

295

REPORT OF GEOLOGICAL SURVEY

AJAX, GEO AND J.P. GROUPS

By G. W. H. NORMAN, Ph. D.,

For: GRANDUC MINES LIMITED (N.P.L.)

June 24 - September 30, 1959

C O N T E N T S

Introduction	1
Location	2
Work Performed	2
Geo Group	2
J.P. Group	3
Ajax Group	3
Geology	4
Previous Work	4
Surficial Rock Units	4
Intrusive Rock Units	6
Structure	8
Mineralization	9

#1 Map: Geology of the Ajax, Geo and J.P. Groups,
800 feet to the inch. In Folder

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INTRODUCTION:

This report presents the geological data collected on the Geo, Ajax and J.P. Groups of claims in the Granduc Mines area of northern British Columbia, 25 miles northwest of the town of Stewart at the head of the Portland Canal. The work of collecting the data was part of a costly geological study made during 1959 of Granduc Mountain. In order to carry out work in this remote area, the camp at the air strip on the Leduc glacier had to be put in shape (see south edge of accompanying map) for the duration of the summer field season. Maintenance of the camp was required to carry out the work on the claims and a part of the maintenance consisted in repairs and other work with a bulldozer (D-6) on the airstrip, as a safety measure for the protection of personnel involved travelling into the area. The Granduc area cannot be reached by road, and to reach the claims air travel is essential. The work done with the cat consisted of packing and flattening the snow, removal of the snow when it became too thin for safety, ditching to prevent erosion by streams and packing and removal of stones and boulders.

LOCATION:

The geo, Ajax and J.P. groups of claims lie north from the North Leduc glacier and on the east side of the head of the South Fork of the Unuk River. The south edge of the group is about 2 miles north of the Granduc Mine and the north edge is 7 miles north of the mine.

WORK PERFORMED:

The geological party consisted of the following men.

G. W. H. Norman, B.A.Sc. 1926 U.B.C.: Ph.D. 1929 Princeton. Chief Geologist
K. G. Sanders, B.A.Sc. 1949 Toronto. Senior Geologist
Don Davidson, B.A.Sc. 1957 U.B.C. Junior Geologist
R. W. Hunt, Engineering Student, U.B.C. Surveyor
L. E. Iverson, Formerly Shift Boss, Granduc Mine, Geological Assistant
L. Meindl, Certified Alpine Guide, Bavaria. Surveyor's Assistant

The results of work performed is shown on the accompanying map, which outlines the three main claim groups in which the claims lie.

GEO GROUP:

A total of 54 man days were spent on and for the benefit of this claim group, which can be broken down as follows:

Chief Geologist	August 26 - September 5 inclusive
Senior Geologist	August 19-26 incl. and September 1-5 incl.
Junior Geologist	August 20 - 26 inclusive
Surveyor	August 19 - 28 inclusive
Geological Assistant	August 19 and September 1-5 inclusive
Surveyor's Assistant	August 22 - 28 inclusive

J.P. GROUP:

A total of 28 man days were spent on and for the benefit of this claim group, which can be broken down as follows:

Chief Geologist	August 21-24 inclusive and September 19th
Senior Geologist	September 22-30 inclusive
Junior Geologist	August 16-20 inclusive
Geological Assistant	September 22-30 inclusive

AJAX GROUP:

A total of 43 man days were spent on and for the benefit of this group, which may be broken down as follows:

Chief Geologist	September 22-29 inclusive
Senior Geologist	July 1-10 incl. and September 7-12 incl.
Junior Geologist	July 1-4 inclusive
Surveyor	July 1-4 inclusive and September 7-9 incl.
Geological Assistant	July 1-4 inclusive
Surveyor's Assistant	July 1-4 inclusive

The results of geological work performed are shown on the accompanying 800-scale contoured map. This map is part of one prepared for the mapping project, which covered an area 4 miles wide and 10 miles long. The cost of this map and the numerous identified photo points which it shows as small numbered circles was approximately \$1,500.00. A small pro rata part of the cost of the base map has been included in the performance of necessary work on the claims.

An Askania torsion type magnetometer was purchased for approximately \$2,000.00 and used in the general work in the region. Some tests were made along the south edge of the claim groups with this instrument, but cost of this work is not included.

Petrographic studies of the various rock types in the district, including those outcropping on the claim groups, are now being carried out by the Junior Geologist. Cost of having thin sections made and the microscopic study are not included.

GEOLOGY

PREVIOUS WORK:

Reconnaissance geological work was carried out in the Granduc area by W. R. Bacon, July 10 to September 10, 1955. His map, on 1 mile to 1 inch, was published by Department of Mines, B. C. The north margin of Bacon's mapping is at the North Leduc glacier and ends at the south edge of the mapping submitted with this report. Map 9-1957, on 4 miles to 1 inch, has been issued by the Geological Survey of Canada. It covers the Granduc Mine area, but merely incorporates Bacon's work without revision. It includes some information of a very generalized type in the area covered by the claims.

SURFICIAL ROCK UNITS:

The older rocks of the area can be separated into two main groups, one consisting of sedimentary rocks and the other of volcanic types. Due to the tight folding and alteration of these rocks it is not completely certain which of the two types is the older. The original sedimentary structures, such as cross-bedding and graded

bedding, have been eliminated by the metamorphic changes due to folding and igneous intrusions. The only structures indicative of the relative movement of adjoining beds are drag folds. Unfortunately, there have been several periods of folding and drag folds, if used without discrimination, yield contradictory information regarding the true superposition of beds. For the region mapped the evidence supports the conclusion that the volcanic rocks are older than the sediments. If the volcanic rocks are eventually shown to be younger than the sediments, the structure of the area will be even more complicated than it appears to be at present.

The volcanic rocks are green to brown weathering chloritic andesites with green amphibole phenocrysts derived from pyroxene, probably augite, and have been called augite porphyrites. They are interstratified with coarse agglomerate beds with semi rounded fragments of porphyritic andesite and siliceous dense well bedded sedimentary bands that are assumed to be tuffaceous in origin. Shearing is commonly present in these volcanic rocks and may be so intense locally that the fragments in the agglomerate are drawn out into long narrow streaks.

The volcanic rocks on the east side of the head of the South Unuk are recrystallized to a spotted hornfels type with small white feldspar metacrysts. This recrystallization is produced near the margin of the foliated granodiorite and diorite which underlie the Geo Claim group.

The sedimentary rocks are well bedded siliceous very dense types, with some interbedded light grey to dark limestone beds. These rocks have the general textures of mylonites produced by breaking down the primary constituent sedimentary grains to particles of smaller size, followed by some recrystallization of biotite, chlorite and sericite. Many fit the definition of phyllonite much better than quartzite. Some could be classed as greywacke or argillaceous greywacke or phyllonites. Depending on the preponderant presence of biotite, chlorite, or sericite, these rocks are respectively brown, green or very pale grey in color. In general, these rocks are well and finely banded, due partly to the rolling out of the original beds. All primary structures and fossils have been destroyed by alteration.

INTRUSIVE ROCK UNITS:

Six types of intrusive rocks were distinguished on the claims and in their general vicinity. The oldest intrusives are schistose diorite and greenstone, shown as a sill like body in claim "J.P.2".

The relative age of the series of diorite granodiorite dikes in the area to other intrusives is not always clear, but they appear to be much more altered than the Coast Range granodiorite. They are probably younger than the foliated granodiorite, but the diorite

dike shown on claim J.P. 8 was not in contact with the foliated granodiorite on J.P. 4, 7 and 9 claims.

The diorite and silicified diorite are probably closely related to the foliated granodiorite. The silicified diorite is a special phase of the diorite outcropping on Ajax Fraction, Ajax 2 and 3. A large mass of the less siliceous diorite outcrops in the centre of the Geo Group, and smaller masses outcrop in the Ajax Group.

The foliated granodiorite outcrops on the south third of the Geo Group and west half of the J.P. Group. It differs from the Coast Range intrusives in having a strong parallel alignment of its constituent minerals. These consist of plagioclase 30% (plus or minus) An. with quartz biotite and some hornblende.

The Coast Range granodiorite is a medium grained unfoliated rock, with the same general mineral composition as the foliated granodiorite. It contains a little potash feldspar, as well as oligoclase plagioclase.

The Coast Range intrusives outcrop about 6,000 feet west of the Geo and J.P. claim groups and are margined by metamorphosed rocks, including amphibolites, granulites, biotite schists. These have formed by recrystallization of sedimentary and volcanic rocks, similar to those which outcrop on the north side of the Geo Group, west and east sides of the J.P. Group and in the Ajax Group. The more intensely metamorphosed and recrystallized rocks are cut

by dikes and sills from the main granodiorite mass.

The youngest intrusive rocks are small basaltic dikes. One of these was noted in Claim J.P.8.

STRUCTURE

Numerous structural features of the rocks outcropping on the Geo, J.P. and Ajax claims were measured. These consisted of the attitude of bedding planes and schistosity planes. The axial plane and plunge of all visible small drag folds were measured. The axial planes of observed small anticlinal and synclinal folds were noted. The location and measurements of these structures on the three claim groups are shown by appropriate symbols on the accompanying map, which shows the approximate boundaries of rock outcrops and rocky areas.

The general interpretation of the structural features noted on the claims is that the foliated granodiorite and diorite on the Geo, Ajax and J.P. groups of claims are intruded along the east side of an anticline trending roughly northwest. This structure is succeeded by a general synclinal structure underlain by sedimentary rocks in the east part of the J.P. and central part of the Ajax Group. The east part of the Ajax Group is underlain by volcanic rocks on the west limb of an anticline intruded by diorite.

MINERALIZATION

The rocks underlying the claims and adjoining areas are cut by a very well developed system of tension joints that resemble bedding planes. The joints dip gently eastward or southward and are commonly filled by quartz a few inches to several feet thick. Three quartz veins in tension joints are shown on the map 500 to 1,500 feet east of Geo 14 and 16 claims. Many contain considerable pyrite which on weathering has heavily stained areas with iron oxides. Large areas stained with iron oxides also occur near some of the intrusive rocks, particularly the Coast Range granodiorite. The iron stained areas have caused considerable fruitless expenditures of effort, due to the rather small percentages of disseminated pyrite that can produce very extensive areas of iron stain.

February 2, 1960


G. W. H. Norman

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA.
TO WIT:

In the Matter of personnel employed and wages, fees and salaries paid by Granduc Mines Limited, from June 1, 1959 to September 30, 1959 for the geological survey of the Ajax, Geo and J.P. Groups in the Skeena Mining Division

I, George W. H. Norman, agent for Granduc Mines Limited (N.P.L.),
of 604-744 West Hastings Street, Vancouver 1,

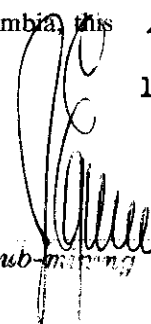
in the Province of British Columbia, do solemnly declare that the following men were employed for the said geological survey and their wages, fees and salaries were as follows:-

G. W. H. Norman, Ph.D.,	Chief Geologist	\$2,000.00 monthly
K. G. Sanders, B.A.Sc.,	Senior Geologist	750.00 monthly
D. Davidson, B.Sc.,	Junior Geologist	600.00 monthly
L. E. Iverson,	Geological Assistant and Camp Foreman	600.00 monthly
R. W. Hunt,	Surveyor	500.00 monthly
L. Meindl,	Surveyor's Assistant	450.00 monthly

The average number of shifts worked per month was 22, in accordance with the Hours of Work Act of the Province of British Columbia

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

DECLARED before me at the city
of Vancouver, in the
Province of British Columbia, this 4th
day of February 1960, A.D.



Sub-judging Recorder

A-Commissioner, etc.

In the Matter of

Personnel and salaries for

geological survey of Ajax,

Geo and J.P. claim groups

Skeena Mining Division

Statutory Declaration

(CANADA EVIDENCE ACT)

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA.

To WIT:

In the Matter of the proper qualifications
for conducting a geological survey of the Ajax,
Geo and J.P. Groups of mineral claims in the
Skeena Mining Division

I, George W. H. Norman,

of 604-744 West Hastings Street, Vancouver 1,

in the Province of British Columbia, do solemnly declare that my experience as a geologist is:-

- 1923-1926 Summer Assistant, Geological Survey, Windermere Map Area, Dease Lake Area, Stikine River Area. Geological Survey of Canada.
- 1926-1929 Part time Geologist in charge 1-mile quadrangle mapping Lake Ainslie Area, N. S. Geological Survey of Canada.
- 1930-1946 Geologist employed by Canadian Geological Survey:
1-mile quadrangle mapping Hillsborough, Moncton Area, N. B. and Oxford Area, N. S., 1930-1932:
4-mile mapping Granville Lake (Lynn Lake) Area, Manitoba, 1933:
Chibougamau, Opemiska, Mattagami Areas, 1934-1938:
Malartic Vald'Or Area, Quebec, 1000-scale geol. mapping, 1939-1946:
- 1947-1950 United Verde Copper Mine Area, Jerome, Arizona. 200-scale mapping for group consisting of Newmont, Phelps-Dodge, Homestake et al.
- 1950-1955 Chief Mine Geologist, Leadville Silver Lead Zinc Camp, Colorado.
- 1954-1957 Uranium exploration, U. S. A. Cordilleran region, Texas-Washington.
- 1958-1959 Geological investigation, British Columbia.

Employed by Newmont Mining Corporation and its subsidiaries as Geologist in U. S. A. since 1950

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

DECLARED before me at the city
of Vancouver, in the
Province of British Columbia, this 4th
day of February, 1960, A.D.

G. W. H. Norman

[Signature]

Witness Recorder A Commissioner, etc.

In the Matter of

The proper qualifications of G. W. H.

Norman for conducting a geological

survey of the Ajax, Geo and J.P.

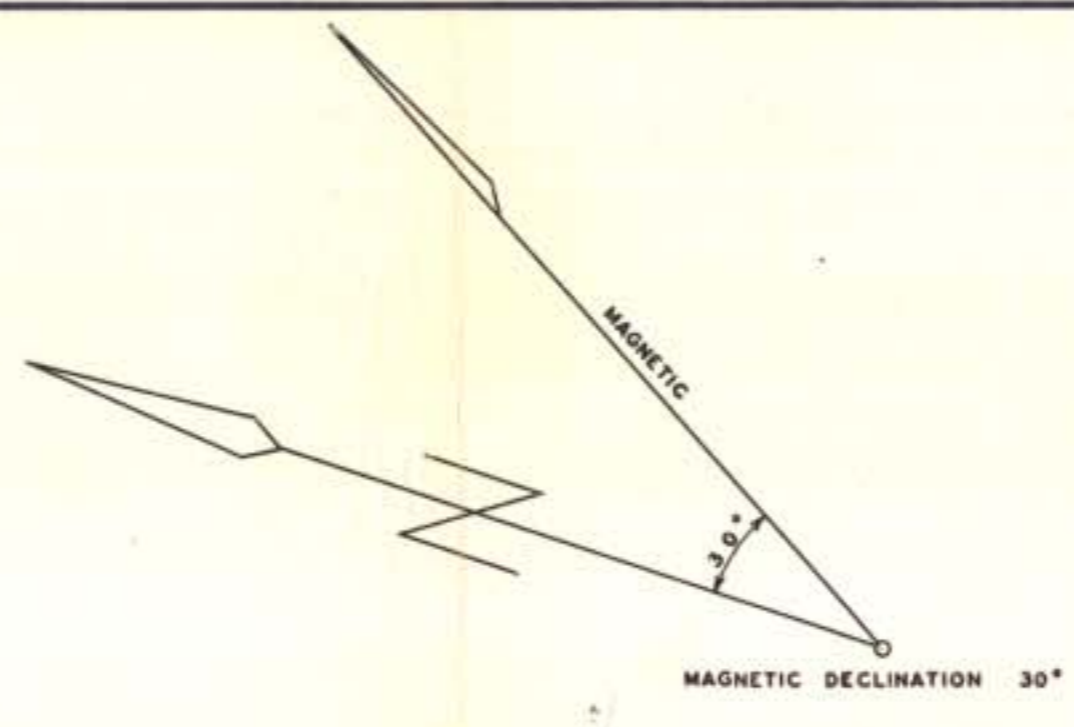
groups of mineral claims in the

Skeena Mining Division

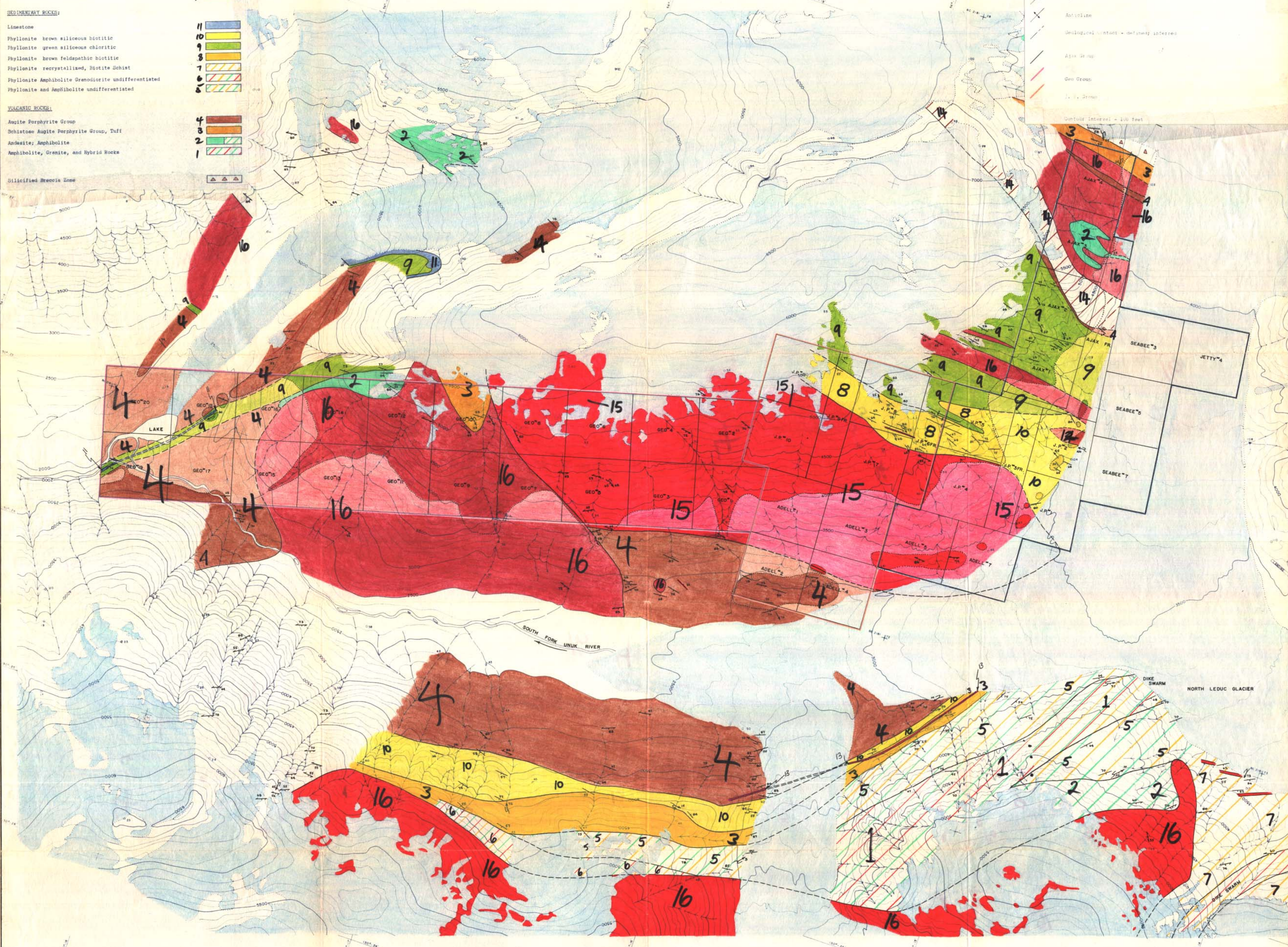
Statutory Declaration

(CANADA EVIDENCE ACT)

- LEGEND**
 NB 4 & 12 are undistinguishable.
 re: colours.
- Ice, Ice and Snow**
 18
- Gossan; Quartz veins**
 17
- INTRUSIVE ROCKS:**
- Tertiary Dikes**
 Coast Range Granodiorite, unfoliated
 16
 Granodiorite, foliated
 15
 Diorite; Silicified Diorite
 14
 Diorite, Granodiorite dikes
 13
 Schistose Diorite and Greenstone
 12
- SEDIMENTARY ROCKS:**
- Limestone
 11
 Phyllonite brown siliceous biotitic
 10
 Phyllonite green siliceous chloritic
 9
 Phyllonite brown feldspathic biotitic
 8
 Phyllonite recrystallized, Biotite Schist
 7
 Phyllonite Amphibolite Granodiorite undifferentiated
 6
 Phyllonite and Amphibolite undifferentiated
 5
- VOLCANIC ROCKS:**
- Andite Porphyrite Group
 4
 Schistose Andite Porphyrite Group, Tuff
 3
 Andesite; Amphibolite
 2
 Amphibolite, Granite, and Hybrid Rocks
 1
- Silicified Breccia Zone
 (Symbol)



- Geological Symbols:**
- Outerop Boundary
 - Bedding - strike and dip
 - Schistosity - strike and dip
 - Drag Fold - showing direction and degree of plunge of constituent anticline
 - Drag Fold - showing dip of axial plane etc.
 - Plunge of Folds - strike direction and degree
 - Syncline
 - Anticline
 - Geological contact - defined inferred
 - Axis of dip
 - Geo Group
 - Group
- Contour Interval - 100 feet



**GEOLOGY OF THE AJAX, GEO, AND J.P. GROUPS
 3 MILES NORTH OF GRANDUC MINE**

SCALE : 1" = 800' JUNE TO SEPTEMBER 1959

TO ACCOMPANY REPORT BY G.W.H. NORMAN P.H.D., FOR GRANDUC MINES LTD.

G.W.H. Norman

FEBRUARY 2, 1960

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 295 MAP #1

295