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**CANADIAN EXPLORATION SERVICES LTD** 

# **CLEGHORN MINERALS LTD.**

Q2474 – Meech Lake Prospect – Waterhole Grid Magnetometer & HLEM Max-Min Surveys

C Jason Ploeger, P.Geo. Melanie Postman, B.Sc.

March 30, 2018



### Abstract

CXS was contracted to perform a small line cutting, magnetometer survey and Max-Min survey over what is known as the Waterhole Grid. The Waterhole Grid is a smaller portion of the Meech Lake Prospect.

Numerous MaxMin HLEM and magnetometer targets were identified with these surveys over the Waterhole grid. Of these anomalous features four areas were noted.

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## 1. SURVEY DETAILS

#### 1.1 PROSPECT NAME

This prospect is known as the Meech Lake Prospect - Waterhole Grid.

### 1.2 CLIENT

CLEGHORN MINERALS LTD.

152 Chemin de la Mine Ecole Val D'Or, Quebec J9P 7B6

### 1.3 LOCATION

The Meech Lake Waterhole is located approximately 22 kilometres north of Matachewan, Ontario. The survey area covers a portion of operational mining claims 239602, 176542, 222464, 247584, 209707, 294733, 313625, and 173483. The entire survey area is located in McNeil and Argyle Townships, within the Larder Lake Mining Division.

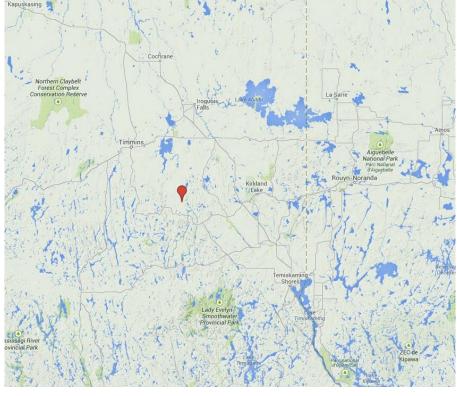


Figure 1: Location of the Meech Lake Waterhole Grid





# 1.4 ACCESS

Access to the property was attained via Highway #566 which extends west from the end of highway #66 in Matachewan. Highway #566 was travelled for 17.5 kilometres, then a forestry access road heading north was taken for an additional 4 kilometres to a creek that was not passable by truck. An ATV was then employed for the final 14 kilometres north to the survey area.

# 1.5 SURVEY GRID

The grid consists of 5.775 kilometres of previously established grid lines. The grid lines are spaced at 50 or 100 metre increments, with stations picketed at 25-metre intervals.

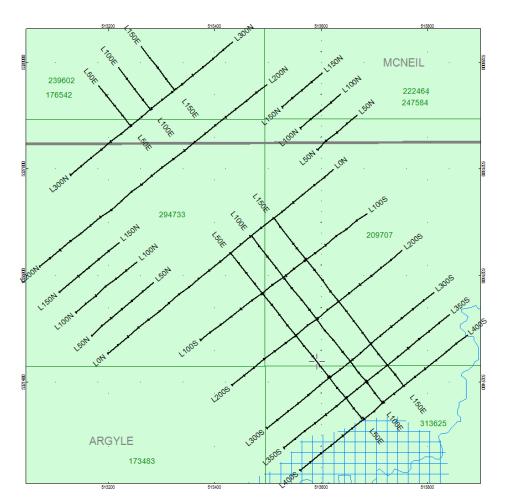


Figure 2: Operational Claim Fabric with Cut Grid





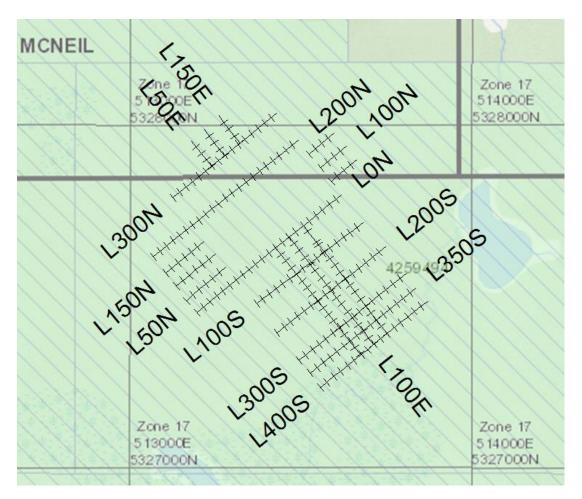


Figure 3: Legacy Claim Fabric with Cut Grid





# 2. SURVEY WORK UNDRTAKEN

### 2.1 SURVEY LOG

Date	Description	Line	Min Extent	Max Extent	Total Survey (m)
January 22, 2018	Begin HLEM Max-Min survey				
	with 50m coil separation.	100E	400S	50S	350
		400S	100W	300E	400
		50E	400S	50S	350
					1100
January 23, 2018	Continue Max-Min survey.	150E	400S	50S	350
		350S	100W	300E	400
		300S	100W	300E	400
		200S	100W	300E	400
		100S	100W	100E	200
					1750
		4000	4005	0005	
January 24, 2018	Continue Max-Min survey.	100S	100E	300E	200
		0N	250W	300E	550
		50N	250W	100W	150
		100N	250W	100W	150
		150N	250W	100W	150
		200N	250W	100E	350
					1550
January 25, 2018	Continue Max-Min survey.	200N	100E	300E	200
January 23, 2010		300N	100L	300E	400
		50E	250N	400N	150
		100E	250N	400N	150
		150E	250N	400N	150
		150L	300E	400N	100
		100N	300E	400E	100
		50N	300E	400L 400E	100
	Change to 100m coil				
	separation.	50E	200N	400N	200
		100E	200N	400N	200
		150E	200N	400N	200
					1950
			4000		
January 26, 2018	Continue Max-Min survey.	300N	100W	300E	400
		200N	250W	300E	550





					Total
			Min	Max	Survey
Date	Description	Line	Extent	Extent	(m)
		150N	250W	100W	150
		100N	250W	100W	150
		50N	250W	100W	150
					1400
January 29, 2018	Continue Max-Min survey.	0N	300W	300E	600
January 30, 2018	Continue Max-Min survey.	100S	100W	325E	425
		200S	100W	300E	400
		150E	400S	50N	450
		1002	1000	0011	1275
					1210
January 31 2018	Continue Max-Min survey.	400S	100W	300E	400
		350S	150E	300E	150
		0000	TOOL	OUOL	550
					550
February 1 2018	Complete Max-Min survey.	100E	400S	0N	400
		350S	100W	200E	300
		300S	100W	300E	400
		5000	400S	0N	400
		002	4000		1500
Total HLEM					1500
Max-Min Line					
Kilometres	<b>11.675</b> (50m coil separation: 5.	75 100r	n coil ser	paration:	5 925)
					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
February 2, 2018	Perform magnetometer survey.				
,	Magnetometer 1.	150E	400S	25N	425
		400S	100W	300E	400
		350S	100W	300E	400
		300S	100W	300E	400
		200S	100W	300E	400
		100S	100W	300E	400
		0N	250W	300E	550
		50E	400S	000L 0N	400
		100E	400S	0N	400
	Magnetometer 2.	50N	300E	400E	100
		100N	300E	400E	100
		150N	300E	400E	100
		200N	250W	300E	550
		50E	300N	400N	100
		100E	300N	400N	100
		TUUE	3001	400IN	100





					Total
			Min	Max	Survey
Date	Description	Line	Extent	Extent	(m)
		150E	300N	400N	100
		300N	100W	300E	400
		150N	250W	100W	150
		100N	250W	100W	150
		50N	250W	100W	150
Total Mag Line					
Kilometres	5.775				

# Table 1: Survey Log

### 2.2 PERSONNEL

Crew Member	Position	Resident	Province
C Jason Ploeger	Magnetometer & Max-Min Operator	Larder Lake	Ontario
Dakota Maurer	Magnetometer & Max-Min Operator	Kirkland Lake	Ontario
Kaylyn Cowie	Max-Min Operator	Kirkland Lake	Ontario

### Table 2: CXS Personnel

### 2.3 SAFETY

Canadian Exploration Services Ltd prides itself in creating and maintaining a safe work environment for its employees. Each crew member is briefed on the jobsite location, equipment safety, standard operating procedures along with our health and safety manual. An emergency response plan is generated relating to the specific job and with the jobsite predominantly in the field, which is unpredictable, morning safety briefings are essential. Topics are generally chosen based off jobsite characteristics of the area, timing and crew experience.

# 2.4 SURVEY SPECIFICATIONS

#### Magnetometer Survey

The survey was conducted with a GSM-19 v7 Overhauser magnetometer with a second GSM-19 magnetometer in base station mode for diurnal correction.

A total of 5.775-line kilometres of magnetometer was read over the Meech Lake Waterhole on February 2<sup>nd</sup>, 2018. This consisted of 7299 magnetometer samples taken at a 1 second sample interval.





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#### Max-Min Survey

The survey was conducted with an Iris Promis Multi Frequency EM System. Frequencies 110Hz, 220Hz, 440Hz, 880Hz, 1760Hz, 3520Hz, 7040Hz, 14080Hz, 28160Hz, and 56320Hz were used with a 50m and 100m coil separation. A Suunto PM-5 clinometer was used to measure slopes between picketed stations. These slopes were averaged over 50m and 100m to determine the correct tilt readings.

A total of 11.675-line kilometres of Max-Min was read between January 22<sup>nd</sup> and February 1<sup>st</sup>, 2018. This consisted of 934 samples taken in 110Hz, 220Hz, 440Hz, 880Hz, 1760Hz, 3520Hz, 7040Hz, 14080Hz, 28160Hz, and 56320Hz.





### 3. OVERVIEW OF SURVEY RESULTS

#### 3.1 SUMMARY INTERPRETATION

The survey was designed to expand the region of a previously performed max-min and magnetic survey over the Kell showing. The grid design was also meant to be an extension of and numbered similar to, the original cut grid. The cut grid was offset from the intended design, however it did still adequately cover the area in question.

Numerous historic trenches and workings were seen by the survey crew; however, their locations were not documented. The only culture noted that may have affected the data was an old collapsed cabin on line 50E at 200S (NAD83 UTM Zone 17 513550E and 5327489N).

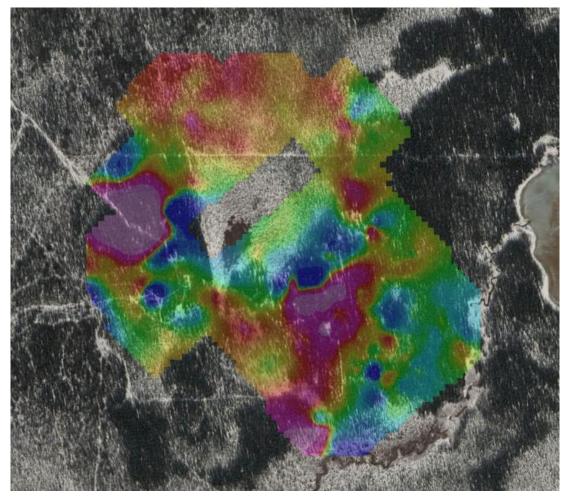


Figure 4: Magnetometer Plan on Google Earth







Figure 5: HLEM Axis on Google Earth

The magnetic survey indicates the presence of two strong magnetic features; one on the west side and the second in the central portion of the survey area. These strong signatures most likely represent an ultramafic unit, which may be the same unit that was interpreted in the previous survey to have undergone strong alteration and shearing through the central region of the grid. A weak north-south axis appears to be flanking these high anomalous magnetic signatures. These flanking weak axes may represent disseminated mineralization.

A second weak axis is observed crossing east-west (100 degrees) across the survey area. It appears to correlate with a slightly elevated magnetic feature. It is interpreted that a regional dike may be the source of the features and correlation.

Another interesting anomaly occurs near the intersection of 100E and 300N. At this location, there is a magnetically elevated area, with a coincident HLEM axis. The interaction of these two anomalous responses indicates the existence of a possible sulphide target.





### 3.2 CONCLUSION AND RECOMMENDATIONS

Numerous Max-Min HLEM and magnetometer targets were identified with these two surveys over the Waterhole grid. Of these anomalous features, four areas were noted. These areas should be explored further through prospecting. It is also recommended that an IP survey be performed to determine if a disseminated mineralization exists.





**APPENDIX A** 

#### STATEMENT OF QUALIFICATIONS

- I, Melanie Postman, hereby declare that:
- 1. I am a soon-to-be Geoscientist-in-Training with residence in Virginiatown, Ontario and am presently employed as a Junior Geophysicist with Canadian Exploration Services Ltd. of Larder Lake, Ontario.
- 2. I graduated with a Bachelor of Science Honors specialization degree in geophysics for professional registration from the University of Western Ontario, in London Ontario, in 2017.
- 3. I am currently undergoing the application process to register as a Geoscientistin-Training to later become a practicing member of the Association of Professional Geoscientists.
- 4. I have previous geophysical work experience during and following my education.
- 5. I do not have nor expect an interest in the properties and securities of **Cleghorn Minerals Ltd.**
- 6. I am responsible for assisting with the final processing and validation of the survey results and the compilation of the presentation of this report. The statements made in this report represent my opinion based on my consideration of the information available to me at the time of writing this report.

Muli Tostm

Melanie Postman, B.Sc. Junior Geophysicist (non-professional)

Larder Lake, ON March 30, 2018





#### **STATEMENT OF QUALIFICATIONS**

- I, C. Jason Ploeger, hereby declare that:
- 7. I am a professional geophysicist with residence in Larder Lake, Ontario and am presently employed as a Geophysicist and Geophysical Manager of Canadian Exploration Services Inc. of Larder Lake, Ontario.
- 8. I am a Practicing Member of the Association of Professional Geoscientists, with membership number 2172.
- 9. I graduated with a Bachelor of Science degree in geophysics from the University of Western Ontario, in London Ontario, in 1999.
- 10.1 have practiced my profession continuously since graduation in Africa, Bulgaria, Canada, Mexico and Mongolia.
- 11.1 am a member of the Ontario Prospectors Association, a Director of the Northern Prospectors Association and a member of the Society of Exploration Geophysicists.
- 12.1 do not have nor expect an interest in the properties and securities of **Cleghorn Minerals Ltd.**
- 13.1 am responsible for the final processing and validation of the survey results and the compilation of the presentation of this report. The statements made in this report represent my professional opinion based on my consideration of the information available to me at the time of writing this report.



C. Jason Ploeger, P.Geo., B.Sc. Geophysical Manager Canadian Exploration Services Inc.

> Larder Lake, ON March 30, 2018





#### **APPENDIX B**

#### THEORETICAL BASIS AND SURVEY PROCEDURES

#### TOTAL FIELD MAGNETIC SURVEY

Base station corrected Total Field Magnetic surveying is conducted using at least two synchronized magnetometers of identical type. One magnetometer unit is set in a fixed position in a region of stable geomagnetic gradient, and away from possible cultural effects (i.e. moving vehicles) to monitor and correct for daily diurnal drift. This magnetometer, given the term 'base station', stores the time, date and total field measurement at fixed time intervals over the survey day. The second, remote mobile unit stores the coordinates, time, date, and the total field measurements simultaneously. The procedure consists of taking total magnetic measurements of the Earth's field at stations, along individual profiles, including Tie and Base lines. A 2 metre staff is used to mount the sensor, in order to optimally minimize localized near-surface geologic noise. At the end of a survey day, the mobile and base-station units are linked, via RS-232 ports, for diurnal drift and other magnetic activity (ionospheric and sferic) corrections using internal software.

For the gradiometer application, two identical sensors are mounted vertically at the ends of a rigid fiberglass tube. The centers of the coils are spaced a fixed distance apart (0.5 to 1.0m). The two coils are then read simultaneously, which alleviates the need to correct the gradient readings for diurnal variations, to measure the gradient of the total magnetic field.





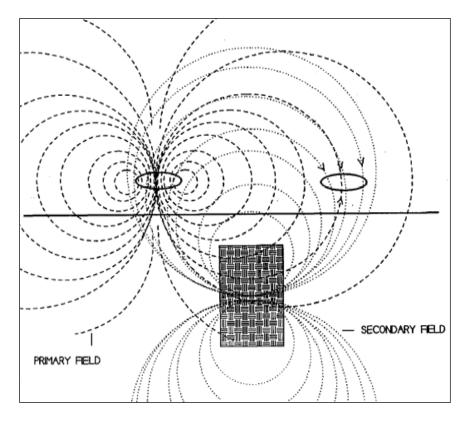
#### **APPENDIX B**

#### THEORETICAL BASIS AND SURVEY PROCEDURES

### **HLEM Electromagnetic**

The HLEM method involves the use of a pair of separated horizontal coils (Figure MMI). Most commonly, the surveys are conducted in the frequency domain. 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 HLEM method requires that a sample of the transmitted signal be sent along a wire to the receiver where it is used to synchronize the phase of the receiver with the transmitter. This permits the receiver to remove the effect of the transmitter signal (primary field) and to split the remaining secondary field into two components. One 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.



MMI: HLEM source field





HLEM instruments remove the primary filed from the signal to leave only the secondary field. By convention, a secondary field in the same direction as the primary field is recorded as positive while a secondary field in the opposite direction to the primary field is recorded as negative. HLEM data is commonly plotted as profiles with the reading plotted at the midpoint between the transmitter and receiver. The reason for this is that the response from a steeply dipping conductor, the most common target of this method, is strongest when the two coils straddle the conductor.





#### **APPENDIX C**

#### **GSM 19**

GEM1 SC210 VII	Systems	Incon
( Martin Bart	Sec.	0000
GSM-19	Överhauser Magnetometer	2 8 8 9

### **Specifications**

**Overhauser Performance** 

Resolution: 0.01 nT Relative Sensitivity: 0.02 nT Absolute Accuracy: 0.2nT Range: 20,000 to 120,000 nT Gradient Tolerance: Over 10,000nT/m Operating Temperature: -40°C to +60°C

### **Operation Modes**

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

Base Station: Time, date and reading stored at 3 to 60 second intervals. Walking Mag: Time, date and reading stored at coordinates of fiducial. Remote Control: Optional remote control using RS-232 interface. Input/Output: RS-232 or analog (optional) output using 6-pin weatherproof connector.

### **Operating Parameters**

Power Consumption: Only 2Ws per reading. Operates continuously for 45 hours on standby.

Power Source: 12V 2.6Ah sealed lead acid battery standard, other batteries available

Operating Temperature: -50°C to +60°C

Storage Capacity

Manual Operation: 29,000 readings standard, with up to 116,000 optional. With 3 VLF stations: 12,000 standard and up to 48,000 optional.

Base Station: 105,000 readings standard, with up to 419,000 optional (88 hours or 14 days uninterrupted operation with 3 sec. intervals)

Gradiometer: 25,000 readings standard, with up to 100,000 optional. With 3 VLF stations: 12,000, with up to 45,000 optional.





### **Omnidirectional VLF**

Performance Parameters: Resolution 0.5% and range to  $\pm 200\%$  of total field. Frequency 15 to 30 kHz.

Measured Parameters: Vertical in-phase & out-of-phase, 2 horizontal components, total field coordinates, date, and time.

Features: Up to 3 stations measured automatically, in-field data review, displays station field strength continuously, and tilt correction for up to  $\pm 10^{\circ}$  tilts.

Dimensions and Weights: 93 x 143 x 150mm and weighs only 1.0kg.

**Dimensions and Weights** 

Dimensions: Console: 223 x 69 x 240mm Sensor: 170 x 71mm diameter cylinder Weight: Console: 2.1kg Sensor and Staff Assembly: 2.0kg

**Standard Components** 

GSM-19 magnetometer console, harness, battery charger, shipping case, sensor with cable, staff, instruction manual, data transfer cable and software.

# Taking Advantage of a "Quirk" of Physics

Overhauser effect magnetometers are essentially proton precession devices except that they produce an order-of magnitude 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 high-sensitivity total field measurement. In comparison with proton precession methods, RF signal generation also keeps power consumption to an absolute minimum and reduces 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).

• The unique Overhauser unit blends physics, data quality, operational efficiency, system design and options into an instrumentation package that ...





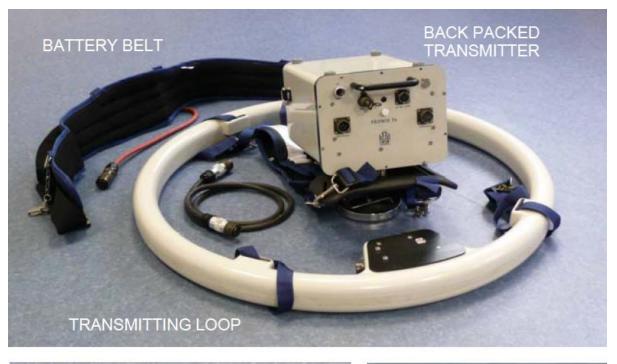
exceeds proton precession and matches costlier optically pumped cesium capabilities





APPENDIX C

#### **IRIS PROMIS MULTI FREQUENCY EM SYSTEM**











Specifications

### TRANSMITTER

- Power supply: NiMh battery belt (10 Ah)
- 200 readings typ. autonomy for 10 frequencies
- 500 readings, 3 freq., 100m spacing, at 20°C
- 10 frequencies from 110 Hz to 56 320 Hz
- Magnetic moments:
  - 360 Am2 @ 110 Hz
  - 320 Am2 @ 220 Hz
  - 280 Am2 @ 440 Hz
  - 235 Am2 @ 880 Hz
  - 220 Am2 @ 1 760 Hz
  - 160 Am2 @ 3 520 Hz
  - 110 Am2 @ 7 040 Hz
  - 60 Am2 @ 14 080 Hz
  - 30 Am2 @ 28 160 Hz
  - 15 Am2 @ 56 320 Hz
- 2 inclinometers for horizontal position
- 2 leds, green & red for end / start of reading
- Back packed transmitter: 30x20x20cm, 5.8kg
- Loop: 75cm diameter, 7kg; Battery belt: 4kg

- Optional loop: 1.3m diameter, 12kg, for doubling the magnetic moments of the 75cm loop

# RECEIVER

- Control of complete system by microprocessor

- Four simultaneous channels for 3 magnetic
- components Hx, Hy, Hz, and the current
- Selection of number of frequencies to measure
- 16 key keyboard: graphic display 12cm diagonal
- A/D converter: 16 bits; dynamic range: 24 bits
- Resolution: 0.01% of primary field
- 50 Hz notch filters; overload detection
- 2 inclinometers for horizontal position, gps input
- Power supply: internal NiMh battery
- Autonomy: 900 data of 10 frequencies (20°C)
- Temperature range: -20°C, +70°C
- Dimensions: 30x15x20cm; weight 5kg
- Magnetic sensor: 20x20x20cm, 2.6kg

### **MEASURING PROCESS**

- Digital synchronous detection
- Digital filtering of harmonics





- Computation of received frequency
- Processing for eliminating noisy data
- Selection of stacking number for each frequency
- Data storage: 20 000 readings capacity

- Stored parameters: in-phase and out-of-phase parts of the three magnetic components Hx, Hy,Hz, standard deviation, tilt angles of transmitter & receiver, battery levels, temperature, gps data

#### TRANSMITTER RECEIVER CABLE

- Cable for distance setting, for transmitter control and for phase reference
- Length: 20, 50, 100, 200, 400m, other on request





**APPENDIX D** 

#### LIST OF MAPS (IN MAP POCKET)

Plan Map (1:2500)

- 1) Q2474-Cleghorn-Waterhole-Mag-Cont
- 2) Q2474-Cleghorn-Waterhole-HLEM50m-110
- 3) Q2474-Cleghorn-Waterhole-HLEM50m-220
- 4) Q2474-Cleghorn-Waterhole-HLEM50m-440
- 5) Q2474-Cleghorn-Waterhole-HLEM50m-880
- 6) Q2474-Cleghorn-Waterhole-HLEM50m-1760
- 7) Q2474-Cleghorn-Waterhole-HLEM50m-3520
- 8) Q2474-Cleghorn-Waterhole-HLEM50m-7040
- 9) Q2474-Cleghorn-Waterhole-HLEM50m-14080
- 10)Q2474-Cleghorn-Waterhole-HLEM50m-28160
- 11)Q2474-Cleghorn-Waterhole-HLEM50m-56320
- 12)Q2474-Cleghorn-Waterhole-HLEM100m-110 13)Q2474-Cleghorn-Waterhole-HLEM100m-220
- 14)Q2474-Cleghorn-Waterhole-HLEM100m-440
- 15)Q2474-Cleghorn-Waterhole-HLEM100m-880
- 16)Q2474-Cleghorn-Waterhole-HLEM100m-1760
- 17)Q2474-Cleghorn-Waterhole-HLEM100m-3520
- 18)Q2474-Cleghorn-Waterhole-HLEM100m-7040
- 19)Q2474-Cleghorn-Waterhole-HLEM100m-14080
- 20)Q2474-Cleghorn-Waterhole-HLEM100m-28160
- 21)Q2474-Cleghorn-Waterhole-HLEM100m-56320
- 22)Q2474-Cleghorn-Waterhole-Interp

Claim Map with Magnetic Traverses

23)Q2474-Cleghorn-Waterhole-Grid-LegacyClaims (1:20000) 24)Q2474-Cleghorn-Waterhole-Grid-OperationalClaims (1:2500)

# TOTAL MAPS = 24

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