathrm{nT}$ (gammas)

## Total Field Absolute Accuracy:

$\pm \mathrm{InT}$
Sensitivity:
0.1 nT at 2 second sampling rate

## Tuning

Fully solid state. Manual or automatic keyboard selectable

## Cycling (Reading) Rates

$0.5,1$ or 2 second sensor, $1 / 2 \mathrm{~m}$ ( 20 inch) staff extender and processor module

## Gradiometer Option

Includes a second sensor, $1 / 2 \mathrm{~m}$ ( 20 inch) staff extender and processor module

## VLF Option

Includes a VLF sensor and harness assembly
'WALKMAG' Mode
0.5 seconds for walking surveys, variable rates for hilly terrain

## Digital Display

LCD 'Super Twist', $240 \times 64$ dots graphics, 8 line $\times 40$ characters alphanumerics

## Display Heater

Thermostatically controlled, for cold weather operations
Keyboard Input
17 keys, dual function, membrane type

## Notebook Function

32 characters, 5 user-defined MACRO's for quick entry

## Standard Memory

Total Field Measurements: 28,000 readings
Gradiometer Measurements: 21,000 readings
Base Station Measurements: 151,000 readings
VLF Measurements: 4,500 readings for 3 frequencies

## Expanded Memory

Total Field Measurements: 140,000 readings
Gradiometer Measurements: 109,000 readings
Base Station Measurements: 750,000 readings
VLF Measurements: 24,000 readings for 3 frequencies

## Real-Time Clock

Records full date, hours, minutes and seconds with I second resolution, $\pm 1$ second stability over 24 hours

## Digital Data Output

RS-232C interface, 600 to 57,600 Baud, 7 or 8 data bits, 1 start,

1 stop bit, no parity format. Selectable carriage return delay ( $0-999 \mathrm{~ms}$ ) to accommodate slow peripherals. Handshaking is done by X -on X -off. High speed Binary Dump

## Analog Output

$0-999 \mathrm{mV}$ full scale output voltage with keyboard selectable range of 1, 10, 100, 1000 or 10,000 full scale

## Power Supply

Rechargeable 'Camcorder’ type, 2.3 Ah, Lead-acid battery 12 Volts at 0.65 Amp for magnetometer, 1.2 Amp for gradiometer External 12 Volt input for base station operations
Optional external battery pouch for cold weather operations

## Battery Charger

110 Volt-230 Volt, $50 / 60 \mathrm{~Hz}$

## Operating Temperature Range

Standard: $-40^{\circ}$ to $60^{\circ} \mathrm{C}$

## Dimensions \& Weight

Console: $\quad 250 \mathrm{~mm} \times 152 \mathrm{~mm} \times 55 \mathrm{~mm}$ $10^{\prime \prime} \times 6^{\prime \prime} \times 2.25^{\prime \prime}$
2.45 kg ( 5.4 lbs ) with rechargeable battery
T.F. sensor: $\quad 70 \mathrm{~mm} \times 175 \mathrm{~mm}$
$2.75^{\prime \prime} \mathrm{d} \times 7^{\prime \prime}$
$1 \mathrm{~kg}(2.2 \mathrm{lbs})$ (sensor)
Gradiometer sensor
and staff extender: $70 \mathrm{~mm} \times 675 \mathrm{~mm}$
$2.75^{\prime \prime} \mathrm{d} \times 26.5^{\prime \prime}$
1.15 kg ( 2.5 lbs ) (sensor)
T.F. staff: $\quad 25 \mathrm{~mm} \times 2 \mathrm{~m}$
$1 " d \times 76$ "
$.8 \mathrm{~kg}(1.75 \mathrm{lbs})$
VLF sensor Head: $140 \mathrm{~mm} \times 130 \mathrm{~mm}$
$5.5^{\prime \prime} \mathrm{d} \times 5.1^{\prime \prime}$
$.9 \mathrm{~kg}(2 \mathrm{lbs})$
VLF Electronics
Module:
$280 \mathrm{~mm} \times 190 \mathrm{~mm} \times 75 \mathrm{~mm}$
$11 " \times 7.5^{\prime \prime} \times 3^{\prime \prime}$
1.7 kg ( 3.7 lbs )

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## APPENDIX B

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Breser





PLATE L2-2x
LOOP 2 (Line 5600E)
URSA MAJOR MINERALS INC.
GRID B
X Component
Base Frequency $=30 \mathrm{~Hz}$
Scale $1 \mathrm{~cm}=\overline{5} 0 \mathrm{~m}$











PLATE L2-4y
LOOP 2 (Line 6000E)
URSA MAJOR MINERALS INC.
GRID B
Y Component
Base Frequency $=30 \mathrm{~Hz}$
Scale $1 \mathrm{~cm}=50 \mathrm{~m}$
JVX Ltd. ref. 3-38, SEPT. 2003






