

**Geological Mapping**

**Magnetometer and Electro-Magnetic**

**Survey**

**Arch Creek Area**

**Kluane Mountains**

**August 21 - September 15, 1967**

This report has been examined by  
the Geological Evaluation Unit.  
Approved as to technical worth by:

*D. C. Finley*  
RESIDENT GEOLOGIST

Approved as to cost in the amount  
of: \$

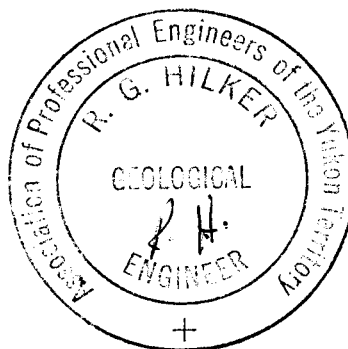
RESIDENT MINING ENGINEER

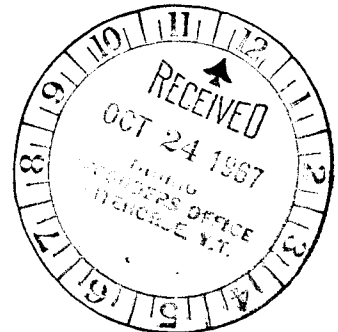
Accepted as representation work  
under Section 53(4) Yukon Quartz  
Mining Act.

COMMISSIONER OF YUKON

**BY**

**R. G. Hilker, P. Eng.**





COMMISSIONER OF YUKON

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Accepted as representation work under Section 53(4) Yukon Quartz Mining Act.

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RESIDENT GEOLOGIST

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Approved as to cost in the amount of \$ \_\_\_\_\_

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RESIDENT GEOLOGIST

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Approved as to technical worth by: \_\_\_\_\_

This report has been examined by the Geological Evaluation Unit.

This report has been examined by the Geological Evaluation Unit. Approved as to technical worth by: \_\_\_\_\_

RESIDENT GEOLOGIST

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Approved as to cost in the amount of: \$ 6150.00

RESIDENT GEOLOGIST

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Approved as representation work under Section 53(4) Yukon Quartz Mining Act.

COMMISSIONER OF YUKON

GEOLOGICAL SURVEY

DEC 1967

Resident Geologist  
Whitehorse, Y. T.

COMMISSIONER OF YUKON

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Approved as to technical worth by: \_\_\_\_\_

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RESIDENT GEOLOGIST

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Approved as to cost in the amount of \$ \_\_\_\_\_

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RESIDENT GEOLOGIST

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Approved as to technical worth by: \_\_\_\_\_

This report has been examined by the Geological Evaluation Unit.

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Introduction:

The following geological and geophysical report is submitted to the Whitehorse Mining Recorders Office for the purpose of assessment work on a group of claims in the Arch Creek Area of the Kluane Mountains.

Geological and geophysical work was conducted over the claim group between August 21st to September 15th, 1967. The survey work was conducted under the direction and supervision of R. G. Hilker, P. Eng.

It is requested that the information and contents of this report remain confidential.

Location:

The Legacy-Tippy-Jiffy group of 46 mineral claims are located in the Quill-Arch Creeks divide in the Kluane Mountains. The claims are accessible by a truck road, twelve miles west of Mile 1111 on the Alaska Highway. The first nine miles of the road was built for access to the Hudson Bay Mining and Smelting Company's Nickel Mine on Quill Creek. The claim group is located on the easterly slope and floor of the northwesterly trending mountain valley of Arch Creek. The valley has a floor elevation of about 4,500 feet and is on the tree line. The Arch Valley intersects the Donjek River Valley, about five miles to the northwest from the Jiffy claims.

The claims are located on Sheet 115-G-5 of the Whitehorse Mining District (Claim Sheet 115-G-5 in the back of report).

Claims:

The following 46 quartz mineral claims are listed with grant numbers and anniversary dates.

<u>Claim</u>	<u>Grant Number</u>	<u>Staker</u>	<u>Anniversary Date</u>
Legacy 1-8	Y12572-Y12579	J. B. O'Neil	April 14, 1967
9-16	Y12580-Y12587	D. R. Small	April 14, 1967
16-24	Y12588-Y12595	S. Shemilt	April 14, 1967
Jiffy 1-8	Y10791-Y20798	Charles Gibbons	October 12, 1966
Tippy 1-6	Y18060-Y18065	Russel Dickson	May 5, 1967
Tippy 9-16	Y18066-Y18073	Harold Chambers	May 5, 1967

The Legacy claims have been all transferred into the name of J. B. O'Neil and the Jiffy-Tippy claims are under the name of Charles Gibbons.

Scope of Work:

Exploration work was conducted on the 46 claim group by geological mapping at 1" = 200 feet, and by two geophysical methods; Ronka E. M. 16 and by fluxgate magnetometer. Three maps are included with this report that show the results of the mapping and surveys.

The exploration covered about two thirds of the ground covered by the claims. Additional work to be northwest of explored area is necessary to completely survey all the claims.

Linecutting Grid:

A linecutting grid of 20 miles was slashed over a part of the claim group to conduct the respective surveys upon. (See Geology Map with Linecutting Grid). The main baseline has a bearing of N27°W and crosslines were cut at 400 foot intervals to the baseline. The lines were chained and pickets placed each 100 feet distance along the crosslines.

Employees:

**Geologist**

Mr. Micheal Brady,  
1206 College Avenue,  
Houghton, Michigan. U.S.A.

Mr. R. G. Hilker,  
P. O. Box 566,  
Whitehorse, Y. T.

**Magnetometer**

Mr. Micheal Redfearn,  
P. O. Box 206,  
Hancock, Michigan. U.S.A.

Mr. Micheal Smith,  
P. O. Box 244,  
Whitehorse, Y. T.

**E. M. 16**

Mr. Fred Orschoff,  
1335 Bowness Road, N. W;  
Calgary, Alberta.

**Linecutters**

Mr. Roger Voisine,  
1139 - 3rd Avenue,  
Val Dor, Quebec.

Mr. Legar Roy,  
P. O. Box 910,  
Val Dor, Quebec.

Mr. Nick Kostilik,  
P. O. Box 910,  
Val Dor, Quebec.

Employees - (Cont'd):

The supervision of all geological and geophysical personnel was by R. G. Hilker, P. Eng., of P. O. Box 566, Whitehorse, Y. T., agent for the claim owners J. B. O'Neil and Charles Gibbons.

Geological Survey:

General Geology

The general geology of the area is described by J. E. Muller in the Geological Survey of Canada Memoir 340, Kluane Lake Map-Area, Yukon Territory.

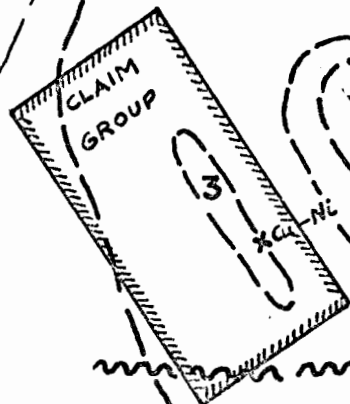
The property is located on the west limb of a northwesterly trending anticlinal structure. The oldest rocks exposed in the area are Lower Permian volcanics and chlorite schist. An upper Permian marine sedimentary assemblage of argillite, sandstone, conglomerate, chert and limestone overlies the older volcanics. The older beds were intruded by peridotite and gabbro sills. Permian and/or Triassic in age. The ultramafic sills strike and appear to plunge in the same northwesterly direction as the axis of the anticlinal structure. Lower Triassic volcanics with minor interbedded sediments are the youngest rocks present and exposed along the axis of the anticline.



DONJEK VALLEY

SHAKWAK

TRENCH



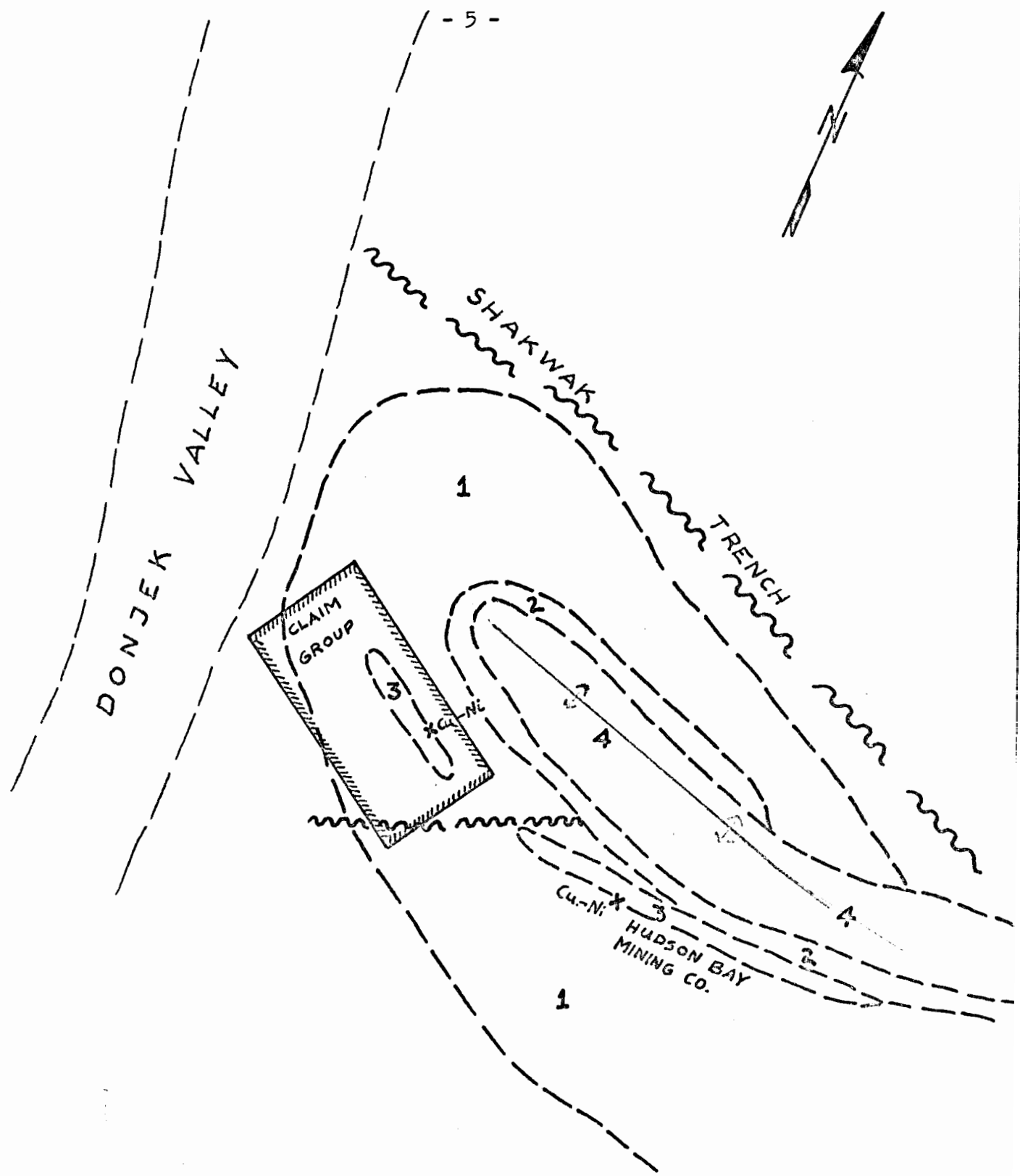
Cu-Ni  
HUDSON BAY  
MINING CO.

# GENERAL GEOLOGY MAP - LEGACY - JIFFY - TIPPY

no scale

Sept. 15<sup>th</sup> / 67  
R.H.

*Legend?*



## Geology

Geological mapping on the claim group partly outlined a peridotite sill with copper-nickel mineralization on the upper contact with older volcanics and sediments (see geology map 1" = 200 feet). The upper contact was mapped for 3,000 feet in a northwest strike direction, the lower contact is exposed along creek beds for 1900 feet. The length of the peridotite sill was inferred along strike direction by the magnetic high as indicated from the magnetometer survey (see magnetics map 1" = 200 feet). The peridotite sill is about 5,600 feet long and between 250-500 feet in width with a strike of N35°W and dip to the S. W.

The peridotite is black colored, fine to dense grained and fractured with serpentine polished slickensides. The peridotite is associated with a fine grained felsite sill that strikes parallel to the upper and lower contacts of the peridotite sill. Mineralization occurs near the felsite and peridotite contacts at the Hudson Bay Mining Company Property, that is located on the peridotite sill south of Legacy-Tippy-Jiffy Claim group.

A second peridotite sill may be covered with overburden about 1800 feet north of the N. W. end of the main peridotite intrusion. The magnetic intensities are similar in the two areas and no bedrock is exposed to indicate the cause of the second magnetic high. The mapping and magnetics need to be extended further north.

TABLE OF FORMATIONS

MESOZOIC

Triassic

4 Volcanics - amygdaloidal purple and green colored  
basalt and andesite, agglomerate, tuffs.  
Minor interbedded sedimentary beds.

Permian and/or Triassic

3 Sills - peridotite and gabbro with nickel-copper  
mineralization.

PALAEOZOIC

Permian

2 Marine Sedimentary Assemblage - argillite, sandstone,  
limestone and chert.  
Contains fossil cup  
corrals.

1 Volcanics - red and green colored andesitic lava,  
tuffs, volcanic breccia. Minor greywacke,  
argillite and limestone.

## Economic Geology

Copper-nickel mineralization is exposed on the upper edge of the peridotite sill. The main showing is about 200 feet long and 50 feet wide. The zone consists of narrow widths of massive sulphides consisting of pyrrhotite and chalcopyrite. Mineralization varies with lens of disseminated to massive sulphides. A composite sample taken across the screen zone and from bedrock assayed 0.32% Cu. Samples of massive sulphides assayed 3.78% Ni and 2.56% Cu. Float peridotite in adjacent creeks at the south end of the claims group, above the small lake, assayed 1.51% Cu-Tr Ni. The mineralization host rock is a platy decomposed argillite and peridotite.

### Geophysical Survey:

#### A. Magnetics

##### 1) Description of Magnetometer

Two Sharpe MF-1 Fluxgate Magnetometers were used to conduct the magnetic survey on the Arch Creek Claims. Specifications of the instrument by the manufacturer are as follows:

Maximum Sensitivity	20 gammas/scale division on 1000 gamma range.
Readability	5 gammas or 1/4 scale division on 1000 gamma range.
Ranges	1000 - 3000 - 10000 - 30000 - 100000 gammas.

Maximum Range	± 100,000 gammas.
Latitude Adjustment Ranges.	10,000 to 75,000 gammas, Northern Hemisphere
Batteries	12 "C" Cell Flashlight Batteries

The fluxgate magnetometer as defined by M. B. Dobrin in the text book "Introduction to Geophysical Prospecting", is as follows:

"The flux-gate magnetometer, also known as the saturable reactor, makes use of a ferrmagnetic element of such high permeability that the earth's field can induce a magnetization that is a substantial proportion of the saturation value. If this field is superimposed upon a cyclic field induced by a sufficiently large alternating current in a coil around the magnet, the resultant field will saturate the core. The phase of each energizing cycle at which saturation is reached gives a measure of the earth's ambient field".

The MF-1 Fluxgate Magnetometer measures the vertical component of total magnetic field. The instrument does not require a tripod and only needs to be oriented in the general north magnetic pole direction. The sensitivity of the instrument cannot be changed except by rough handling of the instrument.

## 2) Magnetism Interpretation

A magnetometer survey conducted over part of the property indicated two areas of high magnetic intensities (see magnetism map 1" = 200 feet). A magnetic base control station of 2000 gammas was assumed and used for all readings taken on the property.

The main background readings vary between 1800-2000 gammas, with high intensities between 4000-5000 gammas. The fluxgate magnetometer used to conduct the survey measured vertical magnetic intensities.

The 5,600 feet long magnetic high corresponds with the geological mapped peridotite sill. The magnetic properties of the peridotite causes the higher magnetic intensities in the central part of the survey area.

Further north from the main peridotite sill a second magnetic high is outlined for 1500 feet. The magnetics vary between a 2000 gamma background to a 6000 gamma high. The area is drift covered and no bedrock is exposed in this region. The magnetic high is probably due to a second peridotite sill. Additional magnetic surveying will outline the remainder of the magnetic high.

## B. Electro-Magnetic Survey - E. M. 16

### 1) Description of Instrument

The Geonics Electro-Magnetic E. M. 16 Instruments is a receiver that measures the secondary vertical component from a conductive body. The power source is from a VLF transmitting station that operates for the detection of submarines on the North American Continent. The VLF transmitters have vertical antenna, the antenna current radiates a concentric horizontal magnetic field. When the magnetic field meets a buried conductive body a secondary field is created. The E. M. 16 receiver measures the horizontal and vertical axis, of the secondary field set up by a conductive body, with an in-phase and quadrature percentage of tilt angle reading.

The instrument is equipped with two crystals for the choice of selection of the VLF power source, parallel to the strike of bedrock in any area worked. The two crystals for the stations used in the Arch Creek Survey were as follows:

Station NPG - Seattle, Washington - Frequency 18.6 KHZ

Station NSS - Annapolis, Maryland - Frequency 21.4 KHZ

The Seattle station has nearly parallel alignment for the Northwesterly bearing bedrock and Yukon River Valley, of the Whitehorse Copperbelt. The Seattle station was used for the entire survey in the Arch Creek area and when required the Annapolis station was used for check work. No results were plotted from the Annapolis station, as few check readings were taken.

## 2) E. M. 16 Interpretation

The electro-magnetic profiles (see E. M. Survey Map 1" = 200 feet), indicate a weak discontinuous anomaly 1500 feet long. The anomaly is between L48 + 00 and L64 + 00 and 1600 feet west of the baseline. The profiles of the in-phase and quadrature readings indicate a long narrow zone of higher than normal conductivity. The area indicated by the anomaly corresponds with the magnetic high on the upper side of the peridotite sill. The anomaly is located between the two copper-nickel showings on the two creeks where the mineralization is exposed. The E.M. anomaly may be due to disseminated to massive sulphides as indicated from the surface mineralization. However, the anomaly could be caused by the peridotite intrusive contact with the contacting volcanics and sediments. The anomaly is not continuous along the

peridotite sill, but only in the area where sulphide mineralization is exposed on two separate showings.

The start of a second anomaly is indicated on L112 + 00 - 15 + 00 feet east of the baseline. This area corresponds to the most northern magnetic high on the magnetometer survey. Further work is necessary in the drift covered area to confirm mineralization and the presence of a peridotite sill.

A third area of interest is indicated from the electro-magnetic profiles, is between L00 + 00 and L16 + 00, 13 + 00 feet east of the baseline. The negative readings of both the in-phase and quadrature readings indicate a narrow zone of good conductivity. This area corresponds with the float that was assayed and found to contain copper mineralization up to 1.51% Cu. This zone requires further follow up prospecting work.

Recommendations and Conclusions:

Due to the close proximity of the Hudson Bay Mining Company, Quill Creek nickel-copper mine and separate peridotite sill the Arch Creek peridotite Cu-Ni prospect is most lucrative. The Quill Creek peridotite contains 3/4 of a million tons of \$100/ton Cu-Ni ore. It is interesting to note that the Quill Creek ore is located on the western side of peridotite, where as the Arch Creek mineralization is located on the eastern side of the peridotite.

The work that has been completed to date to the Legacy-Tippy-Jiffy group of claims should be expanded and continued to the north. Geological mapping has outlined the main peridotite sill and locates the Cu-Ni mineralizations. The magnetics survey outlines the peridotite sill and suggests a second ultramafic sill to the north. The electro-magnetic survey has indicated three zones of conductivity that correspond with Cu-Ni mineralization and the presence of the main peridotite sill.

Additional field prospecting on the south end of the claim group could possibly indicate copper mineralization not associated with the peridotite. However, a peridotite fissure could exist, wide at depth and peaking towards surface with the associated Cu-Ni mineralization.

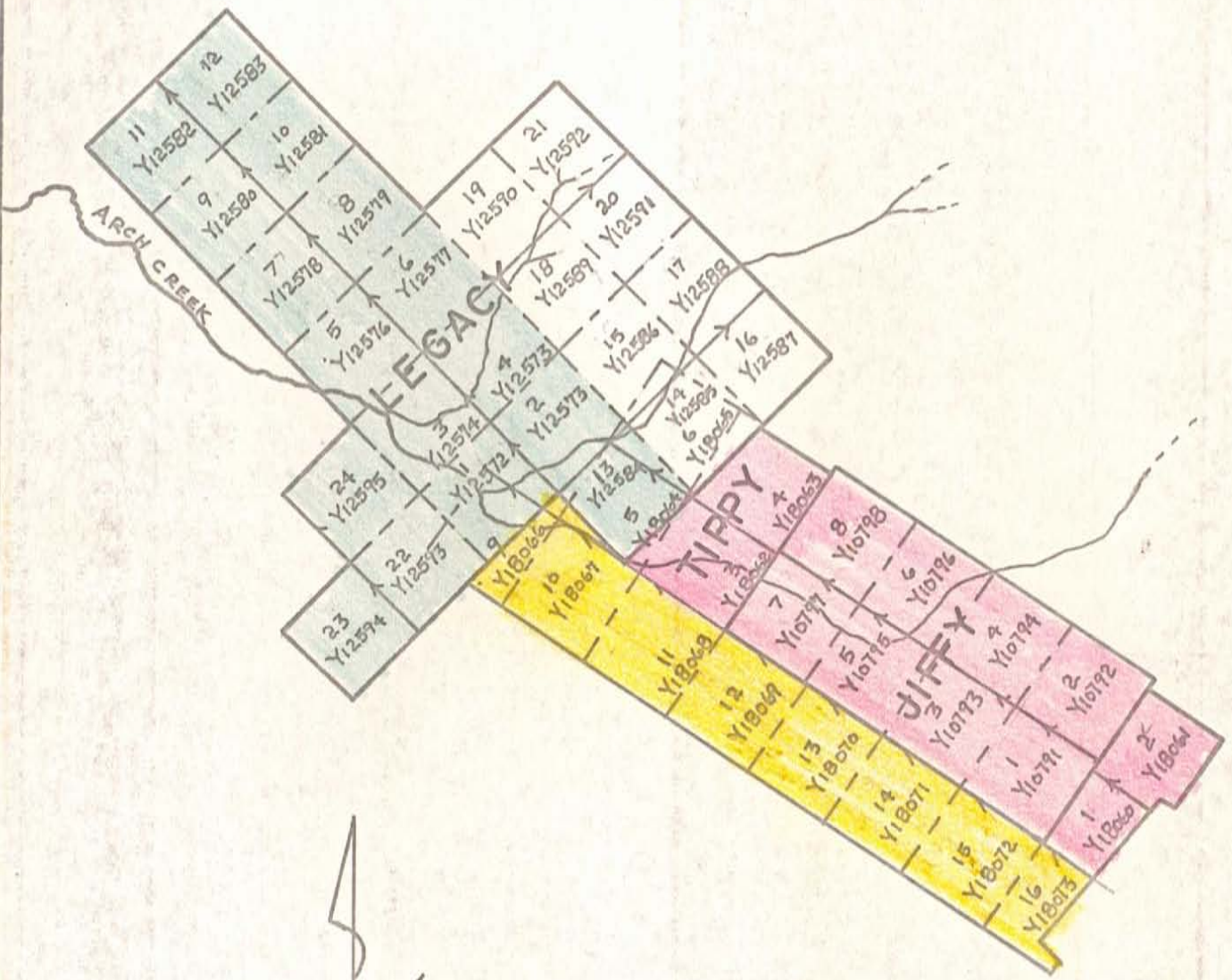
Further work both geological and geophysical should be conducted with an induced polarization survey in the three main areas of interest.

Expenditures:

The following list contains the various costs incurred in the Arch Creek Geological and Geophysical Surveys.

Line Cutting (20 miles @ \$85.00/mile)	\$ 1,700.
Transportation	300.
Geophysics E.M. Survey	1,600.
Geophysics Magnetics	1,800.
Geological Mapping	<u>1,000.</u>

TOTAL: \$ 6,400. - 6300 ?



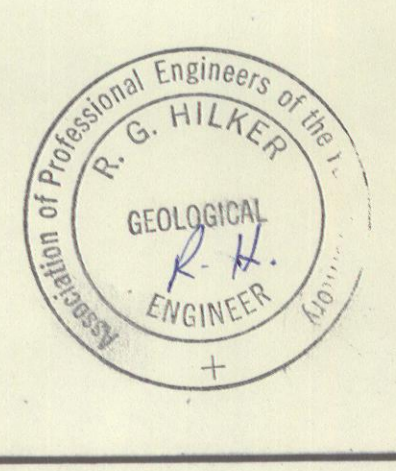
## ARCH CREEK CLAIMS

DR. BY R.M.	APP'D BY -	DIVISIONS
DATE: Oct. 1967	SCALE: 1/2 Mi to 1 in	
REF. NO.	DWG. NO.	



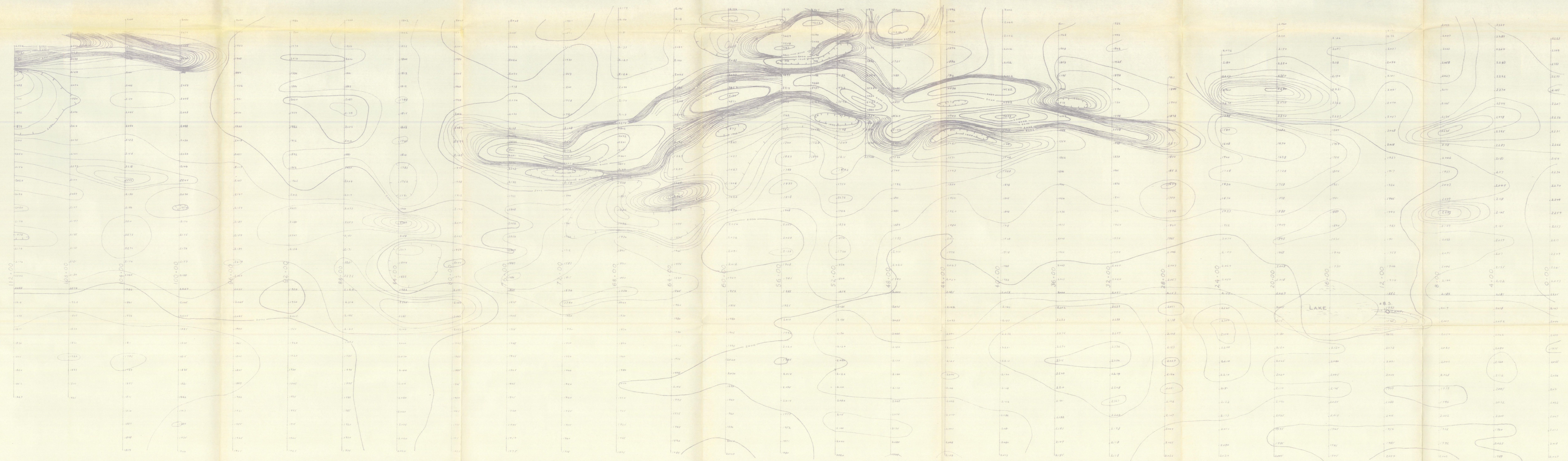
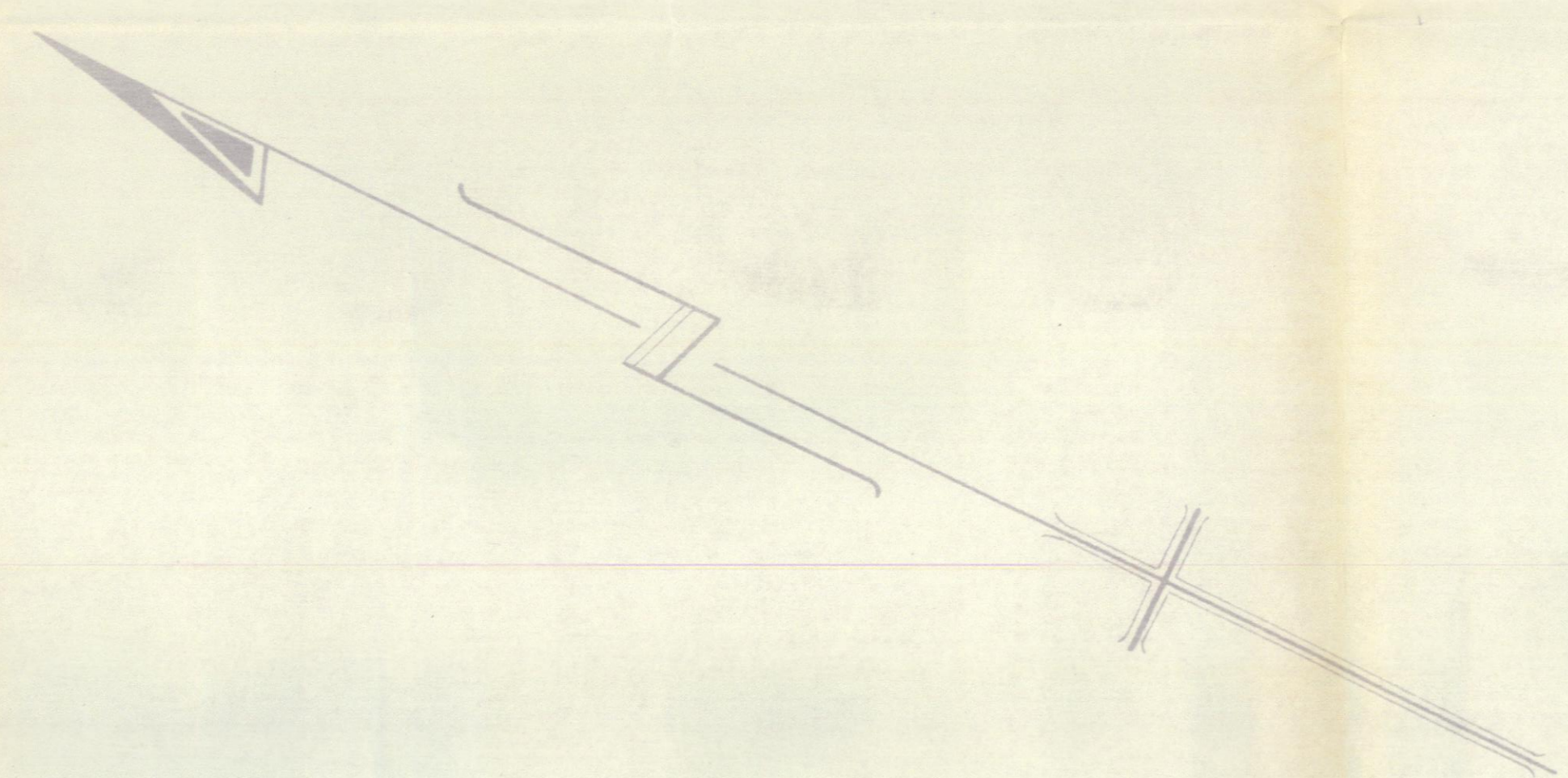
**GEOLOGICAL LEGEND**

Q	GLACIAL TILL
4	VOLCANICS - BASALT, ANDESITE, TUFF, AGGLOMERATE
3	SEDIMENTS - GREYWACKE, SHALE, ARGILLITE
2	FELSITE
1	PERIDOTITE 1A GABBRO

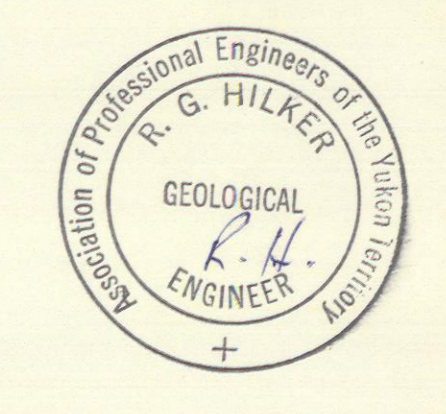


GEOLOGIST

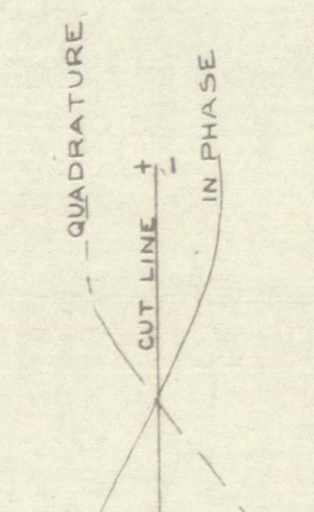
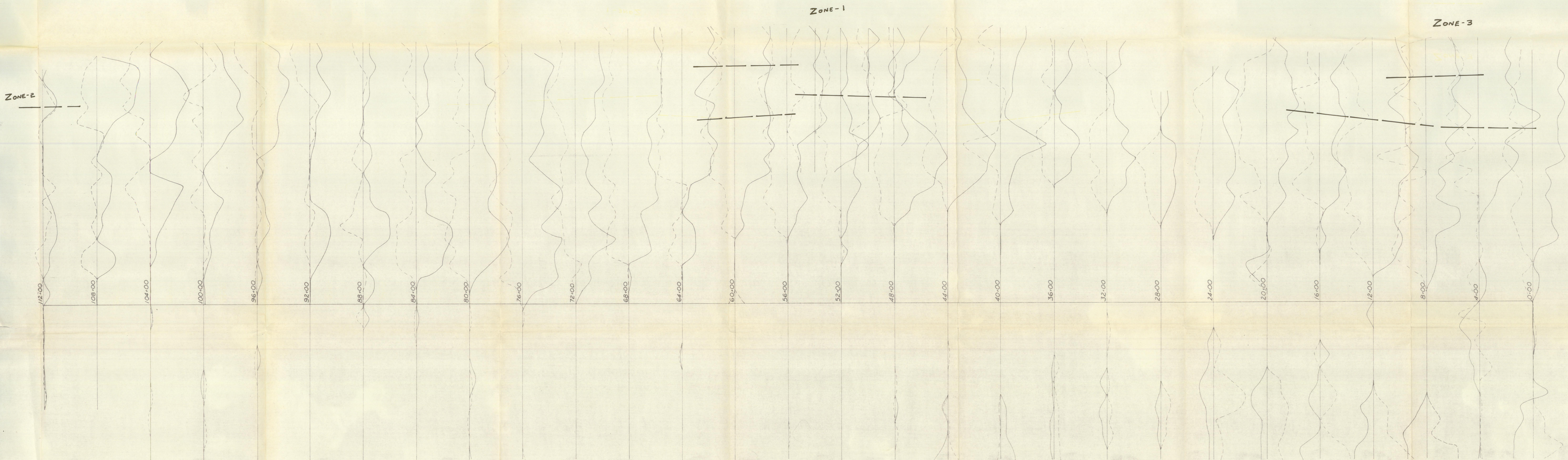
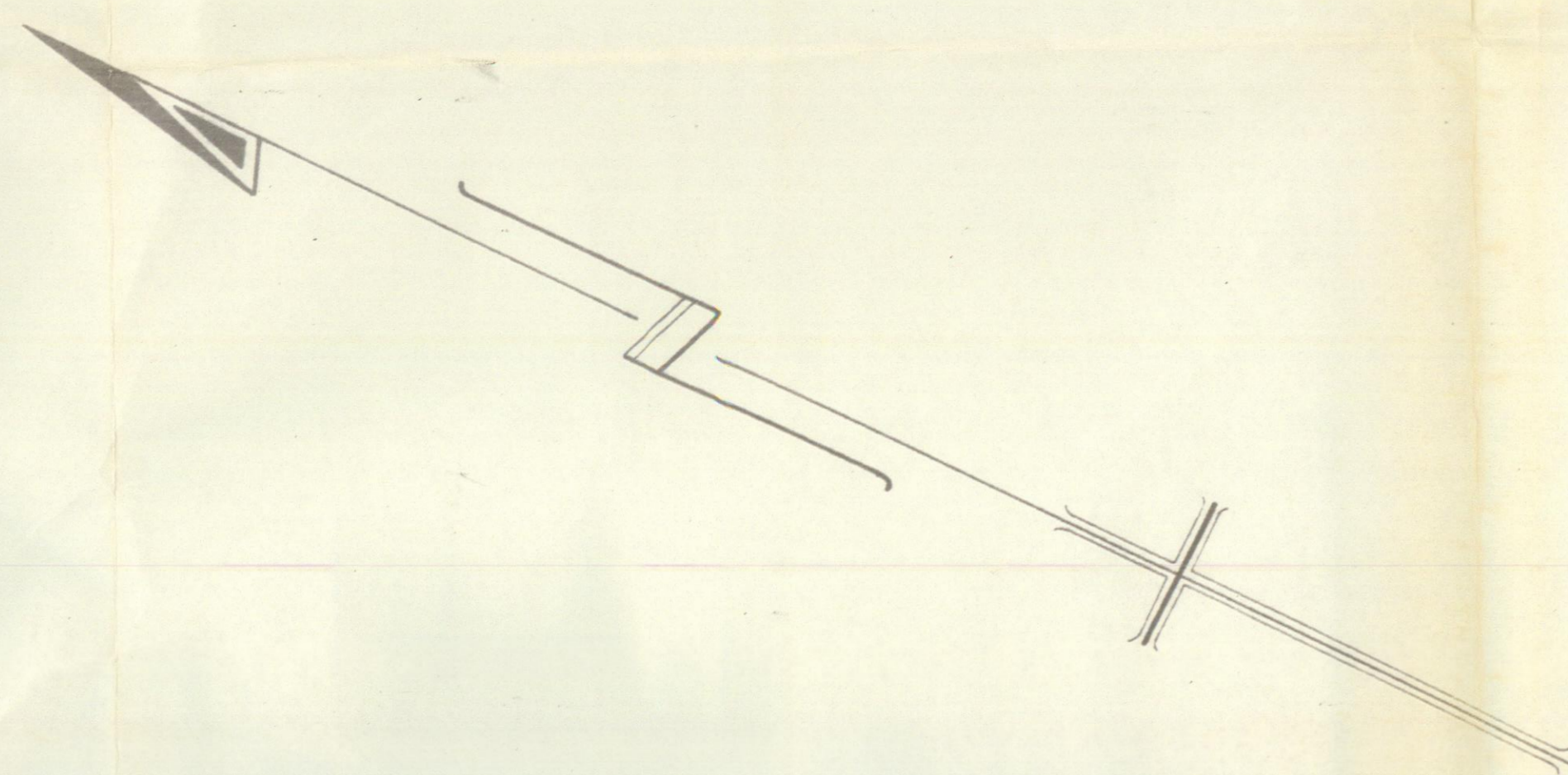
WHITEHORSE T.I.		
ARCH CREEK GEOLOGY MAP		
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WHITEHORSE, V.T.  
**ARCH CREEK MAGNETOMETER SURVEY**  
DR BY *P. G. HICKER* APP'D BY R. WALKER REVISIONS  
DATE SEPT 8 / 87 SCALE 1" = 200'  
REF. NO. DWG. NO.



WHITEHORSE, Y.T.		
ARCH CREEK EM 16 SURVEY		
DR BY F OSACHOFF	APPD BY R HILKER	REVISIONS
DATE SEPT. 6/67	SCALE 1" = 40'	
REF. No.	DWG. No.	

