

Appendix 3: Geophysical Surveys

Crew log

Field Report

Original compilation ELF and HLEM figures from Aurora (digital version only)

Revised compilation ELF and HLEM figures (same as original, except for new geology overlay)

Geosoft database in .gdb format (digital version only)



MMN-13550-YT - Wellgreen EM Test

Weather Day		PERSONNEL : 10 Person-Days BAD WEATHER : 0 Person-Weather Days DAYS ON THE JOB : 5 days					
weather day *1/2 weather day*		Phil Jackson Crew Chief	Cole Plaskett				
Current Job		5	5	0	0	0	0
Aug 2013 Totals		5	5	0	0	0	0
Sep 2013 Totals		0	0	0	0	0	0
Tue 20-Aug-2013							
1	Wed 21-Aug-2013	Mobe to Wellgreen	Mobe to Wellgreen				
2	Thu 22-Aug-2013	HLEM Survey Lines 10 & 12	HLEM Survey Lines 10 & 12				
3	Fri 23-Aug-2013	HLEM & ELF Survey Lines 14 & 16	HLEM & ELF Survey Lines 14 & 16				
4	Sat 24-Aug-2013	ELF Survey Lines 10 & 12	ELF Survey Lines 10 & 12				
5	Sun 25-Aug-2013	Demobe to WH - 1/2 Day	Demobe to WH - 1/2 Day				
6	Mon 26-Aug-2013						
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MNM-13550-YT - Wellgreen EM Test

DATE:

August-21-13

PREPARED BY:

Phil Jackson

LOGISTICS

Type	Contractor	Hrs or units
Truck	AGL	1
ATV	AGL	0
ATV Trailer	AGL	0

Comments

Weather

Hot and Sunny

Notes (production comments, incidents, other)

Drove from Whitehorse to Wellgreen Upper Camp - safety orientation and reconnaissance trip out to grid area via ATV. Steep difficult ground.



MNM-13550-YT - Wellgreen EM Test

DATE:

August-22-13

PREPARED BY:

Phil Jackson

LOGISTICS

Type	Contractor	Hrs or units
Truck	AGL	1
ATV	AGL	0
ATV Trailer	AGL	0

Comments

Weather

Overcast - warm

Notes (production comments, incidents, other)

HLEM on lines 1000 & 1200 - Steep difficult terrain - lines cut with GPS guidance only no sight pickets (lines fairly crooked). Lines not tight chained and only 50m pickets located with handheld GPS.



MNM-13550-YT - Wellgreen EM Test

DATE:

August-23-13

PREPARED BY:

Phil Jackson

LOGISTICS

Type	Contractor	Hrs or units
Truck	AGL	1
ATV	AGL	0
ATV Trailer	AGL	0

Comments

Weather

Overcast then rain in afternoon

Notes (production comments, incidents, other)

HLEM on lines 1400 & 1600 in morning. ELF on lines 1400 & 1600 in afternoon - long day. Rain in afternoon.



MNM-13550-YT - Wellgreen EM Test

DATE:

August-24-13

PREPARED BY:

Phil Jackson

LOGISTICS

Type	Contractor	Hrs or units
Truck	AGL	1
ATV	AGL	0
ATV Trailer	AGL	0

Comments

Weather

Overcast, wet but little to no rain throughout day.

Notes (production comments, incidents, other)

Moved ATV to Lower camp. ELF on lines 1000 & 1200 in afternoon - done by ~ 7pm. Packed up gear for departure in morning.



MNM-13550-YT - Wellgreen EM Test

DATE:

August-25-13

PREPARED BY:

Phil Jackson

LOGISTICS

Type	Contractor	Hrs or units
Truck	AGL	1
ATV	AGL	0
ATV Trailer	AGL	0

Comments

Weather

Overcast - low ceiling - snow on mountain tops overnight.

Notes (production comments, incidents, other)

Drove from Camp to Whitehorse. 1/2 Day.

MEMORANDUM

To: Debbie James
Bill Harris
Midnight Mining Services

Date: 29 August 2013

From: Phil Jackson
Aurora Geosciences Ltd.

Re: Wellgreen EM Test – Donjek-Arch Project - Field Report

This memorandum is a field report describing the results of an HLEM and ELF test surveys conducted for Midnight Mining Services on the Donjek-Arch Project. Aurora Geosciences personnel were on site from August 21-25, 2013 and accessed the property daily by 4x4 truck from upper camp at the Wellgreen Project where the crew was based. The survey area comprised of four lines, each 800 meters in length. The grid was designed to be centered over the Teck showing, described as a small exposure of a 1m wide pyritic fault zone within a feldspar porphyry. Just to the north of the showing lies a linear magnetic high which follows a locally mineralized peridotite sill. A full survey log is attached to this memorandum.

a. Crew and equipment.

The following personnel conducted the surveys:

Phil Jackson	Project Manager	August 21-25, 2013
Cole Plaskett	Helper	August 21-25, 2013

The crew was equipped with the following instruments and equipment:

HLEM Survey :	1 - Apex Parametrics MaxMin I-10 system s/n 1038
	1 - 100m reference cable
	1 - Apex Parametrics MaxMin I-9+ system s/n 9022
ELF Survey:	1 – ELF system – sensor unit and computer
GPS receivers:	2 - Garmin 72sc non-differential receivers
Data processing:	1 - Laptop includes Geosoft and MMC software

Other:	1 – 4x4 Pick Up Truck
	1 – Iridium SAT phone
	2 – VHF radios
	1 - Field office equipment
	1 - Repairs & tool kit

b. Survey Location

The Donjek Arch Project is located 260 km due west of Whitehorse and 40 km northwest of Burwash Landing on NTS mapsheet 115G05. The survey described in this memo took place on a four 800m cut lines. Lines were cut with GPS guidance only and 50 station pickets located with a non-differential handheld GPS. All geophysical data collected were geo-referenced to UTM Zone 07N coordinates in the NAD83 datum. Daily access to the grid was by 4x4 truck from Prophecy Platinum's upper camp at the Wellgreen Project where the crew was based.

c. Survey specifications

The EM surveys were completed according to the following specifications:

<i>Grid:</i>	4 lines totaling 3.2 line-km
<i>Line Spacing:</i>	200 m
<i>Station Spacing:</i>	50 m pickets
<i>ELF Survey:</i>	
<i>Frequencies:</i>	11,22,45,90,180,360,720 and 1440 Hz
<i>Occupation Time:</i>	Typically 3 minutes
<i>Registration:</i>	Data was registered to WGS84 geodetic coordinates using an onboard GPS receiver.
<i>HLEM Survey:</i>	
<i>Frequencies:</i>	220, 880, 3520 and 7040 Hz
<i>Coil Spacing:</i>	100 m
<i>Station Spacing:</i>	25 m
<i>Terrain Corrections:</i>	Slope chain method using coplanar coils. Short coil errors introduced by irregular topography were corrected for during data processing (MMCFIX1)

ELF Survey

The extremely low frequency electromagnetic system (ELF) is a ground geophysical technique that is very portable and cut lines are not necessary. The survey measures vertical and horizontal components of the natural time-varying geomagnetic field originating primarily from global lightning activity. The system calculates the tilt angle, or tipper, of the magnetic fields from 11 to 1440 Hz which are sensitive to 2D and 3D conductivity contrasts. Both real and quadrature components are measured at each frequency. It is designed to image resistivity from depths of 10 metres to 2 kilometers dependant on the host conductivity structure.

HLEM Survey

The HLEM method involves the use of a pair of separated horizontal coils. In this method, a sine wave of variable frequency is sent through one of the coils to create a time-varying vertical magnetic dipole source. The second coil is a receiver which detects both the primary signal from the transmitting coil and a secondary signal created by magnetic induction in a conductive target in the earth. The receiver removes the effect of the transmitter signal (primary field) and splits the remaining secondary field into two components. One component represents the portion of the secondary field which is synchronized or in-phase with the primary field (in-phase component). The second component is the portion of the secondary field which lags the primary field by one quarter cycle (90°) (quadrature component). The ratio of the in-phase to quadrature components is used to determine the electrical conductance of a target.

The HLEM method requires that the coils be held a constant distance apart and be coplanar. In steep irregular terrain, the coils will frequently be less than the nominal coil spacing (short coiling) and may not be coplanar. These variations in coil geometry produce strong in-phase errors and must be removed from the data before plotting and interpretation. The method used to mitigate these effects requires a slope chained grid and requires the operator to measure the station to station terrain slope in percent with a clinometer. This is normally done by the receiver operator who was in the lead position on the surveys. The correct slope required to maintain the coils coplanar is the arithmetic average of the station to station slopes in the interval between the two coils. The operators hold the coils coplanar during the surveys by holding their coils at this orientation which is calculated and displayed for each reading station by the Maxmin MMC. The effect of short coiling created by irregular topography was removed with Apex Parametrics data processing software (MMCFIX1).

HLEM data is displayed in stacked profile plots showing the survey grid and the in-phase and quadrature readings as solid and dashed line profiles. The zero level on each profile is coincident with the survey line. A scale of 10% Hz per cm was used in the plotting. The locations of the ends of the grid lines have been registered to UTM coordinates with the best data available at the time of writing and UTM registration marks are shown on all field plots.

c. Data Processing.

ELF Survey

The raw ELF tipper vectors were visually examined and irregular readings were ejected from the data set. The 1440 Hz data was extremely noisy and no effort was made to reject outliers; instead all the data from this frequency was ignored. Repeat readings were typically taken

every 200 metres and after the irregular readings were eliminated, repeat readings were averaged.

The data were gridded with 50 metre cells, smoothed with a 5X5 Gaussian filter and the divergence was calculated and then displayed as a color grid on a figure for every frequency (in-phase and quadrature) with the tipper vectors. Compilation maps were produced with a geology underlay (based on rough field sketch provided by D. James). The 1440 Hz frequency data was not included in the compilation maps as the signal was frequently insufficient throughout the survey day and has been rejected from the final maps.

HLEM Survey

The HLEM data was downloaded daily and the raw, unedited data archived. A copy of the data was then processed using the APEX Parametrics software MMCREF, MMCFIX1 and MMCPRO87. Processing steps included editing station locations (if entered incorrectly), and the correction of short coil errors introduced by irregular topography. The reduced data were imported into Geosoft databases and geo referenced as UTM coordinates.

The inphase data was extremely noisy and is largely attributed to irregular lines and rugged terrain where cut lines were discontinued around steep terrain. The inphase noise is consistent between frequencies, the 220 Hz data was subtracted from the higher frequencies on the separate profile maps. Due to line and terrain conditions the inphase data has been largely rendered uninterpretable.

Separate profile plots for each frequency showing the survey grid lines and the in-phase and quadrature readings as solid and dashed line profiles were generated.

Stacked inphase and quadrature compilation maps show unfiltered inphase and quadrature data. Compilation maps also include the geology underlay generated from the field sketch provided by D. James.

d. Results and Recommendations.

Weak to moderate conductive features are seen in the ELF data (high divergence in the inphase and quadrature data) which run approximately parallel to the sketched ultramafic contact. HLEM quadrature troughs with a positive datum shift from the expected signature (possibly due to extensive overburden cover) also run parallel to either side of the ultramafic contact. Further notes on the known geology and access to previous magnetic data would be required to further interpret the test results.

Both surveys have detected weak to moderate conductors over the test area however the ELF system is recommended for future work in the area. Line cutting would not be required and ground magnetic data should also be acquired using GPS guidance, again eliminating the need for cut and chained survey lines.

e. Products.

The following files are included in the digital version of this report:

<u>File / Folder name</u>	<u>Description</u>
\raw data\ELF\"Date\".xyz \raw data\HLEM\MM\"Date\"P2.xyz	Raw xyz data files for ELF & HLEM surveys.
\Geosoft_ELF\ Maps & Databases \Geosoft_HLEM\ Maps & Databases	Contains the processed data in geosoft database (*.gdb) format as well as ASCII format (*.xyz). Packed Geosoft maps (*.map) with all layers that created the PDFs are included.
\Figures	Contains compilation maps in PDF format.
MNM-13550-YT Crewlog.pdf	A crew log describing daily operations.
MNM-13550-YT Field Report.pdf	This report in PDF format

Thank you for the opportunity to work with you on this project.

Respectfully submitted,
AURORA GEOSCIENCES LTD.

Phil Jackson, P.Geoph.