

DEPARTMENT OF MINES AND ENERGY  
SOUTH AUSTRALIA

REPT.BK.NO. 78/103

GEOCHEMICAL EXPLORATION FOR GOLD  
MOUNT GRAINGER AREA

GEOLOGICAL SURVEY

by

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MINERAL RESOURCES DIVISION

Rept.Bk.No.	78/103
G.S.	No. 6070
D.M.	No. 263/77

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MOUNT GRAINGER AREA

INTRODUCTION

At Mount Grainger Mine, most of the gold ore was mined underground from a zone of hydrothermal alteration which plunges to the southwest. This alteration is not exposed at the surface. A similar zone exists in one of the workings in the Dustholes Ranges, 3 km to the northwest.

Prospecting and stream sediment surveying was carried out in search of similar alteration zones. Forty two stream samples were collected by W.P. Fradd and J. Martins in March 1978 and analysed by A.A.S. methods for Cu, Pb, Zn, As, Ag and Au.

LOCATION

Mount Grainger Goldfield is located 265 km northeast of Adelaide and 10 km north of the township of Oodlawirra on the Barrier Highway (Figure 1). Access within the goldfield is reasonable. The goldfield is situated in the hundred of Coglein, county Herbert within the District Council of Peterborough, part of the Mid-North Planning Area.

HISTORY AND PRODUCTION

The history and production of the mines at Mount Grainger have been documented by Fairburn and Nixon (1966). A total of approximately 6 400 tonnes of ore was treated for a recovery of 110.7 kg gold bullion. A further 528 tonnes of ore was treated from the Dustholes workings for a recovery of approximately 8.2 kg gold bullion.

## GEOLOGICAL SETTING

The structure and geology of the region are shown on ORROROO (Binks 1968) and outlined by Binks (1971).

Figure 2 is modified from the preliminary draft of Nackara map sheet (unpublished).

Burra Group shales and siltstones are exposed in the core of the Mount Grainger Anticline with Umberatana Group sediments on the flanks. In the core of the anticline, and south of Mount Grainger, dismembered units of the Callana beds are discordantly exposed in a diapiric structure, the Mount Grainger Diapir. Minor andesitic dykes are reported from within the diapir (Wright, 1966).

The Mount Grainger Anticline has been thrust against the Oodlawirra syncline eliminating the eastern limb of the anticline (Binks, 1968). The fold has been overturned to the west, <sup>east</sup> near the northern end of the Mount Grainger Diapir (Binks, 1971) and bulges in a northwest direction near the Dustholes Mines. Near the Mt. Grainger Mine, the statistical axis of the fold has a plunge of  $40^{\circ}$  in the direction of  $243^{\circ}$  (Fairburn and Nixon, 1966) which approximates the plunge direction of the Mt. Grainger Mine ore shoot. Numerous strike and dip faults are present in the area. The strike faults appear to control ore emplacement.

## GOLD MINERALISATION

Gold is restricted to the following two localities within the  $30 \text{ km}^2$  of the Mount Grainger Goldfield.

Mount Grainger, mineralisation extends for 2 km across the nose of the Mount Grainger Anticline. The main mines are

- a) Mount Grainger Mine
- b) Medora Mine
- c) Golden Junction Mine
- d) Jones Shaft

Mineralisation is restricted to a basal arkosic unit of the Appila Tillite at Mount Grainger and Medora Mines and in a sandy unit near the top at the Golden Junction Mine. Jones Shaft has not been inspected.

The workings lie along the trace of the Hanging Wall Vein, a fault/shear zone which strikes northeast and dips west slightly steeper than the enclosing country rocks.

At Mount Grainger Mine, hydrothermal alteration extends up to the full 6 m width of the arkosic unit, but does not penetrate down into the underlying Burra Group shale and siltstone, nor up above the Hanging Wall Vein. Fairburn and Nixon (1966) have shown that the zone of hydrothermal alteration is of a double ended conical shape with the axis of plunge being  $31^{\circ}$  in a direction of  $242^{\circ}$ . Fairburn and Nixon suggest that because of the similar attitudes of the zone and the fold axis, ore may persist at depth beyond the 67 m level in the old workings.

#### Dustholes Workings

The Dustholes workings extend for 2 km across the nose of the Mount Grainger Anticline but higher up the sequence. Gold mineralisation is found along a narrow fault/shear zone which dips steeply west within the Gumbowie Arkose Member, here kaolinised felspathic sandstone. This zone of mineralisation is sandwiched between dense siltstone, Waukaringa Siltstone, at the base, and a massive tillite, Pepuarta Tillite, at the top. The workings are all shallow, maximum depth being about 15 m. From the underground workings the shear zone, appears to narrow with depth. Alteration similar to the alteration at Mt. Grainger Mine is present in this shear zone.

The similarity between the Dustholes workings and the Mount Grainger Mine is striking. In both cases,

- 1) the mineralised zone is localised in an arkosic unit,
- 2) the arkosic units are sandwiched between dense siltstone and shale at the base and massive tillite at the top,
- 3) mineralisation appears to be controlled by fault/shear zones
- 4) and hydrothermal alteration is common to both localities.

Although the country rocks are different stratigraphic units, gold mineralisation appears to have similar lithologic and structural control.

#### SAMPLING AND RESULTS

The locations of 42 stream sediment samples were selected for maximum coverage of the nose of the anticline. The samples were sieved in the field to the 20# fraction (850 microns). Results of analysis by Amdel using A.A.S. for Cu, Pb, Zn, As, Ag, and Au (gold detection limit 50 ppb) comprise the Appendix.

Anomalous gold values were detected up to 500 m downstream in the streams draining from known gold mineralisation. No gold was detected in the other stream sediment samples.

Low order copper anomalies were detected in several streams. The location of these anomalous values does not overlap the anomaleous zone outlined by Binks (1970). The maximum value for copper was 250 ppm. There are only two anomalous zinc and lead values, the highest readings being Zn 680 ppm and Pb 500 ppm. No significant As or Ag values are reported.

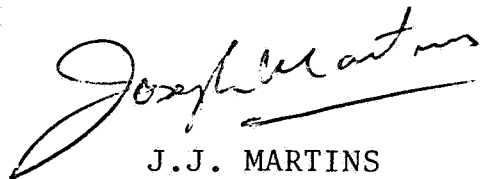
## CONCLUSIONS

Mineralisation at the Mount Grainger goldfield is localised within narrow fault/shear zones. These zones occur in arkosic units which are sandwiched between dense shales and siltstones at the base, and massive tillite at the top.

Gold mineralisation is associated with zones of hydrothermal alteration within fault/shear zones.

No new areas of hydrothermal alteration associated with fault/shear zones have been located.

The stream sediment survey has shown that the 20# fraction of sediment is sufficient to detect gold mineralisation at Mount Grainger where the source may be up to 500 m up stream. The possibility of finding new areas of surface gold mineralisation on this field is remote. However, drilling may be warranted to test the down dip potential of the Mt. Grainger Mine.



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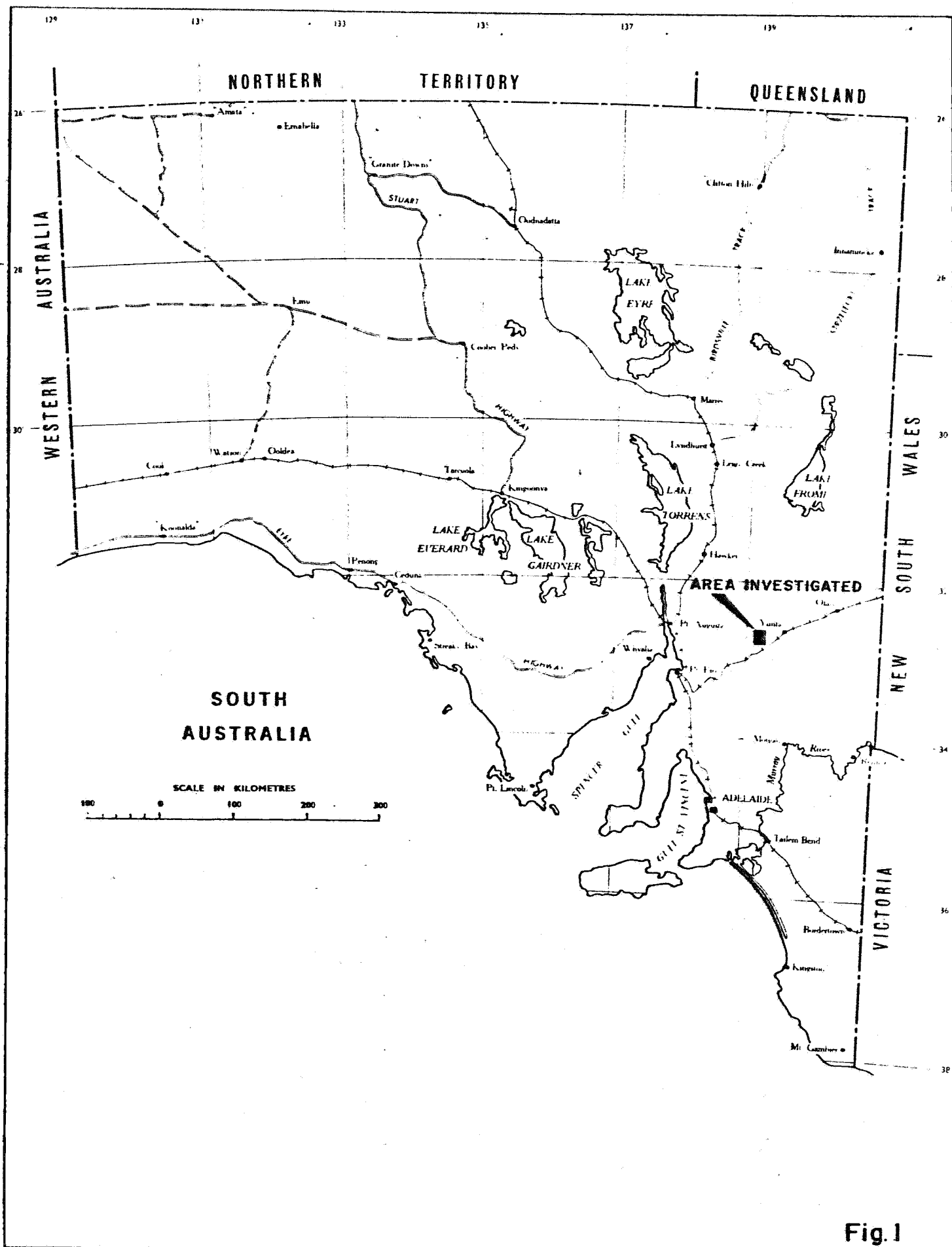


Fig.1

DEPARTMENT OF MINES — SOUTH AUSTRALIA

GEOCHEMICAL EXPLORATION FOR GOLD  
MT. GRAINGER AREA  
LOCALITY MAP

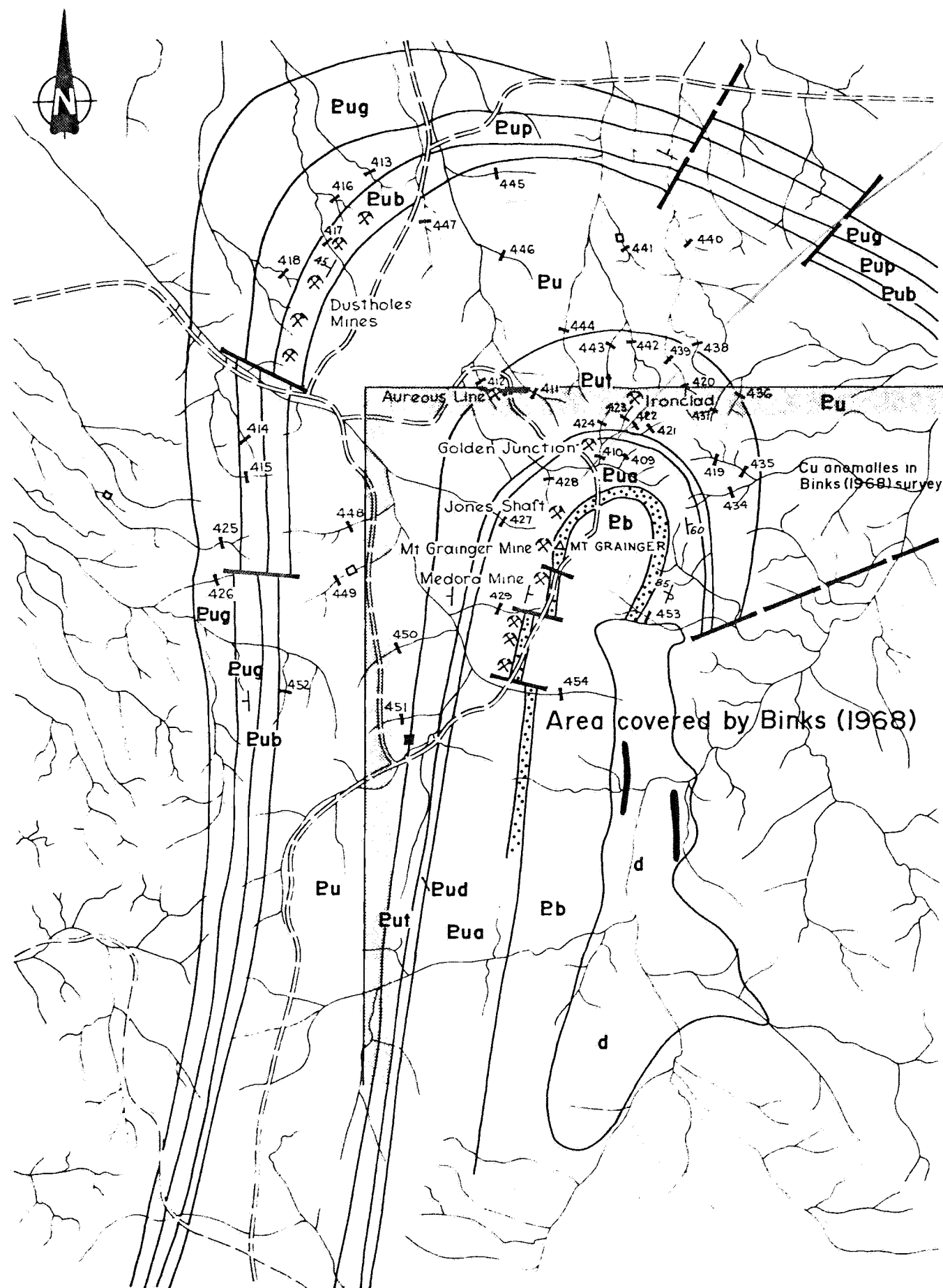
Compiled J. M.

Drawn A.F. C.K.C.

Date August 1978

Drawn No

S13564



Geology after P.J. Binks 1971  
Modified by J.J. Martins

approx position  
of M.C. 831 ~ 868

- Pug GRAMPUS QUARTZITE: Feldspathic, off-white sandstone, locally silicified, some quartzite lenses.
- Pup PEPUARTA TILLITE: Grey-green massive siltstone, local occurrence of small boulders.
- Pub GUMBOWIE ARKOSE MEMBER: Massive off-white feldspathic sandstone, arkose, some siltstone interbeds, minor ripple-marks near base.
- Pu UMBERATANA GROUP: Undifferentiated grey, grey-green, and yellow-brown siltstone, well-laminated, interbeds dolomitic siltstone, shale and sandy siltstone, ripple-marks near top.
- Put TAPLEY HILL FORMATION: Well-laminated, blue-grey sandy siltstone, mottled appearance near base, minor quartzite interbeds, thin calcareous bands.
- Pud TINDELPINA SHALE MEMBER: Finely laminated dark-grey carbonaceous shale, occasional thin dolomite lenses.
- Pua APPILA TILLITE: Boulder tillite, massive yellow-brown siltstone matrix, pinkish boulders mainly quartzite. Arkosic tillite at base.
- Pb BURRA GROUP: Undifferentiated brown, grey and yellow-brown interbedded siltstone, phyllite and calcareous siltstone beds.
- d Diapiric breccia - silicified siltstone, quartzite, dolomitic siltstone and bands of ferruginous sandy siltstone with carbonate matrix. Rafts of contorted siltstone and dolomite.
- Andesite dykes in diapir.

- Geological boundary
- Fault
- Strike and dip of bedding
- Track
- Dam
- Ruin
- Stream sample location (G448/77)
- Mine or workings



Fig. 2

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA		SCALE 1:50000
COMPILED J.J. Martins		DATE August 1978
DRN A.F.	CKD	PLAN NUMBER
GEOCHEMICAL EXPLORATION FOR GOLD MT. GRAINGER AREA GEOLOGY AND SAMPLE LOCATIONS		78-603