DEPARTMENT OF MINES
SOUTH AUSTRALIA

RB 66/158

MARBLE AND NEPHRITIC JADE

Section 116, Hd. Minbrie, Co. Jervois

- H.A. Schiller -

by

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GEOLOGIST
NON METALLIC SECTION

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12th June, 1968

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ABSTRACT

Detailed geological mapping has shown that marble varies from fine-grained, yellow and green to a coarse grained white rock. Reserves in the three deposits mapped amount to 18,500 tons, but only about 20% of this is suitable for slabs because of closely-spaced jointing. The marble masses are irregular in shape but comprise part of a persistent calc silicate formation.

Nephritic jade is confined to the calc silicate zone and occurs on the margins of the marble masses. Gem quality material appears to be related to weathering at the ground surface.

INTRODUCTION

The deposit is situated on Section 116, Hundred of Minbrie, County Jervois, 14 miles due north of Cowell on land which is leasehold with minerals reserved to the Crown. Mineral claims 4827 and 4926 are held by the landowner, Mr. H.A. Schiller, who has done a considerable amount of prospecting in the area.

Polished samples of marble and jade have been submitted to various buyers and because of the interest shown, Mr. Schiller requested geological assistance from the Department of Mines.

The marble deposit on M.C. 4827 was briefly inspected by Steel (1967), who assessed reserves at approximately 32,000 tons. Since then, the deposit has been further exposed by bulldozing.

The present investigation was carried out in two stages. Reconnaissance mapping was completed on 2nd and 3rd February, 1968, and was followed by a stadia survey of the Southern marble deposit (M.C. 4827) on 5th and 6th March, 1968, with assistance from J. Erkelens, Surveyor.

A suite of representative rock samples, collected from sites shown on Figure 3 has been prepared for the claim-holder.

REGIONAL GEOLOGY

Basement rocks in the Cowell area are of Precambrian age and were divided by Johns (1957) into two groups, viz. Gneiss and Schist Group which were subsequently named the Flinders and Hutchison Groups respectively (Johns 1961).

Rocks in the Hundred of Minbrie are equated with the Flinders Group and consist of quartz feldspar gneiss with minor quartzite, schist and amphibolite, all of which have been migmatized.

Locally within the gneisses are lenticular calc-silicate horizons consisting of serpentinous dolomite, calc-magnesium amphibolite and marble. The marble and jade deposits described herein lie in this formation.

Recent regional mapping by Johnson (pers. comm.) has shown the rocks near Mt. Ghearthy to lie on the drag folded west limb of a north plunging anticline. The fold axis is broken by a series of cross fractures showing left hand slip which complicate the geometry of the calcsilicate horizon.

True igneous activity appears to be confined to aplite and pegmatite dykes intruded parallel to the cross fractures.

DETAILED GEOLOGY

The main calcsilicate horizon is surrounded by quartz feldspar gneisses and schists containing a few thin calcsilicate bands (See Figure 3). The metamorphic layering and schistosity strike 30° (True) and are offset by cross fractures, in places tens of feet apart (See Figure 4). All the major marble lenses appear to belong to one calcsilicate horizon which averages 100ft. in width.

The marble lenses are surrounded by nephritic jade, nephrite, green talc and serpentine. The calcsilicate horizons also contain amphibolite gneisses and schists and also granitic masses which appear to be migmatized quartz feldspar rocks mobilised from the adjacent rocks.

Marble occurs in lenses up to 300ft. in length and 100ft. in width, which have sharp boundaries with the adjacent rocks. It is assumed that the depth of the lenses will be, on the average, about half the outcrop length.

There are three main marble masses, referred to as Southern, Central and Northern deposits (See Figure 3), all of which have been exposed by bulldozing or blasting. The southern deposit, which is the largest, lies on the north flank of a low hill and is the deposit previously described by Steel (op. cit.). Each deposit contains fine-grained yellow and green marble and coarser grained white marble, the colour being displayed in bands and as colour splashes in white matrix or white splashes in a colour matrix.

Reserves have been calculated using a conversion factor of 175lbs. per cubic foot (based on S.G. of marble = 2.8) and allowing 30% wastage during quarrying.

In the Southern deposit, assuming that the condition of the wall rock will allow mining to 40ft. (which is doubtful), there are approximately 12,000 tons of marble available. If the proportion of colour remains the same at depth as shown

on the surface, this reserve is made up of 3,000 tons of yellow, 2,000 tons of green, 7,000 of white marble.

The Central deposit contains 6,500 tons of marble of which 2,500 tons are yellow, the remainder white. None of the green variety was seen in this area. Only 2,000 tons are available in the Northern deposit. Coloured varieties are present but have not been calculated individually.

A closely spaced joint system is developed throughout most of the marble and because of this it is considered that only about 20% of the quoted reserve will provide slabs for dimension stone. The remainder could be used for marble chips.

Occurrences of nephritic jade were investigated over the claim areas and found to be confined to the calc-silicate horizons. In fact, nephrite is closely associated with the boundaries of the marble on extensions a few tens of feet along strike. Due to the difficulty in determining gem quality, an accurate assessment of reserves cannot be made. However, the better quality material appears to be related to weathering processes at the present ground surface.

Associated with the marble and nephrite are green serpentinous talc, stringers of chrysotile asbestos and other tremolite-actinolite minerals. However, none of these minerals are sufficiently well developed to be of economic interest.

The reserves quoted have been determined to a depth of 40ft., and removal of overburden has not been considered. Because of the closely spaced jointing in the marble, and low physical strength of the surrounding talc, removal of at least some wallrock will be necessary as quarrying proceeds downwards. This should be carefully considered before mining operations commence. No accurate determination of the dip of the marble bodies could be made, but if a vertical dip is assumed little error in reserve calculations is anticipated.

Petrological descriptions of selected samples of jade and marble are attached in Appendix 1 and 2.

CONCLUSIONS

Marble and nephrite are associated with a major calcsilicate horizon which strikes 30° (True) and is cut in an east-west direction by fractures.

Marble occurs in lenticular masses, with sharp boundaries, having an assumed depth of half the outcrop length. Nephrite and serpentinous talc are closely associated with the marble.

Reserves of marble are assessed at 12,000 tons in the Southern deposit, comprising 3,000 tons of yellow, 2,000 tons of green and 7,000 tons of white; 6,500 tons (2,500 tons of yellow) in the Central deposit and 2,000 tons of mixed coloured marble in the Northern deposit.

The marble is closely jointed and only about 20% of the quoted reserves is suitable for slabs.

Although diamond drilling would enable a more accurate assessment of reserves to be made, exploration by this method will be costly and is not justified.

Nephritic jade is associated with the marble and is possibly related to a weathered ground surface. The quality varies considerably, the total quantity of gem quality material is probably small and detailed ground prospecting would be required to outline limits.

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per

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MGM:CC:SMA
12.6.1968

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APPENDIX 1

Petrological report on selected nephritic jade specimens from Northern Deposit M.C. 4926

Carried out by I.F. Scott of AMDEL.

Location: Section 116, Hd. Minbrie.

P870/66 to P878/66 : TS18703 to TS18711

The following nine thin sections are of the same rock type and therefore only comments on minor variations have been made.

An x-ray diffraction powder photograph was made of the fibrous mineral which forms more than 95% of most of these samples and the mineral identified as an amphibole from the actinolite-tremolite series. Because of its very fine and extremely interwoven texture as well as overall green colour the rocks made of this material are nephritic jade.

TS18703 - Mainly nephrite with a very fine grain size. Larger crystals of colourless amphibole (1.5mm. in length) as well as vermicular structures replaced by the same mineral. Accessory amounts of apatite, chlorite, opaques as well as another biaxially (+) alteration product were observed.

TS18704 - A few coarse grains of fibrous amphibole (0.4mm.), cut by fractures which are sometimes iron stained. Accessory opaques.

TS18705 - Coarse fibrous aggregates (0.8mm. maximum length).

TS18706 - Very fine fibrous nephrite containing a number of peculiar coarse circular structures with fine grained cores.

TS18707 - Very coarse (1cm. length) and very fine nephrite. Some faintly pleochroic in green.

TS18708 - Very fine to medium grained nephrite. Some clay Alteration product and considerable fracturing.

TS18709 - Fine and even grained.

TS18710 - Very fine grained oriented nephrite containing minor clayey patches and some fractures.

TS18711 - Medium grained nephrite with considerable fracturing.

APPENDIX 2

Petrological Investigation of Some Skarn- Type Rocks From Eyre Peninsula - Section 116, Hd. Minbrie.

Carried out by G. Williams, AMDEL.

Sample P102/68: G4: TS20553

Rock Name:

Forsterite marble.

Hand Specimen:

A fine to medium grained rock in which whitish layers free from mafic minerals pass through the generally grey-coloured rock.

Thin Section:

A visual estimate of the constituents gives the following:

	%
Dolomite	40
Calcite	26
Serpentine	26
Olivine	5
Phlogopite, Muscovite, Brucite, Tremolite	3

This is a fine grained xenomorphic rock in which calcite and dolomite crystals are intermixed in an equigranular mosaic. Some bands lacking in calcite are present, and these also lack olivine.

Throughout the dolomite/calcite mosaic are abundant grains of olivine which have been either partially or completely replaced by serpentine. Rare tremolite crystals are also present. Scattered throughout the whole rock are flakes of phlogopite, muscovite, brucite and small patches of opaques.

Sample P103/68: G3: TS20554

Rock Name:

Serpentine marble (ophicalcite).

Hand Specimen:

A medium to coarse grained carbonate rock in which pale green grains of approximately 1mm. diameter are closely packed. Rare specks of a black opaque mineral are randomly scattered.

Thin Section:

A visual estimate of the constituents gives the following:

	%
Calcite	40
Serpentine	50
Dolomite	10
Muscovite)	
Brucite)	Accessory

This is a medium grained rock with a xenoblastic texture. "Grains" of serpentine have a medium diameter of 0.5mm., though exceptional grains of up to 8mm. in length are present. The serpentine in these rounded areas is relatively coarsely fibrous.

Surrounding these serpentine "grains" is a mosaic of equidimensional calcite with interspersed grains of dolomite, and scattered through this are flakes of muscovite commonly seen to grade into ?chlorite.

Sample P104/68: G8: TS20555

Rock Name:

Serpentine marble (ophicalcite).

Hand Specimen:

Coarse grained carbonate crystals at one end of the specimen pass into a finer grained layer through which are abundant irregular pale green grains. Opaque specks are rare.

Thin Section:

A visual estimate of the constituents gives the following:

	%
Dolomite	59
Calcite	20
Serpentine	20
Brucite, Opaques	1

This is generally a coarse grained rock. Layers of very coarse mosaic dolomite alternate with layers of mosaic calcite with lesser dolomite. These latter layers contain "grains" of serpentine of irregular to sub-spherical shape. In many "grains" the serpentine has incorporated ?clay particles causing a brownish colouration. Clusters of brucite flakes are scattered through the carbonate.

Sample P105/68: G11: TS20556

Rock Name:

Tremolite.

Hand Specimen:

A medium grained, pale green rock composed of matted acicular crystals.

Thin Section:

A visual estimate of the constituents gives the following:

	%
Tremolite	99
Calcite	1

This rock is composed almost wholly of tremolite occurring as a felted matt of acicular and subhedral crystals. Very small patches of calcite are scattered throughout.

Discussion:

These four rocks have been collected from an environment of thermal metamorphism.

The parent rock type of P102, P103 and P104 was a dolomite with siliceous impurities. Calcite would also have been present in the parent of P105.

Thermal metamorphism of the dolomites has resulted in their recrystallisation together with the formation of forsterite, or where calcite was also present (P105), tremolite. The olivine has subsequently been serpentinised.

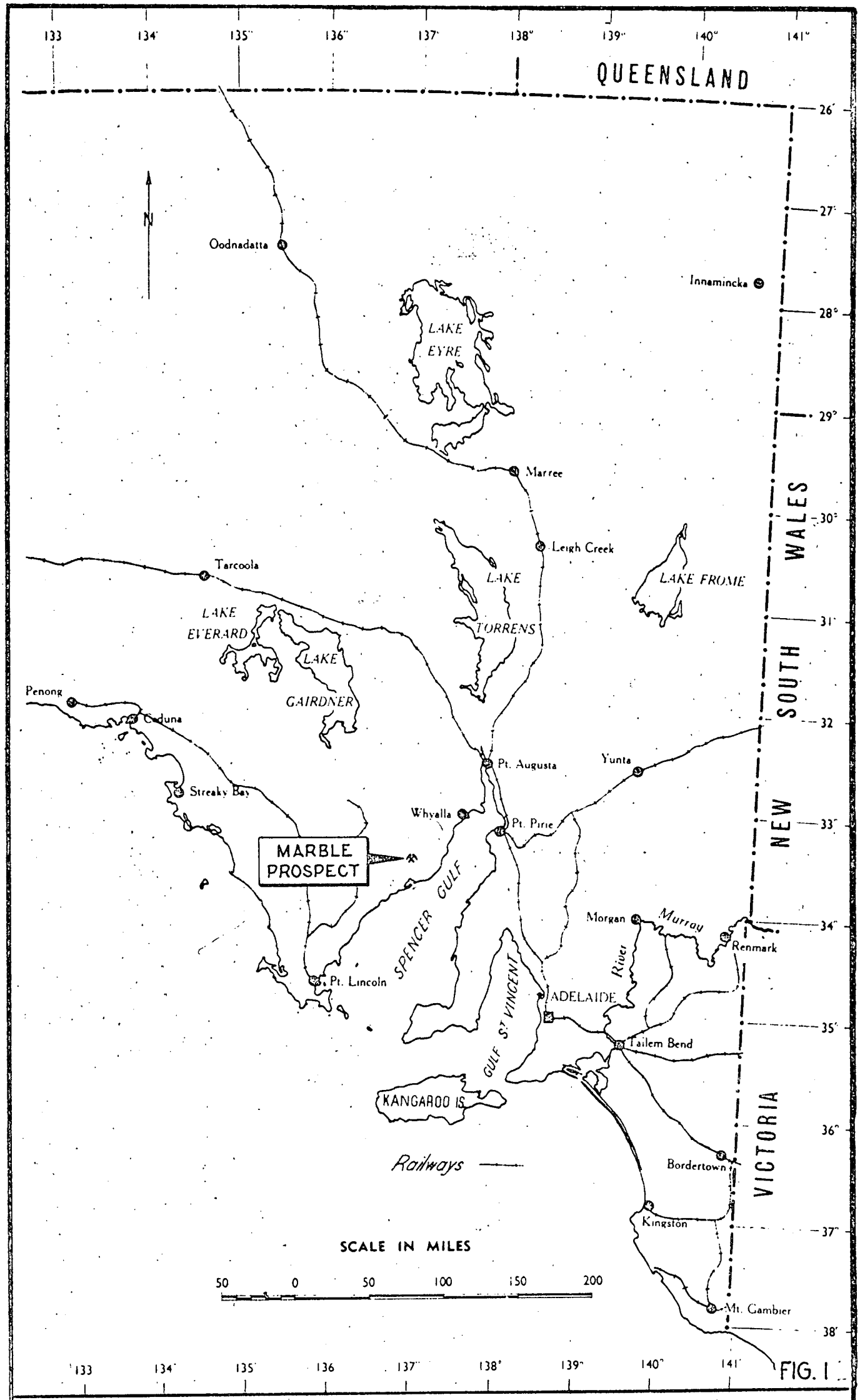

FIG. 1

DEPARTMENT OF MINES — SOUTH AUSTRALIA

NON-METALLIC MINERALS SECTION	Drn. M.M.	MT. GHEARTHY MARBLE DEPOSIT SEC. 116 HD. MINBRIE LOCALITY MAP (H.A. SCHILLER)	SCALE: As shown
	Tcd. R.H.		S6439
	Ckd. L.V.W.		Dm 14
GEOLOGIST	Esd.		DATE: 12.3.66

DF No. S5850 994-2

N

CLAIM PEG

Access Track

Fence

730

740

720

CLAIM PEG

710

720

Fence

730

740

750

760

770

45

65

LEGEND

CALC SILICATE HORIZON

Nephrite, epidote granofels to gneiss contianing variable amounts of nephrite, epidote, quartz, felspar.

Serpentinous granofels– serpentine with tremolite, talc, other calc. silicates.

Marble– white, grey, green and yellow banded marble, serpentinous marble and dolomite.

QUARTZ FELSPAR GNEISS with muscovite and/or biotite.

QUARTZ AMPHIBOLE GNEISS with felspar.

QUARTZ FELSPAR GRANOFELS

Fault

Strike & Dip of foliation 65

Contour based on arbitrary datum 740 750

SCALE

FEET 50 0 50 100 150 200 FEET

68–459

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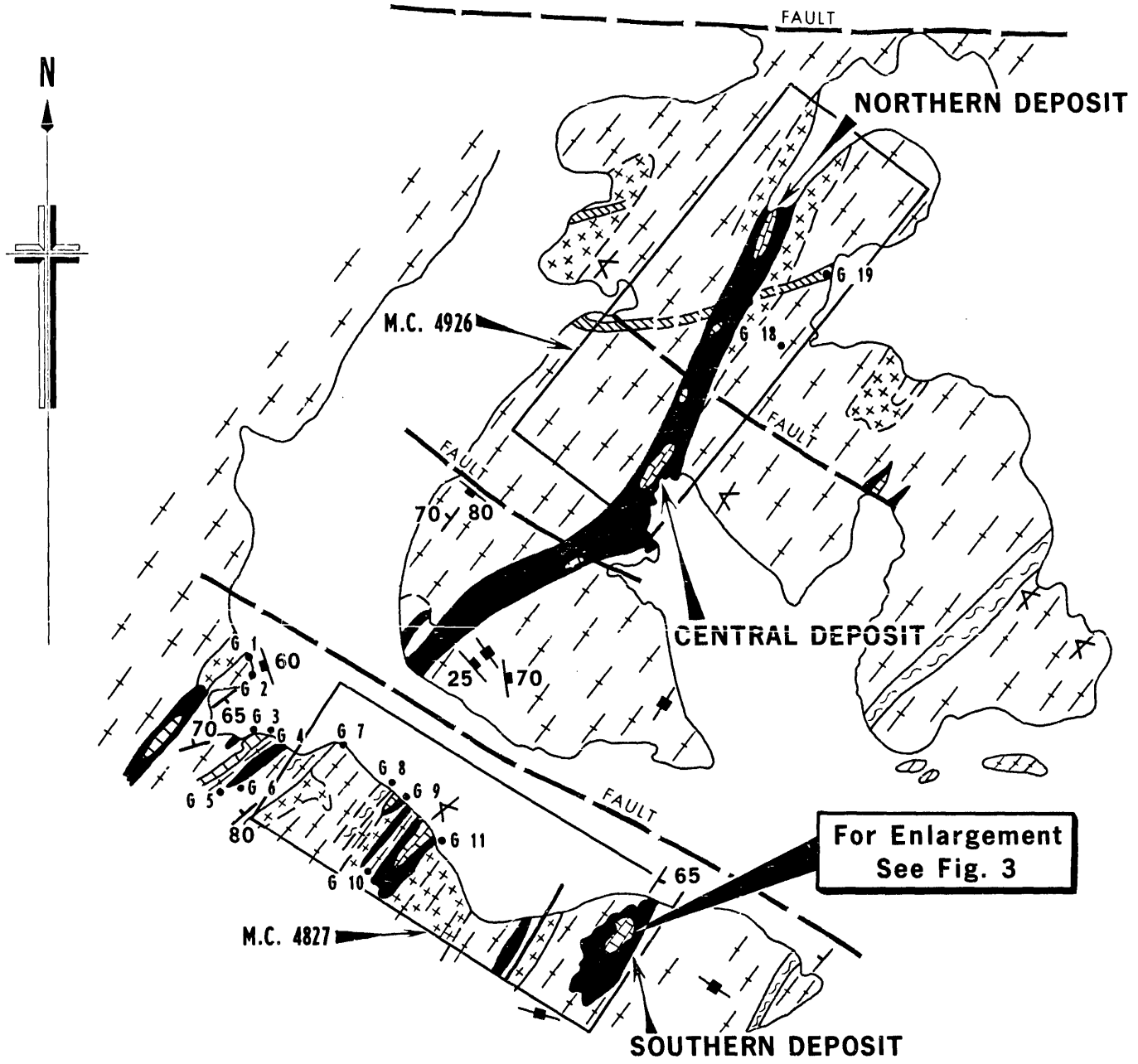

LEGEND

Calc silicate horizon: nephrite, epidote granofels to gneiss, marble and serpentinous marble in lenticular masses, minor tremolite and talc.

Quartz felspar gneiss.

Micaceous schists.

Granite and granitised quartz felspar gneiss.

Alluvial soil

Pegmatite

Strike & Dip of foliation — 65

Strike & Dip of joints — 70

Rock sample location — G 4

SCALE

FEET 500 0 1000 2000 3000 FEET

68—458

M.G. Mason Geologist

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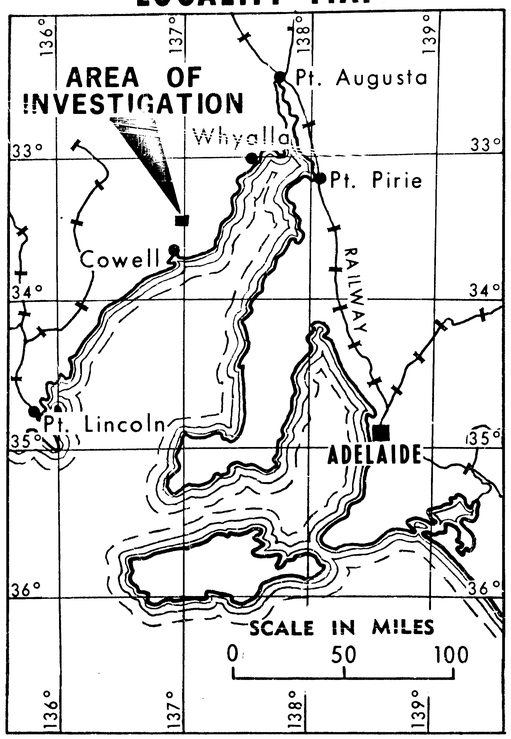
LOCALITY MAP



LEGEND

PRECAMBRIAN

LOWER GNEISS GROUP

Quartz, Felspar gneiss

Quartzite (coarse grained) and quartz sericite Schist

Serpentinous dolomite with calc–magnesian amphiboles, some marble

Plunge of drag fold 68

Strike and dip of bedding 80

SCALE

MILES 0 1 2 3 4 5 MILES

SALT

HIGHWAY

CREEK

? FAULT

? FAULT

MT. GHEARTHY

FAULT

SCARP

MT. GHEARTHY MARBLE DEPOSIT

MINBRIE HILL

RECENT

LINCOLN

24 28 62 76 64 82 20 68 73 27 80 37 58 78 40 80 67 22 54 56 60 57 25 42 21

68–207

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