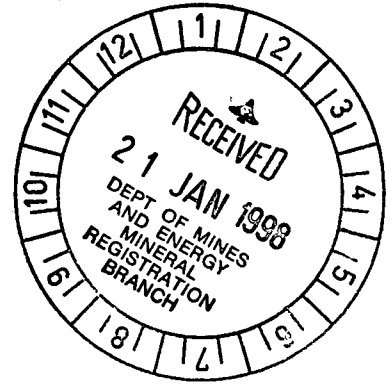


Geophysical, Sampling and Drilling Data

**Digital data was not submitted with all reports up to
and including 24 October 2000**

GOLDSTREAM MINING N.L.
A.C.N. 009 129 560



Annual Report
E.L. 2222 "Mt. Grainger"

From 25 October 1996 to 24 October 1997

Author: I.B. Freytag
Date: December 1997
Copies to: MESA (2)
GDM - Perth
GDM - Adelaide
I & M Filsell

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	(2) Co, Ni, Mo, Zn, Pb
Appendix 4	Analytical data, BCL stream sediment survey - Au, Ag, Cu

1. **Summary**

A licence scale gold reconnaissance in EL 2222 has commenced with a review of historical data and past exploration, followed by drainage sampling for low level gold and associated metals.

Structural characteristics of the licence area and the Mount Grainger goldfield setting have been interpreted from aerial photographs and aeromagnetic images.

The geochemical results have defined a number of catchments with significant gold anomalies. It is planned to follow these up with detailed infill drainage sampling, field checking, and soil or RAB geochemistry as necessary to isolate drill targets in the second year of tenure.

2. **Introduction**

Exploration Licence 2222 covers the Mount Grainger goldfield and surrounding areas in the Nackara Arc. Numerous gold prospects and small mines are scattered through a broad stratigraphic interval, within the complex Mt Grainger Anticline.

Past gold production has been modest, but the recognition in more recent years of certain geological similarities to the Telfer deposit in Western Australia and a lack of systematic gold exploration in the areas surrounding the goldfield in the past, have provided the basis for a new exploration approach within EL 2222.

3. **Location and Access**

Exploration Licence 2222 is located 240 kilometres to the north-north-east of Adelaide (Figure 1). The Barrier Highway to Broken Hill traverses the south eastern corner of the licence area, passing through the small settlement of Oodla Wirra.

Mount Grainger gold mine is 11 kilometres north of Oodla Wirra. It is reached by graded track off the Dawson road, through undulating, sometimes thickly wooded (mallee) pastoral country.

General access in the licence area is available on a network of property tracks, however, vehicle movement is restricted in some of the more rugged terrain, particularly the Dustholes Range flanking the western side of the licence, and parts of the north east.

Climate in this region is semi-arid. Summer storms produce most of the rainfall which may cause sheet flooding.

4. **Tenure**

Exploration Licence 2222 was granted to Ian and Mark Filsell (collectively 50%) and John Simnovec (50%) on 25 October 1996 for an initial term of 12 months. Title has since been extended to 24 October 1998.

EL 2222 covers an area of 375 square kilometres. Eleven small mining leases and claims (aggregate 116 hectares) are excluded from the licence, including the Mount Grainger mine lease.

The licence holders have entered into joint venture with Goldstream Mining N.L. to explore the area with Goldstream as manager.

Land use is devoted entirely to sheep and cattle grazing on a number of small to medium sized freehold station properties.

The area is within the Kuyani Native Title Claim SC95/4.

5. **Geology and Mineralisation**

Exploration Licence 2222 is positioned in the central part of the Nackara Arc, a north east trending component of the Adelaide Fold Belt, which developed in a thick sequence of late Proterozoic sediments during the Delamerian (Cambro-Ordovician) orogeny.

The eastern margin of the Arc is intruded by syn- to late orogenic granitoids.

Gold-bearing quartz veins and reefs are widely scattered across the Nackara Arc, mostly stratabound, saddle reef and fracture-related deposits which developed with the folding. There is a perceived regional association with certain levels in the stratigraphic sequence, and fluid movements resulting in auriferous veining are considered to be granite-related (Morris and Horn, 1990; Reid, 1996).

The Mount Grainger Anticline, covered by EL 2222, is a unique and complex structure described by Conor (1987) as a regional kink (Figure 2). Burra Group sediments are exposed in the core of the fold, also pierced by older diapiric breccias, and the flanks show up-sequence stratigraphy through Umberatana into Wilpena Group sediments (Binks, 1971).

Andesitic rocks were recorded in the diapir by Wright (1966). Amygdaloidal and trachytic andesites were considered to be rafted blocks in the breccia, while a porphyritic type was mapped as dyke rock intruding the breccia. The andesites were reported to be hydrothermally altered with evidence of potash metasomatism (Farrand, 1984).

The focus of the Mount Grainger goldfield has been the Mount Grainger line of workings, striking NNE, where complex quartz veining is largely confined to the basal arkosic member of the Appila Tillite. Small fracture-controlled gold-bearing reefs occur in the underlying Burra Group, and through the sequence upward to the Gumbowie Arkose which hosts the Dustholes line of gold prospects.

Several small copper and ironstone flux mines exist in the licence area, and a group of very small gold workings is located at Oodla Wirra.

6. Previous Exploration

Appendix 1 provides a summary of historical data and past exploration programmes relevant to EL 2222.

Over the past 30 years most exploration has concentrated on the Mount Grainger mine and line of workings, the Dustholes line, and the spread of gold prospects in the inner apical part of the Mount Grainger anticline.

Of significance to the Goldstream reconnaissance is the fact that regional geochemical drainage surveys which took in the licence area did not test for gold.

Some of the detailed geochemical work, for instance on mine samples (Horn, 1987), stream sediments and soil (Morris, 1984 and Binks, 1970), has shown degrees of correlation between gold and Co, Ni, Ag, As, Cu, Zn.

7. Work completed in EL 2222

7.1 Data review

Open file company reports and internal government reports have been examined at the Department of Mines and Energy. A summary featuring work programmes is contained in Appendix 1.

7.2 Remote sensing

A first-pass scan of colour air photographs (scale 1:40,000) has defined regional fracture sets which are considered to have some bearing on the distribution of gold mineralization (Figure 6).

7.3 Geophysics

Interpretation of aeromagnetic images has delineated regional data breaks reflecting deep-seated crustal fractures, and anomaly "lows" which may suggest magmatic or hydrothermal activity (Figure 6).

7.4 Rock sampling

Thirty four miscellaneous samples collected during field familiarization were analysed for Au, Mn, Co, Ni, Cu, Zn, As, Ag, Sb and Pb (Appendix 2).

7.5 Stream sediment BCL survey

A total of 209 samples were taken for 2 kilogram BCL Au, Cu, Ag analysis (Appendix 4; Figure 3). Anomalous values for Au (Figure 4) and Cu (Figure 5) have been chosen arbitrarily from simple frequency plots.

Gold-anomalous catchments thus defined, some with coincident Cu or Ag anomalies, occur along a 5 km wide NW-SE strip through the Dustholes-Mount Grainger area and further south-east.

7.6 -80# stream sediment analyses

Samples of -80# material were collected at each of the BCL sites and analysed for Au, Cu, As (Appendix 3).

Pulps of 70 of these samples located in the gold anomalous zone were later analysed for Co, Ni, Zn, Mo, Pb as likely pathfinder elements. Contrast in this material was found to be low.

8. Planned Future Work

All gold anomalous catchments will be followed up with in-fill stream sediment sampling for BCL analysis. Specific anomalies will be prospected and assessed for soil and/or RAB sampling and drill target definition.

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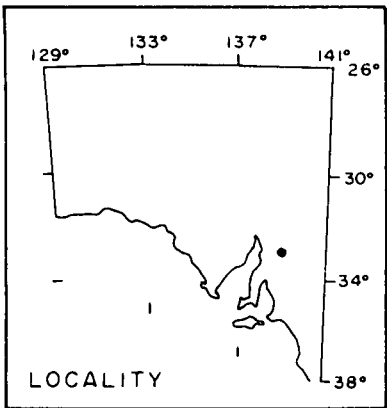
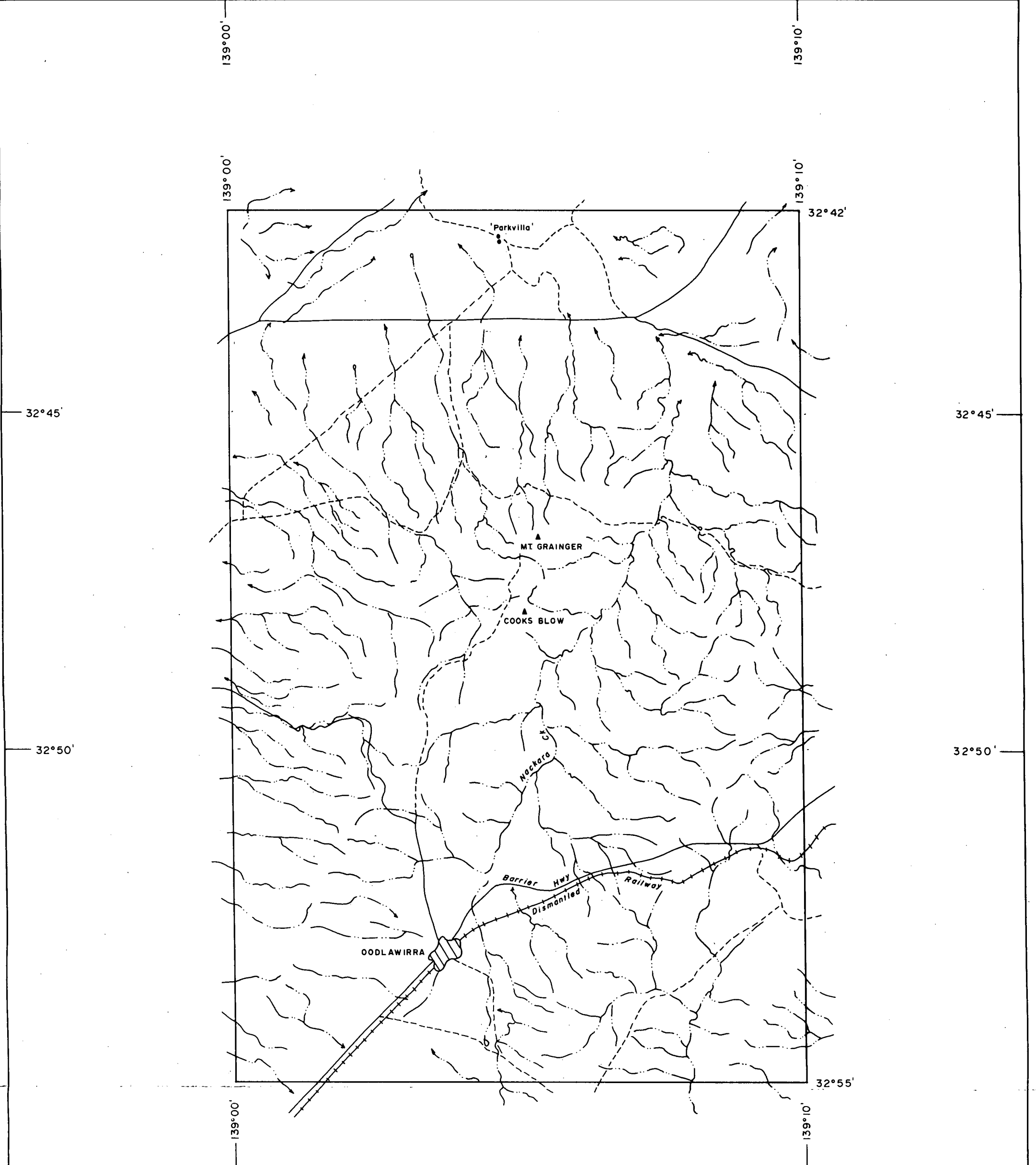
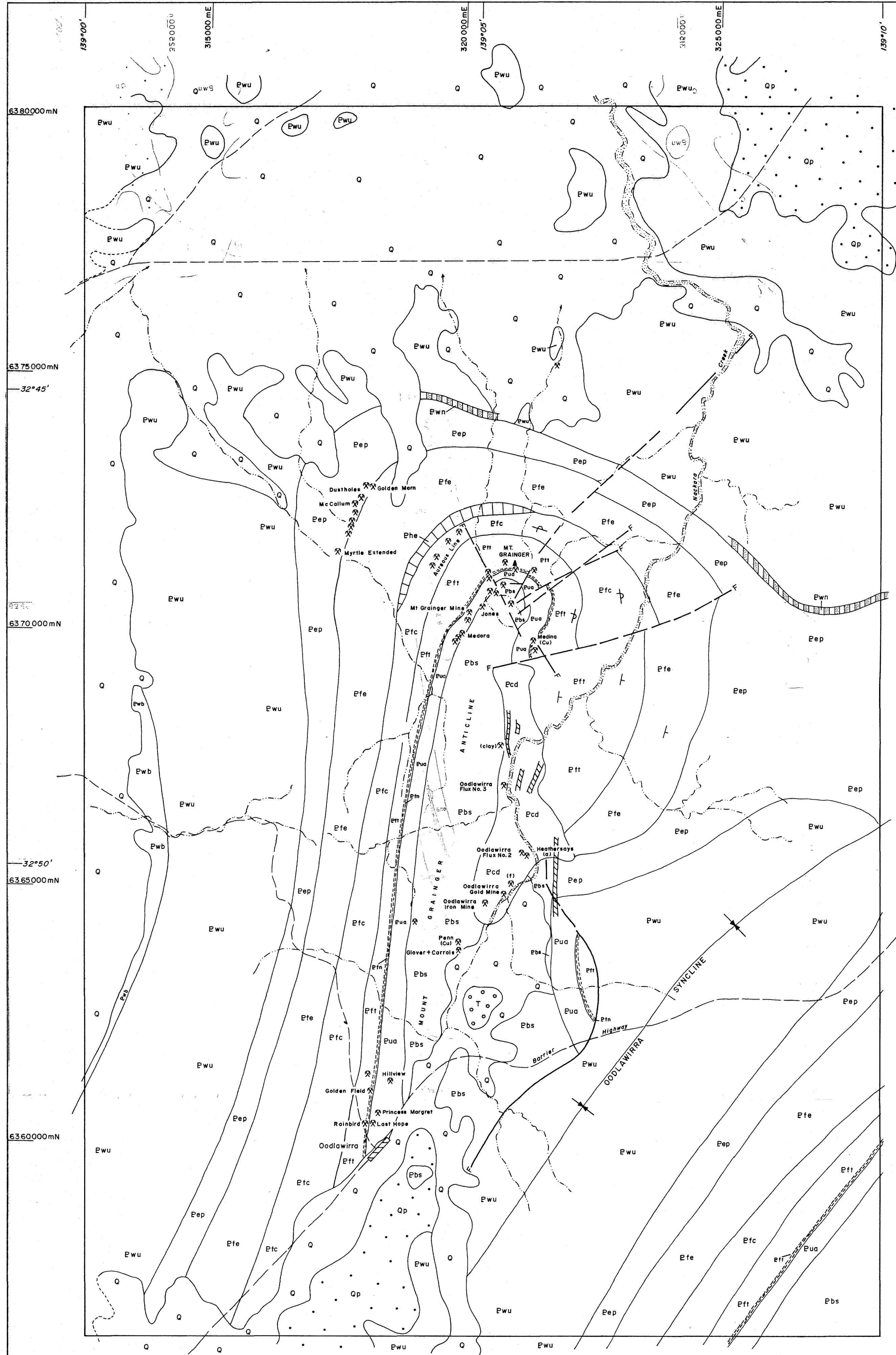
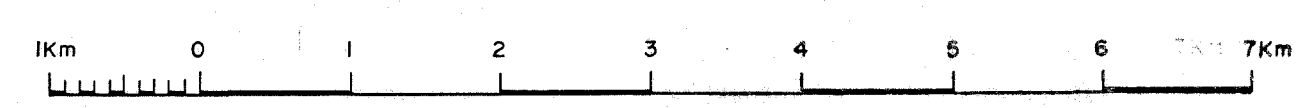


FIG: 1

GOLDSTREAM MINING N. L.		
EL 2222 - MT. GRAINGER		
Location plan		
SCALE: 1:100 000	DATE: DEC 97	
DRAWN: F.R.	REPT. NO.: 011	SA 070



- LEGEND**
- | | | |
|------------------|-----|---|
| QUATERNARY | Q | Surficial cover (undifferentiated) |
| | Qp | Telford gravels, clay, calcrete |
| TERTIARY | Qp | Silcreted gravels |
| WILPENA GROUP | Pwb | Bunyerroo Fm - red shale, siltstone |
| | Pwu | Ulupa Siltstone - green siltstone |
| | Pwn | Nuccaleena Fm - laminated dolomite |
| | Pep | Pepuarta Tillite - massive diamictite (Gumbowie Arkose) |
| UMBERATANA GROUP | Pfe | Enorama Shale - green shale |
| | Phe | Etina Fm - oolitic, stromatolitic limestones |
| | Pfc | Tarcowie Siltstone - grey-green siltstone |
| | Pft | Tapley Hill Fm - grey calcareous siltstone |
| | Pfn | Tindelpina Shale Member - black shale, flaggy dolomite |
| BURRA GROUP | Pua | Appila Tillite - diamictite, dolomite, arkose |
| CALLANNA GROUP | Pbs | Saddleworth Fm - grey-green calcareous siltstone |
| | Pcd | Mt. Grainger Diapir - shale, chert, dolomite (disturbed, ?diapiric emplacement) |
| | | andesite (altered) |
- X Mine / prospect (most Au)
 a - alluvial
 f - flux quarry
 Cu - copper
 F Fault (mapped)
 Main road / highway



Source of data:
Geology of the central Mount Grainger Anticline,
Including the goldfield, from Morris (1984)
Reminder of licence area from
ORROROO 1:250 000 published map (1968)

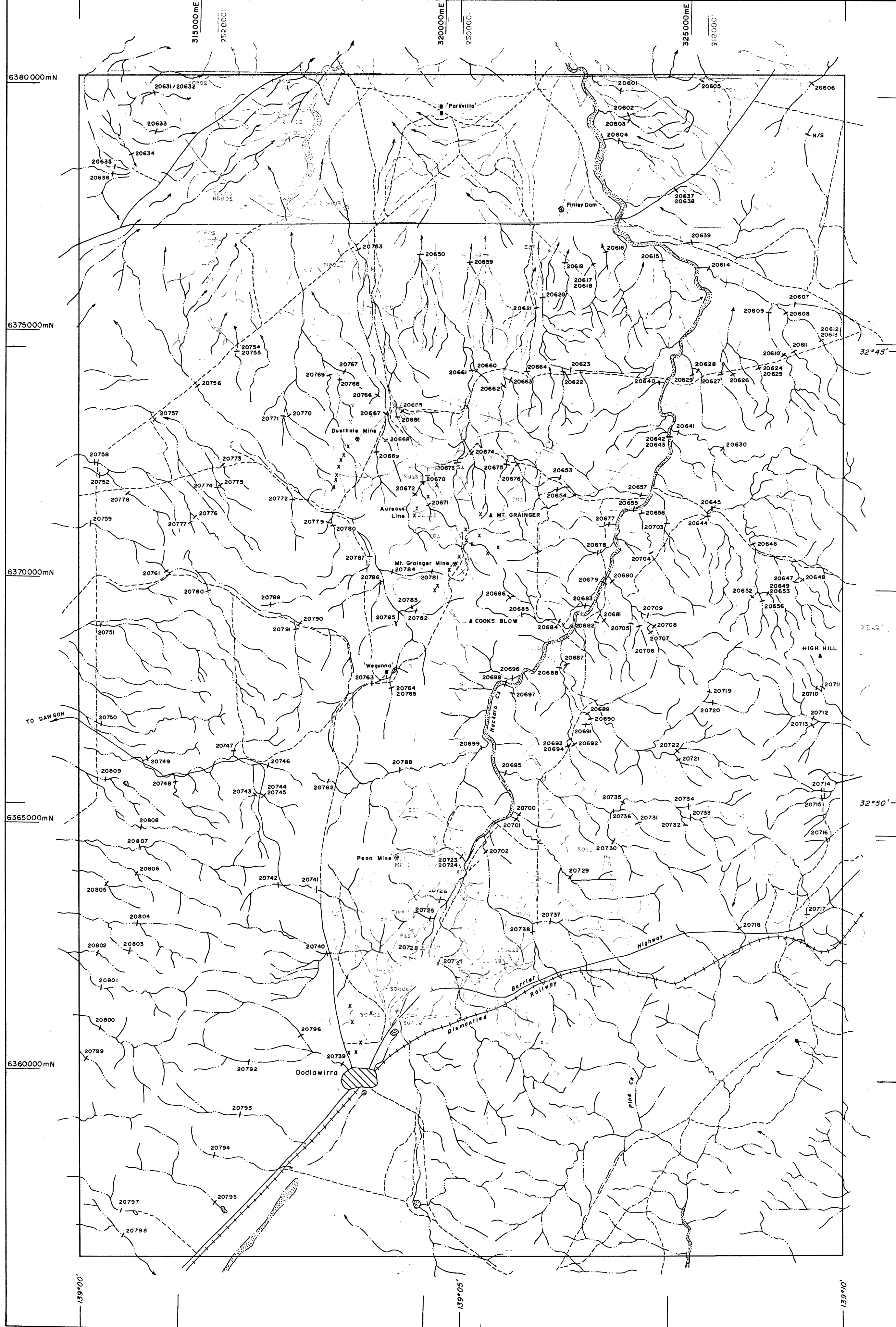
FIG: 2

GOLDSTREAM MINING N. L.

EL 2222 - Mt. GRAINGER

Geological map

SCALE: 1:50 000	DATE: DEC 97
DRAWN: F.R.	REPT. NO.: 011 SA 071



LEGEND

- Track
- Road
- x Gold mine, main prospect
- 20719 Sample location and number



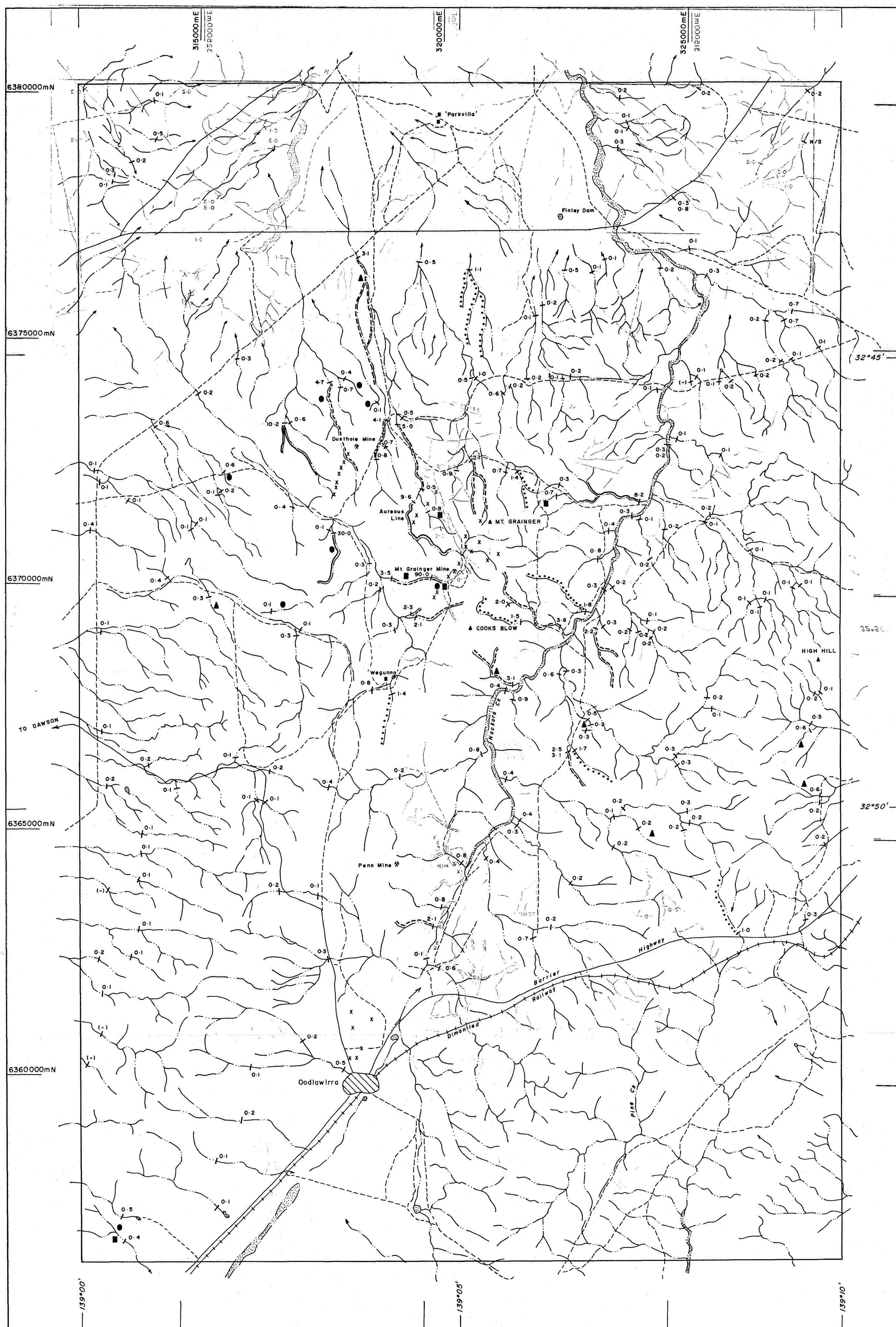
FIG. 3

GOLDSTREAM MINING N. L.

EL 2222 - MT. GRAINGER

BCL stream sediment survey
Sample location map

SCALE: 1:50 000	DATE: DEC 97
DRAWN: F.R.	REPT. NO.: 011 SA 072



LEGEND

x x Gold mines, main prospects

— Road

- - - Track

BCL Au value (ppb)
(-) = below detection

Defined Au anomalies

Very anomalous, >8 ppb

Anomalous, 2-8 ppb

Probably anomalous, 1-2 ppb

Stream segment BCL Ag anomaly, >8 ppb
(incomplete data coverage)

Stream segment with possible BCL Ag
anomaly, >0.03 ppm, flame AAS
(incomplete data coverage)

Stream segment with possible As anomaly, >15 ppm

END

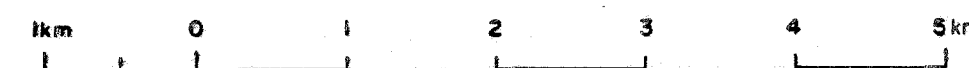


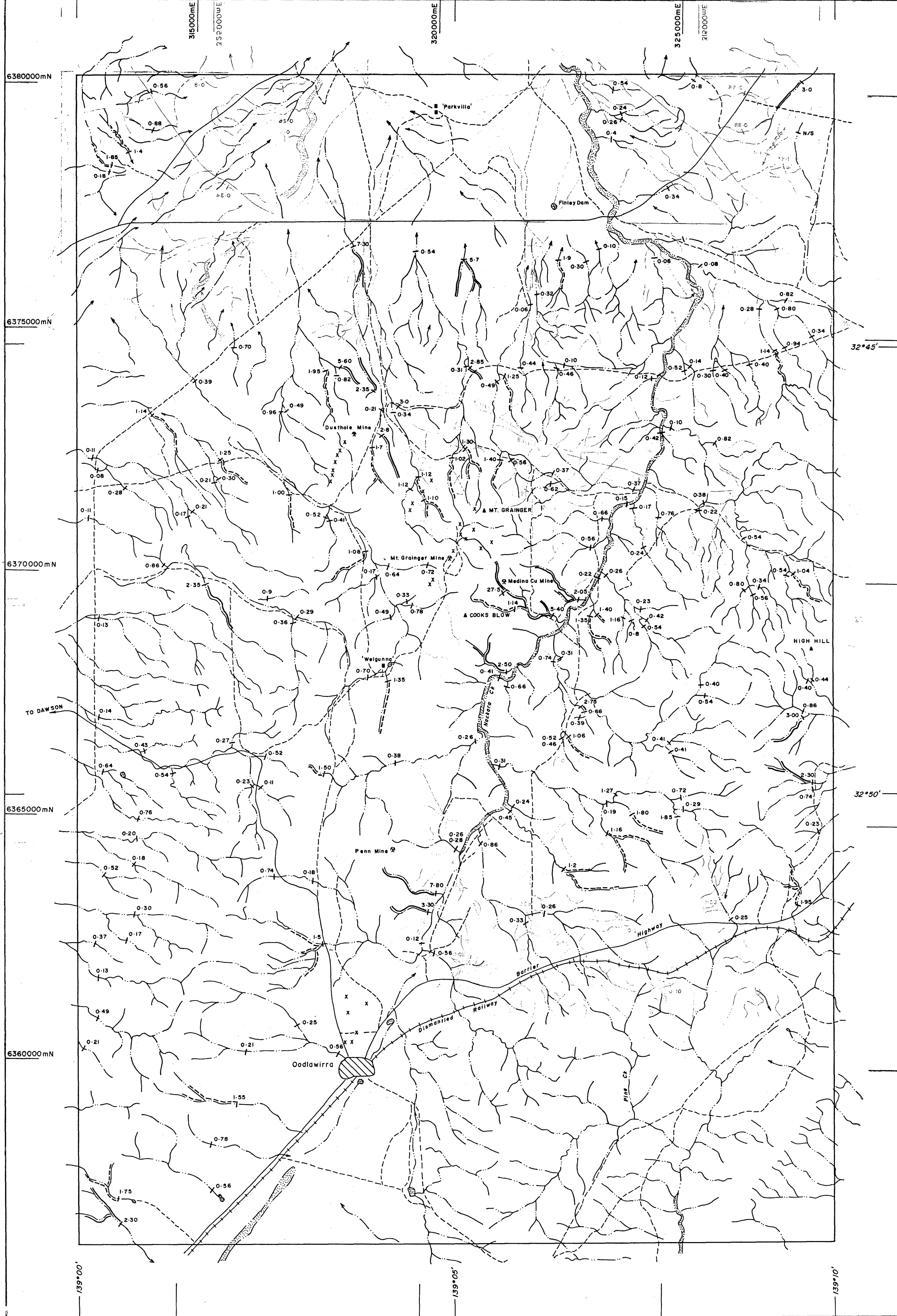
FIG. 4

GOLDSTREAM MINING N. L.

EL 2222 - MT. GRAINGER

BCL stream sediment survey
Low level Au analysis

SCALE: 1:50 000 DATE: DEC 97
DRAWN: F.R. REPT. NO.: 011 SA 073



LEGEND

- X Gold mines, main prospects
- Cu Copper Mine
- Road
- - - Track
- 0.40 BCL Cu value (ppm)

Defined Cu anomalies

- Probably anomalous : 1-2 ppm
- Anomalous: >2 ppm



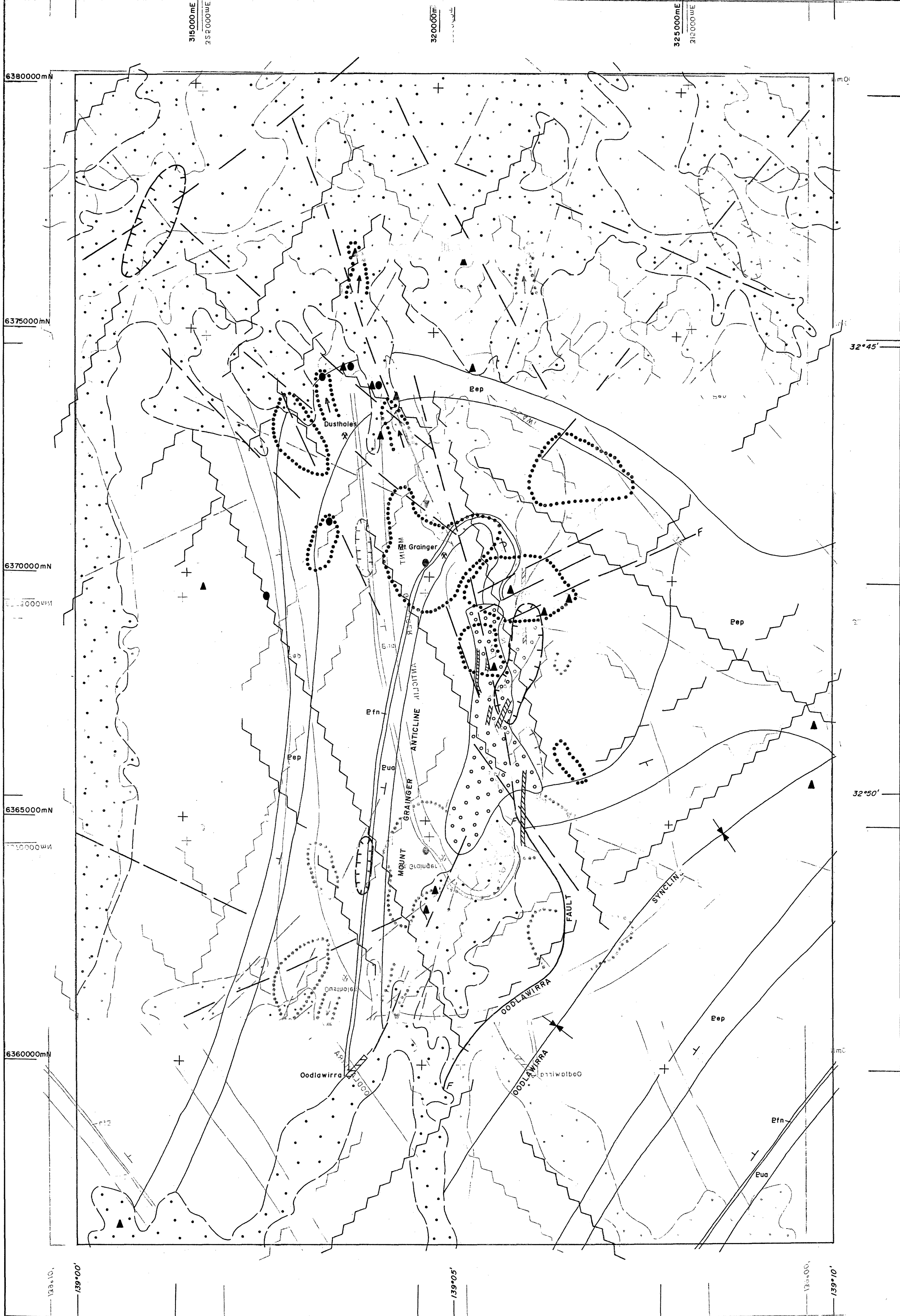
FIG: 5

GOLDSTREAM MINING N. L.

EL 2222 - MT. GRAINGER

BCL stream sediment survey
Low level Cu analysis

SCALE: 1:50 000	DATE: DEC 97
DRAWN: F.R.	REPT. NO.: 011 SA 074



LEGEND

- Cainozoic
- Pepuarta Tillite
- Tindelpina Shale Member
- Appila Tillite
- Mt. Grainger Diapir
- andresite dyke
- Mine
- Interpreted TMI data break, ? Deep-seated fracture
- Interpreted photo-linear, ? fault
- Fault (mapped)
- Significant Au anomalous drainage catchment, Au >2 ppb
- Low level BCL Cu anomaly, Cu >2 ppm
- Low level BCL Ag anomaly, Ag >8 ppb
- Intense TMI low
- Cainozoic



FIG: 6

GOLDSTREAM MINING N. L.

EL 2222 - MT. GRAINGER

Defined Au & Cu catchment anomalies

SCALE: 1:50 000 DATE: DEC 97

DRAWN: F.R. REPT. NO.: 011 SA 075

Appendix 1

Summary of historical data

EXPLORATION LICENCE 2222, MOUNT GRAINGER GOLD PROJECT

SUMMARY OF HISTORICAL DATA

1. GOLD MINING, MOUNT GRAINGER FIELD

alluvial gold was discovered in this area near Nackara Creek in 1882, and gold-in-quartz in the Buttamuck shaft (Well) in 1888.

the consequent Mt Grainger Goldfield is now comprised of many small mines and prospecting excavations within an area 3 x 2 kilometres immediately to the SSW of the Mt Grainger Trig. The Dustholes and the Aureous Lines of workings, approximately 3 km and 1.5 km to the northwest have usually been considered an adjunct to the main field for the purposes of gold assessment.

Fradd (1984) has provided documentation of production and mining at Mt Grainger to 1981, following thorough research of Department of Mines records and publications, newspapers of the day, and Government battery records.

Total gold production from the Mt Grainger field to end of 1981, derived by Fradd, was:

gold bullion	65.8 kg (2,115 oz)
ore treated	5,025 tonnes
apparent grade	13.1 g/t

These figures include all known records of ore treated, as well as gold recovered by amalgamation and cyanidisation, from the mines on the field. The additional quantity of gold recovered at private plants on the field and from interstate treatment is uncertain.

Mt Grainger Mine has been the leading gold producer mainly in the period 1894 to 1916. Fradd reported total production as:

gold bullion	38.9 kg (1,250 oz)
ore treated	3,520 tonnes
apparent grade	11 g/t

Most of this gold came from the Main stope on the No.2 (67 m) mine level. Jack (1913) described the "lode channel as a sericitized zone of variable 6 to 9 metre width dipping 45° - 55° to 300°, with boulders and pseudomorphs after pyrite. It was enriched by cross-cutting, gold-bearing quartz leaders, often projecting at right angles from a hanging wall vein which reached 30 cm in thickness. The leaders rarely persist into the footwall shales.

Where leaders are numerous and the whole mass is impregnated with Fe-oxides, an irregular pipe-like shoot of economic importance occurs in the lode channel" (= basal arkosic sandstone).

2. OTHER SMALL MINES AND PROSPECTS WITHIN EL 2222

GOLD

Besides the many small workings grouped in the Mt Grainger field, several small gold shows are on record to the south as far as Oodla Wirra township. These all appear to be surficial.

Near the southern end of the Mt Grainger Diapir, the source of gold at Heithersay's and Oodla Wirra gold mine has been attributed to elevated erosional remnants of Tertiary gravels which, it is reported, produce colours on panning. The shallow pits and shafts in this area are located on recent materials shed from these gravels (Seymour, 1985).

A group of workings (Golden Hill, Hillview, Condah Hill, Last Hope, Rainbird and Princess Margaret) located immediately north of Oodla Wirra were considered also by Seymour to be eluvial or colluvial deposits. Carthew (1987) reported fractured arkose with minor vein quartz in this vicinity, and some elevated gold values.

COPPER

Copper has been mined at the Penn mine 4.5 km NNE of Oodla Wirra, and at Medina mine, 1.5 km ESE of Mt Grainger mine. No gold association has been recorded in either of these deposits.

Medina is hosted in the Tindelpina Shale member, where high grade bunches of malachite up to 1m in width developed in weathered rock above the pyritic black shale.

At the Penn mine, two shafts were sunk to about 70 metres on thin discontinuous quartz veins striking E-W across the trend of slates of the Burra Group.

IRON FLUX

Limonitic ironstone with minor hematite, sometimes siliceous, was mined at several sites in the Mt Grainger Diapir. Whitten considered that these deposits formed with shallow replacement of brecciated rocks during Tertiary and Recent weathering of the existing land surface.

CLAY

A clay mine is shown on the Orroroo sheet at the margin of the Mt Grainger Diapir, and close to hydrothermally altered andesitic rocks within the diapir.

3. PAST EXPLORATION RELEVANT TO THE EL 2222 AREA

Mineral investigations in the Mt Grainger area have been undertaken fairly consistently since the mid-1960's, under both exploration licence and small mining title.

Much of these efforts was focused on reassessment of the Mt Grainger - Dustholes gold mines for resource extensions and additional reserves.

Most of the technical reports from this period have included the customary review of prior exploration activities and results. For a condensed but comprehensive account, the reader is referred to Horn's (1987) section on "Previous Investigations" in his report on the Department of Mines and Energy programme at Mt Grainger from 1982 to 1986.

The following programmes are on record:

- . 1963- S.A. Department of Mines
departmental property examination for Mt Grainger mine syndicate
Hiern (1966)
- . 1965-66 S.A. Department of Mines
 - assessment of mine potential, Gold Lease No.2003 for Mt Grainger mine syndicate
 - underground and surface mapping, main Mt Grainger mine
 - underground sampling and sampling of significant surface workings (56 samples) for gold assay
 - minor petrology, semi quantitative analyses
Fairburn and Nixon (1966)
- . 1966 Honours Degree project on regional geology and mineralization of Mt Grainger Goldfield.
Wright (1966)
- . 1968 Geosurveys of Australia Pty. Ltd.
field exploration SML 211
Johnson and von Sanden (1969)
- . 1968 SA Department of Mines
 - stream sediment geochemical survey for Cu, Pb, Zn, Co, Ni, over the Mt Grainger diapir and margins
 - 4 rock chip traverses for Cu, Pb, Zn across Appila Tillite - Tindeplina Shale contact
Binks (1970)

- 1970-71 Gold Copper Exploration Ltd., SML 477
- bulk sampling of dump material (180 tons) from Mt Grainger, Medora and Dustholes mines for gold assay.
 - detailed mapping and sampling of most workings in the Mt Grainger goldfield.
 - regional stream sediment geochemical survey for Cu, Pb, Zn, Ba, Mn, Fe, Ag, about half the area relevant to EL 2222.
 - soil geochem traverses for Cu, Pb, Zn near Medina mine anomaly, Penn mine.
- Brown (1971a,b,c); Miller and Brown (1971); Ross (1971).*
- 1977-78 Australian Mineral Development Laboratories
- 6 quartz vein samples from Mt Grainger were tested for fluid inclusions
- Henley (1978)*
- semi-quantitative analytical and petrographic work on 12 samples from Mt Grainger mine
- Henley (1977)*
- 1979 Hamlyn Mining Pty. Ltd. (ML 4696)
- three ore samples taken from below No.2 level in Mt Grainger mine, assayed for gold
- Simnovec (1978)*
- 1984 S.A. Department of Mines and Energy (ML 4830)
- 11 hand auger holes to test tailings and slimes at Mt Grainger. Bulk sample of each was subjected to an agitation cyanide leach test to determine Au grade and amount of extractable gold. Stockpiles were stadia surveyed.
- Morris (1984a)*
- 1984 S.A. Department of Mines and Energy
- geological mapping, grid soil geochemistry (692 samples) and rock-chip geochemistry (63 samples) analysed for Au, Cu, Pb, Zn, Co, Ag, As, around nose of Mt Grainger Anticline.
- Morris (1984b)*
- 1984 S.A. Department of Mines and Energy
- mining history and production, Mt Grainger Goldfield
- Fradd (1984)*
- 1984 Hannes, Walpole and Barlow Pty. Ltd./ Abignano Limited
- reviewed geology, gold occurrence and bulk sampling done by Abignano.

- 2 bulk samples around 4 tonnes each taken from trenches on the floor of No.2 and No.3 open cuts, across the extent of the arkosic host unit, were tested for low grade gold.
- further check sampling of the bulk samples was requested.

Thomson (1984)

1984 Abignano-Amona-Simnovec J.V.

- each half of the 2 previous bulk samples was put through the State Battery at Peterborough
- 10 RCP holes (537 metres) were drilled on the Mt Grainger-Medora line, two holes (one vertical and one -60°) at each of 5 sites along strike.
- one metre cuttings samples assayed for Au

Brink (1984)

1984-85 Western Mining Corporation

- surface and underground samples assayed for Au, also Hg, Sb, Ni, Cu, Co, Cr, Ag, Fe, Mn, Pb, Zn, Bi, As

Woolrich (1984)

1983-85 Jarmand Minerals and Exploration and Cambrian Resources N.L.
(EL 1190)

- rock chip sampling (9 samples) vicinity of Mt Grainger mines and Dustholes for geochemical orientation for Au, Ag, Cu, Pb, Zn, Co, Ni, Cr, Cd, As, Bi, Mn, Mo, Sb, Sn, U, V, W, Fe.
- reconnaissance mapping 1:20,000 Mt Grainger mines area.
- stream sediment geochemical orientation (14 samples), Mt Grainger Dustholes area by C.S.R. Ltd., 5 kg bulk cyanide leach.
- 1:1000 scale mapping of the host basal arkose unit of the Appila Tillite from ML 5017 to the vicinity of the old Wegunna H.S. Followed up with 31 back-hoe trenches and 56 chip channel samples analysed for Au, Cu, Co, Zn.
- reconnaissance of minor gold occurrences between Mt Grainger and Oodla Wirra township.

Seymour (1984, 1985)

1986 Wavrin Holdings Pty. Ltd (EL 1349)

- reconnaissance geological mapping and sampling

- detailed mapping, sampling Mt Grainger line of workings
- general prospecting for gossans, quartz veining, alteration NE of Mt Grainger, Aureous line, Dustholes, southern strike of basal Appila arkose to Oodla Wirra including Wegunna prospect, and other recorded mines. 55 rock samples analysed for Au, Ag, Pb, Cu (AAS), As (XRF).
- gridding Wegunna prospect (500 x 200 m)

Giles (1987); Carthew (1987)

1982-86 S.A. Department of Mines and Energy

- detailed mapping of basal arkose of Appila Tillite around nose of Mt Grainger anticline.
- 19 rock samples of basal Appila Tillite, Burra Group and diapiric rocks (including "dykes") taken for geochemical analysis (Au, Cu, Pb, Zn, Co, Ag, As, Tl) and petrography.
- 1:500 scale geological mapping of ML's 5017, 5018 and 4830, from Orroroo Treasure northward through Mt Grainger mines to Heather Bell, compiled onto base plans prepared from surveyed data.
- compilation of mine plans for Nos. 1 and 2 levels (Main Shaft), North Medora and Jones Shaft workings.
- 7 samples of basal arkose and various other rock types from the mines area were described petrographically and analyzed for 32 different elements.
- 16 costeans (total 270 metres) were cut across the arkosic sandstone unit at the base of Appila Tillite between South Medora and Heather Bell. Trenches were mapped, sampled mostly in 1 to 3 metre intervals and analysed for Au, Cu, Pb, Zn, Co, Ag, As.
- to investigate the generally low gold assays in the costeaning programme; possible inconsistencies from different assay laboratories; and variations in sample representation through gold particle size and distribution, 16 sample sites were chosen at which bulk 10 kg samples and complementary chip/channel samples were taken.

These samples were subjected to a complex procedure involving various sample splits, pulverized size fractions and two commercial

laboratories. Many of the samples were assayed for Cu, Pb, Zn, Co, Ti, Ag and As as well as Au.

- all bulk sampling carried out at Mt Grainger in the period 1961-1983 treated at Peterborough State Battery, was assessed.
- surface sampling summary
 - 56 samples, surface workings and outcrop (*Fairburn and Nixon, 1966*)
 - 162 rock chip and channel samples from outcrop, open cuts and dumps
 - 83 channel samples from back hoe trenches
 - 16 bulk samples (10 kg)
 - 191 samples representing head, tails and various trough samples from parcels 1571 and 1572 at Peterborough
 - 140 samples of head, tails and strake concentrates from parcels 1592 to 1598 treated at Peterborough

- review of geochemical results

analytical results of host rock, quartz vein, regional and spotted shale surface samples were compared with average values for a range of elements in quartz-pebble-conglomerate style gold deposits, and other gold occurrences in the Nackara Arc, viz. Mongolata, Waukaringa, Orama Hill.

Horn (1987)

1987 Golden Deeps Limited

- regional geological and structural appraisal, directed mainly at the nature of the Mt Grainger fold (Anticline), its complexity, and likely kink-style with implications for dilational settings.
- mapping of the lower arkosic unit of the Appila Tillite, from Orroroo Treasure in the south to Heather Bell in the north, in detail. Some detailed stratigraphic and structural observations were made, and doubts raised about the unconformable relationship with underlying Burra Group sediments.
- detailed study of veining and fracturing, most intense in the lower arkosic unit and quite frequent in other sandstone layers up-sequence.
- stereographic plots of vein orientations, joints
- recognition of faulting, including layer-parallel faults
- Buttamuck diapir is described

- three types of alteration are described. 5 specimens from the Main Stope sent for petrographic, XRD and chemical investigation.
- the Mt Grainger mine was described and structural controls on mineralization discussed.

Conor (1987)

1988 Conquest Mines N.L. (ML's 5040-5042)

- appraisal of the Dustholes gold mine area
- analysis of fold features and folding
- analysis of fractures, joints, faults and veining

Two different styles of veining are present - poddy saddle veins with buck quartz in dilatancies in disharmonic fold cores (gold poor) and the more usual shear fracture in-fill.

Five groups of fracture-fill veins were distinguished by their orientation, and mineralogy described.

- extensive sampling was carried out as follows:-

15 kg rock chip samples (13) of vein or wall-rock material from various cuts. Multiple size fractions assayed for Au, plus trace element scan

2-3 kg samples (11) along one vein and marginal country rock, assayed for Au

2-3 kg samples (16) from lithological units along the Dustholes Mine adit, and along the hill flank directly above it, assayed for Au.

3 kg rock-chip samples, one vein quartz and one country rock, 20 m apart along the length of the basal quartzite (strike length c. 1.7 km), analysed for Au, Fe, Mn.

cuttings from RCP drilling, assayed for Au.

2-3 kg rock chip samples (12) of quartz vein and country rock from quartzite layers up-sequence from the main "lode quartzite" assayed for Au.

- 10 vertical RCP holes (total 427 m) were drilled on 6 sections spaced 40 m apart, and centred on the Dustholes mine, thought to be the best mineralized part of the Dustholes line.

- a notional gold reserve approximation pointed toward a low tonnage, narrow stope operation at 3 g/t Au.

Conor (1988a)

1988 Conquest Mines N.L.- (ML's 4830, 5011, 5017, 5018)

- sampling and drilling programme to locate a large, low-grade gold resource that would be amenable to inexpensive open cut extraction methods.
- 18 RCP holes (all vertical except one) total 1120 metres, were drilled from just north of Mt Grainger mine along strike south to near South Medora. These holes were designed to test gold content of the basal arkosic sandstone host from surface outcrop down-dip to approximately 70 metres. One metre samples were riffle-split down to 2-3 kg subsamples for assay.
- a small rock chip sampling programme to test whether any of the four described vein sets at Mt Grainger was preferentially mineralized with gold. The sampling was done along three 5 metre intervals on the 120' mine level.
- 5 rock chip samples were collected from the mine and assayed in the USA at the American Society for Applied Technology. The results were checked with two laboratories in Adelaide.
- the Buttamuck Well diapir was mapped and rock chip sampled (26) for gold assay.
- one inclined 70 m RCP hole was drilled across the SW margin of the hydrothermally altered, gold-anomalous diapiroic rocks.
- one sample was submitted for mineralogical XRD determination and whole-rock geochemistry.

Conor (1988b)

1991 S.A. Department of Mines and Energy (MC 2597)

- appraisal of gold potential at the Golden Slope mine, at request of the claimholder.
- 6 back-hoe trenches were cut across the poorly exposed Burra Group-Appila Tillite boundary, taking in the gold mineralized basal arkosic sandstone and associated fine clastics.
- all trenches were logged and sampled, including quartz veining and stockworks, and sericitized wall-rock. Samples were assayed for Au, Cu, Pb, Zn, Co, Ni, As.

- several bulk samples were split and assayed in three size ranges to check on grain size of gold.

Morris (1995)

Appendix 2

Rock sample analyses

Mt Grainger Rock-Chip data

SAMPLE	EAST	NORTH	NOTES	Au	As	Cu	Ag	Co	Mn	Ni	Pb	Sb	Zn
21701	318280	6371200	Quartz - siderite vein/siltstone (float)	2	15	58	0.1	5	620	14	26	1	220
21702	318450	6371280	Quartz - siderite vein (float)	34	<5	18	<0.1	30	7400	33	7	2	23
21703	318460	6371150	Quartz - siderite (-mica) vein (float)	2	<5	18	<0.1	1	340	5	3	<1	10
21704	314250	6377050	Siltstone/pyrite pseudomorphs (float)	4	20	20	0.1	6	500	13	8	3	50
21705	314250	6377050	Black chert, quartz stringers (float)	3	70	42	0.2	15	1350	26	50	4	140
21706	315650	6377100	Siltstone, ferruginous spots (float)	1	40	78	<0.1	5	48	32	225	<1	135
21707	315650	6377100	Massive ironstone (float)	2	320	145	<0.1	240	3700	66	760	<1	580
21708	315650	6377100	Vein quartz, cavities, iron oxide patches (float)	1	10	21	<0.1	4	84	6	94	<1	21
21709	318450	6376270	Quartz - specularite veining in quartzite/boxworks	4	10	102	0.4	10	62	9	8	<1	7
21710	318190	6375850	Vein quartz/sandy limestone?	2	<5	15	0.1	<1	43	3	2	<1	5
21711	317760	6375150	Quartz - specularite/altered sandstone	4	5	40	0.8	80	58	16	5	<1	12
21712	318990	6373940	Quartz vein, minor specularite, rare malachite	3	<5	13	0.1	1	78	3	5	<1	14
21713	318700	6373800	Vein quartz, rare specularite	1	<5	14	0.1	1	640	3	5	<1	15
21714	318340	6372900	Gossanous quartz vein, rare malachite	15500	55	230	3.5	34	490	25	880	<1	1100
21715	321050	6366850	Dark brown cellular goethitic ironstone	40	5	195	0.3	50	3200	52	13	<1	190
21716	321020	6367880	Dark goethitic ironstone/alt. siltstone	10	15	82	0.1	37	700	56	13	<1	350
21717	321050	6366970	Black manganese - impregnated ? carbonate	7	5	23	<0.1	3	5.25%	12	5	<1	9
21718	321050	6366970	Limonitic sandstone	9	5	50	0.1	13	800	31	7	<1	116
21719	321050	6366850	Dark goethitic ironstone, fragmented vein quartz	5	<5	46	0.3	20	1020	58	8	<1	175
21720	321050	6366850	Altered carbonate	15	10	48	0.1	23	2800	42	7	<1	50
21721	320500	6367820	Dark red-brown cellular gossan (float)	36	690	190	0.4	94	580	120	18	<1	60
21722	320500	6367820	Iron stained goethitic fractured vein quartz	3	25	31	0.2	34	64	68	7	<1	32
21723	320650	6367820	Drusy vein quartz - red clay	1	5	50	<0.1	34	106	26	7	<1	14
21724	320710	6368040	Reddish iron stained vein quartz - red clay	1	65	86	<0.1	7	58	15	9	<1	8
21725	320610	6368100	Highly altered ? carbonate	6	40	33	0.1	27	28	24	8	<1	7

Mt Grainger Rock-Chip data

SAMPLE	EAST	NORTH	NOTES	Au	As	Cu	Ag	Co	Mn	Ni	Pb	Sb	Zn
21726	320610	6368120	Fractured hematitic vein quartz	2	70	96	<0.1	16	98	22	13	<1	16
21727	320960	6367940	Goethitic fractured vein quartz	1	40	82	<0.1	49	460	25	8	<1	24
21728	320900	6367960	Goethitic fractured vein quartz	3	5	42	<0.1	5	58	10	6	<1	9
21729	320740	6368300	Vein quartz + silicate ?	9	<5	44	0.1	7	98	4	6	<1	8
21730	321050	6366850	Yellow-brown altered limonitic sandy rock	5	<5	60	1.0	29	3200	40	12	<1	92
21731	321050	6366970	Dark manganese rich ironstone	8	15	150	0.1	100	4.50	88	23	<1	400
21732	321050	6366970	Fractured quartz - ironstone	7	10	52	0.1	13	700	27	9	<1	78
21733	320500	6367820	Massive brown cellular ironstone (float)	7	70	340	0.2	52	350	180	14	<1	52
21734	320500	6367820	Red-brown gossanous fractured vein quartz (float)	18	560	120	0.3	114	620	52	14	<1	30
21451	323455	6380109	Quartz veins/specular haematite in siltstone	1	<5	5							
21452	323440	6378400	Vein quartz	<1	5	36							
21453	324725	6372730	V quartz + haematite + (?) pyrite	1	<5	27							

Appendix 3
Analytical data – 80# stream sediment survey

Mt Granger -80# Drainage

SAMPLE	DATE	NUMBER	As	As	Co	Co	NI	Zn	Mn	Pb
22150	323452	6380105	-	-	-					
22151	323615	6379500	1	<5	18					
22152	323615	6379520	-	-	-					
22153	323560	6379000	1	5	22					
22154	325210	6380260								
22155	327655	6380360	1	<5	23					
22156	326725	6375834	1	5	18					
22157	326700	6375810	1	<5	17					
22158	326650	6375780	1	<5	18					
22159	327075	6374690	1	<5	22					
22160	327260	6374750	1	<5	19					
22161	327830	6374950	1	<5	17					
22162	327830	6374950	1	<5	17					
22163	325140	6376445	1	<5	18					
22164	324410	6376770	2	<5	23					
22165	323745	6376810	1	<5	20					
22166	323150	6376150	1	<5	25					
22167	323150	6376150	1	<5	22					
22168	322580	6376310	1	<5	19					
22169	322110	6375705	1	<5	19					
22170	322100	6375690	1	5	20	12	13	48	<2	5
22171	322525	6374400	<1	5	12	8	9	49	<2	5
22172	322545	6374410	1	<5	22					
22173	326485	6374530	1	<5	19					
22174	326485	6374530	1	5	20					
22175	325915	6374410	<1	5	19					
22176	325775	6374370	1	<5	19					
22177	325360	6374280	<1	<5	17					
22178	325110	6373860	1	<5	19					
22179	326780	6372545	1	<5	31					
22180	314255	6379820	1	10	20					
22181	314255	6379820	1	<5	15					
22182	314270	6379070	1	<5	15					
22183	313610	6378640	1	<5	22					
22184	313310	6378475	1	<5	18					
22185	313075	6378200	1	5	19					
22186	324530	6377920	1	<5	17					
22187	324530	6377920	1	<5	20					
22188	324415	6377060	1	<5	21					
22189	324365	6374185	<1	5	17					
22190	324810	6373145	1	5	25					
22191	324720	6373035	1	<5	17					
22192	324720	6373035	1	5	18					
22193	325520	6371460	1	<5	15					
22194	325600	6371510	1	5	16					
22195	326610	6370680	<1	<5	15					
22196	327440	6370275	<1	<5	14					
22197	327450	6370290	<1	5	12					
22198	326670	6369900	1	<5	12					
22199	326670	6369900	1	5	10					
22200	326650	6369890	<1	10	11					
22201	326640	6369900	1	<5	14					

SAMPLE	EAST	NORTH	Au	As	Cu	Co	Ni	Zn	Mn	Pb
22202	322510	6372160	1	2	21	12	20	64		5
22203	322440	6371940	2	20	29	15	22	64		15
22204	324200	6371580	1	5	17	11	23	60		5
22205	324280	6371870	1	10	18	10	27	60		5
22206	319560	6376620	1	5	20	12	22	56		10
22207	320540	6376260	1	<5	24	13	24	66		10
22208	320758	6374370	2	5	18	11	23	64		5
22209	320690	6374380	1	10	19	9	18	58		5
22210	321350	6374080	1	5	18	11	16	58		5
22211	321490	6374230	1	10	17	13	13	64		10
22212	321920	6374170	1	<5	17	9	19	64		15
22213	319480	6373420	1	5	21	12	7	72		10
22214	319140	6373420	7	10	20	13	20	46		5
22215	318937	6372915	1	10	16	11	21	66		15
22216	318800	6372840	2	5	18	12	21	62		10
22217	319790	6372030	1	10	19	9	12	56		
22218	319730	6371760	2	15	17	8	19	52		10
22219	319582	6371780	15	5	25	10	16	52		5
22220	320420	6372400	2	10	21					
22221	320740	6372600	2	10	22					
22222	321300	6372590	1	10	21	8	15	56		5
22223	321430	6372450	2	10	20					
22224	323410	6371210	1	<5	20	10	25	78		10
22225	323380	6370690	2	5	25	8	18	92		20
22226	323510	6370100	1	5	21	11	13	66		10
22227	323570	6370140	1	5	14					
22228	323370	6369460	1	5	15	7	6	56		5
22229	323145	6369580	1	10	31	8	14	74		20
22230	322790	6369220	155	5	23	10	18	49		10
22231	321920	6369410	1	10	19	10	19	37		5
22232	322060	6369530	1	5	27	7	14	46		10
22233	322730	6368420	1	5	15	6	16	60		5
22234	322730	6368420	1	<5	13	9	10	62		5
22235	322640	6368430	1	<5	13	8	13	74		5
22236	323450	6367810	1	5	15	7	13	70		5
22237	323380	6367600	1	10	14	5	13	74		10
22238	323360	6367560	1	5	11	8	11	52		
22239	322950	6367520	2	5	15	9	13	58		10
22240	322810	6366790	2	<5	11	8	15	38		5
22241	321450	6366150	2	<5	20					
22242	321820	6368350	1	10	26	6	16	54		20
22243	321620	6367850	2	5	19	12	22	70		10
22244	321600	6367930	2	10	18	15	20	60		5
22245	321090	6366670	2	5	19	12	17	56		5
22246	321090	6366670	1	5	17	11	17	52		5
22247	321680	6365240	2	5	27					
22248	321600	6365160	1	<5	22					
22249	321100	6364620	2	5	32					
22250	324690	6371310	1	5	16					
22251	324450	6370510	1	5	18					
22252	324030	6369460	1	10	16	10	19	64		20
22253	324410	6369040	1	5	15					

Mt Granger -80# Drainage

SAMPLE	EAST	NORTH	Ag	As	Cu	Co	Ni	Zn	Mn	Pb
22254	324450	6369010	1	5	17					
22255	324550	6369070	1	<5	11					
22256	324570	6369160	1	5	12					
22257	327980	6367880	1	5	12					
22258	327560	6367480	2	<5	21					
22259	327980	6367200	1	5	21	9	15	68		10
22260	327930	6365860	1	5	28	13	18	130		10
22261	328010	6365710	<1	5	8					
22262	328220	6365010	1	<5	19					
22263	328220	6365010	1	5	20					
22264	327580	6363110	1	5	24					
22265	326370	6363010	1	<5	20	11	14	52		10
22266	325550	6367720	1	5	12					
22267	325920	6367610	<1	5	13					
22268	325230	6366640	1	<5	20					
22269	325120	6366770	1	<5	14					
22270	320590	6364240	2	5	24	15	21	34		5
22271	319900	6363490	1	10	60	11	18	52		5
22272	320100	6363880	1	5	39	15	16	49		5
22273	320180	6362280	2	<5	23					
22274	320000	6362350	2	10	28					
22275	323100	6363810	1	<5	14					
22276	323740	6364820	<1	<5	22					
22277	324240	6365260	1	5	20					
22278	325150	6365270	1	5	22					
22279	325150	6305310	<1	5	19					
22280	325150	6305310	1	<5	19					
22281	325130	6365495	1	<5	21					
22282	323920	6365550	1	<5	24					
22283	322150	6363090	1	5	21					
22284	322060	6363070	1	5	20					
22285	318560	6360010	1	5	25					
22286	317950	6362440	1	5	26					
22287	317830	6363670	1	5	23					
22288	317020	6363810	<1	<5	20					
22289	316400	6365650	1	<5	23					
22290	316550	6365600	1	5	19					
22291	316560	6366230	1	5	18					
22292	315950	6366450	<1	<5	21					
22293	314740	6366020	1	<5	21					
22294	314140	6366320	1	<5	13					
22295	313120	6367050	1	<5	18					
22296	313050	6369060	<1	<5	17					
22297	313060	6372100	1	5	18					
22298	313060	6372100	1	5	19					
22299	318240	6376780	2	10	14					
22300	315850	6374720	1	<5	17					
22301	315030	6373950	2	5	20					
22302	314180	6373230	1	5	21					
22303	313080	6372270	1	<5	17					
22304	313055	6370810	1	10	21					
22305	315360	6369810	1	<5	23	12	22	56		10

SAMPLE	EAST	NORTH	AU	AS	CU	CO	NI	ZN	MO	PB
22306	314590	6370050	1	5	18					
22307	317850	6364850	1	5	19					
22308	318860	6367950	1	<5	21	10	17	52	2	10
22309	319150	6367950	2	5	23	12	14	47		5
22310	318745	6373819	<1	5	16					
22311	318331	6373769	<1	5	17	8	17	58		10
22312	318157	6373536	1	5	17	8	14	52		10
22313	317851	6373433	5	5	16	7	9	62		10
22314	316948	6373408	1	5	17	10	22	49		10
22315	316839	6373274	1	<5	13	7	15	46		5
22316	317020	6371810	<1	<5	12	9	11	44		5
22317	315640	6372310	<1	5	24	12	20	64		10
22318	315470	6372015	1	5	15					
22319	315620	6371890	<1	10	20	11	12	47		10
22320	315130	6371220	<1	5	17					
22321	314950	6371210	<1	5	13					
22322	314060	6371500	<1	5	16					
22323	317680	6371450	<1	<5	9	7	8	43		10
22324	317875	6371310	1	5	13	7	13	54		5
22325	319990	6370264	35	15	24	15	24	72		10
22326	319530	6369320	3	5	16	13	14	64		15
22327	319580	6369430	3	5	17	11	14	58		10
22328	319390	6370200	11	15	29	12	19	62		5
22329	318760	6369275	1	10	24	11	17	76		10
22330	318910	6370030	<1	10	16	9	9	62		5
22331	318650	6370495	1	10	21	11	21	60		10
22332	318990	6366020	1	10	18					
22333	316750	6369490	<1	5	21					
22334	317369	6369090	<1	5	14					
22335	317180	6369020	<1	10	19					
22336	316230	6360220	<1	5	24					
22337	315660	6359140	1	5	20					
22338	315320	6358560	1	5	32					
22339	317540	6360690	1	5	20					
22340	316110	6357120	2	5	25					
22341	313670	6357110	1	5	23					
22342	313580	6356440	<1	15	24	17	29	78		15
22343	312860	6361100	<1	5	20					
22344	313080	6361390	<1	5	13					
22345	313215	6361720	<1	<5	15					
22346	313200	6362390	1	15	23					
22347	313610	6362650	1	<5	16					
22348	313770	6362990	<1	10	17					
22349	313340	6363750	1	5	17					
22350	313730	6364125	<1	5	18					
22351	314020	6364540	<1	10	17					
22352	314080	6364840	<1	5	15					
22353	313430	6365865	<1	10	17					

Appendix 4

Analytical data BCL stream sediment survey

SAMPLE	EAST	NORTH	AU	GU	AG
20601	323452	6380102	0.2	0.54	0.01
20602	323615	6379500	0.1	0.24	<0.01
20603	323615	6379520	0.1	0.26	<0.01
20604	323560	6379000	0.3	0.40	<0.01
20605	325210	6380260	0.2	0.80	<0.01
20606	327655	6380360	0.2	3.00	0.02
20607	326725	6375834	0.7	0.82	0.01
20608	326700	6375810	0.7	0.80	0.01
20609	326650	6375780	0.2	0.28	<0.01
20610	327075	6374690	0.2	1.14	0.01
20611	327260	6374750	0.1	0.94	0.01
20612	327830	6374950	0.1	0.34	<0.01
20613	327830	6374950	0.1	0.28	<0.01
20614	325140	6376445	0.3	0.08	<0.01
20615	324410	6376770	0.2	0.06	<0.01
20616	323745	6376810	0.1	0.10	<0.01
20617	323150	6376150	0.1	0.30	0.01
20618	323150	6376150	0.1	0.32	0.01
20619	322580	6376310	0.5	1.90	0.02
20620	322110	6375705	0.2	0.32	<0.01
20621	322100	6375690	0.1	0.06	<0.01
20622	322525	6374400	0.1	0.46	0.01
20623	322545	6374410	0.2	0.10	<0.01
20624	326485	6374530	0.2	0.40	0.01
20625	326485	6374530	0.2	0.24	0.01
20626	325915	6374410	0.2	0.40	0.01
20627	325775	6374370	0.1	0.30	0.01
20628	325360	6374280	0.1	0.14	<0.01
20629	325110	6373860	<0.1	0.52	<0.01
20630	326780	6372545	0.1	0.82	0.01
20631	314255	6379819	0.1	0.56	<0.01
20632	314255	6379819	0.1	0.60	<0.01
20633	314270	6379070	0.5	0.88	<0.01
20634	313610	6378640	0.2	1.40	<0.01
20635	313310	6378475	0.3	1.85	0.01
20636	313075	6378200	0.1	0.18	<0.01
20637	324530	6377920	0.3	0.34	0.01
20638	324530	6377920	0.2	0.28	0.01
20639	324415	6377060	0.1	0.62	0.01
20640	324365	6374185	0.1	0.12	<0.01
20641	324810	6373145	0.1	0.10	<0.01
20642	324720	6373040	0.3	0.42	0.01
20643	324720	6373040	0.2	0.38	0.01
20644	325520	6371460	0.1	0.22	<0.01
20645	325600	6371510	0.2	0.38	0.01
20646	326610	6370680	0.1	0.54	0.01
20647	327440	6370275	0.1	0.54	0.01
20648	327450	6370290	0.1	1.04	0.01
20649	326670	6369900	0.1	0.34	0.01
20650	326670	6369900	0.1	0.28	0.01
20651	326650	6369890	0.1	0.56	0.01
20652	326640	6369900	0.1	0.80	0.01

SAMPLE	EAST	NORTH	Au	CU	Ag
20653	322510	6372160	0.3	0.37	<0.01
20654	322440	6371940	0.7	0.62	0.01
20655	324194	6371580	0.3	0.15	<0.01
20656	324200	6371555	0.1	0.17	<0.01
20657	324280	6371870	8.2	0.37	<0.01
20658	319560	6376620	0.5	0.54	0.01
20659	320540	6376260	1.1	5.7	0.02
20660	320758	6374370	1	2.85	0.02
20661	320690	6374380	0.5	0.31	<0.01
20662	321350	6374080	0.6	0.49	0.01
20663	321490	6374230	0.2	1.25	0.01
20664	321920	6374170	0.2	0.44	0.01
20665	319480	6373420	0.5	3.0	0.02
20666	319140	6373420	5	0.34	<0.01
20667	319140	6373420	4.1	0.21	<0.01
20668	318937	6372915	0.7	2.8	0.02
20669	318800	6372840	0.8	1.7	0.01
20670	319790	6372020	0.5	1.12	0.01
20671	319730	6371760	0.8	1.1	0.01
20672	319582	6371780	9.6	0.12	<0.01
20673	320420	6372400	0.9	1.02	0.01
20674	320740	6372600	2.7	1.30	0.01
20675	321300	6372590	0.7	1.40	0.01
20676	321430	6372450	1.4	0.56	0.01
20677	323410	6371210	0.4	0.66	0.01
20678	323380	6370690	0.8	0.56	0.01
20679	323510	6370100	0.3	0.22	<0.01
20680	323570	6370140	0.2	0.26	<0.01
20681	323370	6369460	0.3	1.40	0.01
20682	323370	6369460	2.2	1.35	0.01
20683	323145	6369578	1.8	2.05	0.02
20684	322790	6369220	3.8	5.40	0.01
20685	321920	6369410	1.5	1.14	0.01
20686	322060	6369520	2	27.5	0.01
20687	322730	6368420	0.3	0.31	<0.01
20688	322640	6368430	0.6	0.74	0.01
20689	323450	6367810	0.5	2.75	0.05
20690	323380	6367600	0.2	0.66	0.01
20691	323360	6367560	0.3	0.39	0.01
20692	322950	6367520	1.7	1.06	0.02
20693	322810	6366790	2.5	0.52	0.01
20694	322810	6366790	3.1	0.46	0.01
20695	321450	6366150	0.4	0.31	0.01
20696	321820	6368350	3.1	2.5	0.04
20697	321620	6367850	0.9	0.66	0.01
20698	321600	6367930	0.4	0.41	0.01
20699	321090	6366670	0.8	0.26	<0.01
20700	321670	6365230	0.4	0.24	0.01
20701	321600	6365160	0.3	0.45	0.01
20702	321100	6364620	0.4	0.86	0.01
20703	324690	6371310	0.2	0.76	0.01
20704	324450	6370510	0.2	0.84	0.01

SAMPLE	EAST	NORTH	Au	Cu	Ag
20705	324030	6369460	0.2	1.16	0.01
20706	324410	6369040	0.2	0.8	0.01
20707	324450	6369010	0.2	0.54	0.01
20708	324550	6369070	0.2	0.42	<0.01
20709	324570	6369160	0.1	0.23	<0.01
20710	327980	6367880	0.2	0.40	<0.01
20711	327980	6367880	0.2	0.44	<0.01
20712	327560	6367480	0.3	0.86	0.01
20713	327930	6367210	0.6	3.0	0.03
20714	327930	6365860	0.6	2.3	0.03
20715	328010	6365710	0.2	0.74	0.01
20716	328220	6365010	0.2	0.23	0.01
20717	327580	6363110	0.3	1.95	0.02
20718	326370	6363010	1	0.25	<0.01
20719	325540	6367720	0.2	0.4	<0.01
20720	325920	6367610	0.1	0.54	<0.01
20721	325230	6366640	0.3	0.41	0.01
20722	325120	6366770	0.3	0.41	0.01
20723	320590	6364240	0.8	0.26	<0.01
20724	320590	6364240	0.8	0.28	<0.01
20725	319900	6363490	2.1	3.3	0.01
20726	320100	6363880	0.8	7.8	0.01
20727	320100	6362280	0.6	0.56	0.01
20728	320000	6362350	0.1	0.12	<0.01
20729	323100	6363810	0.2	1.2	0.01
20730	323740	6364820	0.2	1.16	0.01
20731	324240	6365260	0.2	1.8	0.01
20732	325150	6365270	0.2	1.85	0.02
20733	325150	6365310	0.2	0.29	0.01
20734	325130	6365495	0.3	0.72	0.02
20735	323920	6365550	0.2	0.27	0.01
20736	323920	6365550	0.1	0.19	0.01
20737	322150	6363090	0.2	0.26	0.01
20738	322060	6363070	0.7	0.33	0.01
20739	318560	6360010	0.5	0.56	0.01
20740	317950	6362440	0.3	1.5	0.01
20741	317830	6363670	0.1	0.18	<0.01
20742	317020	6363810	0.2	0.74	0.01
20743	316400	6365650	0.1	0.23	0.01
20744	316550	6365600	0.1	0.11	0.01
20745	316550	6365600	0.2	0.13	0.01
20746	316560	6366230	0.2	0.52	0.01
20747	315950	6366450	0.1	0.27	0.01
20748	314740	6366020	0.1	0.54	0.01
20749	314140	6366320	0.2	0.43	0.01
20750	313120	6367050	0.1	0.14	<0.01
20751	313050	6369060	0.1	0.13	<0.01
20752	313060	6372100	0.1	0.08	<0.01
20753	318240	6376780	3.1	7.3	0.04
20754	315850	6374720	0.3	0.7	0.01
20755	315850	6374720	0.2	0.14	<0.01
20756	315030	6373950	0.2	0.39	0.01

20757	314180	6373230	0.6	1.14	0.01
20758	313080	6372270	0.1	0.11	<0.01
20759	313055	6370810	0.4	0.54	0.01
20760	315360	6369810	0.3	2.35	0.03
20761	314590	6370050	0.4	0.86	0.01
20762	317850	6364850	0.4	1.5	0.01
20763	318860	6367950	0.8	0.71	0.01
20764	319150	6367950	1.4	1.35	0.01
20765	319150	6367950	1.2	1.12	0.01
20766	318745	6373819	0.1	2.35	11.6
20767	318331	6373769	0.4	5.60	26.0
20768	318157	6373536	0.7	0.82	3.4
20769	317851	6373433	0.7	1.95	14.0
20770	316948	6373408	0.6	0.49	4.0
20771	316839	6373274	10.2	0.96	6.0
20772	317020	6371810	0.4	1.00	5.6
20773	315640	6372310	0.6	1.25	14.5
20774	315470	6372015	0.1	0.21	1.9
20775	315620	6371890	0.2	0.30	4.7
20776	315130	6371220	0.1	0.21	3.7
20777	314950	6371210	0.1	0.17	2.1
20778	314060	6371500	0.1	0.28	4.1
20779	317680	6371450	0.1	0.52	4.7
20780	317875	6371310	30.0	0.41	11.6
20781	319990	6370264	90.0	0.72	13.0
20782	319530	6369320	2.1	0.78	5.8
20783	319580	6369430	2.3	0.33	3.4
20784	319390	6370200	3.5	0.64	5.8
20785	318760	6369275	0.3	0.49	4.2
20786	318910	6370030	0.2	0.17	1.7
20787	318650	6370495	0.3	1.08	7.4
20788	318990	6366020	0.2	0.38	1.7
20789	316750	6369490	0.1	0.90	9.2
20790	317369	6369090	0.1	0.29	2.2
20791	317180	6369020	0.3	0.36	2.4
20792	316230	6360220	0.1	0.21	2.1
20793	315660	6359140	0.2	1.55	5.8
20794	315320	6358560	0.1	0.78	3.3
20795	317540	6360690	0.1	0.56	3.8
20796	316110	6357120	0.2	0.25	7.0
20797	313670	6357110	0.5	1.75	7.2
20798	313580	6356440	0.4	2.30	20.5
20799	312860	6361100	<0.1	0.21	3.8
20800	313080	6361390	<0.1	0.49	6.0
20801	313275	6361720	0.1	0.13	4.9
20802	313400	6362390	0.2	0.37	7.8
20803	313610	6362650	0.1	0.17	4.7
20804	313770	6362990	0.1	0.30	4.0
20805	313340	6363750	<0.1	0.52	4.6
20806	313730	6364125	0.1	0.18	3.9
20807	314020	6364540	0.1	0.20	4.2
20808	314080	6364840	0.1	0.76	5.8
20809	313430	6365865	0.2	0.64	7.2

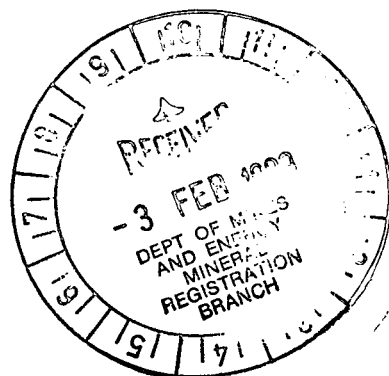
GOLDSTREAM MINING N.L.
A.C.N. 009 129 560

Annual Report

E.L. 2222 "MOUNT GRAINGER"

From 25th OCTOBER 1997 to 24th OCTOBER 1998

Author: I.Freytag
Date: December 1998
Copies to: PIRSA (2)
GDM – Perth
GDM – Adelaide
I. & M. Filsell



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Figure 1 EL 2222, Mount Grainger locality map

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Appendix I	Analytical data, BCL stream sediment fill-in survey
Appendix 2	Analytical data, rock and rock chip sampling

1. Summary

The BCL Au/Cu/Ag stream sediment catchment anomalies defined in the licence reconnaissance sampling, have been followed up with in-fill stream sediment sampling and prospecting.

Nine geochemical target areas have been detailed for further investigation. Soil BCL geochemistry, petrography and RAB drilling for bedrock geochemistry are recommended in the coming year.

2. Introduction

Exploration Licence 2222 covers the Mount Grainger goldfield and surrounding area, within the Nackara Arc gold province. The goldfield is defined by numerous old prospects and small mines, scattered through a broad stratigraphic sequence within the complex Mount Grainger Anticline.

Past gold production has been modest but recognition in the past decade or more of geological similarities to the Telfer (W.A.) deposit setting provided the basis for a renewed exploration approach in EL 2222.

Goldstream's first year programme concentrated on reconnaissance drainage geochemistry, and interpretive airphoto and aeromagnetic structural studies (Freytag, 1997).

The 1998 programme, recorded in this report, has followed up the previously defined Au/Cu anomalous catchment areas with fill-in drainage sampling, prospecting and rock sampling for geochemistry.

3. Location and Access

The Mount Grainger licence is located 240 kilometres to the north-north east of Adelaide (Fig.1). The Barrier Highway to Broken Hill traverses the south eastern corner of the licence, passing through the small settlement of Oodla Wirra.

The Mount Grainger gold mine is 11 kilometres north of Oodla Wirra, via a graded track branching off the Dawson road through undulating, sometimes mallee-covered, pastoral country.

The climate in this region is semi-arid. Land use is devoted to sheep and cattle grazing on small to medium sized leasehold and freehold properties.

Ground access in the licence area is available via a network of property tracks, however, vehicle movement is restricted in some of the steeper terrain.

4. Tenure

Exploration Licence 2222 was granted to Ian and Mark Filsell (collectively 50%) and John Simnovec (50%) on 25 October 1996. Title for a third year has been extended to 24 October 1999.

The licence covers an area of 375 square kilometres. A number of claims and leases, including the Mount Grainger mine lease, are excluded.

Messrs Filsell and Simnovec have entered into joint venture with Goldstream Mining N.L. to explore the area, with Goldstream the manager.

The area lies within the Kuyani Native Title Claim SC 95/4.

5. Geology and Mineralisation

A brief summary of the geological setting and mineralisation in EL 2222 has been recorded in the previous Annual Report (Freytag, 1998).

The regional geology over the licence area is shown in Figure 2 of this report.

6. Work completed, Year 2

6.1 Stream sediment BCL geochemistry

98 additional stream sediment samples have been taken to detail Au/Cu anomalous catchments defined in 1997, and to extend geochemical coverage over the flat country in the north west corner of the licence, where several of the larger channels registered Au or Cu anomalies, open downstream (Plate 2).

Sediment samples comprised 2 kg of -40 mesh active sediment. They were analysed for BCL Au, Cu, Ag. Results are listed in Appendix 1 and plotted in Plates 1 to 2.

Final anomaly thresholds chosen from simple frequency plots are

Au	3 ppb
Cu	4 ppm
Ag	35 ppb

The results define nine geochemical target areas, shown in Plate 7, as well as several one sample anomalies.

6. Work completed, Year 2 (con't)

6.2 Stream anomaly prospecting

Most of the creeks which registered anomalous Au/Cu have been traversed for evidence of anomaly source, most likely to be veined, altered or mineralised outcrop.

Outcrops of interest were sampled and mapped (Plates 3 to 6). In some places float or lag material was also sampled, where it may have contributed to the geochemical results.

107 rock and rock chip samples were collected and assayed for Au, Co, Cu, Zn, As, Ag, Pb (see Appendix 2).

Selected rock samples are to be examined petrographically.

The geochemical target areas checked (Plate 7) were:

Target 1 - "Buttamuck Creek"

This location drew early attention (Freytag, 1997) because of a discrete aeromagnetic image low at the intersection of aeromagnetic and airphoto-inferred fractures (?faults). Here Buttamuck Creek spreads into a broad flood plain with several linear SW-NE channels.

Three sediment samples in these channels returned anomalies in both BCL Cu and Ag. There is some evidence of layered calcrete beneath the modern alluvium.

Spoil from an old well at the northern end of the area includes altered fine sediments and carbonate with coarse ?tal. These rocks are slightly anomalous in gold, sample 99404 returning 47 ppb Au.

Target 2

Small creeks draining the northern watershed of Mount Grainger are anomalous in Au, Cu and Ag. Initial sampling of quartz vein materials and ferruginous (some pyritic) sediments gave little indication of gold mineralisation. A pyritic limestone (sample 99446) gave 25 ppb Au.

Target 3

Four creeks draining the ridge to the north east of Medina Mine carry anomalous Au, Cu and Ag.

The Tindelpina Shale, a metal anomalous black slate also following the ridge in this area, hosts the Medina copper mineralisation. A sample (99489) of quartz-veined slate from the shafts assayed 22 ppb Au, of which 18 ppb were attributed by analyses, to the slate.

6. **Work completed, Year 2 (con't)**

Target 4

This catchment straddles the northern part of the Mt Grainger Diapir. Creek traversing showed that it is underlain by massive carbonate-quartz-limonite rock and some ?lava in the western half, and bedded fine clastic sediments in the eastern half.

Source of the BCL Cu/Ag anomalies in creeks is not evident.

Target 5

This small area east of Nackara Creek produced low level anomalous Au values (max. 39 ppb, sample 99627) in eight stream sediment samples (2 surveys).

Initial prospecting of these creeks located outcrops of massive quartz-siderite-calcite rock, and scattered quartz specularite-siderite veining, generally in siltstones.

The highest Au value in these is 8 ppb (sample 99440).

Target 6

Without more definitive work, the source of gold anomalies in this drainage can be reasonably attributed to the Dustholes mine area. However, gold anomalies (max. 29.5 ppb) in separate drainage channels a kilometre north-east of Dustholes require further investigation.

Target 7

Stream sediment gold-copper anomalies occur in a larger channel cut through up to 3 metres of alluvial outwash gravels. A number of quartzite and siltstone outcrops host quartz veining, which appears to be barren.

Lag sample 99421 from a mounded area west of the channel, with a abundance of white quartz and ironstone, returned a value of 275 ppb Au.

Target 8

Follow-up of gold anomalous creeks draining the western slope of No.2 Flux mine hill located ferruginous quartz veining in bleached siltstone which assayed 40 ppb Au (sample 99423) and brecciated siliceous and ferruginous rocks with up to 42 ppb Au (sample 99428).

Target 9

Several small creeks to the south east of the Penn Copper Mine are anomalous in Cu, and one returned 23.5 ppb Au. The area is largely soil covered.

Sample 99204 from the Penn workings contained 145 ppb Au.

7. Recommended Further Work

The geochemical targets need to be rated for further investigation in the light of current knowledge.

Recommended work will include

- . petrography of various altered, siliceous and ferruginous rocks
- . orientation and test sampling of soils for low level Au, Cu, Ag
- . bedrock drilling for lithology and geochemistry
- . test Au, Cu geochemistry in calcrete

Recommended priorities are:

- 1) RAB drilling of the composite aeromagnetic /structural /geochemical Buttamuck Creek anomaly (Target 1)
- 2) Orientation BCL soil geochemistry and bedrock drilling in the No.2 Flux Mine - Heithersay's area (Target 8)
- 3) Test soil and calcrete geochemistry around Targets 6 and 7.
- 4) Reconnaissance soil geochemistry lines across the Penn Mine area.

8 References

Freytag, I.B. 1997 Annual Report EL 2222 "Mt. Grainger" from 25 October 1996 to 24 October 1997. Goldstream Mining Report No. 011.

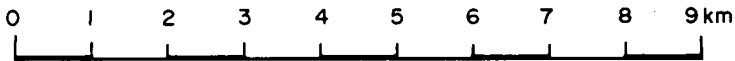
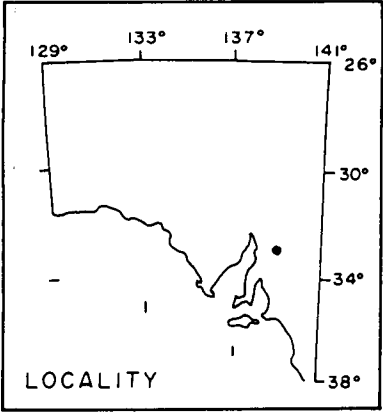
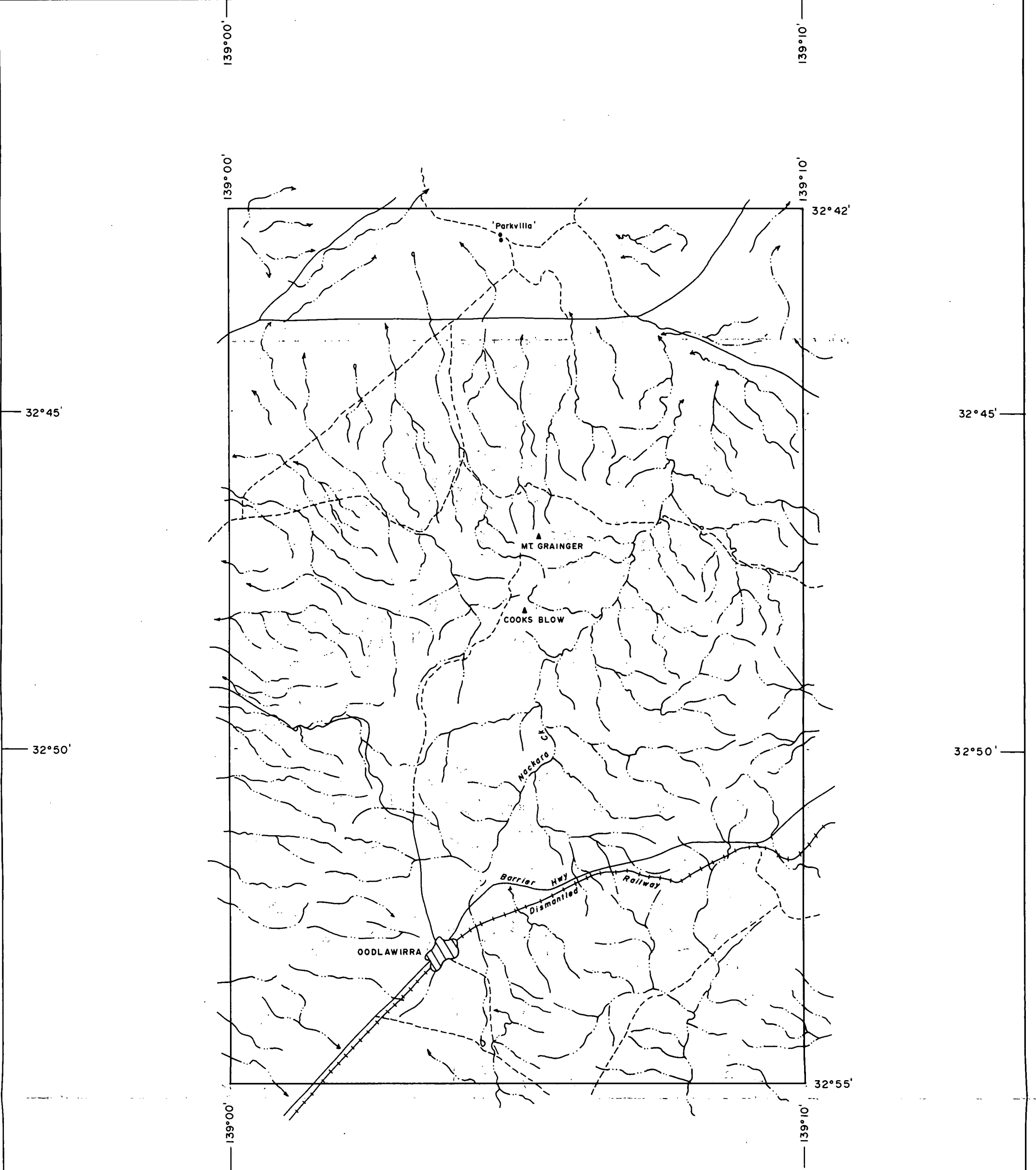
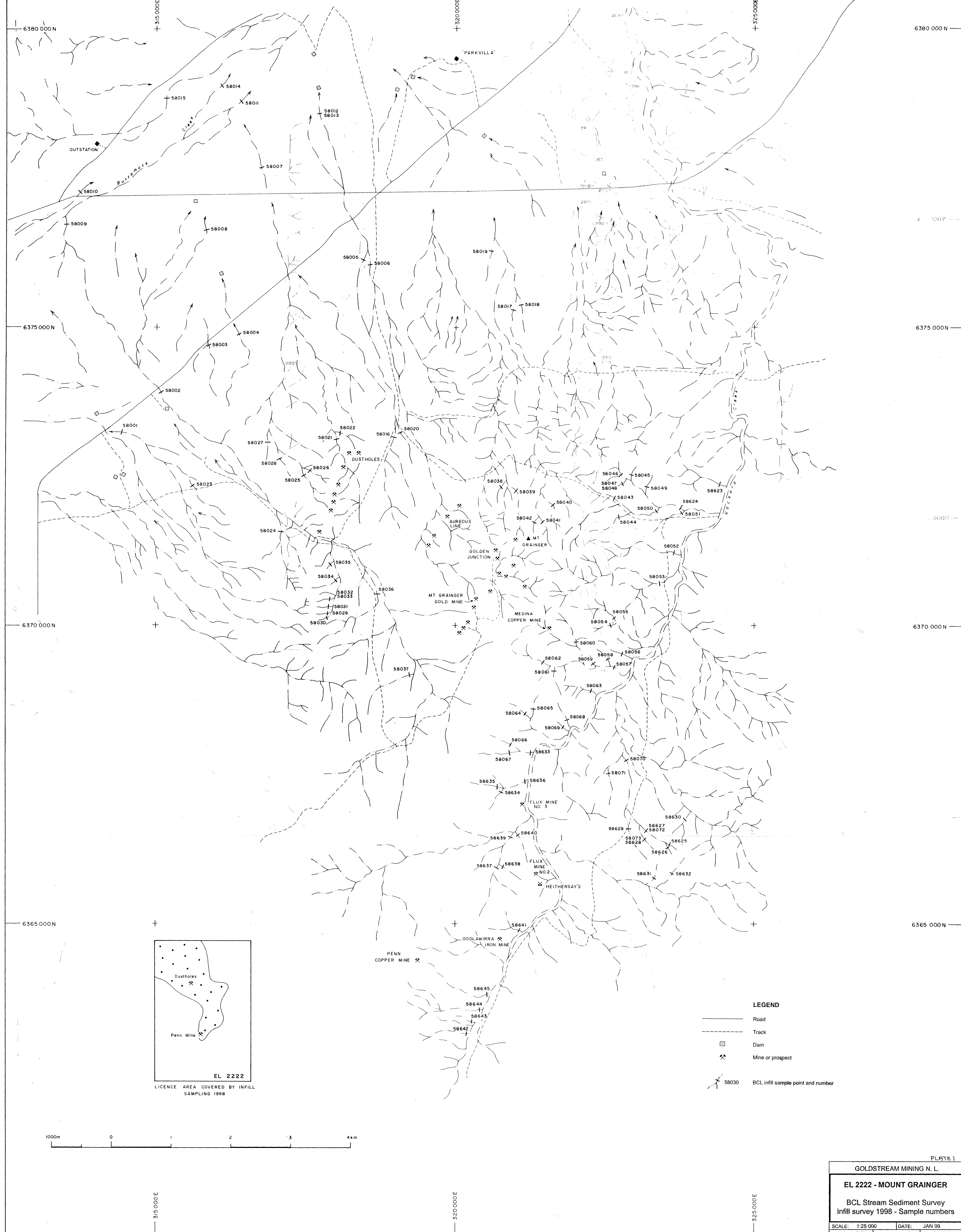
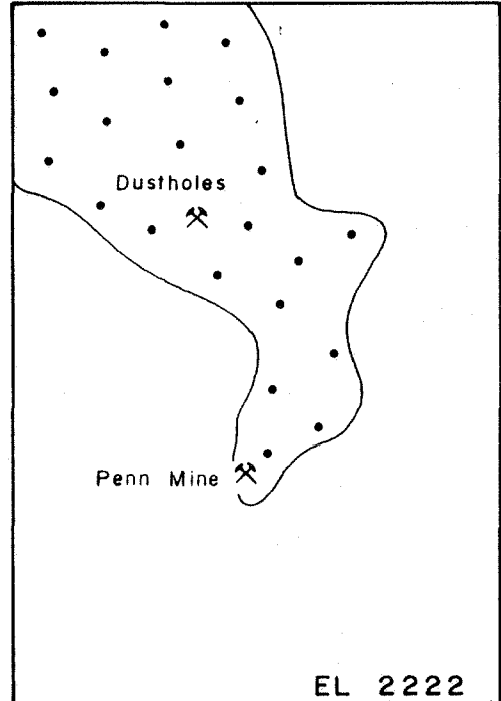
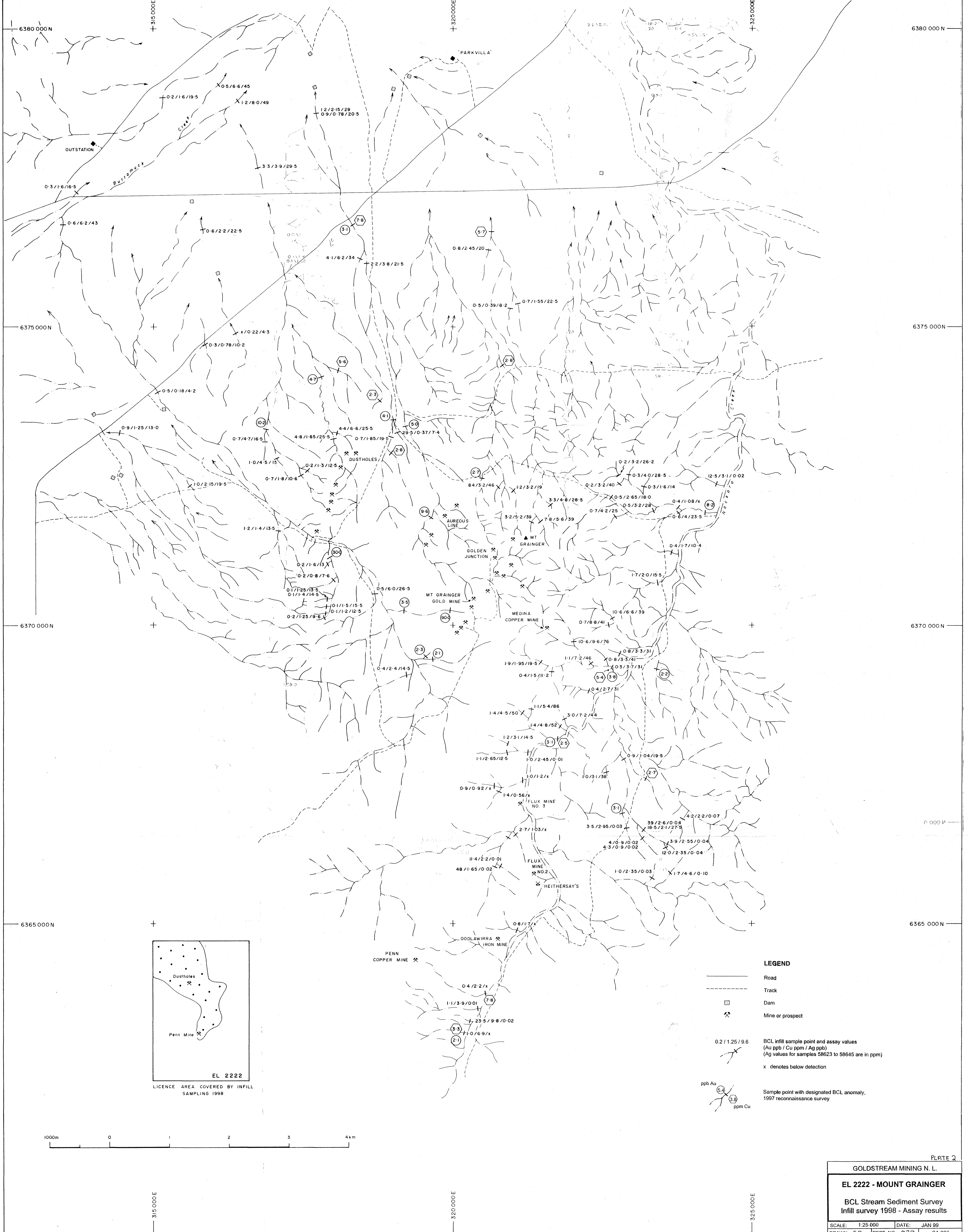


FIG. 1

GOLDSTREAM MINING N. L.		
EL 2222 - MT. GRAINGER		
Location plan		
SCALE: 1:100 000	DATE: DEC 97	
DRAWN: F.R.	REPT. NO.: 037	SA 070





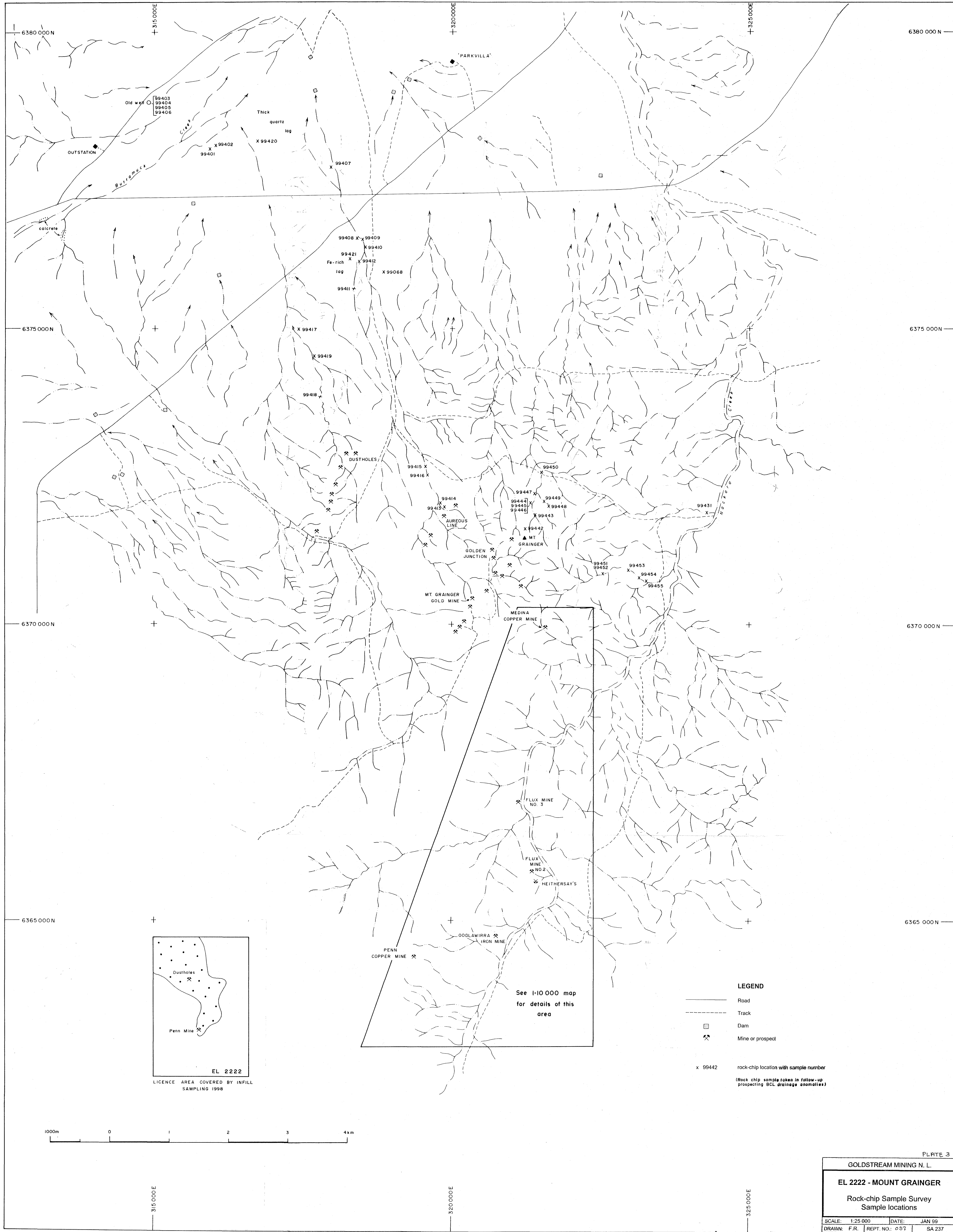
EL 2222
LICENCE AREA COVERED BY INFILL
SAMPLING 1998

LEGEND

— Road
--- Track
▣ Dam
✱ Mine or prospect

0.2 / 1.25 / 9.6
BCL infill sample point and assay values
(Au ppb / Cu ppm / Ag ppb)
(Ag values for samples 58623 to 58645 are in ppm)
x denotes below detection

ppb Au
ppm Cu
Sample point with designated BCL anomaly,
1997 reconnaissance survey

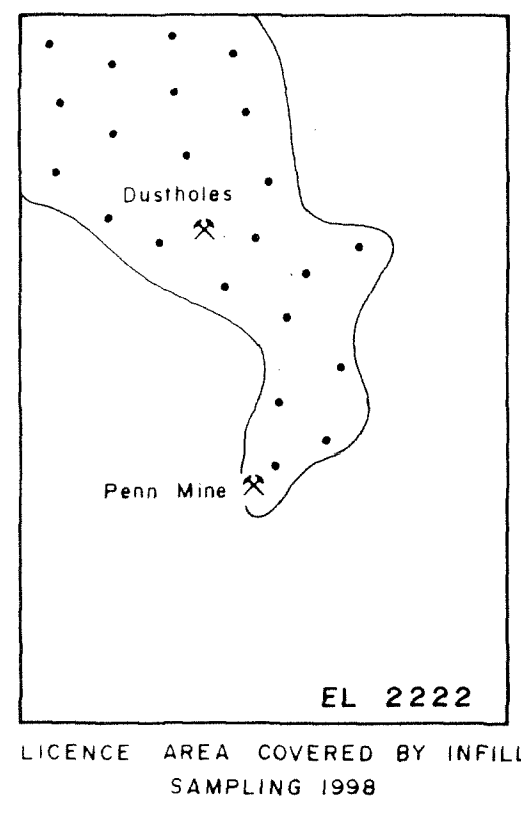
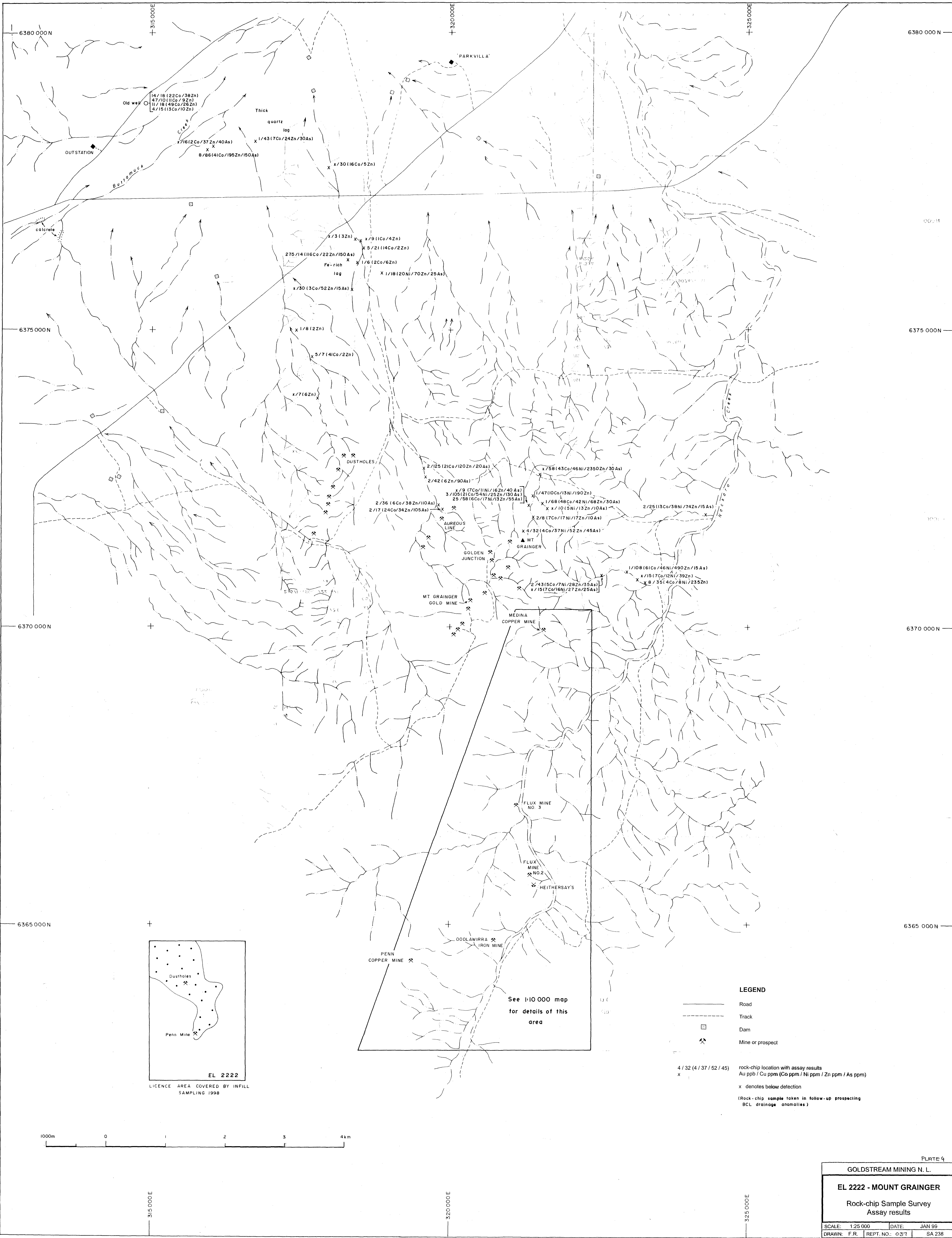


LEGEND

- Road
- - - Track
- ▣ Dam
- ⚡ Mine or prospect

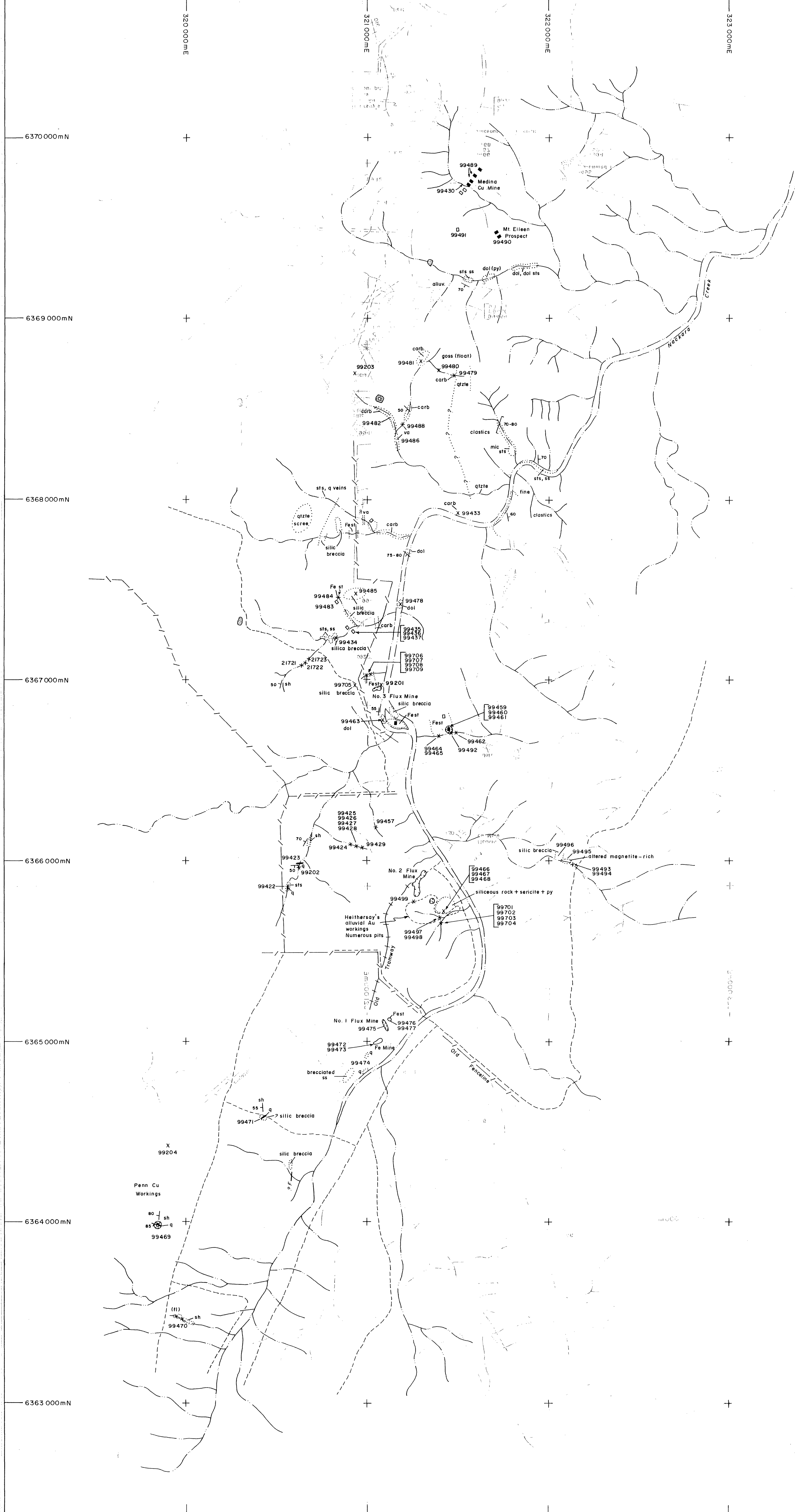
x 99442 rock-chip location with sample number

(Rock chip sample taken in follow-up prospecting BCL drainage anomalies)



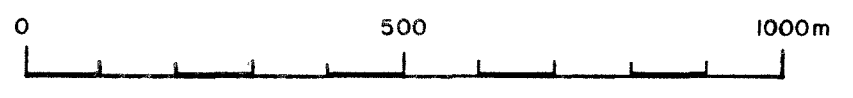
- LEGEND**
- Road
 - - - Track
 - ▣ Dam
 - ⋈ Mine or prospect

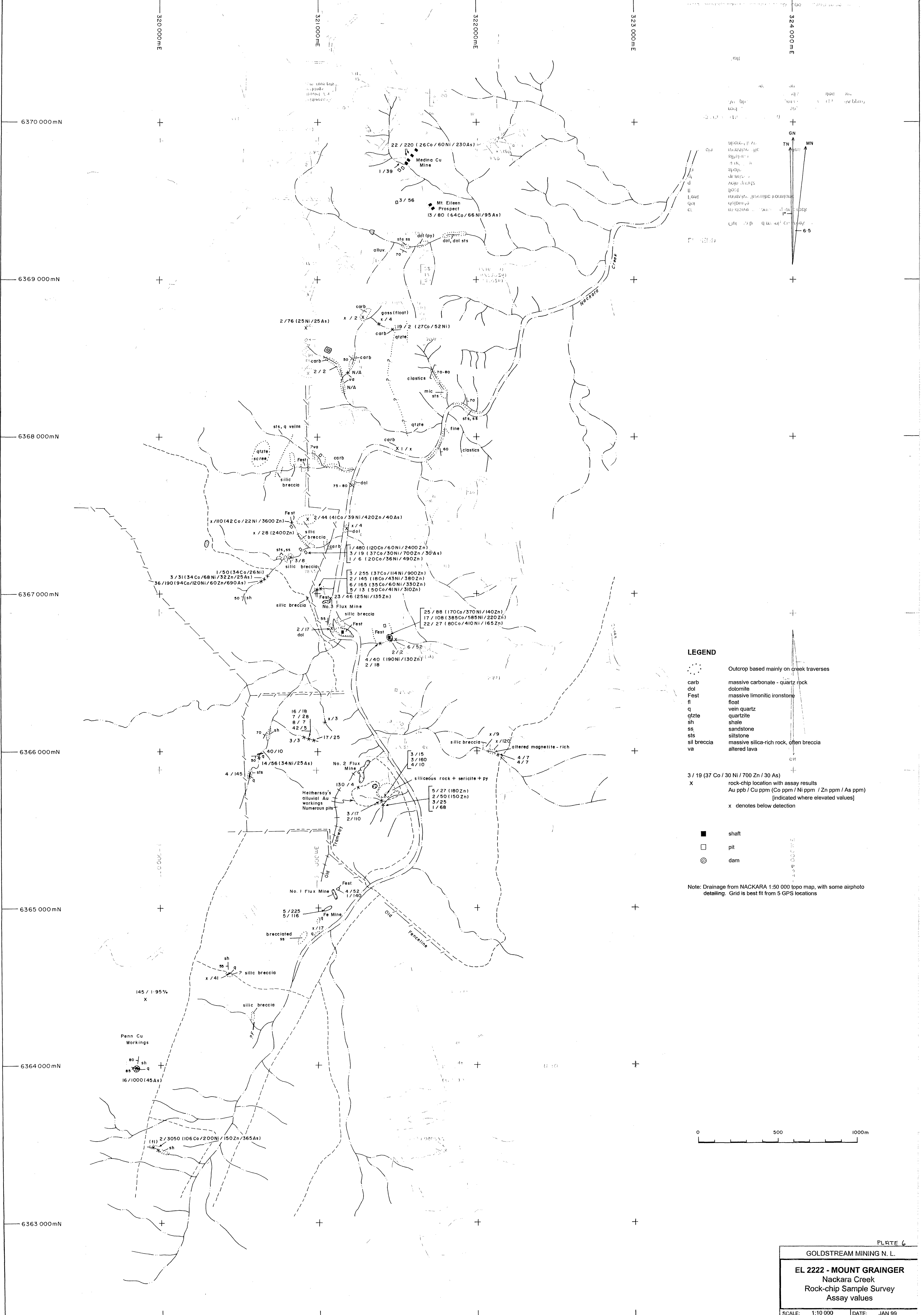
4 / 32 (4 / 37 / 52 / 45)
x rock-chip location with assay results
Au ppb / Cu ppm (Co ppm / Ni ppm / Zn ppm / As ppm)
x denotes below detection
(Rock-chip sample taken in follow-up prospecting
BCL drainage anomalies)

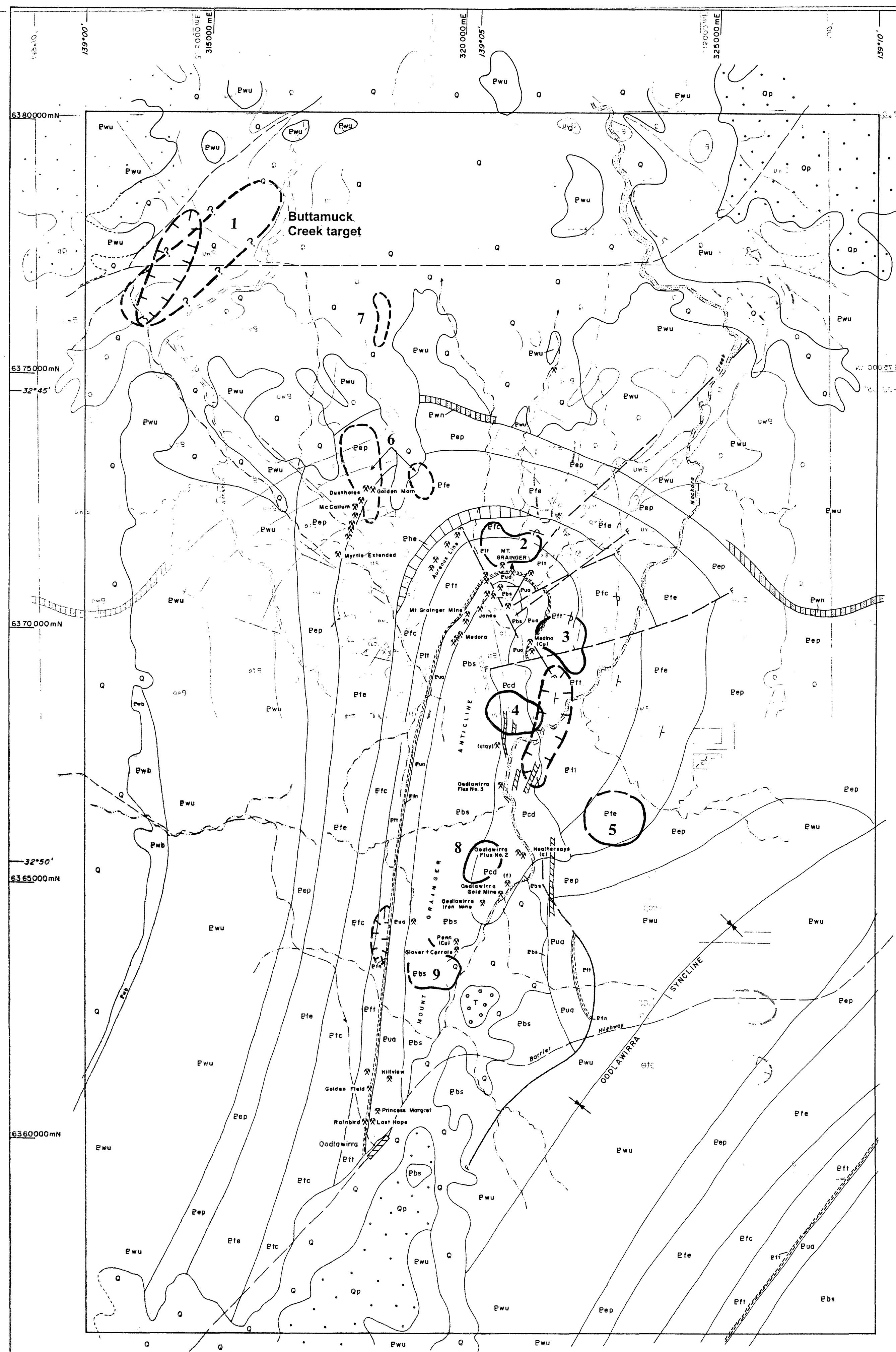


- LEGEND**
- Outcrop based mainly on creek traverses
 - carb massive carbonate - quartz rock
 - dol dolomite
 - Fest massive limonitic ironstone
 - fl float
 - q vein quartz
 - qtze quartzite
 - sh shale
 - ss sandstone
 - sts siltstone
 - sil breccia massive silica-rich rock, often breccia
 - va altered lava
 - X 99702 rock-chip location with sample number
 - shaft
 - pit
 - ⊙ dam

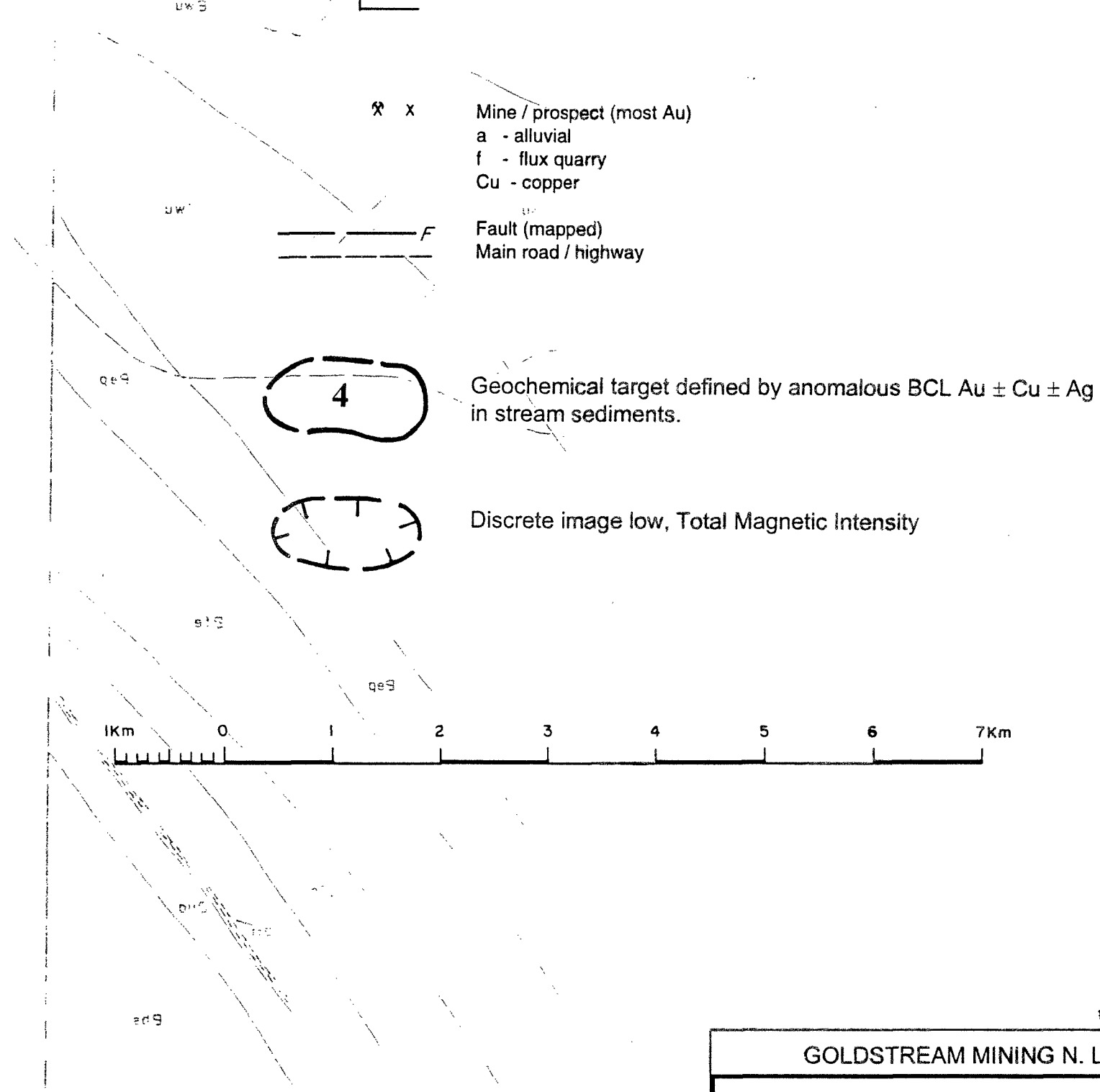
Note: Drainage from NACKARA 1:50 000 topo map, with some airphoto detailing. Grid is best fit from 5 GPS locations







LEGEND	
QUATERNARY	Q Surficial cover (undifferentiated)
	Qp Telford gravels, clay, calcrete
TERTIARY	T Silcreted gravels
WILPENA GROUP	Ewb Bunyeroo Fm - red shale, siltstone
	Ewu Ulupa Siltstone - green siltstone
	Ewn Nuccaleena Fm - laminated dolomite
UMBERATANA GROUP	Eep Pepuarta Tillite - massive diamictite (Gumbowie Arkose)
	Efe Enorama Shale - green shale
	Ehe Etina Fm - oolitic, stromatolitic limestones
BURRA GROUP	Efc Farrow Siltstone - grey-green siltstone
	Eft Tapley Hill Fm - grey calcareous siltstone
	Efn Tindelpina Shale Member - black shale, flaggy dolomite
CALLANNA GROUP	Eua Appila Tillite - diamictite, dolomite, arkose
	Ebs Saddleworth Fm - grey-green calcareous siltstone
	Ecd Mt. Grainger Diapir - shale, chert, dolomite (disturbed, ?diapiric emplacement)
	And andesite (altered)



Source of data:
Geology of the central Mount Grainger Anticline.
Including the goldfield, from Morris (1984)
Remainder of licence area from
ORROROO 1:250 000 published map (1968)

Appendix 1
Analytical Data – BCL Stream Sediment Fill-in Survey

Appendix 1. Analytical data, BCL stream sediment fill-in survey.					
SAMPLE	EAST	NORTH	Au (ppb)	Cu (ppm)	Ag (ppb)
58001	314160	6373270	0.9	1.25	13
58002	315000	6373920	0.5	0.18	4.2
58003	315850	6374720	0.3	0.78	10.2
58004	316330	6374810	<0.1	0.22	4.3
58005	318440	6376180	4.1	6.2	34
58006	318530	6375930	2.2	3.8	21.5
58007	316760	6377620	3.3	3.9	29.5
58008	315850	6376780	0.6	2.2	22.5
58009	313560	6376750	0.6	6.2	43
58010	313730	6377160	0.3	1.6	16.5
58011	316460	6378760	1.2	8	49
58012	317740	6378520	1.2	2.15	29
58013	317740	6378520	0.9	0.78	20.5
58014	315790	6378860	0.5	6.6	45
58015	315190	6378940	0.2	1.6	19.5
58016	318930	6373130	0.7	1.85	19
58017	320960	6375450	0.5	0.39	8.2
58018	321030	6375400	0.7	1.55	22.5
58019	320540	6376300	0.8	2.45	20
58020	319210	6373280	29.5	0.37	7.4
58021	318010	6373070	4.8	1.85	25.5
58022	318020	6373230	4.4	6.6	25.5
58023	315640	6372310	1	2.15	19.5
58024	317000	6371930	1.2	1.4	13.5
58025	317440	6372470	0.7	1.8	10.6
58026	317490	6372600	0.2	1.3	12.5
58027	316830	6372940	0.7	4.7	16.5
58028	317010	6372840	1	4.5	15
58029	317830	6370210	0.1	1.2	12.5
58030	317790	6370070	0.2	1.25	9.6
58031	317830	6370280	0.1	1.5	15.5
58032	317870	6370440	0.1	1.4	14.5
58033	317870	6370440	0.1	1.25	13.5
58034	317900	6370700	0.2	0.8	7.6
58035	317980	6371040	0.2	1.6	13
58036	318650	6370450	0.5	6	26.5
58037	318670	6369460	0.4	2.4	14.5
58038	320750	6372490	84	3.2	46
58039	320850	6372300	1.2	3.2	19
58040	321350	6372190	3.3	4.8	28.5
58041	321270	6371930	7.8	5.6	39
58042	321250	6371930	3.2	5.2	39
58043	322510	6372160	0.5	2.65	18
58044	322840	6371850	0.7	4.2	25
58045	322850	6372360	0.3	4	28.5
58046	322830	6372360	0.2	3.2	26.5
58047	322990	6372250	0.2	3.2	40
58048	322990	6372250	0.3	3.2	41
58049	323030	6372160	0.3	1.6	14
58050	323320	6371890	0.5	3.2	28
58051	323950	6371770	0.6	4	23.5

SAMPLE	EAST	NORTH	Au(ppb)	Cu(ppm)	Ag(ppb)
58052	323520	6371130	0.4	1.7	10.4
58053	323330	6370690	1.7	2	15.5
58054	322440	6369930	0.7	8.8	41
58055	322410	6369970	10.6	6.6	39
58056	322870	6369530	0.8	3.3	31
58057	322560	6369260	0.3	3.7	31
58058	322450	6369280	0.8	3.3	41
58059	322300	6369310	1.1	7.2	46
58060	322040	6369590	10.6	9.6	76
58061	321620	6369300	0.4	1.5	11.2
58062	321500	6369290	1.9	1.95	19.5
58063	322170	6368900	0.4	2.7	31
58064	321640	6368550	1.4	4.5	50
58065	321650	6368560	1.1	5.4	86
58066	320930	6367950	1.2	3.1	14.5
58067	320940	6367830	1.1	2.65	12.5
58068	321890	6368350	3	7.2	44
58069	321770	6368210	1.4	4.8	52
58070	322860	6367290	0.9	1.04	19.5
58071	322500	6367410	1	3.1	38
58072	323040	6366660	18.5	2.1	27.5
58073	323040	6366650	4	0.9	0.02
58623	324350	6371910	12.5	3.1	0.02
58624	324150	6371850	0.4	1.08	<0.01
58625	323190	6366600	3.9	2.55	0.04
58626	323190	6366580	12	2.35	0.04
58627	323010	6366630	39	2.6	0.04
58628	323010	6366600	4.3	0.9	0.02
58629	322980	6366600	3.5	2.95	0.03
58630	323720	6366860	4.2	2.2	0.07
58631	323080	6365690	1	2.35	0.03
58632	323530	6365470	1.7	4.6	0.1
58633	321230	6367840	1	2.45	0.01
58634	320750	6367210	1.4	0.56	<0.01
58635	320750	6367220	0.9	0.92	<0.01
58636	321160	6367420	1	1.2	<0.01
58637	320630	6365960	48	1.65	<0.01
58638	320640	6365980	11.4	2.2	0.01
58639	320920	6366500	2.2	2.75	0.01
58640	320930	6366480	2.7	1.08	<0.01
58641	320990	6364860	0.8	1.7	<0.01
58642	320030	6363150	1	6.9	<0.01
58643	320010	6363450	23.5	9.8	0.02
58644	320150	6363540	1.1	3.9	0.01
58645	320320	6363980	0.4	2.2	<0.01

Appendix 2

Analytical Data – Rock & Rock-chip Sampling

Appendix 2. Analytical data, rock and rock chip sampling.

SAMPLE	EAST	NORTH	Au	As	Cu	Ag	Co	Ni	Pb	Zn
21721	320500	6367820	36	690	190	0.4	94	120	18	60
21722	320500	6367820	3	25	31	0.2	34	68	7	32
21723	320650	6367820	1	5	50	<0.1	34	26	7	14
99068	318530	6375930	1	25	18	<0.1		20	17	70
99201	321060	6366970	23	<5	46	0.4		25	<1	135
99202	320630	6365960	14	25	56	0.5		34	140	11
99203	320930	6368690	2	25	76	0.2		25	5	11
99204	319900	6364420	180	45	19500	0.7		31	5	17
99401	315920	6378040	8	150	86	0.3	41		2	195
99402	316000	6378100	<1	40	16	<0.1	2		2	37
99403	314900	6378830	14	<5	18	<0.1	22		1	38
99404	314900	6378830	47	<5	10	0.2	11		<1	9
99405	314900	6378830	11	<5	18	<0.1	49		9	26
99406	314900	6378830	4	<5	15	<0.1	13		2	10
99407	317960	6377720	<1	<5	30	<0.1	16		3	5
99408	318400	6376540	<1	<5	3	<0.1	<1		3	3
99409	318480	6376500	<1	<5	9	<0.1	1		1	4
99410	318540	6376380	5	<5	21	<0.1	14		<1	2
99411	318600	6375650	1	15	30	<0.1	3		17	52
99412	318450	6376100	1	<5	6	<0.1	2		2	6
99413	319880	6371980	2	105	17	<0.1	24		5	34
99414	319800	6372030	2	110	36	<0.1	6		16	38
99415	319570	6372650	2	20	125	0.1	21		2	120
99416	319600	6372520	2	90	42	<0.1	<1		1	6
99417	317430	6375000	1	<5	8	<0.1	<1		4	2
99418	317780	6373840	<1	<5	7	<0.1	<1		4	6
99419	317700	6374500	5	<5	7	<0.1	41		2	2
99420	316700	6378170	1	30	43	0.1	7		7	24
99421	318300	6376170	275	150	14	<0.1	116		2	22
99422	320610	6365780	4	25	145	0.1	25	52	11	21
99423	320680	6365920	40	45	70	0.8	33	47	125	23
99424	320930	6366140	3	5	3	<0.1	2	4	4	9

SAMPLE	EAST	NORTH	Au	As	Cu	Ag	Co	Ni	Pb	Zn
99425	320960	6366120	16	5	18	<0.1	3	3	3	15
99426	320960	6366120	7	15	28	<0.1	24	29	1	22
99427	320960	6366120	8	15	7	<0.1	45	84	<1	62
99428	320970	6366110	42	10	5	0.1	98	132	<1	40
99429	321020	6366080	17	5	25	<0.1	5	6	2	7
99430	321600	6369900	1	10	39	<0.1	2	9	14	40
99431	324300	6371880	2	15	25	<0.1	13	38	36	74
99432	320970	6367300	1	45	60	<0.1	52	84	<1	620
99433	321560	6368000	1	<5	<1	<0.1	4	15	2	24
99434	320820	6367280	3	10	8	<0.1	2	7	3	12
99435	321040	6367320	1	5	480	<0.1	120	60	<1	2400
99436	321040	6367320	3	30	19	<0.1	37	30	2	700
99437	321040	6367320	1	<5	6	<0.1	20	36	<1	490
99438	323040	6366700	2	<5	1	<0.1	12	31	2	22
99439	323640	6366860	7	<5	2	<0.1	6	7	4	17
99440	323630	6366780	8	<5	<1	<0.1	2	33	4	12
99441	323720	6366890	5	5	<1	<0.1	4	1	3	13
99442	321250	6371620	4	45	32	0.3	4	37	2	52
99443	321400	6371840	2	10	8	<0.1	7	17	<1	17
99444	321370	6372040	<1	40	9	<0.1	7	11	4	16
99445	321370	6372040	3	130	105	<0.1	21	54	2	25
99446	321370	6372040	25	55	58	<0.1	6	17	2	13
99447	321420	6372180	1	<5	47	<0.1	10	13	4	190
99448	321640	6372000	<1	10	10	<0.1	<1	5	3	13
99449	321560	6372070	1	30	68	<0.1	48	42	4	68
99450	321540	6372550	<1	30	58	0.1	43	46	1600	2350
99451	322560	6370830	2	35	43	<0.1	5	7	15	28
99452	322560	6370830	<1	25	15	<0.1	7	16	14	27
99453	323000	6370900	1	15	108	<0.1	61	46	12	490
99454	323180	6370780	<1	<5	15	<0.1	7	12	11	39
99455	323300	6370720	8	<5	35	<0.1	4	8	8	235
99456	323600	6366930	4	10	6	<0.1	21	41	2	21
99457	321170	6366220	<1	<5	8	<0.1	6	9	3	9

SAMPLE	EAST	NORTH	Au	As	Cu	Ag	Co	Ni	Pb	Zn
99459	321450	6366725	25	<5	88	<0.1	170	370	3	140
99460	321450	6366725	17	<5	108	<0.1	385	585	<1	220
99461	321450	6366725	22	<5	27	<0.1	80	410	1	165
99462	321490	6366700	6	5	52	<0.1	21	102	1	14
99463	321080	6366770	1	10	17	0.6	15	16	1	38
99464	321300	6366690	4	<5	40	0.2	23	190	2	130
99465	321380	6366690	2	5	18	<0.1	6	8	<1	20
99466	321430	6365720	3	5	15	<0.1	3	<1	1	3
99467	321430	6365720	3	10	160	<0.1	2	2	1	19
99468	321430	6365720	4	<5	10	<0.1	2	<1	<1	6
99469	319850	6363980	16	45	1000	<0.1	6	14	<1	9
99470	319950	6363470	2	365	3050	<0.1	106	200	6	150
99471	320430	6364580	<1	15	41	<0.1	2	8	2	5
99472	321050	6364990	5	15	225	<0.1	9	2	1	37
99473	321050	6364990	5	25	116	<0.1	23	10	<1	60
99474	321000	6364920	<1	10	17	<0.1	2	<1	<1	1
99475	321100	6365090	<1	10	210	<0.1	12	12	4	31
99476	321120	6365130	4	<5	52	<0.1	6	<1	2	33
99477	321120	6365130	1	10	140	<0.1	26	26	<1	84
99478	321180	6367410	<1	<5	4	<0.1	3	<1	1	3
99479	321470	6368680	19	<5	2	<0.1	27	52	3	12
99480	321390	6368710	<1	<5	4	<0.1	4	<1	2	2
99481	321290	6368760	<1	<5	2	<0.1	3	7	<1	6
99482	321120	6368450	2	<5	2	<0.1	15	23	1	31
99483	320830	6367430	<1	10	28	0.1	17	21	2	2400
99484	320840	6367440	<1	25	110	<0.1	42	22	2	3600
99485	320930	6367480	2	40	44	<0.1	41	39	2	420
99489	321580	6369770	22	250	220		26	60		52
99490	321720	6369460	13	95	80		64	66		56
99491	321490	6369490	3	30	56		23	28		24
99492	321470	6366700	2	10	2		4	26		5
99493	322130	6365980	4	5	7		2	6		3
99494	322130	6365980	4	5	7		1	7		2

SAMPLE	EAST	NORTH	Au	As	Cu	Ag	Co	Ni	Pb	Zn
99495	322090	6366000	<1	<5	120		35	20		18
99496	322100	6366020	<1	5	9		5	13		5
99497	321400	6365690	3	5	17		<1	3		3
99498	321400	6365690	2	<5	110		2	5		2
99499	321250	6365780	130	<5	4		<1	4		<1
99701	321400	6365660	5	15	27		6	11		
99702	321400	6365660	3	<5	50		<1	13		
99703	321400	6365660	3	5	25		1	13		
99704	321400	6365660	1	<5	68		1	6		
99706	321020	6367030	3	10	255		37	114		
99707	321020	6367030	2	10	145		18	43		
99708	321020	6367030	6	10	165		35	60		
99709	321020	6367030	5	10	13		50	41		

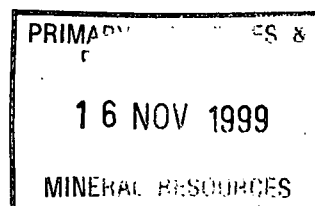
GOLDSTREAM MINING N.L.
A.C.N. 009 129 560

Annual Report

E.L. 2222 "MOUNT GRAINGER" J/V

For period 25 October 1998 to 24 October 1999

Author: H. Parry
Date: November 1999
Copies to: PIRSA (2)
GDM – Perth
GDM – Adelaide
I & M Filsells
J. Simnovec



GDM Report No: 066



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Appendix 2 : -2mm BCL Soil Geochemical Data

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Appendix 4.: RAB Geochemical Data

1. Summary

Exploration for gold on E.L. 2222 "Mt Grainger" has consisted of rockchip and BCL soil sampling and RAB drilling (411m) of four geophysical targets.

BCL soil sampling failed to define a target large enough to meet Goldstream's current exploration criteria. Some elevated results were returned from the drilling but Goldstream does not give them high priority in the company's current exploration strategy.

2. Introduction

Exploration Licence 2222 "Mt Grainger" is located 240km north-northeast of Adelaide. The Barrier Highway to Broken Hill traverses the southeastern corner of the licence, passing through the town of Oodla Wirra. Access to the tenement is good, via numerous roads and station tracks. Land is generally used for stock grazing and consists of undulating paddocks, some of which are thickly vegetated with mallee scrub.

The licence covers the Mount Grainger goldfield and much of the surrounding Nackara Arc. Numerous historic gold prospects and small mines are scattered through a broad stratigraphic interval within the Mt Grainger Anticline.

3. Tenure

Exploration Licence 2222 "Mt Grainger" was granted to Ian and Mark Filsell (50%) and John Simnovéc (50%) on 25th October 1996. Goldstream Mining N.L. entered into a joint venture, as managing partner, with provision to earn a 90% equity.

The licence covers an area of 375 km², with a number of claims, including the Mt Grainger mine lease, being excluded.

4. Geology

The geology of the tenement has been discussed in the first annual report to 24th October 1997.

5. Previous Exploration

Exploration by previous companies covering E.L. 2222 has been summarised in Appendix 1 of the first annual report to 24th October 1997.

6. Current Exploration

6.1 Rockchip Geochemistry

Five rockchip samples were collected and analysed for Au, As, Ag, Co, Pb and Zn. No significant metal values were returned (Appendix 1).

6.2 BCL Soil Geochemistry

Two hundred and two -2mm BCL soil samples were collected in the Nackara Creek area (Plate 1) and thirty were collected on the White Kangaroo Prospect (Appendix 2). Peak results were 170 ppb Au, 17 ppm Cu and 88ppm Ag, from the Nackara Creek Prospect (Plates 2 - 4). No significant results were returned from the White Kangaroo Prospect.

6.3 RAB Drilling

Eleven RAB holes were drilled, for 417m (Plate 5), over four aeromagnetic. The drillholes targeted two discrete magnetic lows and two magnetic highs. Basement rocks, where intersected, included fine-grained mafic intrusives and quartz-feldspar-biotite granitoids. Basement rocks were overlain by fine-grained Adelaidean sediments and recent transported unconsolidated cover sequences (Appendix 3).

Five metre composites were analysed for Au, As, Cu, Ag, Pb, and Zn. A peak Au value of 320 ppb was returned within a transported cover sequence above a fine grained mafic intrusive (Plate 6). Other peak results include 205 ppm Cu, 0.6 ppm Ag, 125 ppm Pb and 660 ppm Zn (Appendix 4). Drill targets were generated from an interpretation of the regional aeromagnetic TMI data (Plate 7) by Chris Anderson and Associates.

7. Conclusions

Surface geochemical sampling failed to produce any anomalies of significant size and the anomalous Au values returned from the Nackara Creek area were not investigated any further. RAB drilling failed to identify any anomalous basement geochemistry associated with the aeromagnetic targets. At this point Goldstream feels that E.L. 2222 "Mt Grainger" does not rate highly against other currently active tenements and therefore the company has chosen to withdraw from the joint venture.

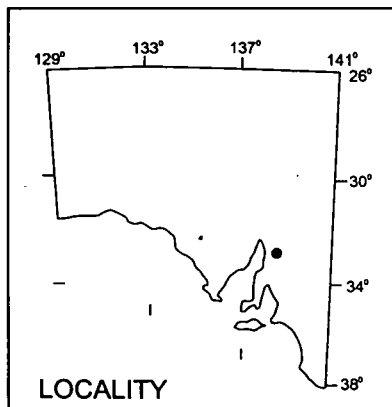
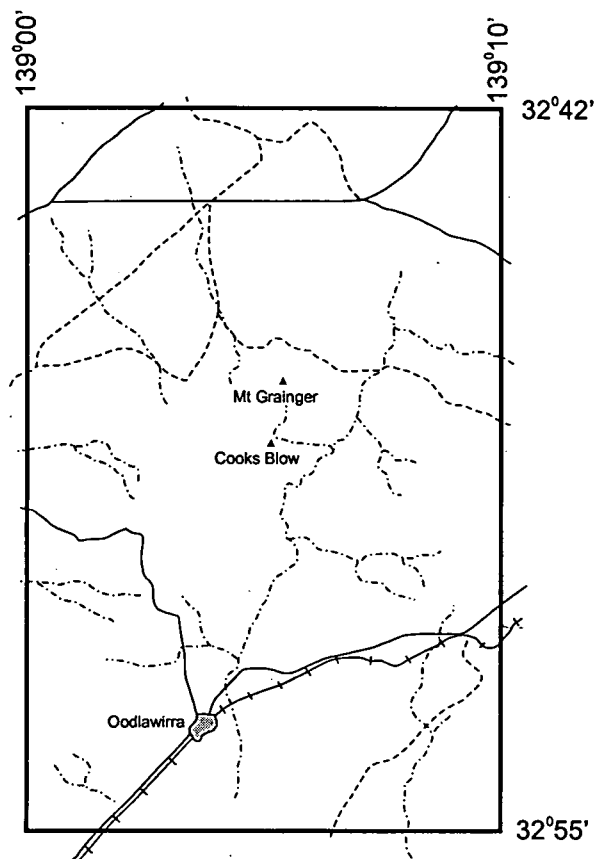
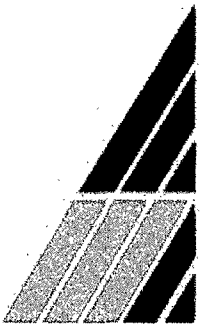
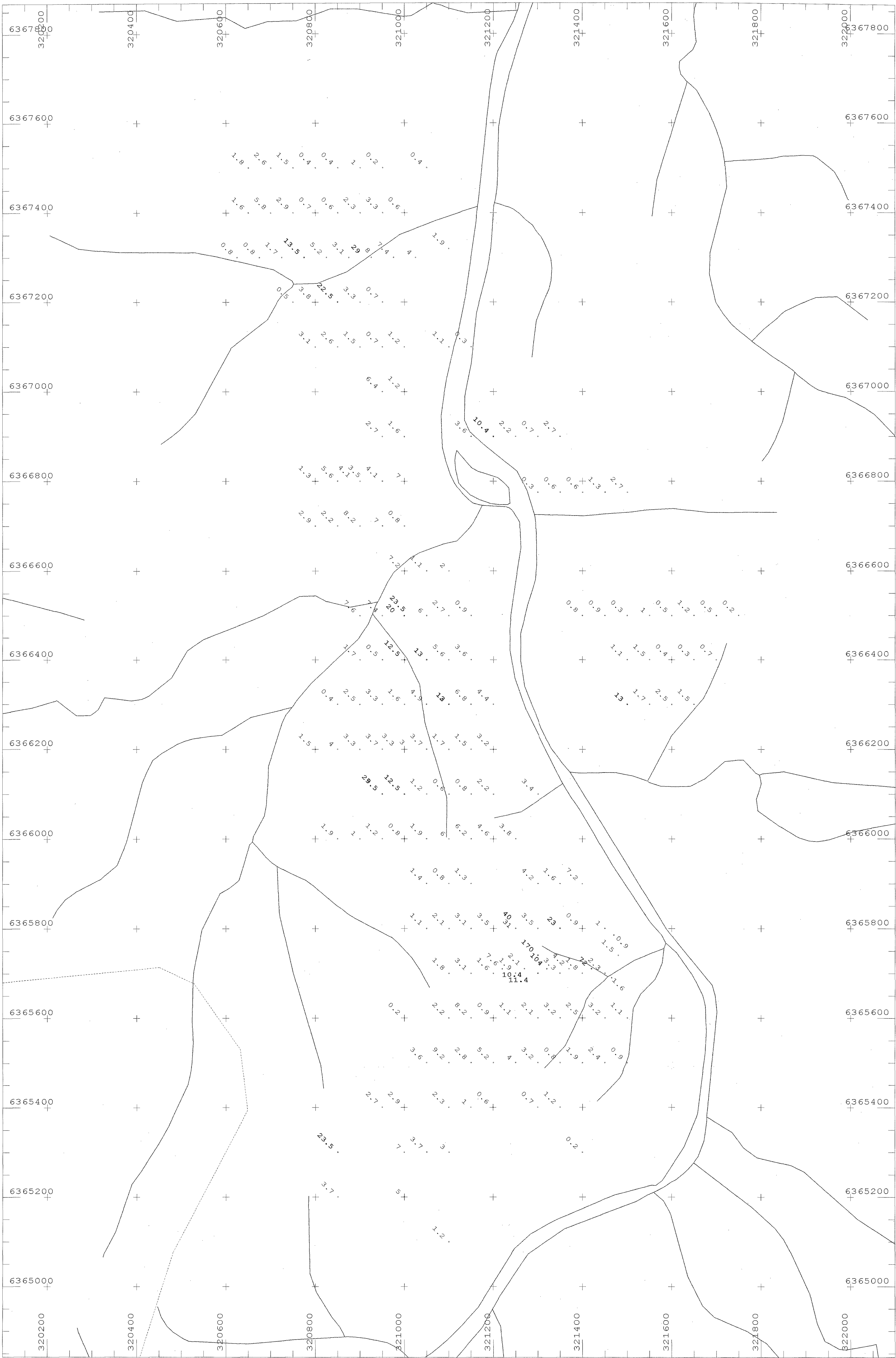


FIG. 1

GOLDSTREAM MINING N.L.		
EL 2222 - MT GRAINGER		
Location plan		
SCALE: 1:250 00		DATE: SEP 99
DRAWN: F.R.	REPT. NO.: 66	SA 283



GOLDSTREAM MINING N.L.

Scale

1:5000

DATE

REF No.

1

NACKARA CRK SOILS

SHEET

1 of 1

FILE

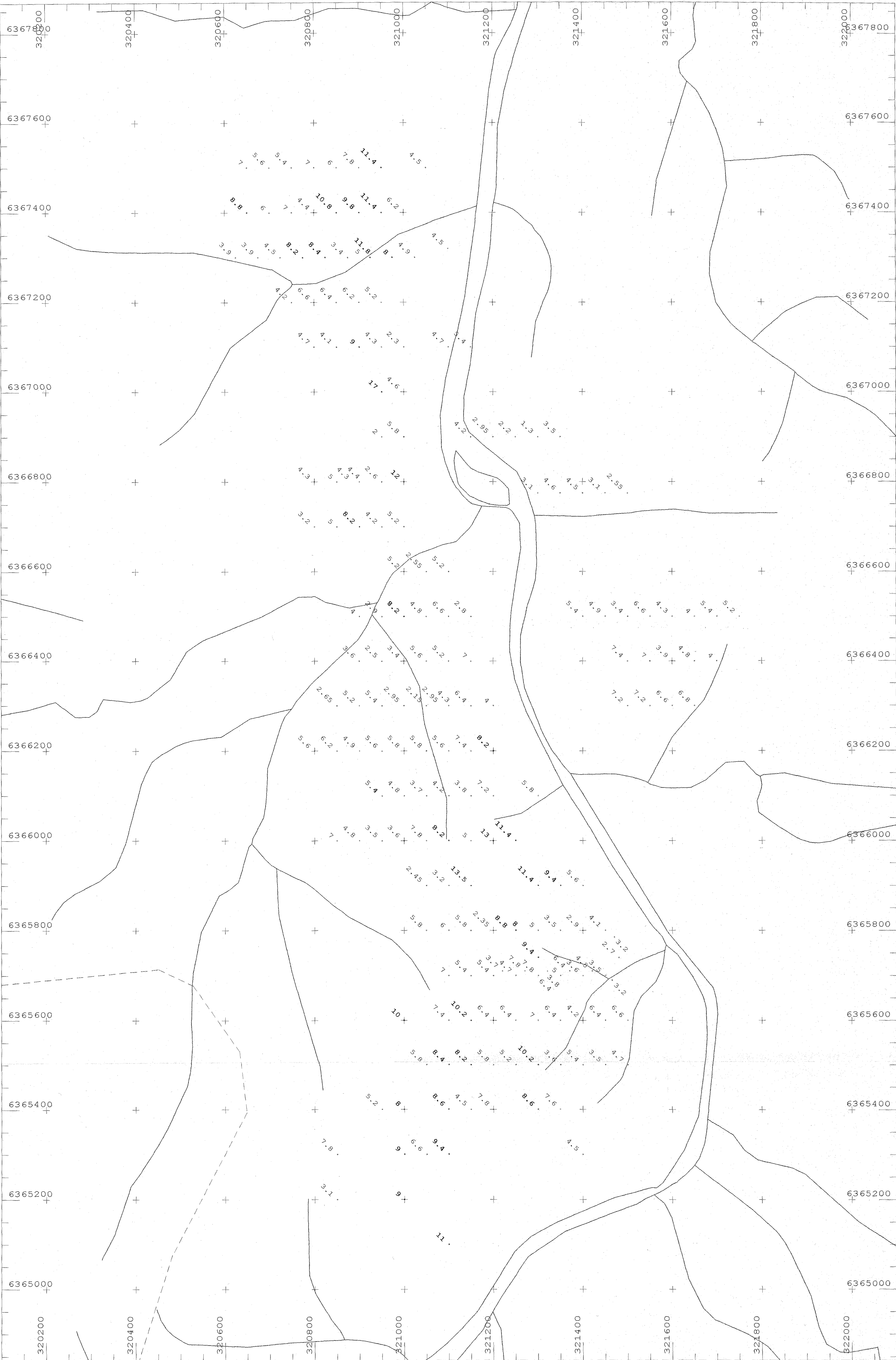
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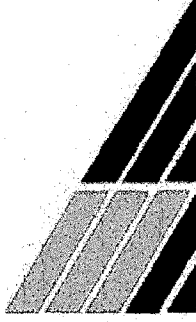
250

500m

PLATE 2

E.L. 2222 Mt Grainger
Nackara Creek
-2mm BCL Soil
Au Values (ppb)





Scale

1:5000

DATE

REF No.

1

SHEET

1 of 1

FILE

NACKARA CRK SOILS

0

250

500m

PLATE 3

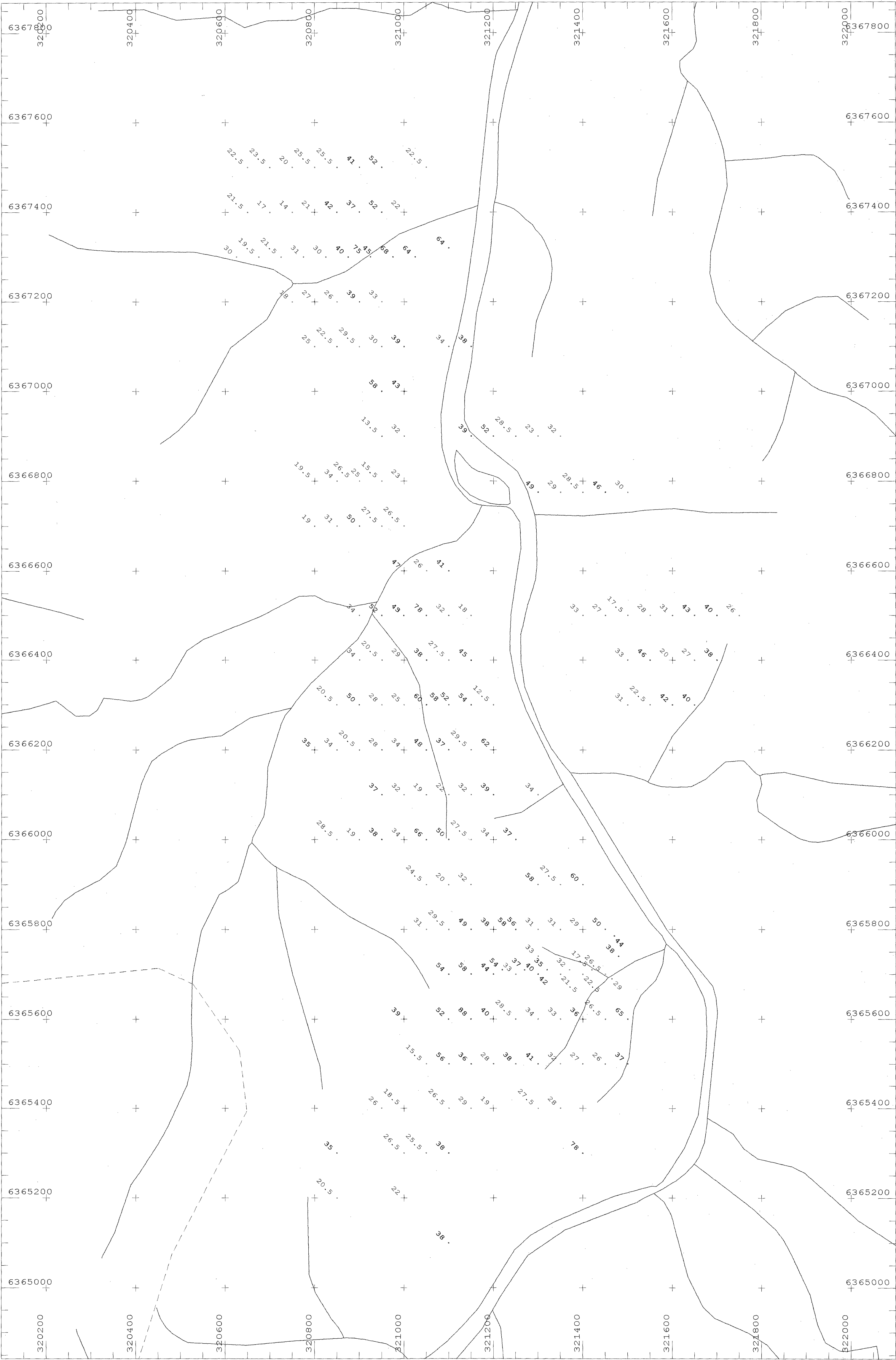
E.L. 2222 Mt Grainger

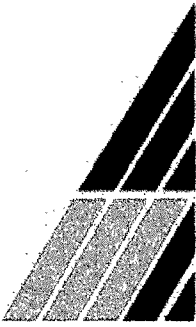
Nackara Creek

-2mm BCL Soil

Cu Values (ppm)

SA 291
QOM REPT 066

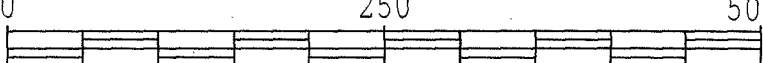




GOLDSTREAM MINING N.L.

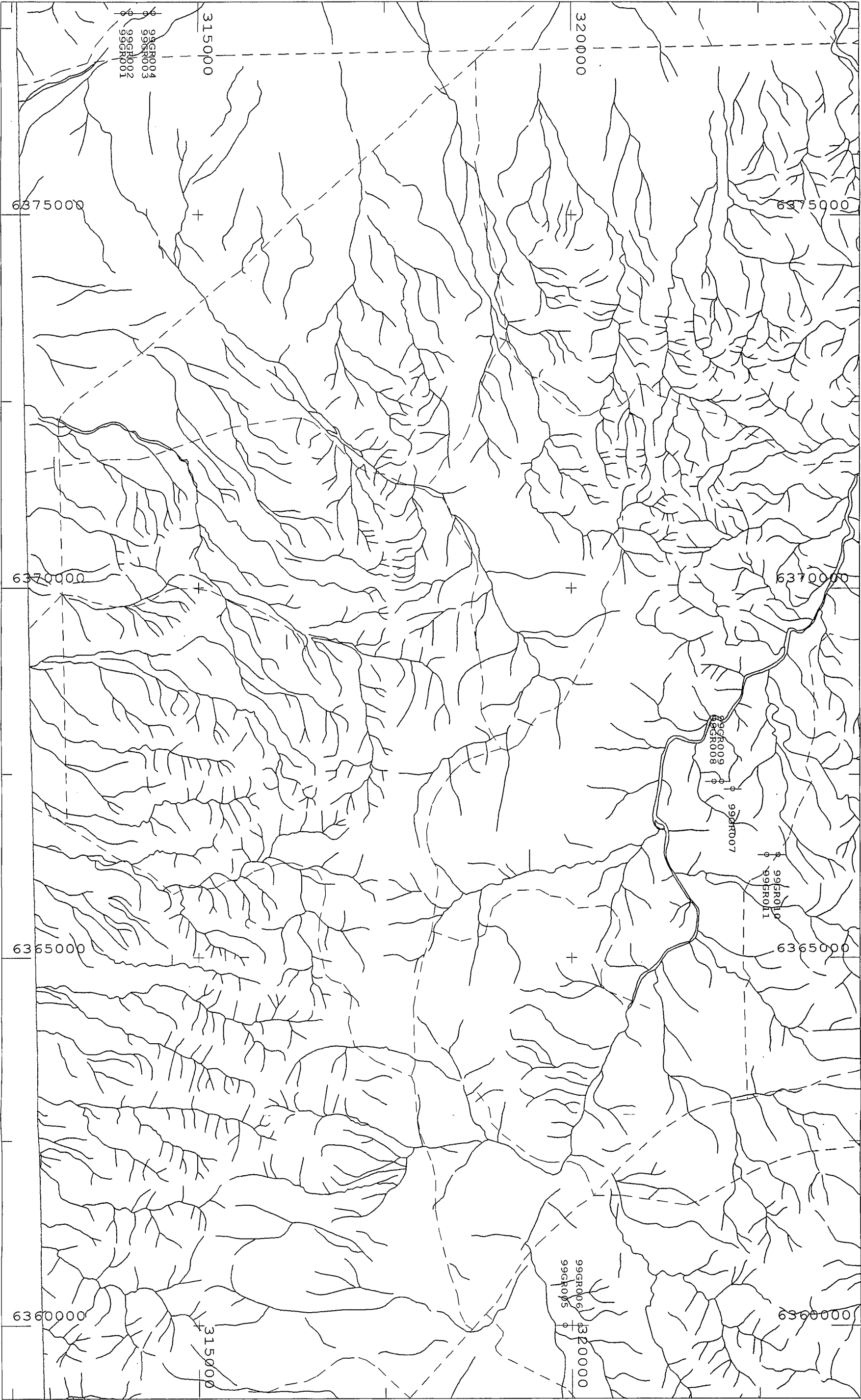
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0250500m

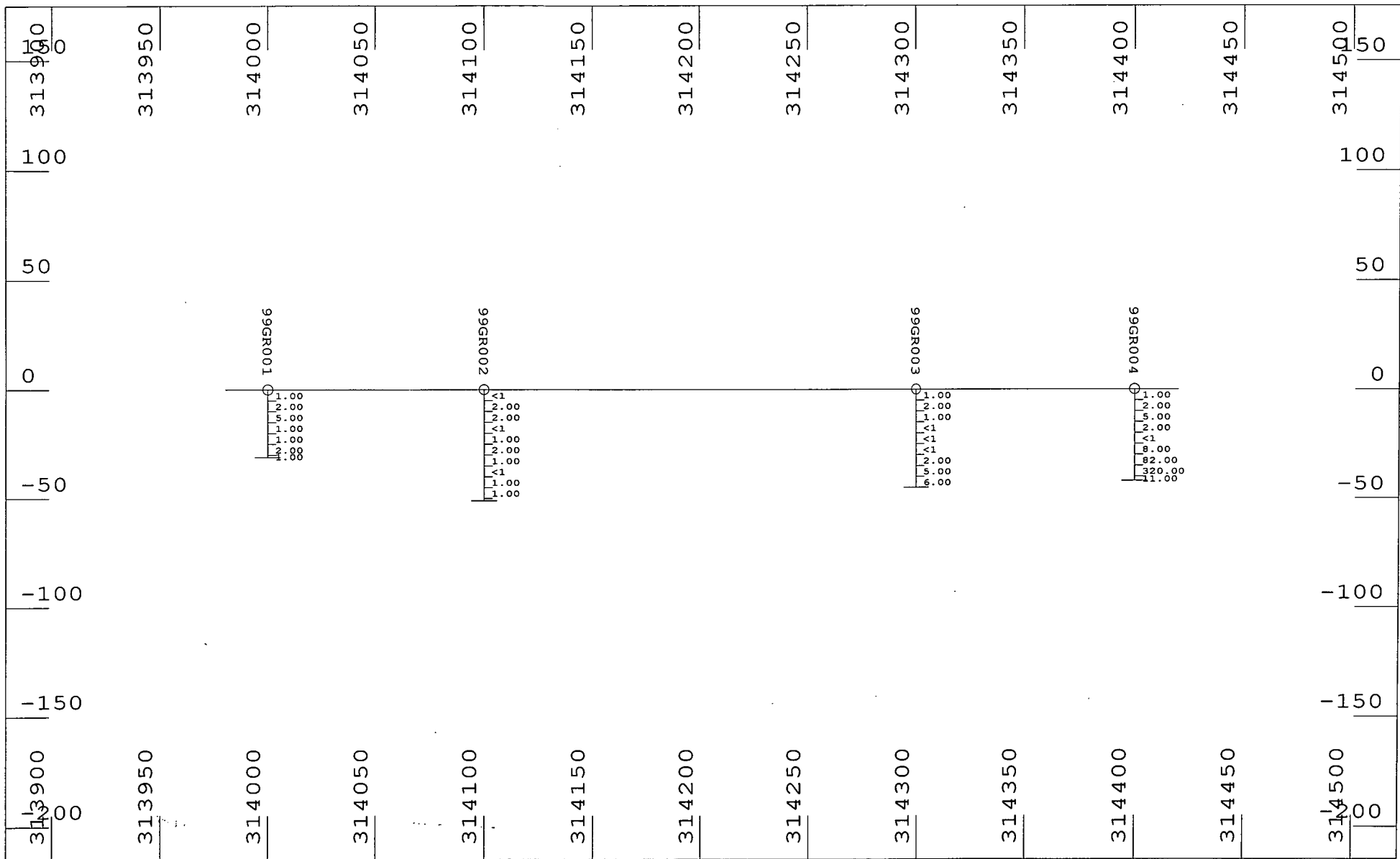


E.L. 2222 Mt Grainger
Nackara Creek
-2mm BCL Soil
Ag Values (ppm)

PLATE 4
SA 792
ADM REPT 066



 GOLDSTREAM MINING N. L.	Scale 1:50000	DATE REF No. 1	SHEET 1 of 1 FILE GRAINGER DRILL PLAN	PLATE 5 E.L. 2222 Mt Grainger Drillhole Plan SA 287 ADM REPT 066
	0 2500m			



GOLDSTREAM MINING N. L.

Scale
1:2500

DATE

REF No.
1

SHEET
1 of 1

FILE
BUTTAMUCK

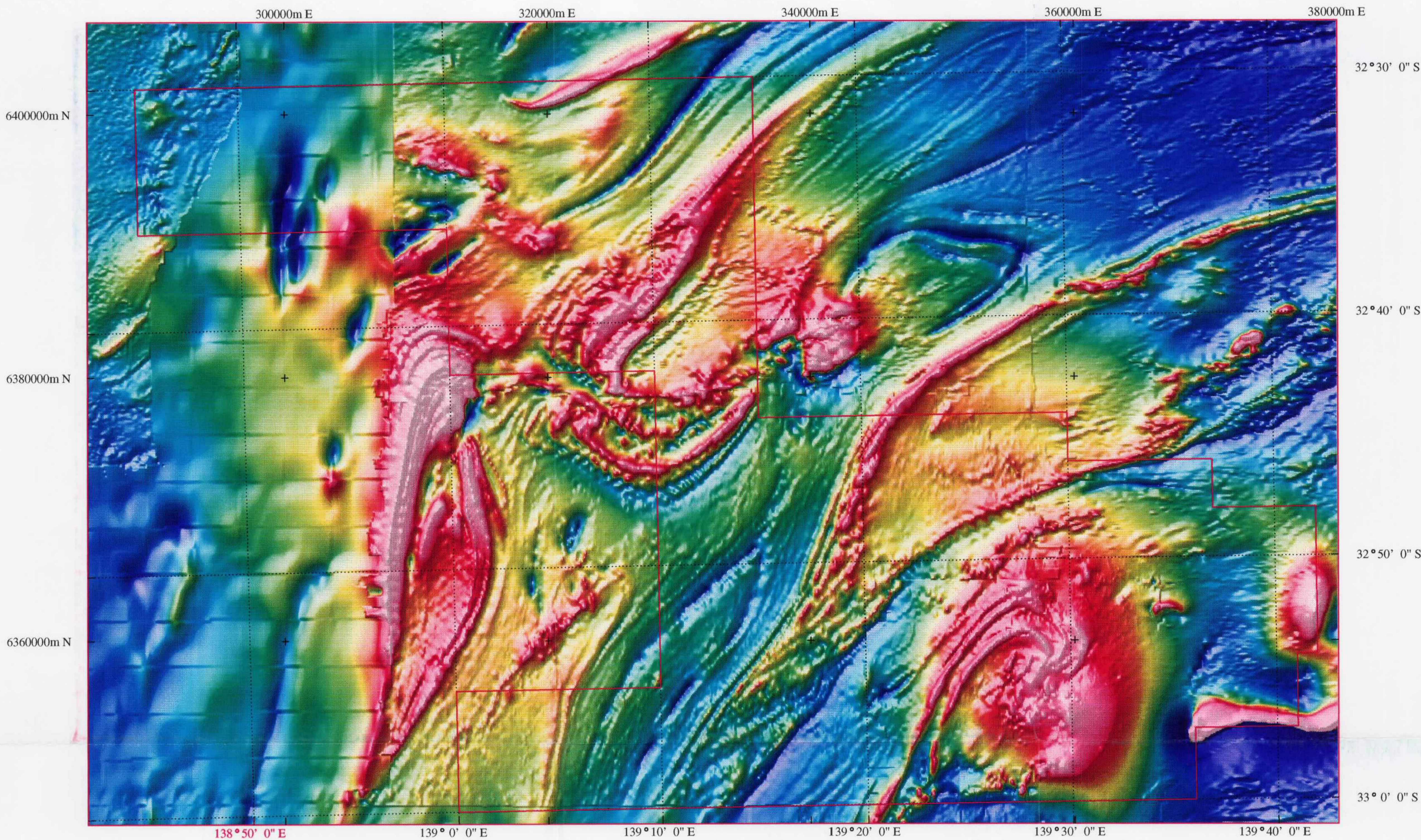
E.L. 2222 Mt Grainger
Drillhole Section
6377700N
Au Values (ppb)

PLATE 6

SA 288

GDM REPT 066

NACKARA TMI



GOLDSTREAM MINING NL	
NACKARA ELA	
TMI IMAGE	
REF.	
SCALE 1:250000	PLATE 7
AUTHOR : CGA	REPORT : GDM C66
DATE : 2/11/1999	PLAN NO. :

Appendix 1

Rockchip Geochemical Data

Appendix 1. Rockchip Geochemical Data.

SAMPLE	EAST	NORTH	DATE	NOTES	Au (ppb)	As (ppm)	Ag (ppm)	Co (ppm)	Pb (ppm)	Zn (ppm)
99205	320980	6367200	3/3/99	Jaspilitic rock, some jarisite(?), minor haematite	4	20	<0.1	20	6	150
99206	321220	6365920	4/3/99	Fe-ox rich altered sediment, minor qtz haematite.	10	30	0.2	38	2	235
99207	321100	6365200	4/3/99	Haematite, Fe-ox altered sediment, minor qtz	2	25	<0.1	15	1	92
99208	321070	6365180	4/3/99	Fe-ox alt sed, some poor bedding remaining	9	25	<0.1	36	1	88
99209	319100	6364500	5/3/99	Qtz vein, strike ~ 180 - 190 deg, parallel to bedding.	1	10	<0.1	2	2	6

Appendix 2

-2mm BCL Soil Geochemical Data

Appendix 2. -2mm BCL Soil Geochemical Data.

SAMPLE	EAST	NORTH	PROSPECT	Au (ppb)	Cu(ppm)	Ag(ppm)
54125	321000	6365600	Nackara Creek	0.2	10	39
54126	321050	6367500	Nackara Creek	0.4	4.5	22.5
54127	320950	6367500	Nackara Creek	0.2	11.4	52
54128	320900	6367500	Nackara Creek	1	7.8	41
54129	320850	6367500	Nackara Creek	0.4	6	25.5
54130	320800	6367500	Nackara Creek	0.4	7	25.5
54131	320750	6367500	Nackara Creek	1.5	5.4	20
54132	320700	6367500	Nackara Creek	2.6	5.6	23.5
54133	320650	6367500	Nackara Creek	1.8	7	22.5
54134	321000	6367400	Nackara Creek	0.6	6.2	22
54135	320950	6367400	Nackara Creek	3.3	11.4	52
54136	320900	6367400	Nackara Creek	2.3	9.8	37
54137	320850	6367400	Nackara Creek	0.6	10.8	42
54138	320800	6367400	Nackara Creek	0.7	4.4	21
54139	320750	6367400	Nackara Creek	2.9	7	14
54140	320700	6367400	Nackara Creek	5.8	6	17
54141	320650	6367400	Nackara Creek	1.6	8.8	21.5
54142	320925	6367300	Nackara Creek	8	11.8	75
54143	320950	6367200	Nackara Creek	0.7	5.2	33
54144	320900	6367200	Nackara Creek	3.3	6.2	39
54145	320850	6367200	Nackara Creek	22.5	6.4	26
54146	320800	6367200	Nackara Creek	3.8	6.6	27
54147	320750	6367200	Nackara Creek	0.5	4.2	18
54148	320900	6367100	Nackara Creek	1.5	9	29.5
54149	320850	6367100	Nackara Creek	2.6	4.1	22.5
54150	320800	6367100	Nackara Creek	3.1	4.7	25
54151	321000	6366800	Nackara Creek	7	12	23
54152	320950	6366800	Nackara Creek	4.1	2.6	15.5
54153	320900	6366800	Nackara Creek	4.1	4.3	26.5
54154	320900	6366800	Nackara Creek	3.5	4.4	25
54155	320850	6366800	Nackara Creek	5.6	5	34
54156	320800	6366800	Nackara Creek	1.3	4.3	19.5
54157	320900	6366700	Nackara Creek	8.2	8.2	50
54158	320850	6366700	Nackara Creek	2.2	5	31
54159	320800	6366700	Nackara Creek	2.9	3.2	19
54160	321000	6366600	Nackara Creek	7.2	5.2	47
54161	321050	6366600	Nackara Creek	1.1	2.55	26
54162	321100	6366600	Nackara Creek	2	5.2	41
54163	320900	6366500	Nackara Creek	7.6	4	34
54164	321000	6366500	Nackara Creek	23.5	8.2	45
54165	321000	6366400	Nackara Creek	12.5	3.4	29
54166	320950	6366400	Nackara Creek	0.5	2.5	20.5
54167	320900	6366400	Nackara Creek	1.7	3.6	34
54168	321050	6366400	Nackara Creek	13	5.6	38
54169	321100	6366400	Nackara Creek	5.6	5.2	27.5
54170	321150	6366400	Nackara Creek	3.6	7	45
54171	321100	6366300	Nackara Creek	13	4.3	52
54172	320900	6366300	Nackara Creek	2.5	5.2	50
54173	320850	6366300	Nackara Creek	0.4	2.65	20.5
54174	321000	6366200	Nackara Creek	3.3	5.8	34
54175	321000	6366200	Nackara Creek	3	5.8	34
54176	320950	6366200	Nackara Creek	3.7	5.6	28

Appendix 2. -2mm BCL Soil Geochemical Data.

SAMPLE	EAST	NORTH	PROSPECT	Au (ppb)	Cu (ppm)	Ag (ppm)
54177	320900	6366200	Nackara Creek	3.3	4.9	20.5
54178	320850	6366200	Nackara Creek	4	6.2	34
54179	320800	6366200	Nackara Creek	1.5	5.6	35
54180	321050	6366200	Nackara Creek	3.7	5.8	48
54181	321100	6366200	Nackara Creek	1.7	5.6	37
54182	321150	6366200	Nackara Creek	1.5	7.4	29.5
54183	321200	6366200	Nackara Creek	3.2	8.2	62
54184	320950	6366100	Nackara Creek	25.5	5.4	37
54185	321000	6366000	Nackara Creek	0.8	3.6	34
54186	320950	6366000	Nackara Creek	1.2	3.5	38
54187	320900	6366000	Nackara Creek	1	4.8	19
54188	320850	6366000	Nackara Creek	1.9	7	28.5
54189	321050	6366000	Nackara Creek	1.9	7.8	66
54190	321100	6366000	Nackara Creek	6	8.2	50
54191	321150	6366000	Nackara Creek	6.2	5	27.5
54192	321200	6366000	Nackara Creek	4.6	13	34
54193	321250	6366000	Nackara Creek	3.8	11.4	37
54194	321250	6365800	Nackara Creek	31	8.8	56
54195	321300	6365700	Nackara Creek	10.4	7.8	40
54196	321100	6365600	Nackara Creek	2.2	7.4	52
54197	321150	6365600	Nackara Creek	8.2	10.2	88
54198	321200	6365600	Nackara Creek	0.9	6.4	40
54199	321250	6365600	Nackara Creek	1.1	6.4	28.5
54200	321300	6365600	Nackara Creek	2.1	7	34
54201	321350	6365600	Nackara Creek	3.2	6.4	33
54202	321400	6365600	Nackara Creek	2.5	4.2	36
54203	321450	6365600	Nackara Creek	3.2	6.4	26.5
54204	321500	6365600	Nackara Creek	1.1	6.6	65
54205	321100	6365500	Nackara Creek	9.2	8.4	56
54206	321050	6365500	Nackara Creek	3.6	5.8	15.5
54207	321000	6365400	Nackara Creek	2.9	8	18.5
54208	320950	6365400	Nackara Creek	2.7	5.2	26
54209	321100	6365400	Nackara Creek	2.3	8.6	26.5
54210	321150	6365400	Nackara Creek	1	4.5	29
54211	321200	6365400	Nackara Creek	0.6	7.8	19
54212	321300	6365400	Nackara Creek	0.7	8.6	27.5
54213	321350	6365400	Nackara Creek	1.2	7.6	28
54214	320850	6365300	Nackara Creek	23.5	7.8	35
54215	321000	6365200	Nackara Creek	5	9	22
54216	320850	6365200	Nackara Creek	3.7	3.1	20.5
54217	321550	6366300	Nackara Creek	1.7	7.2	22.5
54218	321600	6366300	Nackara Creek	2.5	6.6	42
54219	321650	6366300	Nackara Creek	1.5	6.8	40
54220	321300	6365740	Nackara Creek	170	9.4	33
54221	321550	6366500	Nackara Creek	1	6.6	28
54222	321600	6366500	Nackara Creek	0.5	4.3	31
54223	321650	6366500	Nackara Creek	1.2	4	43
54224	321700	6366500	Nackara Creek	0.5	5.4	40
54225	321750	6366500	Nackara Creek	0.2	5.2	26
54226	321500	6366400	Nackara Creek	1.1	7.4	33
54227	321550	6366400	Nackara Creek	1.5	7	46
54228	321600	6366400	Nackara Creek	0.4	3.9	20

Appendix 2. -2mm BCL Soil Geochemical Data.

SAMPLE	EAST	NORTH	PROSPECT	Au (ppb)	Cu (ppm)	Ag (ppm)
54229	321650	6366400	Nackara Creek	0.3	4.8	27
54230	321700	6366400	Nackara Creek	0.7	4	38
54231	318350	6365000	White Kangaroo	0.8	10	31
54232	318450	6365000	White Kangaroo	1.5	10.2	30
54233	318550	6365000	White Kangaroo	1.6	11.8	29.5
54234	318800	6365000	White Kangaroo	1.6	8.8	25.5
54235	318900	6365000	White Kangaroo	1.6	12	20.5
54236	319000	6365000	White Kangaroo	1.1	8.4	20
54237	319050	6365000	White Kangaroo	7.4	10.8	21.5
54238	319100	6365000	White Kangaroo	1.8	10.4	18.5
54239	319300	6365000	White Kangaroo	1.4	9.8	13.5
54240	318300	6364500	White Kangaroo	0.3	7.4	12
54241	318400	6364500	White Kangaroo	0.8	7.4	17
54242	318750	6364500	White Kangaroo	0.4	6	5.6
54243	318850	6364500	White Kangaroo	22	8.4	23
54244	318900	6364500	White Kangaroo	0.8	9.6	11.8
54245	319000	6364500	White Kangaroo	0.2	3.6	8.4
54246	319100	6364500	White Kangaroo	3.8	10.6	22
54247	319150	6364500	White Kangaroo	1.2	11.8	17.5
54248	319200	6364500	White Kangaroo	0.6	6.8	22
54249	319300	6364500	White Kangaroo	0.5	9	25
54250	318300	6364000	White Kangaroo	2.4	7	17
54251	318300	6364000	White Kangaroo	2.4	7	16
54252	318350	6364000	White Kangaroo	1.9	7	18
54253	318650	6364000	White Kangaroo	4.3	10.6	17.5
54254	318750	6364000	White Kangaroo	1.3	11	16.5
54255	318800	6364000	White Kangaroo	0.5	10.4	13.5
54256	318850	6364000	White Kangaroo	0.7	10	12
54257	319000	6364000	White Kangaroo	0.4	7.4	9.8
54258	319100	6364000	White Kangaroo	0.1	9.6	12.5
54259	319150	6364000	White Kangaroo	1.2	8.4	11.8
54260	319300	6364000	White Kangaroo	0.5	7.4	37
51648	321220	6365710	Nackara Creek	7.6	3.7	54
51649	321270	6365710	Nackara Creek	2.1	7.8	37
51650	321320	6365710	Nackara Creek	104	3.8	35
51651	321370	6365710	Nackara Creek	4.2	6.4	32
51652	321420	6365710	Nackara Creek	72	4.5	17.5
51653	321465	6365690	Nackara Creek	1.6	3.2	29
51654	321480	6365740	Nackara Creek	1.5	2.7	38
51655	321470	6365785	Nackara Creek	0.9	3.2	44
51656	320625	6367300	Nackara Creek	0.8	3.9	30
51657	320675	6367300	Nackara Creek	0.8	3.9	19.5
51658	320725	6367300	Nackara Creek	1.7	4.5	21.5
51659	320775	6367300	Nackara Creek	13.5	8.2	31
51660	320825	6367300	Nackara Creek	5.2	8.4	30
51661	320875	6367300	Nackara Creek	3.1	3.4	40
51662	320925	6367300	Nackara Creek	29	5	45
51663	320975	6367300	Nackara Creek	7.4	8	68
51664	321025	6367300	Nackara Creek	4	4.9	64
51665	321100	6367320	Nackara Creek	1.9	4.5	64
51666	321500	6366775	Nackara Creek	2.7	2.55	30
51667	321450	6366775	Nackara Creek	1.3	3.1	46

Appendix 2. -2mm BCL Soil Geochemical Data.

SAMPLE	EAST	NORTH	PROSPECT	Au (ppb)	Cu (ppm)	Ag (ppm)
51668	321400	6366775	Nackara Creek	0.6	4.5	28.5
51669	321350	6366775	Nackara Creek	0.6	4.6	29
51670	321300	6366775	Nackara Creek	0.3	3.1	49
54052	320950	6367100	Nackara Creek	0.7	4.3	30
54053	321000	6367100	Nackara Creek	1.2	2.3	39
54054	321100	6367100	Nackara Creek	1.1	4.7	34
54055	321150	6367100	Nackara Creek	0.3	5.4	38
54056	320950	6367000	Nackara Creek	6.4	17	58
54057	321000	6367000	Nackara Creek	1.2	4.6	43
54058	320950	6366900	Nackara Creek	2.7	2	13.5
54059	321000	6366900	Nackara Creek	1.6	5.8	32
54060	321150	6366900	Nackara Creek	3.6	4.2	39
54061	321200	6366900	Nackara Creek	10.4	2.95	52
54062	321250	6366900	Nackara Creek	2.2	2.2	28.5
54063	321300	6366900	Nackara Creek	0.7	1.3	23
54064	321350	6366900	Nackara Creek	2.7	3.5	32
54065	320950	6366700	Nackara Creek	7	4.2	27.5
54066	321000	6366700	Nackara Creek	0.8	5.2	26.5
54067	320950	6366500	Nackara Creek	7.4	2.9	52
54068	321000	6366500	Nackara Creek	20	7.2	43
54069	321050	6366500	Nackara Creek	6	4.8	78
54070	321100	6366500	Nackara Creek	2.7	6.6	32
54071	321150	6366500	Nackara Creek	0.9	2.8	18
54072	321400	6366500	Nackara Creek	.8	5.4	33
54073	321450	6366500	Nackara Creek	.9	4.9	27
54074	321500	6366500	Nackara Creek	.3	3.4	17.5
54075	320950	6366300	Nackara Creek	3.3	5.4	28
54076	321000	6366300	Nackara Creek	1.6	2.95	25
54077	321050	6366300	Nackara Creek	4.9	2.15	60
54078	321100	6366300	Nackara Creek	12	2.95	58
54079	321150	6366300	Nackara Creek	6.8	6.4	54
54080	321200	6366300	Nackara Creek	4.4	4	12.5
54081	321500	6366300	Nackara Creek	13	7.2	31
54082	320950	6366100	Nackara Creek	29.5	4	37
54083	321000	6366100	Nackara Creek	12.5	4.8	32
54084	321050	6366100	Nackara Creek	1.2	3.7	19
54085	321100	6366100	Nackara Creek	0.6	4.2	22
54086	321150	6366100	Nackara Creek	0.8	3.8	32
54087	321200	6366100	Nackara Creek	2.2	7.2	39
54088	321300	6366100	Nackara Creek	3.4	5.8	34
54089	321050	6365900	Nackara Creek	1.4	2.45	24.5
54090	321100	6365900	Nackara Creek	0.8	3.2	20
54091	321150	6365900	Nackara Creek	1.3	13.5	32
54092	321300	6365900	Nackara Creek	4.2	11.4	58
54093	321350	6365900	Nackara Creek	1.6	9.4	27.5
54094	321400	6365900	Nackara Creek	7.2	5.6	60
54095	321050	6365800	Nackara Creek	1.1	5.8	31
54096	321100	6365800	Nackara Creek	2.1	6	29.5
54097	321150	6365800	Nackara Creek	3.1	5.8	49
54098	321200	6365800	Nackara Creek	3.5	2.35	38
54099	321250	6365800	Nackara Creek	40	8	58
54100	321300	6365800	Nackara Creek	3.5	5	31

Appendix 2. -2mm BCL Soil Geochemical Data.

SAMPLE	EAST	NORTH	PROSPECT	Au (ppb)	Cu (ppm)	Ag (ppm)
54101	321350	6365800	Nackara Creek	23	3.5	31
54102	321400	6365800	Nackara Creek	0.9	2.9	29
54103	321450	6365800	Nackara Creek	1	4.1	50
54104	321100	6365700	Nackara Creek	1.8	7	54
54105	321150	6365700	Nackara Creek	3.1	5.4	58
54106	321200	6365700	Nackara Creek	1.6	5.4	44
54107	321250	6365700	Nackara Creek	1.9	4.7	33
54108	321300	6365700	Nackara Creek	11.4	6.4	42
54109	321350	6365700	Nackara Creek	3.3	5	21.5
54110	321400	6365700	Nackara Creek	1.8	3.6	22.5
54111	321450	6365700	Nackara Creek	2.3	3.5	26.5
54112	321150	6365500	Nackara Creek	2.8	8.2	36
54113	321200	6365500	Nackara Creek	5.2	5.8	28
54114	321250	6365500	Nackara Creek	4	5.2	38
54115	321300	6365500	Nackara Creek	3.2	10.2	41
54116	321350	6365500	Nackara Creek	0.8	3.6	32
54117	321400	6365500	Nackara Creek	1.9	5.4	27
54118	321450	6365500	Nackara Creek	2.4	3.5	26
54119	321500	6365500	Nackara Creek	0.9	4.7	37
54120	321000	6365300	Nackara Creek	7	9	26.5
54121	321050	6365300	Nackara Creek	3.7	6.6	25.5
54122	321100	6365300	Nackara Creek	3	9.4	38
54123	321400	6365300	Nackara Creek	0.2	4.5	78
54124	321100	6365100	Nackara Creek	1.2	11	38

Appendix 3

RAB Drillhole Logs

Goldstream Mining

Drill Logging Codes: Summary

Regolith & Overburden

Occ - calcrete
Ocy - clay
Ofc - ferricrete
Ogv - gravel
Osn - sand (unconsolidated)
Osc - silcrete
Ois - ironstone
Ohp - hardpan
Osu - soil general
Oou - overburden general
Oln - lignite
Osl - siltstone

Igneous (non-extrusive)

Gdl- dolerite
Ggd- granodiorite
Ggu- granitoid(undifferentiated)
Gmu- mafic (undifferentiated)
Gpg- pegmatite
Gum- ultramafic general
Gfu - felsic (undifferentiated)
Gry - rhyolite
Gdr - diorite

Volcanics

Vrd- rhyodacitic volcanic
Vry- rhyolite volcanic
Vbs - basalt
Vum - ultramafic volcanic
Vvm - mafic volcanic
Try - rhyolitic tuff
Vvf - felsic volcanic
Vvu - volcanic undifferentiated
Vvi - intermediate volcanic

Sediments- Clastic

Ssn- sandstone
Ssl- siltstone
Sqt - quartzite
Scy - claystone
Smd - mudstone
Sar - arenite
Ssh - shale

Sediments - Chemical

Sjs - jaspilite/jasper
Sil - Fe formation silica facies
Sis - Fe formation sulphide facies
Sif - Fe formation, general

Metamorphic

Mgn- gneiss
Msc- schist
Mam - amphibolite
Mms - schist
Mmu - undifferentiated

Alteration

acl- chlorite alteration
ahe/he alt- haematite alteration
ep alt- epidote alteration
aser/asr - sericite alteration
asi - silica alteration

Weathering

Whl- highly weathered
Wmd- moderately weathered
Wsl- slightly weathered
Frs- fresh

Colour

A- grey
B- brown
G- green
I- pink
L- olive
N- black
O- orange
P- purple
R- red
U- blue
W- white
Y- yellow

Strength/Shade

1- very pale
2- pale
3- light
4- medium light
5- moderate
6- dusky
7- very dusky
8- dark
9- very dark

Mineral Names

apy- arsenopyrite
bi- biotite
cl- chlorite
fx- feldspar
gn- garnet
he- haematite
li- limonite
nt- nontronite
py-pyrite
qz- quartz
se/sr/ser- sericite
ep- epidote
fe - iron
go - goethite
gy - gypsum
si - silica
fl - fluorite
gr/gf - graphite
ck - chalcedony
ca - calcite
az - azurite
mu - muscovite
mt - magnetite
di - diopside
mi - mica general

Other

Ind- indurated
ox- oxidised
pal- pallid
sap- saprolitic
shd- sheared
sl- slightly
st- strongly
tr- trace
bnd- bedded/banded
Rku - rock general
Ruu - undifferentiated rock
pyc- pyroclastic
por - porphyritic/phenocrysts
mod - moderately
hpn - hardpan
wk - weak
Vqz - quartz vein
cy - clay general
Rvq - quartz vein
gzc - coarse grained

HOLE NO. : 99 GR001

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 314000 N 6377700

Elevation:

T.D.....31m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 23/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Ogv		76525		Oou
3	4	Ogv				Oou
4	5	Ogv		x	x	Oou
5	6	Ogv				Oou
6	7	Ogv				Oou
7	8	Ogv		76526		Oou
8	9	Ogv				Oou
9	10	hpn Osl		x		Oou
10	11	hpn Osl				Oou
11	12	hpn Osl				Oou
12	13	hpn Osl		76527		Oou
13	14	hpn Osl				Oou
14	15	hpn Osl		x		Oou
15	16	hpn Osl / Ogv				Oou
16	17	hpn Osl / Ogv				Oou
17	18	hpn Osl / Ogv		76528		Oou
18	19	hpn Osl / Ogv				Oou
19	20	Water hpn Osl / Ogv		x		Oou
20	21	hpn Osl / Ogv				Oou
21	22	hpn Osl / Ogv				Oou
22	23	hpn Osn / Ogv		76529		Oou
23	24	hpn Osn / Ogv				Oou
24	25	hpn Osn / Ogv		x		Oou
25	26	hpn Osn / Ogv				Oou
26	27	Ssn / Ssl AN7				Ssn
27	28	Ssn / Ssl AN7		76530		Ssn
28	29	Ssn / Ssl AN7				Ssn
29	30	Ssn / Ssl AN7		x		Ssn

HOLE NO. : 99 GR001

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	Ssn / Ssl AN7		76531		Ssn
31	32	E.O.H. @ 31 m				
32	33	Collar blown				
33	34					
34	35					
35	36					
36	37					
37	38					
38	39					
39	40					
40	41					
41	42					
42	43					
43	44					
44	45					
45	46					
46	47					
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO. : 99 GR002

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 314100 N 6377700

Elevation:

T.D.....51m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 23/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osn		76532		Oou
3	4	Ogv				Oou
4	5	Ogv		x		Oou
5	6	Ogv				Oou
6	7	Ogv				Oou
7	8	Ogv		76533		Oou
8	9	hpn Osl				Oou
9	10	hpn Osl		x		Oou
10	11	hpn Osl				Oou
11	12	hpn Osl				Oou
12	13	hpn Osl		76534		Oou
13	14	hpn Osl				Oou
14	15	hpn Osl		x		Oou
15	16	hpn Osl				Oou
16	17	hpn Osl				Oou
17	18	hpn Osl		76535		Oou
18	19	hpn Osl				Oou
19	20	hpn Osl		x		Oou
20	21	hpn Osl				Oou
21	22	hpn Osl				Oou
22	23	hpn Osl		76536		Oou
23	24	hpn Osl				Oou
24	25	hpn Osl		x		Oou
25	26	Ssn / Ssl AN7	Wmd			Ssn
26	27	Ssn / Ssl AN7	Wmd			Ssn
27	28	H Ssn / Ssl AN7	Wmd	76537		Ssn
28	29	Ssn / Ssl AN7	Wmd			Ssn
29	30	Ssn / Ssl AN7	Wmd	x		Ssn

HOLE NO. : 99 GR002

From	To	Geology		Weathering	Sample	Au	Lithology
30	31	Ssn / Ssl	AN8	Wmd			Ssn
31	32	Ssn / Ssl	AN8	Wmd			Ssn
32	33	Ssn / Ssl	AN8	Wmd	76538		Ssn
33	34	Ssn / Ssl	AN8	Wmd			Ssn
34	35	Ssn / Ssl	AN8	Wmd	x		Ssn
35	36	Ssl / Ssh	N8	Frs			Ssn
36	37	Ssl / Ssh	N8	Frs	76539 /		Ssn
37	38	Ssl / Ssh	N8	Frs	76540		Ssn
38	39	Ssl / Ssh	N8	Frs			Ssn
39	40	Ssl / Ssh	N8	Frs	x		Ssn
40	41	Ssl / Ssh	N8	Frs			Ssn
41	42	Ssl / Ssh	N8	Frs			Ssn
42	43	Ssl / Ssh	N8	Frs	76541		Ssn
43	44	Ssl / Ssh	N8	Frs			Ssn
44	45	Sample Ssl / Ssh	N8	Frs	x		Ssn
45	46	Contamin-	Ssl / Ssh	Frs			Ssn
46	47	ation Ssl / Ssh	N8	Frs			Ssn
47	48	" Ssl / Ssh	N8	Frs	76542		Ssn
48	49	" Ssl / Ssh	N8	Frs			Ssn
49	50	" Ssl / Ssh	N8	Frs	x		Ssn
50	51	" Ssl / Ssh	N8	Frs	No sample		Ssn
51	52	E.O.H. @ 51 m					
52	53	Collar collapse					
53	54						
54	55						
55	56						
56	57						
57	58						
58	59						
59	60						
60	61						
61	62						
62	63						
63	64						
64	65						

HOLE NO. : 99 GR003

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 314300 N 6377700

Elevation:

T.D....45m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 24/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osn / Ogv		76543		Oou
3	4	Ogv				Oou
4	5	Ogv		x		Oou
5	6	Ogv				Oou
6	7	Ogv				Oou
7	8	Ogv		76544		Oou
8	9	Ogv				Oou
9	10	Ogv Osc		x		Oou
10	11	Ogv Osc				Oou
11	12	hpn Osl				Oou
12	13	hpn Osl		76545		Oou
13	14	hpn Osl				Oou
14	15	hpn Osl		x		Oou
15	16	hpn Osl				Oou
16	17	hpn Osl				Oou
17	18	hpn Osl		76546		Oou
18	19	hpn Osl				Oou
19	20	hpn Osl		x		Oou
20	21	hpn Osl				Oou
21	22	hpn Osl				Oou
22	23	hpn Osl		76547		Oou
23	24	hpn Osl				Oou
24	25	hpn Osl		x		Oou
25	26	hpn Osl				Oou
26	27	hpn Osl				Oou
27	28	hpn Osl		76548		Oou
28	29	hpn Osl				Oou
29	30	hpn Osl				Oou

HOLE NO. : 99 GR003

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	hpn Osl				Oou
31	32	hpn Osl				Oou
32	33	hpn Osl		76549		Oou
33	34	hpn Osl				Oou
34	35	H hpn Osl		x		Oou
35	36	hpn Osl				Oou
36	37	hpn Osl				Oou
37	38	hpn Osl / Ssl		76550		Oou
38	39	hpn Osl / Ssl				Oou
39	40	hpn Osl / Ssl		x		Oou
40	41	hpn Osl / Ssl				Oou
41	42	hpn Osl / Ssl				Oou
42	43	hpn Osl / Ssl		76551		Oou
43	44	Gdl (?) / Gmu (?)				Gdl/Gmu
44	45	Gdl (?) / Gmu (?)		x		Gdl/Gmu
45	46	E.O.H. @ 45 m				
46	47	Rods bogging				
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO.: 99 GR004.

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 314400 N 6377700

Elevation:

T.D.....43m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 24/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osn, Ogv		76552		Oou
3	4	Ogv				Oou
4	5	Ogv		x		Oou
5	6	Ogv				Oou
6	7	Ogv				Oou
7	8	Ogv		76553		Oou
8	9	Ogv				Oou
9	10	Ogv, Ocy		x		Oou
10	11	Ogv, Ocy				Oou
11	12	Ogv, Ocy				Oou
12	13	Ogv, Ocy		76554		Oou
13	14	Ogv, Ocy				Oou
14	15	hpn Ocy		x		Oou
15	16	hpn Ocy				Oou
16	17	hpn Ocy				Oou
17	18	hpn Ocy		76555		Oou
18	19	hpn Ocy				Oou
19	20	hpn Ocy		x		Oou
20	21	Ocy				Oou
21	22	Ocy				Oou
22	23	Ocy		76556		Oou
23	24	Ocy				Oou
24	25	Ocy		x		Oou
25	26	Osn / Ssn				Oou
26	27	Osn / Ssn				Oou
27	28	Osn / Ssn		76557		Oou
28	29	Osn / Ssn				Oou
29	30	Osn / Ssn				Oou

HOLE NO. : 99 GR004

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	Osn / Ssn				Oou
31	32	Osn / Ssn				Oou
32	33	Osn / Ssn		76558		Oou
33	34	Osn / Ssn				Oou
34	35	Osn / Ssn		x		Oou
35	36	Osn / Ssn				Oou
36	37	H Osn / Ssn				Oou
37	38	qz Ogv		76559		Oou
38	39	qz Ogv				Oou
39	40	qz Ogv		x		Oou
40	41	qz Ogv				Oou
41	42	qz Ogv		76560		Oou
42	43	qz Ogv		x		Oou
43	44	E.O.H. @ 43 m				
44	45	Hole terminated				
45	46					
46	47					
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO. : 99 GR005

Tenement name/no: Mt. Grainger

Prospect:

Type: RAB

Location : E 319900 N 6360000

Elevation:

T.D.....45m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 25/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osn		76593		Oou
3	4	Osl				Oou
4	5	Osl		x		Oou
5	6	Osl				Oou
6	7	Osl / hpn Osl				Oou
7	8	Osl / hpn Osl		76594		Oou
8	9	Osl / hpn Osl				Oou
9	10	Osl / hpn Osl		x		Oou
10	11	Osl / hpn Osl				Oou
11	12	Osl / hpn Osl				Oou
12	13	Osl		76595		Oou
13	14	Osl Ogv				Oou
14	15	Osl		x		Oou
15	16	hpn Osl / Osl				Oou
16	17	hpn Osl / Osl				Oou
17	18	hpn Osl / Osl		76596		Oou
18	19	hpn Osl / Osl				Oou
19	20	hpn Osl / Osl		x		Oou
20	21	hpn Osl / Osl				Oou
21	22	hpn Osl / Osl				Oou
22	23	hpn Osl / Osl		76597		Oou
23	24	hpn Osl / Osl				Oou
24	25	hpn Osl / Osl		x		Oou
25	26	Osl / Osl				Ssl
26	27	Ssl				Ssl
27	28	Ssl		76598		Ssl
28	29	Ssl				Ssl
29	30	Ssl		x		Ssl

HOLE NO. : 99 GR005

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	Ssl				Ssl
31	32	Ssl				Ssl
32	33	Ssl		76599		Ssl
33	34	Ssl				Ssl
34	35	Ssl		x		Ssl
35	36	Ssl				Ssl
36	37	Ssl				Ssl
37	38	Ssl		76600		Ssl
38	39	Ssl				Ssl
39	40	Ssl		x		Ssl
40	41	Ssl				Ssl
41	42	Ssl				Ssl
42	43	Ssl		76601		Ssl
43	44	Ssl				Ssl
44	45	Ssl		x		Ssl
45	46	E.O.H. @ 45 m				
46	47	Hole terminated				
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO. : 99 GR006

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 320100 N 6360000

Elevation:

T.D.....39m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 26/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osl		76602		Oou
3	4	Osl				Oou
4	5	Osl		x		Oou
5	6	Osl				Oou
6	7	Osl				Oou
7	8	Osl		76603		Oou
8	9	Osl				Oou
9	10	Osl		x		Oou
10	11	Osl				Oou
11	12	Osl				Oou
12	13	Osl		76604		Oou
13	14	Osl				Oou
14	15	Osl		x		Oou
15	16	Osl				Oou
16	17	Osl				Oou
17	18	Osl		76605		Oou
18	19	Osl				Oou
19	20	Osl		x		Oou
20	21	Ssl AN6				Ssl
21	22	Ssl				Ssl
22	23	Ssl		76606		Ssl
23	24	Ssl				Ssl
24	25	Ssl		x		Ssl
25	26	Ssl				Ssl
26	27	Ssl				Ssl
27	28	Ssl		76607		Ssl
28	29	Ssl				Ssl
29	30	Ssl		x		Ssl

HOLE NO. : 99 GR006

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	Ssl A5				Ssl
31	32	Ssl				Ssl
32	33	Ssl		76608		Ssl
33	34	Ssl				Ssl
34	35	Ssl		x		Ssl
35	36	Ssl				Ssl
36	37	Ssl		76609		Ssl
37	38	Ssl				Ssl
38	39	Ssl		x		Ssl
39	40	E.O.H. @ 39 m				
40	41	Hole terminated				
41	42					
42	43					
43	44					
44	45					
45	46					
46	47					
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO. : 99 GR007

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 322150 N 6367300

Elevation:

T.D.....21m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 26/09/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn Ogv				Oou
1	2	Osn Ogv				Oou
2	3	Osn Ogv		76610		Oou
3	4	Ssl / Ssn YB6				Oou
4	5	Ssl / Ssn YB6		x		Oou
5	6	Ssl / Ssn YB6				Oou
6	7	Ssl / Ssn YB6				Oou
7	8	Ssl / Ssn YB6		76611		Oou
8	9	Ssl / Ssn YB6				Oou
9	10	Ssl / Ssn YB6		x		Oou
10	11	vqz Ssl / vqz Ssh AN7				Ssl/Ssh
11	12	Ssl / Ssh AN7				Ssl/Ssh
12	13	Ssl / Ssh AN7		76612		Ssl/Ssh
13	14	Ssl / Ssh AN7				Ssl/Ssh
14	15	Ssl / Ssh AN7		x		Ssl/Ssh
15	16	Ssl / Ssh AN7				Ssl/Ssh
16	17	Ssl / Ssh AN7				Ssl/Ssh
17	18	Ssl / Ssh AN8		76613		Ssl/Ssh
18	19	Ssl / Ssh AN8				Ssl/Ssh
19	20	Ssl / Ssh AN8		x		Ssl/Ssh
20	21	Ssl / Ssh AN8		76614		Ssl/Ssh
21	22	E.O.H. @ 21 m				
22	23	Rods bogged				
23	24					
24	25					
25	26					
26	27					
27	28					
28	29					
29	30					

HOLE NO. : 99 GR008

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 321900 N 6376400

Elevation:

T.D.....25m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 26/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn Ogv				Oou
1	2	Osn Ogv				Oou
2	3	Osc		76615		Oou
3	4	Osc				Oou
4	5	Osc		x		Oou
5	6	H Ggu (?) A6	Wmd			Ggu
6	7	Ggu (?) A6	Wmd			Ggu
7	8	Ggu (?) A6	Wmd	76616		Ggu
8	9	Ggu (?) A6	Wmd			Ggu
9	10	Ggu (?) A6	Wmd	x		Ggu
10	11	Ggu (?) / Gdr (?) AO6	Wsl			Ggu
11	12	Ggu (?) / Gdr (?) AO6	Wsl			Ggu
12	13	Ggu (?) / Gdr (?) AO6	Wsl	76617		Ggu
13	14	Ggu (?) / Gdr (?) AO6	Wsl			Ggu
14	15	Ggu (?) / Gdr (?) AO6	Wsl	x		Ggu
15	16	Ggu (?) / Gdr (?) AO6	Wsl			Ggu
16	17	Ggu (?) / Gdr (?) AO6	Wsl			Ggu
17	18	Ggu (?) / Gdr (?) AO6	Wsl	76618		Ggu
18	19	Ggu (?) OY4	Wsl			Ggu
19	20	Ggu (?) OY4	Wsl	x		Ggu
20	21	Ggu (?) OY4	Wsl			Ggu
21	22	Ggu (?) OY4	Wsl			Ggu
22	23	Ggu (?) OY4	Wsl	76619		Ggu
23	24	Ggu (?) OY4	Wsl			Ggu
24	25	Ggu (?) OY4	Wsl	x		Ggu
25	26	E.O.H. @ 25 m				
26	27	Hole terminated				
27	28					
28	29					
29	30					

HOLE NO. : 99 GR009

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 322000 N 6367400

Elevation:

T.D....34m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 26/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osn		76620		Oou
3	4	Osc				Oou
4	5	Osc		x		Qou
5	6	Osc				Oou
6	7	Osc				Oou
7	8	Osc		76621		Oou
8	9	Osc				Oou
9	10	Osc		x		Oou
10	11	Ssn (?)				Ssn
11	12	Ssn (?)				Ssn
12	13	Ssn (?)		76622		Ssn
13	14	Ssn (?)				Ssn
14	15	Ssn (?)		x		Ssn
15	16	Ssn (?)				Ssn
16	17	H Ssn (?)				Ssn
17	18	Ssn / Ssl		76623		Ssn
18	19	Ssn / Ssl				Ssn
19	20	Ssn / Ssl		x		Ssn
20	21	Ssn / Ssl				Ssn
21	22	Ssn / Ssl				Ssn
22	23	Ssn / Ssl		76624		Ssn
23	24	Ggu (?)				Ggu
24	25	Ggu (?)		x		Ggu
25	26	Ggu (?)				Ggu
26	27	Ggu (?)				Ggu
27	28	Ggu (?)		76625		Ggu
28	29	Ggu (?)				Ggu
29	30	Ggu (?)		x		Ggu

HOLE NO. : 99 GR009

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	Ggu				Ggu
31	32	Ggu		76626/		Ggu
32	33	Ggu		76627		Ggu
33	34	Ggu		x		Ggu
34	35	E.O.H. @ 34 m				
35	36	Hole terminated				
36	37					
37	38					
38	39					
39	40					
40	41					
41	42					
42	43					
43	44					
44	45					
45	46					
46	47					
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO. : 99 GR010

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 322750 N 6366400

Elevation:

T.D....49m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 26/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	Osn		76628		Oou
3	4	Osn				Oou
4	5	mi Gmu (?)	Whl	x		Gmu
5	6	mi Gmu (?)	Whl			Gmu
6	7	mi Gmu (?)	Whl			Gmu
7	8	mi Gmu (?)	Whl	76629		Gmu
8	9	mi Gmu (?)	Whl			Gmu
9	10	mi Gmu (?)	Whl	x		Gmu
10	11	mi Gmu (?)	Whl			Gmu
11	12	mi Gmu (?)	Whl			Gmu
12	13	mi Gmu (?)	Whl	76630		Gmu
13	14	mi Gmu (?)	Whl			Gmu
14	15	mi Gmu (?)	Whl	x		Gmu
15	16	mi Gmu (?)	Whl			Gmu
16	17	mi Gmu (?)	Whl			Gmu
17	18	mi Gmu (?)	Whl	76631		Gmu
18	19	mi Gmu (?)	Whl			Gmu
19	20	mi Gmu (?)	Whl	x		Gmu
20	21	mi Gmu (?)	Whl			Gmu
21	22	mi Gmu (?)	Whl			Gmu
22	23	mi Gmu (?)	Whl	76632		Gmu
23	24	mi Gmu (?)	Whl			Gmu
24	25	mi Gmu (?)	Whl	x		Gmu
25	26	mi Gmu (?)	Whl			Gmu
26	27	mi Gmu (?)	Whl			Gmu
27	28	mi Gmu (?)	Whl	76633		Gmu
28	29	mi Gmu (?)	Whl			Gmu
29	30	mi Gmu (?)	Whl	x		Gmu

HOLE NO. : 99 GR010

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	mi Gmu (?)	Whl			Gmu
31	32	mi Gmu (?)	Whl			Gmu
32	33	mi Gmu (?)	Whl	76634		Gmu
33	34	mi Gmu (?)	Whl			Gmu
34	35	mi Gmu (?)	Whl	x		Gmu
35	36	vqz mi Gmu (?) V7	Wmd			Gmu
36	37	vqz mi Gmu (?) V7	Wmd			Gmu
37	38	vqz mi Gmu (?) V7	Wmd	76635		Gmu
38	39	vqz mi Gmu (?) V7	Wmd			Gmu
39	40	Gmu (?) N7	Wmd	x		Gmu
40	41	Gmu (?) N7	Wmd			Gmu
41	42	H Gmu (?) N7	Wmd			Gmu
42	43	Gmu (?) N7	Wmd	76636		Gmu
43	44	vqz Gmu (?) N7	Wmd			Gmu
44	45	vqz Gmu (?) N7	Wmd	x		Gmu
45	46	Gmu (?) N7	Wsl			Gmu
46	47	Gmu (?) N7	Wsl	76637		Gmu
47	48	Gmu (?) N7	Wsl			Gmu
48	49					
49	50	E.O.H. @ 48 m				
50	51	Hole terminated				
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

HOLE NO. : 99 GR011

Tenement name/no: Mt Grainger

Prospect:

Type: RAB

Location : E 322600 N 6366400

Elevation:

T.D.....36m

Azimuth/Inclination: - / - 90°

Logged by: H.P.

Date: 27/9/1999

From	To	Geology	Weathering	Sample	Au	Lithology
0	1	Osn				Oou
1	2	Osn				Oou
2	3	H Osc		76638		Oou
3	4	Osc				Oou
4	5	Osc		x		Oou
5	6	Osc				Oou
6	7	Osc				Oou
7	8	Osc		76639		Oou
8	9	Ssn (?)				Ssn
9	10	Ssn (?)		x		Ssn
10	11	Ssn (?)				Ssn
11	12	Ssn (?)				Ssn
12	13	H Ssn (?)		76640		Ssn
13	14	Ggu (?)	Whl			Ggu
14	15	Ggu (?)	Whl	x		Ggu
15	16	Ggu (?)	Whl			Ggu
16	17	Ggu (?)	Whl			Ggu
17	18	Ggu (?)	Whl	76641		Ggu
18	19	Ggu (?)	Whl			Ggu
19	20	Ggu (?)	Whl	x		Ggu
20	21	Ggu (?)	Whl			Ggu
21	22	Ggu (?)	Whl			Ggu
22	23	Ggu (?)	Wmd	76642		Ggu
23	24	Ggu (?)	Wmd			Ggu
24	25	Ggu (?)	Wmd	x		Ggu
25	26	Ggu (?)	Wmd			Ggu
26	27	Ggu (?)	Wmd	76643 /		Ggu
27	28	Ggu (?)	Wmd	76644		Ggu
28	29	Ggu (?)	Wmd			Ggu
29	30	Ggu (?)	Wmd	x		Ggu

HOLE NO. : 99 GR011

From	To	Geology	Weathering	Sample	Au	Lithology
30	31	Ggu (?)	Wmd			Ggu
31	32	Ggu (?)	Wmd			Ggu
32	33	Ggu (?)	Wmd	76645		Ggu
33	34	Ggu (?)	Wmd			Ggu
34	35	Ggu (?)	Frs			Ggu
35	36	Ggu (?)	Frs	x		Ggu
36	37	E.O.H. @ 36 m				
37	38	Hole terminated				
38	39					
39	40					
40	41					
41	42					
42	43					
43	44					
44	45					
45	46					
46	47					
47	48					
48	49					
49	50					
50	51					
51	52					
52	53					
53	54					
54	55					
55	56					
56	57					
57	58					
58	59					
59	60					
60	61					
61	62					
62	63					
63	64					
64	65					

Appendix 4

RAB Geochemical Data

Appendix 4. RAB Drillhole Geochemical Data.

TENEMENT	EL NO	PROSPECT	DRILLHOLE	SAMPLE NO	DEPTH FROM	DEPTH TO	Au (ppb)	As (ppm)	Cu (ppm)	Ag (ppm)	Pb (ppm)	Zn (ppm)
Mt Grainger	2222	Regional	99GR001	76525	0	5	1	10	26	0.2	14	56
Mt Grainger	2222	Regional	99GR001	76526	5	10	2	10	25	<0.1	12	58
Mt Grainger	2222	Regional	99GR001	76527	10	15	5	10	86	0.2	125	660
Mt Grainger	2222	Regional	99GR001	76528	15	20	1	10	108	0.1	84	420
Mt Grainger	2222	Regional	99GR001	76529	20	25	1	10	26	0.1	15	60
Mt Grainger	2222	Regional	99GR001	76530	25	30	2	10	45	0.2	10	45
Mt Grainger	2222	Regional	99GR001	76531	30	31	1	15	66	0.1	11	64
Mt Grainger	2222	Regional	99GR002	76532	0	5	<1	5	26	<0.1	14	60
Mt Grainger	2222	Regional	99GR002	76533	5	10	2	5	22	0.1	12	46
Mt Grainger	2222	Regional	99GR002	76534	10	15	2	5	16	<0.1	5	32
Mt Grainger	2222	Regional	99GR002	76535	15	20	<1	15	11	<0.1	9	35
Mt Grainger	2222	Regional	99GR002	76536	20	25	1	15	205	0.1	29	78
Mt Grainger	2222	Regional	99GR002	76537	25	30	2	15	72	<0.1	17	54
Mt Grainger	2222	Regional	99GR002	76538	30	35	1	10	50	0.1	10	43
Mt Grainger	2222	Regional	99GR002	76539	35	40	<1	10	34	<0.1	10	39
Mt Grainger	2222	Regional	99GR002	76540	35	40	1	10	32	0.1	12	44
Mt Grainger	2222	Regional	99GR002	76541	40	45	1	15	35	0.1	9	39
Mt Grainger	2222	Regional	99GR002	76542	45	50	1	15	136	0.1	7	42
Mt Grainger	2222	Regional	99GR003	76543	0	5	1	10	30	<0.1	15	62
Mt Grainger	2222	Regional	99GR003	76544	5	10	2	10	32	<0.1	13	56
Mt Grainger	2222	Regional	99GR003	76545	10	15	1	10	14	<0.1	4	19
Mt Grainger	2222	Regional	99GR003	76546	15	20	<1	10	19	<0.1	4	20
Mt Grainger	2222	Regional	99GR003	76547	20	25	<1	10	13	<0.1	4	17
Mt Grainger	2222	Regional	99GR003	76548	25	30	<1	5	8	<0.1	4	10
Mt Grainger	2222	Regional	99GR003	76549	30	35	2	10	8	<0.1	3	11
Mt Grainger	2222	Regional	99GR003	76550	35	40	5	5	13	<0.1	6	17
Mt Grainger	2222	Regional	99GR003	76551	40	45	6	5	15	<0.1	5	22
Mt Grainger	2222	Regional	99GR004	76552	0	5	1	10	27	<0.1	15	58
Mt Grainger	2222	Regional	99GR004	76553	5	10	2	10	31	<0.1	14	58
Mt Grainger	2222	Regional	99GR004	76554	10	15	5	10	25	<0.1	4	45
Mt Grainger	2222	Regional	99GR004	76555	15	20	2	5	30	<0.1	3	48
Mt Grainger	2222	Regional	99GR004	76556	20	25	<1	5	30	<0.1	3	38
Mt Grainger	2222	Regional	99GR004	76557	25	30	8	10	22	<0.1	2	32

Appendix 4. RAB Drillhole Geochemical Data.

TENEMENT	EL NO.	PROSPECT	DRILLHOLE	SAMPLE NO.	DEPTH FROM	DEPTH TO	Au (ppb)	As (ppm)	Cu (ppm)	Ag (ppm)	Pb (ppm)	Zn (ppm)
Mt Grainger	2222	Regional	99GR004	76558	30	35	82	5	34	<0.1	2	43
Mt Grainger	2222	Regional	99GR004	76559	35	40	320	<5	21	<0.1	3	41
Mt Grainger	2222	Regional	99GR004	76560	40	42	11	5	27	<0.1	3	28
Mt Grainger	2222	Regional	99GR005	76593	0	5	1	5	48	<0.1	7	110
Mt Grainger	2222	Regional	99GR005	76594	5	10	2	<5	62	<0.1	6	125
Mt Grainger	2222	Regional	99GR005	76595	10	15	4	<5	62	<0.1	4	114
Mt Grainger	2222	Regional	99GR005	76596	15	20	2	5	52	<0.1	14	106
Mt Grainger	2222	Regional	99GR005	76597	20	25	3	5	52	<0.1	11	100
Mt Grainger	2222	Regional	99GR005	76598	25	30	1	<5	52	<0.1	5	96
Mt Grainger	2222	Regional	99GR005	76599	30	35	1	5	45	<0.1	5	84
Mt Grainger	2222	Regional	99GR005	76600	35	40	<1	5	50	<0.1	5	94
Mt Grainger	2222	Regional	99GR005	76601	40	45	<1	<5	68	<0.1	3	94
Mt Grainger	2222	Regional	99GR006	76602	0	5	1	<5	25	<0.1	3	35
Mt Grainger	2222	Regional	99GR006	76603	5	10	<1	<5	66	<0.1	2	26
Mt Grainger	2222	Regional	99GR006	76604	10	15	1	5	9	<0.1	2	33
Mt Grainger	2222	Regional	99GR006	76605	15	20	2	5	9	<0.1	2	24
Mt Grainger	2222	Regional	99GR006	76606	20	25	2	5	37	<0.1	2	24
Mt Grainger	2222	Regional	99GR006	76607	25	30	2	<5	66	<0.1	2	26
Mt Grainger	2222	Regional	99GR006	76608	30	35	2	10	54	<0.1	2	24
Mt Grainger	2222	Regional	99GR006	76609	35	39	2	5	44	<0.1	2	25
Mt Grainger	2222	Regional	99GR007	76610	0	5	6	15	16	<0.1	2	12
Mt Grainger	2222	Regional	99GR007	76611	5	10	4	25	24	<0.1	17	84
Mt Grainger	2222	Regional	99GR007	76612	10	15	1	20	20	<0.1	20	106
Mt Grainger	2222	Regional	99GR007	76613	15	20	<1	15	11	<0.1	2	27
Mt Grainger	2222	Regional	99GR007	76614	20	21	<1	5	6	<0.1	<1	12
Mt Grainger	2222	Regional	99GR008	76615	0	5	2	5	6	<0.1	<1	10
Mt Grainger	2222	Regional	99GR008	76616	5	10	2	5	5	<0.1	<1	11
Mt Grainger	2222	Regional	99GR008	76617	10	15	6	5	8	<0.1	<1	14
Mt Grainger	2222	Regional	99GR008	76618	15	20	2	5	4	<0.1	<1	12
Mt Grainger	2222	Regional	99GR008	76619	20	25	3	10	6	<0.1	<1	11
Mt Grainger	2222	Regional	99GR009	76620	0	5	2	5	21	0.6	<1	6
Mt Grainger	2222	Regional	99GR009	76621	5	10	1	<5	7	0.2	1	6
Mt Grainger	2222	Regional	99GR009	76622	10	15	2	<5	7	0.2	<1	5

Appendix 4. RAB Drillhole Geochemical Data.

TENEMENT	EL NO.	PROSPECT	DRILLHOLE	SAMPLE NO.	DEPTH FROM	DEPTH TO	Au (ppb)	As (ppm)	Cu (ppm)	Ag (ppm)	Pb (ppm)	Zn (ppm)
Mt Grainger	2222	Regional	99GR009	76623	15	20	2	<5	8	0.3	<1	8
Mt Grainger	2222	Regional	99GR009	76624	20	25	3	<5	18	0.1	<1	9
Mt Grainger	2222	Regional	99GR009	76625	25	30	3	5	29	<0.1	<1	8
Mt Grainger	2222	Regional	99GR009	76626	30	34	2	10	6	0.1	<1	6
Mt Grainger	2222	Regional	99GR009	76627	30	34	2	5	8	<0.1	<1	7
Mt Grainger	2222	Regional	99GR010	76628	0	5	2	5	9	<0.1	1	27
Mt Grainger	2222	Regional	99GR010	76629	5	10	<1	5	3	<0.1	<1	18
Mt Grainger	2222	Regional	99GR010	76630	10	15	1	<5	1	<0.1	<1	22
Mt Grainger	2222	Regional	99GR010	76631	15	20	1	<5	6	<0.1	<1	16
Mt Grainger	2222	Regional	99GR010	76632	20	25	1	<5	3	0.1	<1	19
Mt Grainger	2222	Regional	99GR010	76633	25	30	1	<5	3	<0.1	<1	18
Mt Grainger	2222	Regional	99GR010	76634	30	35	1	<5	5	<0.1	<1	20
Mt Grainger	2222	Regional	99GR010	76635	35	40	<1	<5	10	<0.1	<1	21
Mt Grainger	2222	Regional	99GR010	76636	40	45	1	<5	7	0.1	<1	21
Mt Grainger	2222	Regional	99GR010	76637	45	48	<1	<5	8	0.2	<1	15
Mt Grainger	2222	Regional	99GR011	76638	0	5	3	<5	15	0.4	3	11
Mt Grainger	2222	Regional	99GR011	76639	5	10	2	<5	29	0.2	<1	13
Mt Grainger	2222	Regional	99GR011	76640	10	15	3	<5	20	0.2	1	12
Mt Grainger	2222	Regional	99GR011	76641	15	20	2	<5	9	0.1	1	14
Mt Grainger	2222	Regional	99GR011	76642	20	25	4	<5	5	0.1	<1	8
Mt Grainger	2222	Regional	99GR011	76643	25	30	2	<5	10	0.3	2	10
Mt Grainger	2222	Regional	99GR011	76644	25	30	2	<5	12	0.2	<1	8
Mt Grainger	2222	Regional	99GR011	76645	30	36	1	<5	8	0.2	<1	7

I., M. and W. FILSELL

**EXPLORATION LICENCE 2222
“MOUNT GRAINGER”**

Annual report to 24 October 2000

VOLUME 1

Compiled by D. Edgecombe
Adelaide
February 2001

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FIGURES:

Figure.1 Location plan

Figure.2 Sample location plan

APPENDICES:

Appendix 1. Memorandum by R.Burke, December 2000.

Appendix 2. Sample and Assay Data.

Appendix 3. Petrographic reports (Volume 2)

1. SUMMARY

Exploration during the period has comprised detailed field geology, soil/rock/stream sediment sampling, geophysical interpretation and petrographic study.

This work has highlighted both the significance of mafic and felsic igneous activity in the genesis of known mineralisation and also the potential for previously unrecognised styles associated with intense magmatic sourced alteration. Geochemical sampling over some of the altered zones has produced significantly anomalous base and precious metal results which warrant follow up sampling and drilling.

2. LOCATION AND ACCESS

Exploration Licence 2222 is located 240 kilometres north-northeast of Adelaide (Figure 1) and covers an area dominated by Neoproterozoic and Cainozoic sediments. Access through the area is excellent on a network of station tracks.

3. TENEMENT STATUS

Exploration Licence 2222, held by I., M. and W. Filsell, covers 375 square kilometres and was granted on 25 October 1996. The tenement has been renewed in full and will expire on 24 October 2001. Several small mining leases occur within the Licence.

4. PREVIOUS EXPLORATION

The area has been subject to sporadic gold and base metal exploration for many years, with major focus on historic small gold and copper mines (e.g. Mt. Grainger, Dustholes, Penn, Medina). A summary of this work was included in the Annual Report on E.L. 2222 to 24 October 1997.

Under a joint venture agreement the tenement was explored for gold by Goldstream Mining N.L. Goldstream conducted drainage, soil and rock-chip sampling, geophysical interpretation, mapping, petrographic studies and a small bedrock RAB drilling programme but did not locate any significant mineralisation.

Following withdrawal of Goldstream from the joint venture exploration has been conducted by the tenement holders.

5. CURRENT PERIOD EXPLORATION

5.1 Geology

Detailed geological examination has been completed over much of the tenement, focused on the areas of strong alteration associated with magmatic activity. Results of this work are summarised in Appendix 1.

5.2 Rock-chip sampling

In conjunction with geological mapping some 469 rock-chip samples have been collected and assayed for a range of elements. Sample location data and analyses are included as Appendix 2.

Several highly anomalous results were encountered in this work. These are discussed further in Appendix 1.

5.3 Stream sediment sampling

Drainage BCL samples (total 23) were collected from several areas, focused on the magnetically anomalous area extending northeast from Oodla Wirra. Samples were sieved to -2mm. Location and assay data are included in Appendix 2.

5.4 Soil sampling

Grid base soil sampling was conducted at “Silica Ridge”, at a grid located 1.5 kms west of Flux Quarry No.2 (Figure 2) and over the Oodla Wirra magnetic feature. In total 87 samples, sieved to -2mm, were collected for analysis by MMI or BCL. Locations and assay data are included in Appendix 2.

5.5 Geophysical interpretation

An interpretation of aeromagnetic data was completed by AngloGold, as part of a review of the project area. Their interpretation suggested that the area was cut by regionally extensive northwest dipping thrust faults and that magmatic activity and associated alteration were strongly focused by these structures.

5.6 Petrology

Petrographic studies have focused on igneous suites and alteration assemblages. Results of this work are included as Appendix 3.

6. FUTURE EXPLORATION

Evidence of moderate to high temperature, high salinity alteration and location of both mafic and felsic intrusives, coupled with a range of chemically reactive host rocks (carbonaceous siltstones, carbonates) make this area highly prospective for intrusive related base and precious metal deposits. Future work on E.L.2222, using a range of geochemical and geological methods, will be directed at location of mineralised sites focused by structural zones proximal to areas of intense alteration and magmatic activity.

**APPENDIX 1: MEMORANDUM BY R. BURKE,
DECEMBER 2000.**

To: Ian and Mark Filsell

From: Bob Burke

Subject: The potential economic significance of recently discovered felsic-silicic igneous rocks and associated alteration and mineralization in the Nackara Arc of South Australia

Date: 7/12/00

INTRODUCTION

Hitherto most exploration interest in the Nackara Arc has focussed on small scale gold and copper mines worked around the turn of last century. These tended to be looked at and explored in isolation from their regional tectono-magmatic context and hence exploration invariably foundered on the rock of size. To increase the chances of success one must look at and integrate all aspects of the tectonic, stratigraphic, magmatic, alteration and mineralization environment and then home in on the real “fire” in the area and not the “smoke and embers” that divert one’s attention. The negative results of previous exploration in the area may be a case of “couldn’t see the forest for the trees”. This kind of problem is common during exploration of large porphyry or intrusive related systems.

The recent discovery of felsic intrusions and felsic/silicic volcanics in the Nackara Arc provides a new perspective from which to assess the prospectivity of the area. This is because, for the first time, there is now evidence for magmatic fractionation processes that would facilitate the concentration of metals into late stage magmatic/hydrothermal fluids. The newly discovered fractionated igneous rocks also explain the zoned alteration previously observed in area. Alteration includes potassic, phyllic, propylitic, silicic and calc silicate types that are related to and zoned around the newly discovered intrusions. The mafic-felsic igneous association also explains why mafic association metals like Cu-Co-Ni have been mobilized by late stage fluids that also contain highly anomalous Mo that is usually associated with silicic/felsic suites. The transition from magnetite dominant gabbros and dolerites to

hematite dominant rhyolites records an evolution towards an increasingly more oxidized state during fractionation. These high oxidation states will have prevented the precipitation of reduced metal sulphides during crystallization thereby leaving metal available for concentration in the melt and transport in late stage magmatic/hydrothermal fluids. Finally, the presence of abundant Fe in the form of magnetite and hematite in igneous rocks and siderite, specularite and to a lesser extent pyrite as ore gangue minerals indicates that this is an Fe-ox system. This also changes the perspective from which the system must be viewed as such systems tend to be relatively large. For these reasons, the Nackara Arc deserves another look through new spectacles that will view the bimodal igneous systems and their evolutionary processes holistically and not focus on small mines individually as has been the case in the past.

NACKARA ARC TECTONICS

The Nackara Arc is defined by a distinct change in strike of the Adelaidean sediments from N-S to NE. The locus of the arc corresponds to a pronounced, regionally anomalous NW trending magnetic lineament together with localized disturbance to “normal” Delamerian fold trends. The strike of the magnetic lineament is subparallel to the nearby Orroroo lineament that appears to control kimberlite occurrences in the Eurelia area. The extension of the magnetic corridor trends to the NW directly through Olympic Dam. The northeast striking Darling or Broken Hill lineament is perpendicular to the Orroroo lineament and the two lineaments intersect in the Nackara Arc near Pitcairn station where kimberlites have also been found. These major crustal breaks probably reflect deep extensional faults in the lower Proterozoic? basement that controlled Adelaidean sedimentation. The presence of these extensional faults in the basement and their reactivation during the Delamerian orogeny may explain the presence of the newly discovered igneous rocks and their associated magnetic anomalies in the overlying Adelaidean cover sequence.

Since the igneous rocks crosscut fold structures and intrude doubly plunging anticlines and because they have in turn have been faulted they must be syn to late tectonic and Delamerian in age. It is suspected that the igneous complexes reflect decompression melting during relaxation and extension immediately following Delamerian compression. Faults cutting the felsic igneous rocks are probably caused by ongoing relaxation and post consolidation extension.

Intrusive dolerites, gabbros, diorites and andesites were previously recognized in the Nackara Arc during 1:250,000 scale mapping of the area in the 1960's and in the course of drilling during diamond exploration. Field investigations showed that the mapped “diapirs” have been misinterpreted and that they really

result from localized disruption resulting from the intrusion of igneous rocks into structural domes.

THE MT GRAINGER ANTICLINE AND THE OODLA WIRRA IGNEOUS COMPLEX

Dyke-like andesites are mapped on the 1:250,000 Orroroo map sheet intruding along the axis of the Mt Grainger anticline. Terry Leach has identified skarn mineralization carrying trace copper mineralization in wall rocks to some of these dyke-like intrusions. Two types of intermediate dyke/intrusion have been identified in the field; a green porphyritic andesite that is propylitically altered and a biotite rich lamprophyre or biotized diorite that is strongly magnetic. Altered sedimentary float containing in excess of 1.0% Cu as malachite was recently found downstream from the large, complex, magnetic anomaly in the centre of the Mt Grainger anticline. Both of the above types of intrusion were found outcropping upstream of the float discovery.

A field visit to the Oodla Wirra locality in April 2000 to check a northeast trending, 7km X 1km discordant magnetic anomaly that crosscuts the regional N-S strike of beds in the Mt Grainger anticline resulted in the discovery of phyllic altered “dacites” in Mercer’s paddock at Tank Hill. These were sampled and some were collected for petrographical examination and sent to Terry Leach. In addition to the samples from the Tank Hill “dacite” some more samples were subsequently collected near the big bend in the Barrier Highway (“Big Bend”) and some of these were also sent off for petrographic examination.

Terry Leach subsequently confirmed that the samples from Tank Hill were of phyllic altered rhyolite and phyllic altered sedimentary wallrock. He reported the presence of biotite (potassic) alteration in a hydrothermally brecciated rhyolite from Big Bend. He also described a magnetite rich micro tonalite from near Dryblower’s Hill. The alteration was placed into a regional context by comparing the alteration style with other rocks he had previously examined from along the axial plane of the Mt Grainger anticline. They included clay altered sediments containing k-feldspar, muscovite-sericite altered sediments and jasperoid containing tourmaline and anomalous molybdenum. This belt of highly altered rocks extends from the Oodla Wirra intrusion all the way to the main mining district in the nose of the Mt Grainger anticline, a distance of about 8 km. The altered zone is about 500m wide.

The igneous and wall rock samples from Big Bend returned very highly anomalous assay values. These include Ag (up to 9.5 ppm), Cu (up to 3400

ppm), Co (up to 7500 ppm), Ni (up to 2100 ppm), Zn (up to 593 ppm), Mo (up to 92 ppm), As (up to 69 ppm) and occasional spotty Au values (up to 100 ppb). The best values reported from MnO and FeO rich samples as would be expected in the weathering environment.

The numerous small gold mines around the nose of the Mt Grainger anticline feature disseminated gold associated with sericite-specularite alteration in a permeable (Apilla) tillite unit or disseminated in fracture related quartz-sericite-specularite alteration in calcareous, carbonaceous, pyritic (Tindelpina) shale immediately above the tillite. Samples of sericite rich jasperoid near the Golden Junction mine have returned up to 1.99 ppm Au. There is a consistent pattern of highly anomalous Co-Ni-Cu-As reporting with gold.

In addition to the gold mines there are a number of old flux quarries where secondary goethite was mined earlier in the last century by BHP. These lie along a high angle reverse fault in the axial plane of the Mt Grainger anticline. The goethite is weakly anomalous in metals.

During a visit to the Mt Grainger anticline in Oct-Nov some geochemical character sampling was conducted at some of the known base metal anomalies. The Penn copper mine trend follows a magnetic low connected to the Oodla Wirra igneous complex. It extends to the north for about 4km along the western limb of the Mt Grainger anticline. Mineralization is contained in sheeted quartz-sulphide veins that cut across shales of the Saddleworth formation. The mineralization is intermittently expressed and of variable intensity along this trend. It features, in addition to copper, highly anomalous As (up to 1600 ppm), Co (up to 2400 ppm), Ni (up to 480 ppm), Mo (up to 25 ppm) and Au (up to 450 ppb).

The Medina copper mineralization extends along a northeast trending fault zone. Mineralization occurs in bedding conformable quartz-siderite veins and sheared siltstone. In addition to copper the following metals are also anomalous: Pb (up to 1350 ppm), Zn (up to 390 ppm), As (up to 850 ppm), Co (up to 195 ppm) and Ni (up to 320 ppm). The high Pb levels are probably sufficient to explain the Pb-Zn anomaly along this trend reported by Binks in the 1960's.

Hematite which subcrops at the junction of the NE trending Medina fault and the N-S trending Mt Grainger axial plane fault has returned gold assays up to 421 ppb together with highly anomalous nickel and cobalt.

The most recent round of sampling in Oct-Nov resulted in the discovery of a new area of sheeted quartz-sulphide vein mineralization. The veins cover an area 1.3km long by about 50m wide. The veins cut across the Saddleworth formation along the eastern limb of the Mt Grainger anticline and are anomalous over the whole area. Assays up to 1.0 % Cu, 1300 ppm Co, 300 ppm Ni, 120 ppm As, 7 ppm Ag, 30 ppb Au and up to 43 ppm Mo have been reported.

The Big Bend area was also revisited at this time and subcropping altered syenite was discovered adjacent to the potassic altered hydrothermal breccia previously described by Terry Leach. Additional sampling extended the area known to contain highly anomalous base metals to approximately 600m by 50m. One sample also returned 0.31 ppm Au with 1050 ppm Co and another returned 3700 ppm Zn, 4750 ppm Co, 2600 ppm Ni and 3200 ppm Cu. It was confirmed in the field that some of the mineralization is hosted in structures that crosscut and disrupt the rhyolite as well as the sediments. This strongly suggests that the mineralization is genetically related to the late stage underlying syenite intrusion which is magnetite bearing and not the non magnetic rhyolite which is a wall rock. Since the rhyolite and sediments are not magnetic this syenite discovery may explain the large amplitude magnetic anomalies underlying the area. The high amplitude magnetic anomalies follow the 7+ km long cross cutting Oodla Wirra (“OW”) fault and do not correlate with rhyolite or sediments outcropping in the field. Modelling of the magnetic source suggests that it is between 150m-250m below surface.

One of the features of the Big Bend area is the close association of breccias containing MnO₂ >> FeO and highly anomalous base metals. Additional bodies of rhyolite were found NE of Big Bend in October. These large bodies appear to be dyke-like and have intruded sediments NE of Big Bend. Manganese rich rocks at the contact with the rhyolite have returned anomalous Zn (up to 1300 ppm), Co (up to 2800 ppm), Ni (up to 2200 ppm), Cu (up to 800 ppm), Ag (up to 6 ppm) and Mo (up to 96 ppm).

THE WHYDOWN DOME AND THE PARATOO IGNEOUS COMPLEX

Dolerite has been mined in the Whydown Dome for railway ballast over many years. The dolerite/gabbro features a very strong magnetic signature. The discovery of widespread outcrops of rhyolite in Nov 2000 resulted from visits to magnetic lows within the large magnetic high caused by the dolerite. In each case flow banded rhyolite was discovered. The outcrops have been mapped previously as “diapiric breccia” by explorers because of their contorted flow banding.

The rhyolite is a pink rock comprised of quartz and k-feldspar phenocrysts of various sizes and in quite variable proportions. With its granular appearance it could be mistaken for a potassic altered sandstone except that it forms intrusive breccias near wallrock contacts. One of the primary feldspars is invariably altered to a pale green sericite. Siderite is ubiquitous but it is not known whether this is a supergene or hypogene effect. The flow foliation is defined by fine grained specular hematite constituting up to 30 % of the rock volume.

An intrusive breccia comprising matrix rhyolite and sedimentary fragments, some of which have been biotized marks the contact of rhyolite with surrounding sediments and this together with the coarse grain size of the rhyolite suggests that it is, in part, intrusive. Clastic and carbonate wallrocks are usually silicified or give the appearance of being somewhat baked. In some places carbonate wall rocks have been mineralized with specularite and copper (up to 3500 ppm).

The Paratoo copper mine is less than 300m away from a rhyolite outcrop. Other rhyolite float has been found near a large outcrop of stromatolitic (Skillogalee?) dolomite in the axis of the anticline. Massive black manganese oxide and some FeO and gossan textures after sulphide boxwork occurs along its margin and in cross cutting fractures. The MnO₂>>FeO rich material returned assays up to 2900 ppm Cu, 2550 ppm Co and 800 ppm Ni. It is thought that the rhyolite bodies and sediments are wallrock to underlying late stage felsic intrusions that are genetically related to the base metal mineralization. These intrusions have not yet been identified in the field at Paratoo. Field relationships show that the rhyolite has intruded through the dolerite.

Late stage shears that crosscut dolerite/gabbro contain spotty copper occurrences, sometimes in percent levels and with anomalous gold. This mineralization is usually associated with siderite, specularite and coarse grained secondary biotite. In other areas, the dolerite is bleached white and altered to well crystallized sericite and quartz.

THE MAFEKING INTRUSIVE COMPLEX

Not much work has been done on this complex but mafic intrusions are known in an area mapped as Tertiary laterite. The air magnetics indicate that this is a large complex intrusion with a very high magnetic intensity. The area has not yet been prospected for rhyolites but some felsic rocks were intersected during diamond exploration. The mafic rocks are almost identical to the Paratoo complex dolerites and gabbros and have also undergone propylitic alteration. A

large sub economic shale-hosted zinc anomaly near the intrusion was drilled by Placer Exploration. The Cu-Mo anomalous Bendigo granodiorite outcrops to the south. It is likely that the Mafeking complex will also prove to be bimodal.

ECONOMIC SIGNIFICANCE

The discovery of two late stage felsic/silicic intrusive complexes with zoned porphyry style alteration in a domal setting is considered to enhance the prospectivity of the Nackara Arc considerably. A third bimodal system is probably present at Mafeking. Many of the observed geological, alteration and geochemical features are consistent with an Fe-ox affinity for the mineralization. Other factors like a long lived high oxidation state increases the potential of these fractionated bimodal suites to have produced considerable quantities of metals. The domal structural setting and reverse faulting increase the chance that fluid flow will be focussed. The presence of dolomites and calc shale wall rocks can be expected to provide pH barriers to the slightly acidic fluids that have resulted in the large volumes of phyllic alteration noted in both complexes. It can be expected, on the basis of stratigraphic considerations, that the carbonate content of the sedimentary pile will increase with depth. The pyritic, calcareous, reduced black shales can be expected to produce redox fronts favourable for the deposition of metals from highly oxidized fluids. The presence of redox and pH barriers suggests that mineralization will be tightly constrained against the mineralizing intrusions and major fluid conduits. It follows that the mineralization is likely to be high grade. The intense weathering and leaching also suggest that anomalous surface values will increase with depth and this has been found to be the case in copper and gold mines in this district and further afield in the Olary and Curnamona provinces.

None of the felsic/silicic centres have been mapped nor have they undergone systematic soil sampling. None have been drilled. All of the upside potential is still there. For these reasons the Nackara Arc is deemed to have excellent exploration potential.

APPENDIX 2: SAMPLE AND ASSAY DATA

ROCK-CHIP & LAG SAMPLE DATA

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BD-F001	320317	6370138	Rockchip	Anglogold	Mt Grainger	
BD-F002	320350	6370138	Rockchip	Anglogold	Mt Grainger	
BD-F003	320550	6371186	Rockchip	Anglogold	Golden Junction	
BD-F004	320704	6371114	Rockchip	Anglogold	Golden Junction	
BD-F005	320750	6370744	Rockchip	Anglogold	Heather Belle	
BD-F007	321228	6370598	Rockchip	Anglogold	Bob Johnston's	
BD-F008	321250	6370651	Rockchip	Anglogold	Bob Johnston's	
BD-F009	321235	6370713	Rockchip	Anglogold	Bob Johnston's	
BD-F010	321351	6370715	Rockchip	Anglogold	Bob Johnston's	
BD-F011	321444	6370721	Rockchip	Anglogold	Bob Johnston's	
BD-F012	320828	6367283	Rockchip	Anglogold		
BD-F013	320868	6367311	Rockchip	Anglogold		
BD-F014	320892	6367392	Rockchip	Anglogold		
BD-F015	321051	6367221	Rockchip	Anglogold	Flux Quarry3	
BD-F016	321144	6369279	Rockchip	Anglogold		
BD-F018	321056	6369277	Rockchip	Anglogold		
BD-F019	321259	6365758	Rockchip	Anglogold	"Alluvials"	
BD-F020	321259	6365658	Rockchip	Anglogold	"Alluvials"	
BD-F021	321366	6365578	Rockchip	Anglogold	"Alluvials"	
BD-F022	321360	6365599	Rockchip	Anglogold	"Alluvials"	
BD-F023	320408	6365923	Rockchip	Anglogold	Black Jasperoid	
BD-F024	320408	6365923	Rockchip	Anglogold	Black Jasperoid	
BD-F025	320394	6361135	Rockchip	Anglogold		
BT05	305500	6373100	Rock chip	Filsell		
BT06	305500	6373100	Rock chip	Filsell		
BT07	300450	6366450	Rock chip	Filsell		
BT08	320950	6364200	Rock chip	Filsell		
BT09	320730	6369540	Rock chip	Filsell	Cooks Blow	
BT10	320780	6367310	Rock chip	Filsell		
BT11	320810	6367375	Rock chip	Filsell		
BT12	320710	6367310	Rock chip	Filsell		
BT13	320710	6367310	Rock chip	Filsell		
BT14	320940	6367470	Rock chip	Filsell		
BT15	321420	6365770	Rock chip	Filsell	Heithersays	
BT16	321420	6365770	Rock chip	Filsell	Heithersays	
BT17	322100	6366060	Rock chip	Filsell		
BT18	322100	6366060	Rock chip	Filsell		
BT19	322750	6366210	Rock chip	Filsell		
BT20	320620	6365230	Rock chip	Filsell		
BT31	321250	6365580	Rock chip	Filsell		
BT32	320500	6366010	Rock chip	Filsell		
BT33	320500	6366010	Rock chip	Filsell		
BT34	320500	6366010	Rock chip	Filsell		
BT35	320500	6366010	Rock chip	Filsell		
BT36	320500	6366010	Rock chip	Filsell		

Sample ID	Notes
BD-F001	Sericite-sulphide altered rock and late qtz flooding veins from ore stock pile
BD-F002	Sericite-sulphide altered rock and late qtz flooding veins from old working
BD-F003	Limonite rich clays and sericite alteration adjacent hematite rich jasperoid
BD-F004	Jasperoid (previously assayed 2g/t)
BD-F005	Footwall of lower arkose unit showing extensive sericite-qtz-hem +/- sulphide alteration, shaft spoil
BD-F007	Extensive sericite-qtz-hem alteration probably trending N-S at old workings on mineral claim. Previously reported drilling 15m @ 6.6g/t or 21m @ 4 g/t.
BD-F008	Altered clay rock adjacent unaltered siltstone
BD-F009	Limonite and bleached friable siltstone
BD-F010	extensively quartz veined +/- sulphide? Veining in altered jasperoid, trending 110
BD-F011	Laminated sericite altered carbonaceous siltstone with pyrite pseudomorphs adjacent tensioned qtz veined jasperoid as in BD-F009
BD-F012	silica- pyrite Jasperoid (see Filsell petrology)
BD-F013	Highly weathered purple brown sugary-sericite hematite altered ?sediment, slightly down stream from BD-F010
BD-F014	talc alteration (previous petrology indicates illite alteration) associated with extensive Fe hematite ?alteration or supergene enrichment
BD-F015	silica- pyrite Jasperoid, adjacent Fe flux quarry where Fe is supergene enriched
BD-F016	silica jasperoid - sugary texture with sericite and large % of tourmaline
BD-F018	Composite silica jasperoid, Festone, laminated silicified siltstone which has been extensively brittle fractured with Fe infill
BD-F019	extremely weathered conglomerate matrix or regolith clays
BD-F020	Boulder conglomerate
BD-F021	bedded pebble(<7cm) conglomerate, in creek with claystone/siltstone matrix which is possibly altered
BD-F022	east dipping dolomitic beds with talcy alteration clays
BD-F023	yellow khaki "spongy" spotted (after pyrite or scapolite) siltstone
BD-F024	Fe stained siltstone breccia in area with grey silicified siltstone (?graphitic shale)
BD-F025	bleached extremely weathered conglomerate (>1cm pebbles) with some talcy clay (?illite) development
BT05	Sericite-FeOx alteration
BT06	Sericite-FeOx alteration
BT07	quartz-carbonate veins
BT08	Grab sample-downstream of Burnt Pussy Mine
BT09	Siltstone with FeOx veinlets
BT10	FeOx-sericite, 50 m R/C
BT11	Silic siltstone, sericite
BT12	Jasperoid with jarosite
BT13	FeOx band next to jasperoids
BT14	FeOx sandy siltstone
BT15	S end of workinbs
BT16	N end of workinbs
BT17	Lamprophyre-silic rich
BT18	Lamprophyre-silic/sericite/carbonate
BT19	Endoskarn-carbonate rich
BT20	Jasperoids-S end Goldstream grid
BT31	Sandy/vuggy horizon,W of Heithersays
BT32	Dark jasperoid-FeOx sample
BT33	Dark jasperoid-very high silica
BT34	Ironstone lag-W of main o/c
BT35	Quartz vein,some boxworks
BT36	Very dark jasperoid

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BD-F001	1.211			1.5	8	4.02	37.8	12
BD-F002	4.016	3.34		1.6	24	33.07	45.4	12
BD-F003	0.129			0.2	6	0.51	15.1	6
BD-F004	0.47			0.1	2	1.76	37.5	6
BD-F005	0.143			0.1	6	0.06	17.1	1
BD-F007	6.132	5.98		0.2	11	7.52	184.7	3
BD-F008	0.092			0.1	9	2.64	84.5	10
BD-F009	0.019			<0.1	7	0.09	8.9	6
BD-F010	0.015			<0.1	8	0.1	10.1	12
BD-F011	0.005			<0.1	16	0.11	27.4	7
BD-F012	0.005			<0.1	3	0.08	3.5	19
BD-F013	0.007			0.2	24	0.06	65.1	34
BD-F014	0.015			0.2	3	0.09	69.4	BLD
BD-F015	0.004			0.6	6	0.2	6.9	70
BD-F016	0.002			<0.1	1	0.01	6.8	6
BD-F018	0.043			0.3	17	0.27	91	20
BD-F019	0.032			<0.1	3	0.81	2.5	16
BD-F020	0.007			<0.1	16	0.18	24.3	108
BD-F021	0.003			0.2	2	0.03	3.8	187
BD-F022	0.004			0.2	BLD	0.16	2.5	46
BD-F023	0.011			0.4	4	0.86	19.1	205
BD-F024	0.192			0.6	82	2.09	150.3	2637
BD-F025	0.003			<0.1	1	-0.01	1.4	4
BT05	BLD			BLD	BLD	BLD	BLD	31
BT06	BLD			BLD	BLD	BLD	9	22
BT07	BLD			BLD	BLD	BLD	BLD	14
BT08	BLD			BLD	BLD	BLD	BLD	43
BT09	BLD			BLD	120	BLD	8	95
BT10	BLD			BLD	17	BLD	24	BLD
BT11	BLD			BLD	BLD	BLD	BLD	21
BT12	BLD			BLD	12	BLD	BLD	27
BT13	0.014	0.014		BLD	86	BLD	14	210
BT14	BLD			BLD	23	BLD	BLD	32
BT15	0.32	0.37		BLD	BLD	BLD	BLD	24
BT16	0.19	0.18		BLD	BLD	BLD	BLD	18
BT17	BLD			BLD	BLD	BLD	12	12
BT18	0.003			BLD	BLD	BLD	BLD	BLD
BT19	0.002			BLD	BLD	BLD	20	BLD
BT20	BLD			BLD	BLD	BLD	BLD	8
BT31	0.008			<3	<10	<20	<5	59
BT32	0.005			<3	29	<20	76	465
BT33	0.009			<3	<10	<20	<5	23
BT34	1.19	1.16		<3	21	<20	23	61
BT35	0.013	0.023		<3	<10	<20	<5	104
BT36	0.003			<3	<10	<20	<5	54

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BD-F001	36900	1262	0.8	45	5	0.6	36.3	3.4	16.8	38
BD-F002	248800	594	2	57	9	0.82	4.7	26.1	16.1	15
BD-F003	102600	646	1.9	32	2	0.67	29.5	0.7	14.3	13
BD-F004	50900	831	2.3	39	4	0.52	4.3	3	16.9	BLD
BD-F005	122000	4418	2.7	89	4	0.56	14.9	0.6	18.5	93
BD-F007	226300	101	2.9	225	4	1.02	1.9	10.5	3.5	BLD
BD-F008	103100	423	1	102	6	0.72	8.8	3.4	6.6	12
BD-F009	27400	71	0.7	13	3	0.51	1.9	0.1	1.7	17
BD-F010	40200	102	1.1	13	2	1.09	2.6	0.1	2.6	17
BD-F011	93400	7931	1.1	27	4	0.84	4.5	0.2	2.2	23
BD-F012	12400	132	1.7	8	2	0.78	0.6	<0.1	0.5	13
BD-F013	128600	3827	1.8	92	2	0.33	0.2	<0.1	0.4	497
BD-F014	155200	97260	3.4	59	<2	0.22	0.1	<0.1	0.3	2276
BD-F015	93300	502	1.4	14	<2	0.36	0.3	<0.1	0.4	72
BD-F016	30000	300	1.3	40	<2	0.17	1.5	<0.1	0.9	15
BD-F018	294800	302	1.8	118	4	14.18	0.3	0.3	27.8	24
BD-F019	9400	67	1.3	7	7	0.57	1.3	<0.1	1.3	10
BD-F020	363000	4220	2.7	54	3	3.78	0.1	<0.1	1.6	828
BD-F021	33700	263	1.2	6	<2	2.06	0.1	0.1	0.7	61
BD-F022	14300	825	0.8	10	<2	0.11	-0.1	0.1	0.4	77
BD-F023	51600	243	1	34	8	0.57	1.7	<0.1	1.9	20
BD-F024	320100	275	2	156	19	4.62	2.7	1.2	2.9	106
BD-F025	9400	30	1	4	12	0.17	6.3	<0.1	1.5	BLD
BT05	54500	1540	BLD	BLD	BLD	BLD				6
BT06	91000	2090	BLD	BLD	BLD	BLD				13
BT07	14700	420	BLD	BLD	BLD	BLD				10
BT08	12500	89	BLD	BLD	28	BLD				10
BT09	66000	160	BLD	29	BLD	BLD				9
BT10	473000	10000	BLD	16	BLD	BLD				387
BT11	11100	305	BLD	BLD	BLD	BLD				11
BT12	23500	180	BLD	BLD	BLD	BLD				9
BT13	147000	1250	BLD	21	28	23				47
BT14	67000	58	BLD	BLD	BLD	BLD				BLD
BT15	6760	77	BLD	BLD	BLD	BLD				11
BT16	9880	135	14	BLD	BLD	BLD				5
BT17	23500	835	BLD	36	BLD	BLD				BLD
BT18	26000	710	BLD	25	BLD	BLD				12
BT19	38000	1290	BLD	30	BLD	BLD				8
BT20	12100	160	10	BLD	BLD	BLD				7
BT31	7830	170	<10	<10	<20	<10				31
BT32	238000	980	<10	96	<20	<10				66
BT33	5830	60	<10	<10	<20	<10				<5
BT34	40500	320	<10	17	<20	<10				7
BT35	9620	215	11	<10	<20	<10				15
BT36	6720	73	<10	<10	<20	<10				<5

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT37	320500	6366010	Rock chip	Filsell		
BT38	320500	6366010	Rock chip	Filsell		
BT39	320880	6364051	Rock chip	Filsell		
BT40	320510	6363490	Rock chip	Filsell		
BT41	321520	6365320	Rock chip	Filsell		
BT42	319950	6362620	Rock chip	Filsell		
BT43	319950	6362620	Rock chip	Filsell		
BT44	319950	6362620	Rock chip	Filsell		
BT45	320880	6364051	Rock chip	Filsell		
BT55	350210	6362010	Rock chip	Filsell		
BT56	350210	6362010	Rock chip	Filsell		
BT57	350210	6362010	Rock chip	Filsell		
BT58	350210	6362010	Rock chip	Filsell		
BT59	350210	6362010	Rock chip	Filsell		
BT60	319900	6366290	Rock chip	Filsell		
BT61	319850	6366055	Rock chip	Filsell		
BT62	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT63	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT64	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT65	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT66	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT67	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT68	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT69	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT70	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT71	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT72	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT73	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT74	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT75	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT76	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT77	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT78	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT79	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT80	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT81	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT82	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT83	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT84	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT85	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT86	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT87	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT88	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT89	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT90	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT91	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT92	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT93	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT94	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT95	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT96	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT97	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT98	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	

Sample_ID	Notes
BT37	Fe rich jasperoid in creek
BT38	FeOx vein material in creek
BT39	Small alluvial working, edge of scrub
BT40	Vuggy silica, silica ridge
BT41	Jasperoid in Nackara Creek
BT42	Jasperoid, FeOx rich
BT43	Jasperoid, FeOx veinlets
BT44	Jasperoid, just silica
BT45	Grab sample at workings
BT55	Jasperoid o/c next to track, south side
BT56	Jasperoid o/c.R/C of south side
BT57	Jasperoid o/c.R/C of north side
BT58	Small digging next to jasperoid
BT59	Small digging next to jasperoid
BT60	Dark jasperoid, pyrite/calcite/quartz veinlets
BT61	Dark jasperoid, silic flooded, secondary quartz microveinlets, calcite.
BT62	
BT63	
BT64	
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BT95	
BT96	
BT97	
BT98	

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT37	0.002			<3	32	<20	16	141
BT38	0.003			<3	37	<20	51	204
BT39	0.065	0.068		<3	<10	<20	<5	96
BT40	0.013	0.018		<3	<10	<20	14	238
BT41	0.004			<3	<10	<20	<5	61
BT42	0.004			<3	84	<20	63	264
BT43	<0.001			<3	37	<20	31	98
BT44	0.004			<3	<10	<20	5	20
BT45	0.061	0.068		<3	<10	<20	<5	27
BT55	0.001			<3	69	<20	570	401
BT56	0.001			<3	105	24	221	219
BT57	<0.001	<0.001		<3	175	<20	18	95
BT58	0.014	0.01		<3	340	<20	51	423
BT59	0.001			<3	250	<20	27	297
BT60	BLD							
BT61	0.001							
BT62	0.002	0.001						
BT63	0.002							
BT64	0.002							
BT65	0.002	0.001						
BT66	0.002							
BT67	BLD							
BT68	0.002							
BT69	BLD							
BT70	0.002							
BT71	0.002	0.001						
BT72	0.001							
BT73	BLD							
BT74	BLD							
BT75	0.001	0.001						
BT76	BLD							
BT77	0.001							
BT78	BLD							
BT79	0.002							
BT80	BLD							
BT81	BLD							
BT82	0.005	0.004						
BT83	0.001							
BT84	BLD							
BT85	BLD							
BT86	BLD							
BT87	BLD							
BT88	BLD							
BT89	BLD							
BT90	BLD							
BT91	BLD							
BT92	0.001	0.001						
BT93	BLD							
BT94	BLD							
BT95	0.001							
BT96	BLD							
BT97	BLD							
BT98	0.001	0.001						

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT37	48500	205	<10	21	<20	<10				13
BT38	215000	590	<10	26	<20	<10				37
BT39	9860	135	<10	<10	<20	<10				<5
BT40	14100	205	<10	14	<20	<10				<5
BT41	6720	460	<10	<10	<20	<10				<5
BT42	236000	870	<10	98	<20	<10				165
BT43	95500	215	<10	65	<20	<10				67
BT44	11200	110	<10	13	<20	<10				7
BT45	6420	58	<10	11	<20	<10				14
BT55	32500	10000	<10	54	<20	12				105
BT56	54000	10000	<10	<10	<20	13				80
BT57	65500	1380	<10	<10	<20	<10				59
BT58	133000	1130	<10	17	<20	12				173
BT59	115000	730	<10	<10	<20	20				121
BT60										
BT61										
BT62										
BT63										
BT64										
BT65										
BT66										
BT67										
BT68										
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BT90										
BT91										
BT92										
BT93										
BT94										
BT95										
BT96										
BT97										
BT98										

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT99	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT100	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT101	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT102	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT103	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT104	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT105	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT106	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT107	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT108	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT109	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT110	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT111	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT112	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT113	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT114	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT115	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT116	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT117	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT118	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT119	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT120	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT121	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT122	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT123	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT124	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT125	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT126	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT127	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT128	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT129	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT130	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT131	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT132	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT133	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT134	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT135	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT136	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT137	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT138	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT139	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT140	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT141	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT153	319889	6364390	Rock chip	Filsell	Penn Cu Mine	
BT154	320432	6364572	Rock chip	Filsell		
BT155	320432	6364572	Rock chip	Filsell	Flux Quarry 3	
BT156	320432	6364572	Rock chip	Filsell		
BT157	321280	6365756	Rock chip	Filsell	Heithersay's	
BT158	321280	6365756	Rock chip	Filsell	Heithersay's	
BT159	321312	6365689	Rock chip	Filsell	Heithersay's	
BT160	321312	6365717	Rock chip	Filsell	Heithersay's	
BT161	321421	6365800	Rock chip	Filsell	Heithersay's	
BT162	321363	6365780	Rock chip	Filsell	Heithersay's	

Sample ID	Notes
BT99	
BT100	
BT101	
BT102	
BT103	
BT104	
BT105	
BT106	
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BT111	
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BT126	
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BT128	
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BT131	
BT132	
BT133	
BT134	
BT135	
BT136	
BT137	
BT138	
BT139	
BT140	
BT141	
BT153	Altered slate from spoil dump
BT154	Alteration in creek next to track to Penn Mine
BT155	50m rock chip going E/W north of drive into hill
BT156	50m rock chip going E/W south of drive into hill, starting Nackara Ck.
BT157	Screened material, old w'ings above alluvial w'ings
BT158	Undersize from BT157. Close to Goldstream peg.
BT159	Just rocks, eluvial w'ings, S end of field.
BT160	Old trench over Fe rich horizon
BT161	Old dumps, N end of w'ings
BT162	Old eluvial w'ings

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT99	BLD							
BT100	BLD	0.001						
BT101	BLD							
BT102	0.11	0.115		<3	<10	<20	<5	71
BT103	0.005			<3	<10	<20	<5	75
BT104	0.006			<3	<10	<20	<5	157
BT105	0.011	0.015		<3	<10	<20	<5	147
BT106	0.01	0.012		<3	<10	<20	<5	85
BT107	0.002			<3	<10	<20	12	121
BT108	0.006	0.004		<3	19	<20	84	143
BT109	0.003			<3	21	<20	109	174
BT110	0.001			<3	19	<20	101	153
BT111	BLD			<3	23	<20	57	114
BT112	0.001	0.001		<3	23	<20	54	96
BT113	BLD			<3	16	<20	33	71
BT114	BLD			<3	<10	<20	12	64
BT115	BLD			<3	<10	<20	23	103
BT116	BLD			<3	<10	<20	21	86
BT117	0.003	0.004		<3	12	<20	18	190
BT118	0.007	0.006	0.008	<3	22	<20	30	411
BT119	0.006	0.007		<3	31	<20	83	449
BT120	0.001			<3	15	<20	23	135
BT121	0.008	0.006		<3	31	<20	32	233
BT122	0.006			<3	<10	<20	6	133
BT123	0.027	0.032		<3	<10	<20	17	61
BT124	0.014	0.014		<3	<10	<20	<5	56
BT125	0.014	0.016		<3	<10	<20	6	145
BT126	0.009	0.008		<3	<10	<20	6	162
BT127	0.003			<3	<10	<20	<5	80
BT128	0.002			<3	<10	<20	7	86
BT129	BLD			<3	<10	<20	6	82
BT130	0.003	0.002		<3	<10	<20	7	77
BT131	0.003	0.001		<3	<10	<20	<5	42
BT132	BLD			<3	<10	<20	6	128
BT133	0.001			<3	<10	<20	9	237
BT134	BLD			<3	<10	<20	<5	67
BT135	0.001			<3	<10	<20	<5	50
BT136	0.002	0.001		<3	11	<20	5	108
BT137	0.015	0.019		<3	12	<20	6	154
BT138	0.25	0.245		7	47	<20	201	1230
BT139	0.029			<3	30	<20	46	672
BT140	0.019	0.023		<3	20	<20	14	185
BT141	0.006	0.005		<3	14	<20	16	195
BT153	0.019	0.014						
BT154	0.003		0.005					
BT155	0.003	0.004						
BT156	0.012	0.014						
BT157	0.002							
BT158	0.005							
BT159	0.315	0.309						
BT160	0.014	0.011						
BT161	0.397	0.4						
BT162	0.074	0.083						

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT99										
BT100										
BT101										
BT102	5490	115	<10	<10	<20	<10				<5
BT103	9290	110	10	14	<20	<10				8
BT104	8780	110	12	<10	<20	<10				5
BT105	7920	120	11	<10	<20	<10				<5
BT106	7910	96	<10	<10	<20	<10				<5
BT107	18500	115	<10	20	<20	<10				11
BT108	132000	1570	<10	66	<20	<10				41
BT109	168000	1680	<10	80	<20	<10				54
BT110	150000	1240	<10	77	<20	<10				63
BT111	233000	1930	<10	62	<20	<10				59
BT112	222000	1840	<10	65	<20	<10				56
BT113	143000	985	<10	36	<20	<10				43
BT114	24000	270	11	16	<20	<10				10
BT115	29000	270	11	37	<20	<10				19
BT116	26000	410	11	26	<20	<10				19
BT117	38500	245	<10	28	<20	<10				18
BT118	78500	250	<10	57	<20	<10				36
BT119	105000	330	<10	100	24	<10				55
BT120	54000	225	<10	41	<20	<10				25
BT121	66000	180	<10	60	<20	<10				42
BT122	7080	74	<10	<10	<20	<10				<5
BT123	63000	340	<10	18	<20	<10				12
BT124	5350	115	<10	<10	<20	<10				<5
BT125	6900	145	<10	<10	<20	<10				<5
BT126	6690	190	<10	<10	<20	<10				6
BT127	5740	100	<10	<10	<20	<10				<5
BT128	5300	205	<10	<10	<20	<10				5
BT129	5240	160	<10	<10	<20	<10				<5
BT130	4570	200	<10	<10	<20	<10				<5
BT131	6970	95	11	<10	<20	<10				5
BT132	19700	310	11	<10	<20	<10				9
BT133	19300	110	<10	16	28	<10				35
BT134	9270	150	<10	<10	<20	<10				7
BT135	18800	255	<10	<10	<20	<10				10
BT136	27000	160	<10	22	<20	<10				15
BT137	22000	175	<10	19	<20	<10				17
BT138	205000	165	<10	295	<20	<10				68
BT139	84500	295	<10	66	<20	<10				34
BT140	44000	240	<10	30	<20	<10				15
BT141	36000	210	<10	33	<20	<10				20
BT153										
BT154										
BT155										
BT156										
BT157										
BT158										
BT159										
BT160										
BT161										
BT162										

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT163	319953	6365883	Rock chip	Filsell		
BT164	319944	6365998	Rock chip	Filsell		
BT165	319993	6361124	Rock chip	Filsell		
BT166	320132	6366040	Rock chip	Filsell		
BT167	320030	6365881	Rock chip	Filsell		
BT168	321822	6364768	Rock chip	Filsell		
BT169	323153	6365997	Rock chip	Filsell		
BT170	323268	6365986	Rock chip	Filsell		
BT171	323442	6366034	Rock chip	Filsell		
BT173	321326	6365890	Rock chip	Filsell	Flux Quarry 2	
BT174	321326	6365890	Rock chip	Filsell	Flux Quarry 2	
BT175	321326	6365890	Rock chip	Filsell	Flux Quarry 2	
BT176	321326	6365890	Rock chip	Filsell	Flux Quarry 2	
BT177	see plan	see plan	Rock chip	Filsell	Flux Quarry 2 West	
BT178	see plan	see plan	Rock chip	Filsell	Flux Quarry 2 West	
BT180	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT181	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT182	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT183	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT184	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT185	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT186	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT187	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT188	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT189	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT190	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT191	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT192	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT193	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT194	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT195	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT196	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT197	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT198	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT199	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT202	see plan	see plan	Lag	Filsell	Flux Quarry 2 West	
BT203	see plan	see plan	Rock chip	Filsell		
BT204	see plan	see plan	Rock chip	Filsell		
BT205	see plan	see plan	Rock chip	Filsell		
BT207	320364	6362295	Rock chip	Filsell	S Silica Ridge	5/05/00
BT208	320364	6362325	Rock chip	Filsell	S Silica Ridge	5/05/00
BT209	320965	6363887	Rock chip	Filsell		5/05/00
BT210	320536	6365794	Rock chip	Filsell		5/05/00
BT211	320414	6362994	Rock chip	Filsell	W Silica Ridge	5/05/00
BT212	320043	6362032	Rock chip	Filsell	S Silica Ridge	5/05/00
BT216	339726	6377912	Rock chip	Filsell	Jasp	6/05/00
BT217	339726	6377912	Rock chip	Filsell	Jasp	6/05/00
BT225	320430	6378164	Rock chip	Filsell		8/05/00
BT226	320430	6378164	Rock chip	Filsell	Golden Junction	8/05/00
BT227	320430	6378164	Rock chip	Filsell		8/05/00
BT228	320430	6378164	Rock chip	Filsell		8/05/00
BT229	320678	6371124	Rock chip	Filsell		8/05/00
BT230	320678	6371124	Rock chip	Filsell		8/05/00

Sample_ID	Notes
BT163	W of dark jasperoid outcrop
BT164	W of dark jasperoid outcrop
BT165	W of dark jasperoid outcrop
BT166	First ridge W of West Dark Jasperoid
BT167	As above, further S.
BT168	Silic/calc rich slate unit, E side Nackara Ck on side track
BT169	Lower unit on ridge, E Nackara
BT170	Upper unit on top of ridge, E Nackara
BT171	Upper unit on top of ridge, E Nackara
BT173	Quartz zone. N end of quarry. Approx.4m chip.
BT174	Quartz zone, adjoins BT173(N) and BT175(S).Approx.4m chip.
BT175	Quartz zone, adjoins BT174(N) and BT176(S).Approx.4m chip.
BT176	Quartz zone, S end quarry. Approx.4m chip.
BT177	Jasperoid. Repeat of BT138.
BT178	Grab sample around BT138 site.
BT180	
BT181	
BT182	
BT183	
BT184	
BT185	
BT186	
BT187	
BT188	
BT189	
BT190	
BT191	
BT192	
BT193	
BT194	
BT195	
BT196	
BT197	
BT198	
BT199	
BT202	5m E of BT102
BT203	Quartz with pyrite. Split from BT201.
BT204	Boxworked slate. Split from BT201.
BT205	Fe rich sample from old pit at BT200
BT207	Jasperoidal black slate
BT208	Quartz/carbonate/sericite rock. Marble host.
BT209	Slickensided ochreous limonite. From old pit.
BT210	Jasperoid/quartz vein in ck.
BT211	Quartz breccia and ironstone
BT212	Black jasperoid.
BT216	Silic breccia zone
BT217	S extension of silic breccia zone in BT216. More FeO here.
BT225	Quartzite+specularite`<200m behind Grainger camp.
BT226	Dump sample - sericitised wallrock, no quartz.
BT227	Downslope decline. Micaceous rock+specularite.
BT228	Lowermost 2 adits. Sericite/specularite altered tillite below shale contact.
BT229	Jasperoid and coarse sericite
BT230	As above,sericite rich sample.

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT163	0.002			<3	BLD	<20	BLD	27
BT164	0.001			<3	BLD	<20	BLD	11
BT165	BLD			<3	BLD	<20	BLD	9
BT166	0.001			<3	14	<20	7	397
BT167	0.002	0.001		<3	22	<20	9	383
BT168	0.002							
BT169	0.003	0.005						
BT170	0.001							
BT171	0.003	0.002						
BT173	0.002			<3		<20		23
BT174	0.004			<3	BLD	<20	BLD	14
BT175	0.007			<3	BLD	<20	BLD	25
BT176	0.005			<3	BLD	<20	BLD	8
BT177	0.17	0.15	0.14	<3	80	<20	119	1865
BT178	0.16	0.162						
BT180	0.01		0.012					
BT181	0.021							
BT182	0.02	0.015						
BT183	0.013	0.015						
BT184	0.03	0.027						
BT185	0.004							
BT186	0.006							
BT187	0.002							
BT188	0.002							
BT189	0.01							
BT190	0.014	0.016						
BT191	0.015	0.02						
BT192	0.01							
BT193	0.492	0.38	0.46					
BT194	0.362	0.35						
BT195	0.031							
BT196	0.007							
BT197	0.003							
BT198	0.001							
BT199	0.002							
BT202	0.015	0.02	0.018					
BT203	0.002	0.002						
BT204	0.002							
BT205	0.005	0.005	0.006					
BT207	0.006	0.009		<3	16		10	56
BT208	0.001			<3	<10		<5	5
BT209	0.003			<3	22		22	1745
BT210	0.003			<3	15		39	175
BT211	0.003	0.005		<3	53		35	152
BT212	0.007			<3	<10		<5	6
BT216	0.063			<3	<10		5	<5
BT217	0.01			<3	89		50	122
BT225	0.004			<3	<10		87	<5
BT226	0.106	0.119		<3	19		20	<5
BT227	0.198			<3	11		25	<5
BT228	0.052			<3	<10		20	<5
BT229	0.604			<3	<10		106	<5
BT230	1.99	1.75		<3	<10		230	<5

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT163	9020	750	<10	BLD	<20	BLD				10
BT164	13600	975	<10	BLD	<20	BLD				25
BT165	10800	750	<10	BLD	<20	BLD				18
BT166	56500	380	<10	23	<20	BLD				26
BT167	73000	335	<10	25	<20	BLD				16
BT168										
BT169										
BT170										
BT171										
BT173			<10		<20					<5
BT174	4160	26	<10	BLD	<20	BLD				7
BT175	7460	41	<10	BLD	<20	BLD				7
BT176	5420	31	<10	33	<20	BLD				7
BT177	294000	330	<10	160	<20	14				108
BT178										
BT180										
BT181										
BT182										
BT183										
BT184										
BT185										
BT186										
BT187										
BT188										
BT189										
BT190										
BT191										
BT192										
BT193										
BT194										
BT195										
BT196										
BT197										
BT198										
BT199										
BT202										
BT203										
BT204										
BT205										
BT207	24000		10.7	25	<20	0.7				15
BT208	1820		0.6	<5	<20	<0.1				11
BT209	163000		6	34	40	3				226
BT210	59500		7.8	50	<20	1.2				31
BT211	209000		10.1	42	<20	2.2				237
BT212	11000		10.5	8	22	1.7				10
BT216	12900		5.9	10	<20	3.4				32
BT217	139000		7.4	78	110	8.1				462
BT225	55500		3.5	41	<20	1.9				55
BT226	101000		2	27	<20	1.4				19
BT227	63000		1.9	34	<20	1.1				6
BT228	89000		6.9	36	<20	1.1				16
BT229	99500		4.7	95	<20	1.4				17
BT230	189000		4.9	193	<20	1.3				28

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT231	321129	6371296	Rock chip	Filsell		8/05/00
BT232	321129	6371296	Rock chip	Filsell		8/05/00
BT233	320752	6370742	Rock chip	Filsell	Heather Belle	8/05/00
BT234	320752	6370742	Rock chip	Filsell	Heather Belle	8/05/00
BT235	319553	6368650	Rock chip	Filsell	Wilgenna	8/05/00
BT236	318576	6360487	Rock chip	Filsell	Schoolhouse	10/05/00
BT237	318576	6360487	Rock chip	Filsell		10/05/00
BT238	318576	6360487	Rock chip	Filsell		10/05/00
BT239	318576	6360487	Rock chip	Filsell		10/05/00
BT240	318771	6360546	Rock chip	Filsell		10/05/00
BT241	318771	6360546	Rock chip	Filsell		10/05/00
BT242	318771	6360546	Rock chip	Filsell		10/05/00
BT243	318930	6360578	Rock chip	Filsell		10/05/00
BT244	318930	6360578	Rock chip	Filsell		10/05/00
BT245	318760	6360793	Rock chip	Filsell		10/05/00
BT246	318760	6360793	Rock chip	Filsell		10/05/00
BT247	318760	6360793	Rock chip	Filsell		10/05/00
BT248	318760	6360793	Rock chip	Filsell		10/05/00
BT249	319682	6359278	Rock chip	Filsell	Rowe's	11/05/00
BT250	319682	6359278	Rock chip	Filsell		11/05/00
BT251	319765	6359136	Rock chip	Filsell		11/05/00
BT252	319682	6359278	Rock chip	Filsell		11/05/00
BT253	319553	6368650	Rock chip	Filsell	Wilgunna	12/05/00
BT254	319553	6368650	Rock chip	Filsell		12/05/00
BT255	319553	6368650	Rock chip	Filsell		12/05/00
BT256	320971	6368924	Rock chip	Filsell	Cook's Blow S	12/05/00
BT257	328922	6368699	Rock chip	Filsell	Cook's Blow E	12/05/00
BT267	320750	6370741	Rock chip	Filsell	H.Blle/Gldn.Jcn.	13/05/00
BT268	320750	6370741	Rock chip	Filsell	H.Blle/Gldn.Jcn.	13/05/00
BT269	320430	6378164	Rock chip	Filsell	H.Blle/Gldn.Jcn.	13/05/00
BT270	320430	6378164	Rock chip	Filsell	H.Blle/Gldn.Jcn.	13/05/00
BT271	320430	6378164	Rock chip	Filsell	Buttamuck Well	13/05/00
BT272	320270	6371609	Rock chip	Filsell		13/05/00
BT273	320171	6371795	Rock chip	Filsell	Goat Workings	13/05/00
BT274	320171	6371795	Rock chip	Filsell		13/05/00
BT275	320171	6371795	Rock chip	Filsell		13/05/00
BT276	320171	6371795	Rock chip	Filsell		13/05/00
BT277	320171	6371795	Rock chip	Filsell		13/05/00
BT278	320171	6371795	Rock chip	Filsell		13/05/00
BT280	298806	6369441	Rock chip	Filsell		14/05/00
BT281	328400	6357000	Rock chip	Filsell	Wheal Basset A'cline	15/05/00
BT282	328200	6356919	Rock chip	Filsell		15/05/00
BT284	320569	6360637	Rock chip	Filsell		15/05/00
BT285	320569	6360637	Rock chip	Filsell	Dacite Ridge	
BT286	320569	6360637	Rock chip	Filsell	Dacite Ridge	
BT287	320569	6360637	Rock chip	Filsell	Dacite Ridge	
BT288	320595	6360272	Rock chip	Filsell	Dacite Ridge	
BT289	320595	6360272	Rock chip	Filsell	Dacite Ridge	
BT290	320595	6360272	Rock chip	Filsell	Dacite Ridge	
BT291	320595	6360272	Rock chip	Filsell	Dacite Ridge	
BT292	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT293	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT294	320586	6360425	Rock chip	Filsell	Dacite Ridge	

Sample ID	Notes
BT231	Reddish purple sericite altered shale from pit/adit.
BT232	Crush zone in Golden Junction Ck. Abundant sericite + specularite.
BT233	Mine dump fines.
BT234	Jasperoid.
BT235	Quartz/sericite+sericite altered tillite below shale contact.
BT236	Quartz veined arkose. W-line.
BT237	Vuggy silica. W line.
BT238	Carbonate breccia. W line.
BT239	Silicified sandstone. W line.
BT240	Ferrous rich grab from mine dump. Central line.
BT241	Grab FeO. Central line, S end of diggings.
BT242	Grab FeO. Central line, near fence.
BT243	Quartz breccia+FeO cements, boulder in dam. E line.
BT244	Jasperoid float. E line.
BT245	Silic sandstone+quartz, limonite in vugs.
BT246	Granite erratic?/subcrop? Microcline/quartz/plagioclase.
BT247	Foliated granite erratic?/subcrop?. Abundant biotite, sericite.
BT248	Granite with sericite.
BT249	Intensely silic sandstone, abundant specularite, rare very fine pyrite.
BT250	Intensely silic sandstone, abundant specularite, rare very fine pyrite.
BT251	Vuggy jasperoid. S side of road.
BT252	Siliceous sandstone+specularite in boulder. Main Au diggings?
BT253	FeO+specularite+MnO in fractures/veins in shale from old pits.
BT254	As above but in sericitised tillite stratigraphically below shale
BT255	Red haematitic shale, specularite veinlets.
BT256	Limonitic foliated sediments. ? In axial plane.
BT257	Haematitic grab.
BT267	1st costean N of H.B. Grab from dump.
BT268	2nd costean
BT269	3rd costean.
BT270	4th costean.
BT271	Dump sample.
BT272	Disrupted sandstone+FeO. Big hill N of Golden Junction.
BT273	FeO+sericite in pale green banded contorted shale.
BT274	Banded shale.
BT275	Ptygmatic, contorted banded shale+FeO.
BT276	Brecciated sandstone, thin quartz veinlets+FeO.
BT277	Chocolate coloured shale.
BT278	Brecciated quartz in sandstone+FeO.
BT280	Brecciated sericitic sediments. Grab. Road cut.
BT281	FeOx from ~70m NW of dolerite dyke.
BT282	Ironstone. Grab-SW end.
BT284	Grab. Cu stained sericite altered rocks in pits (dacite).
BT285	Quartz/Fe carbonate/specularite. Grab-small scrape.
BT286	General rock chip around BT285 site.
BT287	Iron rich altered sediment. Grab-small scrape.
BT288	Dacite. grab from small pit.
BT289	Iron rich breccia-specularite. 40m chip across ridge.
BT290	Breccia-Fe carbonate, specularite.
BT291	Quartz/Fe rich breccia. Grab-small digging.
BT292	Fe rich grab from 4 small diggings.
BT293	Fe breccia.
BT294	Sheared dacite, Fe breccia. Specularite.

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT231	0.04			<3	100		71	144
BT232	0.084	0.091	0.082	<3	<10		28	<5
BT233	0.323	0.273		<3	<10		33	<5
BT234	0.253	0.241		<3	<10		43	<5
BT235	0.018			<3	<10		5	<5
BT236	0.011	0.009		BLD	13		113	82
BT237	0.005	0.006		BLD	19		20	57
BT238	0.006			BLD	46		27	26
BT239	0.014			BLD	16		5	16
BT240	0.005			BLD	125		10	106
BT241	0.002			BLD	105		11	124
BT242	0.002			BLD	51		18	116
BT243	0.008			BLD	25		107	205
BT244	0.001			BLD	20		15	59
BT245	0.011	0.011		BLD	14		13	440
BT246	0.001			BLD	11		BLD	31
BT247	BLD			BLD	BLD		8	30
BT248	0.001			BLD	BLD		BLD	17
BT249	0.004			BLD	BLD		26	13
BT250	0.002			BLD	BLD		12	9
BT251	0.002			BLD	BLD		11	31
BT252	0.004			BLD	BLD		16	12
BT253	0.006			BLD	29		227	67
BT254	0.002			BLD	16		6	11
BT255	0.027	0.025		BLD	22		95	48
BT256	0.003			BLD	BLD		26	24
BT257	0.063	0.06		BLD	98		13	101
BT267	0.074	0.07		BLD	18		35	6
BT268	0.117	0.135	0.13	BLD	12		13	5
BT269	0.208	0.19	0.211	BLD	12		32	6
BT270	0.075	0.078		BLD	12		30	6
BT271	0.311	0.29		BLD	11		36	BLD
BT272	0.01			BLD	76		14	46
BT273	0.01			BLD	76		8	55
BT274	0.003			BLD	78		8	64
BT275	0.002			BLD	64		13	66
BT276	0.002			BLD	44		BLD	43
BT277	0.002			BLD	69		11	39
BT278	0.002			BLD	86		9	122
BT280	0.004			BLD	11		50	33
BT281	0.002			BLD	200		18	146
BT282	0.001			BLD	145		57	1010
BT284	0.001			BLD	BLD		61	15
BT285	0.002			BLD	BLD		13	17
BT286	0.001			BLD	10		193	74
BT287	BLD			BLD	BLD		894	183
BT288	BLD			BLD	BLD		45	11
BT289	0.002	0.003		BLD	BLD		163	71
BT290	0.001			BLD	11		17	97
BT291	0.002			4	19		30	59
BT292	0.001			BLD	19		52	100
BT293	0.002			3	17		124	52
BT294	0.001			BLD	13		7	44

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT231	275000		5	118	<20	0.4				78
BT232	91000		6.5	39	<20	0.8				12
BT233	117000		4.9	71	<20	0.9				78
BT234	125000		6.5	52	<20	0.3				35
BT235	40500		8.2	22	<20	1				13
BT236			6.6	58	175					446
BT237			4.8	47	22					41
BT238			5.5	31	BLD					92
BT239			6	17	BLD					20
BT240			3.3	BLD	24					397
BT241			2.8	20	82					633
BT242			5.4	18	84					413
BT243			5.2	92	BLD					218
BT244			5.5	16	38					128
BT245			9.9	18	32					348
BT246			4.8	BLD	22					211
BT247			6.2	33	BLD					31
BT248			3.5	BLD	BLD					26
BT249			7.9	56	BLD					28
BT250			6.2	23	BLD					21
BT251			6.2	28	BLD					15
BT252			6.4	38	BLD					24
BT253			4	53	BLD					168
BT254			6.5	12	BLD					10
BT255			3	BLD	BLD					32
BT256			4.3	22	BLD					14
BT257			8	BLD	BLD					19
BT267			5.9	71	BLD					55
BT268			5.8	59	BLD					45
BT269			6.2	115	BLD					37
BT270			4.7	37	BLD					12
BT271			4.4	93	BLD					29
BT272			3	42	BLD					30
BT273			1.7	20	BLD					19
BT274			4.1	11	BLD					19
BT275			4	20	BLD					18
BT276			1.4	13	BLD					15
BT277			2.1	73	BLD					213
BT278			3.3	19	BLD					25
BT280			3.6	39	BLD					46
BT281			4.9	27	66					86
BT282			4.7	69	26					287
BT284			5.6	84	BLD					15
BT285			2.9	21	BLD					14
BT286			9.4	200	BLD					25
BT287			7.2	245	BLD					42
BT288			0.4	175	BLD					49
BT289			5.9	75	BLD					15
BT290			7.3	22	BLD					17
BT291			1.9	BLD	BLD					61
BT292			1.9	29	26					356
BT293			7.6	95	BLD					189
BT294			4.8	BLD	BLD					28

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT295	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT296	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT297	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT298	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT299	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT300	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT301	320586	6360425	Rock chip	Filsell	Dacite Ridge	
BT302	320426	6360647	Rock chip	Filsell	Dacite Ridge	
BT303	320426	6360647	Rock chip	Filsell	Dacite Ridge	
BT304	320426	6360647	Rock chip	Filsell	Dacite Ridge	
BT305	320426	6360647	Rock chip	Filsell	Dacite Ridge	
BT306	318442	6357947	Rock chip	Filsell		
BT307	318442	6357947	Rock chip	Filsell		
BT308	318977	6358167	Rock chip	Filsell		
BT309	318977	6358167	Rock chip	Filsell		
BT310	317618	6357001	Rock chip	Filsell		
BT311	318570	6360500	Rock chip	Filsell	Rowe's paddock	
BT320	322050	6362195	Rock chip	Filsell	Mercer's paddock N	
BT321	322050	6362195	Rock chip	Filsell	Mercer's paddock N	
BT322	322239	6362370	Rock chip	Filsell	Mercer's paddock N	
BT324	320586	6360423	Rock chip	Filsell	Mercer's paddock	
BT325	320586	6360423	Rock chip	Filsell	Dacite Ridge	
BT326	320586	6360423	Rock chip	Filsell	Dacite Ridge	
BT327	320586	6360423	Rock chip	Filsell	Dacite Ridge	
BT328	322239	6362370	Rock chip	Filsell	Mercer's paddock N	
BT330	320845	6360995	Rock chip	Filsell		
BT331	321520	6361285	Rock chip	Filsell		
BT332	321645	6361442	Rock chip	Filsell		
BT333	322038	6361709	Rock chip	Filsell		
BT334	332433	6361928	Rock chip	Filsell		
BT335	322006	6361572	Rock chip	Filsell		
BT336	322006	6361572	Rock chip	Filsell		
BT337	321590	6361260	Rock chip	Filsell		
BT338	321590	6361260	Rock chip	Filsell		
BT339	321590	6361260	Rock chip	Filsell		
BT340	~321590	~6361235	Rock chip	Filsell		
BT341	321393	6361060	Rock chip	Filsell		
BT342	321366	6361113	Rock chip	Filsell		
BT343	~321390	~6361113	Rock chip	Filsell		
BT344	321200	6361127	Rock chip	Filsell		
BT345	321073	6361043	Rock chip	Filsell		
BT347	363784	6364268	Rock chip	Filsell		
BT348	321645	6361442	Rock chip	Filsell		
BT349	321588	6361431	Rock chip	Filsell		
BT350	321203	6361129	Rock chip	Filsell		
BT351	321172	6361102	Rock chip	Filsell		
BT352	321172	6361102	Rock chip	Filsell		
BT353	319429	6358055	Rock chip	Filsell	Martin Hills	
BT354	321304	6360664	Rock chip	Filsell	Black Tank	11-12/7/00
BT355	320952	6360593	Rock chip	Filsell	Black Tank	11-12/7/00
BT356	320975	6360759	Rock chip	Filsell	Black Tank	11-12/7/00
BT357	320007	6360878	Rock chip	Filsell	Black Tank	11-12/7/00
BT358	320007	6360878	Rock chip	Filsell	Black Tank	11-12/7/00

Sample_ID	Notes
BT295	Fe breccia-small digging.
BT296	Quartz from dacite/Cu diggings.
BT297	Dacite from dacite/Cu diggings.
BT298	Sheared quartz-dacite stockwork.
BT299	Dacite breccia-sericite,illite.
BT300	Pink dacite.
BT301	Sheared dacite with quartz.
BT302	Dacite, Fe breccia. Small digging.
BT303	Quartz/ironstone breccia.Small diggings.
BT304	Fe quartz. Small diggings.
BT305	Fe quartz. Small diggings.
BT306	Calcrete. Small alluvial diggings.
BT307	Calcrete, sieved from dumps-dry blowers/small alluvial workings.
BT308	Fe quartz dacite. NE of BT307.
BT309	As above. Fe carbonate trachyte?
BT310	Calcrete. Dumps-alluvial/dry blower.
BT311	Specularite. Gold diggings.
BT320	Quartzite/quartz breccia.Highway diggings on small hill.
BT321	Grab sample-dry blower spoil heaps.
BT322	Dacite?Pit in creek.
BT324	Dacite (main o/c).Minor quartz veining.
BT325	Sheared quartz veined dacite.
BT326	Dacite with slickensides.Next to tank.
BT327	Shear zone,W flank dacite.
BT328	Fine grained igneous rock,abundant opaques,some pyrite.
BT330	Silica flooded sandstone
BT331	Quartz-sericite-specularite
BT332	Fe rich breccia.
BT333	Jasperoid next to hwy-high Au
BT334	Jasperoid-large o/c on Hwy near DBH. 50m S of altered slate.
BT335	Altered slate,Fe, silic ?sides
BT336	Breccia,quartz rich,jasperoid?
BT337	Fine porphyry. Casts after pyrite.
BT338	Coarse porphyry-breccia.
BT339	Grab from dumps
BT340	Quartz breccia. Small digging.
BT341	Quartz breccia.
BT342	Red-pink rock. Boxworks?
BT343	Fe rich jasperoid,breccia.
BT344	Boxworked jasperoid? Sandstone.
BT345	Vuggy sandstone
BT347	Ironstone o/c. Road to Oakpark.
BT348	Fe rich breccia. Repeat of BT332.
BT349	Fe rich breccia. Down drainage from BT348.
BT350	Boxworked sandstone.Same site as BT344, more Fe rich.
BT351	Ironstone/jasperoid.
BT352	General chip around o/c.
BT353	Sericite altered siltstone.
BT354	Sericite altered mudstone,fine quartz/haematite veining.
BT355	Haematite/quartz ironstone, not gossanous.Prominent jasperoid to NW.
BT356	Intensely clay/silica altered zone,fine quartz veinlets.Adjacent banded silica.Local shear
BT357	Quartz veined(<5%) clay alteration zone.Small open pit.
BT358	Brecciated quartz vein zone, same pit. FeOx stain.

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT295	BLD			8	34		43	50
BT296	BLD			BLD	BLD		24	9
BT297	BLD			BLD	BLD		38	7
BT298	0.001			BLD	BLD		15	6
BT299	BLD			BLD	BLD		BLD	7
BT300	BLD			BLD	BLD		BLD	14
BT301	BLD			BLD	BLD		5	35
BT302	BLD			5	33		51	145
BT303	BLD	0.002		3	69		53	24
BT304	0.001			BLD	11		18	39
BT305	0.001			5	19		296	234
BT306	BLD			BLD	BLD		2	5
BT307	BLD			BLD	BLD		1	3
BT308	BLD	0.002		BLD	15		18	45
BT309	0.012	0.014		BLD	180		120	148
BT310	BLD			BLD	BLD		6	7
BT311	BLD			BLD	BLD		6	5
BT320	0.001			BLD	BLD		BLD	14
BT321	BLD			BLD	BLD		6	22
BT322	0.003	0.003		BLD	10		BLD	12
BT324	BLD			BLD	BLD		14	37
BT325	BLD	0.001		BLD	BLD		BLD	46
BT326	BLD			BLD	BLD		6	7
BT327	BLD			BLD	BLD		BLD	6
BT328	0.003	0.003		BLD	BLD		11	12
BT330	0.005			0.4	<10		<5	20
BT331	0.006			1.1	<10		574	282
BT332	0.003			7.1	45		7490	3400
BT333	0.052			0.2	<10		273	120
BT334	0.003			4.6	<10		15	86
BT335	0.003			1.9	<10		14	18
BT336	0.045			1.3	<10		15	20
BT337	0.003			<0.01	<10		22	13
BT338	0.002	0.002	0.002	<0.01	<10		7	<5
BT339	0.004			0.1	<10		23	84
BT340	0.003			<0.01	<10		8	12
BT341	0.002			0.6	<10		68	40
BT342	0.004			0.6	<10		35	23
BT343	0.004			0.7	16		1370	866
BT344	0.003			3.9	14		2860	1435
BT345	0.003			0.7	<10		22	16
BT347	0.001	0.001		0.2	18		8	45
BT348	0.002			9.5	86		5510	3160
BT349	0.002			5.5	49		4990	2540
BT350	0.002			3	20		1370	824
BT351	0.002			0.3	29		1565	1295
BT352	0.004			0.8	78		869	471
BT353	0.001			0.3	10		20	36
BT354	0.001			0.3	<10		13	50
BT355	0.001			0.2	12		22	245
BT356	<0.001			0.3	<10		<5	16
BT357	<0.001			0.1	<10		<5	11
BT358	<0.001			<0.1	<10		<5	26

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT295			4.8	61	28					277
BT296			7.4	57	BLD					15
BT297			0.5	105	BLD					13
BT298			3.1	130	BLD					38
BT299			4.4	BLD	BLD					6
BT300			2.3	32	BLD					19
BT301			3.3	BLD	BLD					32
BT302			4.6	110	BLD					213
BT303			8.2	78	BLD					127
BT304			4.5	BLD	BLD					40
BT305			7.2	66	BLD					311
BT306			BLD	2	BLD					8
BT307			BLD	2	BLD					4
BT308			0.5	50	BLD					23
BT309			14.9	135	20					81
BT310			3	7	BLD					5
BT311			2.4	BLD	BLD					10
BT320			5.5	BLD	BLD					5
BT321			3.8	13	BLD					22
BT322			3.7	BLD	BLD					5
BT324			3.2	13	BLD					67
BT325			2.6	20	BLD					12
BT326			6	BLD	BLD					10
BT327			5.1	10	BLD					7
BT328			1.5	25	BLD					11
BT330			10.1	11	<20					21
BT331			15.8	305	<20					183
BT332			74.2	2150	58					593
BT333			14.4	81	24					69
BT334			4.8	23	<20					78
BT335			4.8	21	<20					75
BT336			11.9	33	<20					26
BT337			5.4	62	<20					39
BT338			10.2	15	<20					166
BT339			5.8	22	<20					38
BT340			5	<10	<20					12
BT341			9.7	65	<20					30
BT342			6	75	<20					35
BT343			15.1	1210	<20					318
BT344			14.8	1390	<20					580
BT345			6.5	22	<20					17
BT347			3.2	<5	20					17
BT348			92.4	2850	28					711
BT349			45.9	1970	22					623
BT350			14	938	<20					380
BT351			9.3	1450	<20					407
BT352			3.5	354	<20					137
BT353			0.5	37	<20					36
BT354			0.7	20	<20					10
BT355			2.7	47	<20					74
BT356			0.8	26	<20					7
BT357			0.7	21	34					7
BT358			0.8	11	24					<5

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT359	320205	6360399	Rock chip	Filsell	Black Tank	11-12/7/00
BT360	319219	6359658	Rock chip	Filsell	Black Tank	11-12/7/00
BT361	319195	6359799	Rock chip	Filsell	Rowe's	13/07/00
BT362	319608	6359996	Rock chip	Filsell	Rowe's	13/07/00
BT363	319777	6359510	Rock chip	Filsell	Rowe's	13/07/00
BT364	318879	6358395	Rock chip	Filsell	Martin's	13/07/00
BT365	320063	6361562	Rock chip	Filsell		
BT366	319735	6360860	Rock chip	Filsell		
BT367	319619	6360767	Rock chip	Filsell		
BT368	319811	6360813	Rock chip	Filsell		
BT369	320214	6361097	Rock chip	Filsell		
BT370	320377	6361139	Rock chip	Filsell		
BT371	320377	6361139	Rock chip	Filsell		
BT372	319950	6360935	Rock chip	Filsell		
BT373	322542	6360918	Rock chip	Filsell		
BT374	322278	6360990	Rock chip	Filsell		
BT375	322506	6361336	Rock chip	Filsell		
BT376	321051	6367221	Rock chip	Filsell		
BT378	322639	6362237	Rock Chip	Filsell	Rhyo Ridge	Oct-00
BT379	322629	6362227	Rock Chip	Filsell	Rhyo Ridge	Oct-00
BT380	322619	6362217	Rock Chip	Filsell	Rhyo Ridge	Oct-00
BT381	322399	6362740	Rock Chip	Filsell	Rhyo Ridge	Oct-00
BT382	322357	6362740	Rock Chip	Filsell	Rhyo Ridge	Oct-00
BT383	322316	6362617	Rock Chip	Filsell	Rhyo Ridge	Oct-00
BT385	321836	6364377	Rock Chip	Filsell	E Limb FeO	Oct-00
BT386	321867	6364532	Rock Chip	Filsell	E Limb FeO	Oct-00
BT387	321746	6364432	Rock Chip	Filsell	E Limb FeO	Oct-00
BT388	323388	6366167	Rock Chip	Filsell	12ppb anom	Oct-00
BT389	323390	6366170	Rock Chip	Filsell	12ppb anom	Oct-00
BT390	323310	6366191	Rock Chip	Filsell	12ppb anom	Oct-00
BT391	323315	6366190	Rock Chip	Filsell	12ppb anom	Oct-00
BT392	321990	6367713	Rock Chip	Filsell	Cent. Intr.	Oct-00
BT393	321907	6367694	Rock Chip	Filsell	Cent. Intr.	Oct-00
BT394	321822	6367577	Rock Chip	Filsell	Cent. Intr.	Oct-00
BT395	321822	6367570	Rock Chip	Filsell	Cent. Intr.	Oct-00
BT396	321746	6367883	Rock Chip	Filsell	Cent. Intr.	Oct-00
BT397	321177	6367382	Rock Chip	Filsell	Flux 3	Oct-00
BT398	321518	6368947	Rock Chip	Filsell	A'cline axis	Oct-00
BT399	321510	6368947	Rock Chip	Filsell	A'cline axis	Oct-00
BT400	321509	6368416	Rock Chip	Filsell	A'cline axis	Oct-00
BT401	322895	6362563	Rock Chip	Filsell	E fl Rhyo R	Oct-00
BT402	322900	6362673	Rock Chip	Filsell	E fl Rhyo R	Oct-00
BT403	322972	6362774	Rock Chip	Filsell	E fl Rhyo R	Oct-00
BT404	323004	6364213	Rock Chip	Filsell	Hut andesite	Oct-00
BT405	322815	6364311	Rock Chip	Filsell	Hut andesite	Oct-00
BT406	322729	6364555	Rock Chip	Filsell	Hut andesite	Oct-00
BT407	321398	6366090	Rock Chip	Filsell	Flux 2	Oct-00
BT408	321390	6366080	Rock Chip	Filsell	Flux 2	Oct-00
BT409	321506	6365948	Rock Chip	Filsell	Heithersays	Oct-00
BT410	321248	6365311	Rock Chip	Filsell	Flux 1	Oct-00
BT411	321405	6365737	Rock Chip	Filsell	Flux 2 Sth	Oct-00
BT412	321510	6365875	Rock Chip	Filsell	Heithersays	Oct-00
BT413	320181	6363718	Rock Chip	Filsell	Penn Sth	Oct-00

Sample_ID	Notes
BT359	Lag quartz/maghaemite veining,boxworks after pyrite.
BT360	Coarse haematite/quartz veins,hosted in siltstone.Veins range 1BLD50mm,various orien
BT361	Magnetic lag,same site as soil sample OW53
BT362	Magnetic lag,same site as soil sample OW57.Also petro.sample.
BT363	Magnetite/haematite ironstone float from creek.
BT364	Magnetite/haematite ironstone veining from small gully..
BT365	Fe quartz sediment. Scrapes
BT366	Fe rich breccia.Small pit.
BT367	Fe quartz breccia.Casts in quartz. 25m radius chip around 2 small scrapes.
BT368	Fe rich sediment. Quartz with holes.
BT369	Quartz stockworked zone, leached holes.100m chip of ~12 small pits trending NW.
BT370	Sheared quartz,vuggy silica.Chip from 12 small pits.
BT371	General chip from ~20 small pits,W from site to BT369 site
BT372	Quartz Fe breccia from small pits.
BT373	Sheared/contorted sediment, some Fe.BT-BCLBLD8-drainage.
BT374	Sericitic Fe rich sediment horizon 50m wide.
BT375	Sediment with Fe rich stringer stockworks.
BT376	Jasperoid just N of Flux Quarry 3
BT378	MnO rich fractured, baked sltst along contact with rhyolite
BT379	MnO rich fractured, baked sltst along contact with rhyolite
BT380	MnO rich fractured, baked sltst along contact with rhyolite
BT381	FeO and MnO rich baked sltst along southern contact of rholite
BT382	FeO rich breccia in fault cutting rhyolite
BT383	FeO-rich breccia in fault cutting rhyolite
BT385	Hematite float on claypan, possible sulphide gossan
BT386	Hematite float on claypan, possible sulphide gossan. Small pit nearby
BT387	Magnetite float coming from thin veins concordant with sltst
BT388	Sericite-specularite altered sandstone with minor pyrite along Q stwk zone
BT389	Sericite-specularite altered sandstone with minor pyrite along Q stwk zone
BT390	Sericite-specularite altered sandstone with minor pyrite along Q stwk zone
BT391	Sericite-specularite altered sandstone with minor pyrite along Q stwk zone
BT392	Green prop (act/ep/chl) alt andesite porphyry
BT393	Q+carbonate+green chlorite adjacent to andesite porphyry. Pyrite in chl rich areas
BT394	Q+carbonate+green chlorite+specularite adjacent to and biotite rich intrusion
BT395	Q+carbonate+green chlorite+specularite adjacent to and biotite rich intrusion
BT396	Diss malachite in convoluted sericitic SS
BT397	Character sample of goethite and hematite from main outcrop
BT398	Goethite float adjacent to andesite porphyry. Banded FeO + minor Q
BT399	Tourmaline rich sedimentary bx near northern andesite porphyry outcrop
BT400	Tourmaline rich sedimentary bx near southern andesite porphyry outcrop
BT401	Q vein in rhyolite. Contains red-brown well cleaved mineral
BT402	Q with specularite in rhyolite
BT403	Ferruginous Q veins in baked sediment next to rhyolite contact
BT404	Speculate float near biotite rich andesite porphyry contact with sediments
BT405	Q + specularite float d/s from above contact
BT406	Magnetite float d/s from above contact
BT407	Character sample of sericite rich rock, very little goethite
BT408	Character sample of goethite rich rock with slickensides
BT409	Character sample of roned Q pebbles in sandy matrix
BT410	Character sample of goethite from main outcrop
BT411	Character sample of ferruginous jasperoid
BT412	Kaolinized sltst from gutter
BT413	Gossanous Q-limonite

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT359	<0.001			0.1	<10		32	47
BT360	0.001			0.1	<10		10	15
BT361	0.008			0.3	31		44	47
BT362	<0.001			0.3	33		47	42
BT363	<0.001			<0.1	16		81	21
BT364	0.001			0.2	44		9	17
BT365	0.004							
BT366	0.009							
BT367	0.003							
BT368	0.002							
BT369	0.002							
BT370	0.001							
BT371	<0.001							
BT372	0.004							
BT373	0.002							
BT374	0.001							
BT375	0.003							
BT376								
BT378	0.01	0.009		5.5	13		2800	800
BT379	BLD			6	17		2200	600
BT380	0.001			2	20		1300	260
BT381	BLD			6	26		150	34
BT382	BLD			<0.5	13		18	13
BT383	0.003			1	54		25	45
BT385	BLD			1.5	81		29	70
BT386	0.002	BLD		1	40		26	12
BT387	BLD			1	56		30	29
BT388	BLD			1	9		41	10
BT389	BLD			<0.5	5		6	3
BT390	0.002			0.5	6		38	2
BT391	0.012			<0.5	24		22	8
BT392	BLD			<0.5	<1		25	5
BT393	0.001			<0.5	<1		31	3
BT394	BLD			1	3		7	58
BT395	BLD			<0.5	<1		3	<1
BT396	0.13	0.09		1	3		79	18800
BT397	0.003			1	20		30	62
BT398	BLD			1	4		3	94
BT399	0.001			<0.5	<1		2	3
BT400	BLD			<0.5	1		2	4
BT401	BLD			<0.5	2		3	3
BT402	0.004			1	4		9	150
BT403	BLD			<0.5	9		<1	3
BT404	0.002			1	17		27	16
BT405	0.002			<0.5	2		26	44
BT406	BLD			1.5	15		15	1
BT407	0.006			1	13		40	58
BT408	0.01	0.01		1	11		43	89
BT409	0.004			<0.5	<1		<1	5
BT410	0.002			1	12		13	160
BT411	0.002			<0.5	5		2	39
BT412	0.005			<0.5	2		<1	11
BT413	0.006			1.5	56		105	2450

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT359			0.8	20	<20					22
BT360			1.2	<5	<20					9
BT361			1.9	75	58					135
BT362			1.9	86	68					125
BT363			0.6	54	<20					10
BT364			0.8	11	<20					<5
BT365										
BT366										
BT367										
BT368										
BT369										
BT370										
BT371										
BT372										
BT373										
BT374										
BT375										
BT376										
BT378	16100	81000	96	2200	38					1300
BT379	14500	57900	6	850	22					550
BT380	227000	17900	35	350	18					170
BT381	131000	80600	3	35	18					57
BT382	92500	600	2	37	6					34
BT383	238000	1350	<1	51	8					55
BT385	419000	470	<1	16	4					135
BT386	390000	500	<1	8	6					25
BT387	325000	550	<1	15	8					78
BT388	147000	1300	<1	27	4					14
BT389	118000	145	<1	6	6					7
BT390	155000	500	<1	30	<3					10
BT391	160000	800	<1	28	<3					17
BT392	39900	280	<1	78	<3					35
BT393	31300	550	<1	6	<3					4
BT394	126000	700	<1	9	<3					3
BT395	28300	650	<1	9	<3					9
BT396	37600	65	61	20	99					19
BT397	322000	550	<1	51	4					210
BT398	181000	170	<1	3	4					4
BT399	33800	1000	<1	9	<3					6
BT400	16500	450	<1	18	<3					3
BT401	24900	320	<1	5	<3					4
BT402	145000	130	<1	12	<3					5
BT403	18000	30	<1	2	4					1
BT404	330000	170	<1	92	4					6
BT405	77800	130	<1	59	<3					27
BT406	447000	350	<1	66	<3					17
BT407	195000	1250	<1	47	6					94
BT408	307000	1050	<1	70	<3					130
BT409	5000	40	<1	2	<3					2
BT410	254000	390	<1	17	<3					59
BT411	27900	120	<1	3	<3					4
BT412	3350	10	<1	1	8					8
BT413	274000	7850	2	98	22					50

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT414	320083	6363623	Rock Chip	Filsell	Penn Sth	Oct-00
BT415	321340	6362440	Rock Chip	Filsell	Quartz Rise	Oct-00
BT416	321351	6362435	Rock Chip	Filsell	Quartz Rise	Oct-00
BT419	320205	6360399	Rock Chip	Filsell	Nr OW-28	Oct-00
BT420	321401	6360197	Rock Chip	Filsell	At OW-41	Oct-00
BT421	321941	6360830	Rock Chip	Filsell	At OWBLD4	Oct-00
BT422	320366	6361225	Rock Chip	Filsell	Rhyo NW of railway	Oct-00
BT423	321850	6361569	Rock Chip	Filsell	Big Bend	Oct-00
BT424	321737	6361655	Rock Chip	Filsell	Big Bend	Oct-00
BT425	321383	6360199	Rock Chip	Filsell	At OW-41	Oct-00
BT426	321412	6360183	Rock Chip	Filsell	At OW-41	Oct-00
BT427	321521	6360346	Rock Chip	Filsell	SE Q st wk zone	Oct-00
BT428	320753	6360338	Rock Chip	Filsell	Black Tank	Oct-00
BT429	320199	6360599	Rock Chip	Filsell	At OW-24	Oct-00
BT430	320793	6360421	Rock Chip	Filsell	At OW-2	Oct-00
BT431	321603	6361700	Rock Chip	Filsell	Big Bend Cu pits	Oct-00
BT432	321914	6361206	Rock Chip	Filsell	SE Q st wk zone	Oct-00
BT433	321873	6361176	Rock Chip	Filsell	SE Q st wk zone	Oct-00
BT434	321865	6361145	Rock Chip	Filsell	SE Q st wk zone	Oct-00
BT435	321690	6361000	Rock Chip	Filsell	SE Q st wk zone	Oct-00
BT436	321658	6361543	Rock Chip	Filsell	Big Bend	Oct-00
BT437	321191	6366328	Rock Chip	Filsell	Flux 2 mag high	Oct-00
BT438	321191	6366357	Rock Chip	Filsell	Flux 2 mag high	Oct-00
BT439	321070	6366629	Rock Chip	Filsell	Flux 2 Nth	Oct-00
BT440	321083	6366625	Rock Chip	Filsell	Flux 2 Nth	Oct-00
BT441	321128	6366564	Rock Chip	Filsell	Flux 2 Nth	Oct-00
BT442	321332	6365777	Rock Chip	Filsell	Flux 2 Sth	Oct-00
BT443	320943	6365824	Rock Chip	Filsell	Flux 2 SW	Oct-00
BT444	320958	6365874	Rock Chip	Filsell	Flux 2 SW	Oct-00
BT445	319956	6363470	Rock Chip	Filsell	Penn Sth	Oct-00
BT446	319960	6363480	Rock Chip	Filsell	Penn Sth	Oct-00
BT447	319981	6363157	Rock Chip	Filsell	Penn Sth	Oct-00
BT448	320075	6365151	Rock Chip	Filsell	Penn Nth	Oct-00
BT449	320070	6365085	Rock Chip	Filsell	Penn Nth	Oct-00
BT450	320210	6365034	Rock Chip	Filsell	Penn Nth	Oct-00
BT451	320045	6365023	Rock Chip	Filsell	Penn Nth	Oct-00
BT452	319969	6363992	Rock Chip	Filsell	Penn Sth	Oct-00
BT453	319980	6363816	Rock Chip	Filsell	Penn Sth	Oct-00
BT454	322846	6365342	Rock Chip	Filsell	Hut st wk	Oct-00
BT455	321926	6364922	Rock Chip	Filsell	Fence st wk	Oct-00
BT456	321321	6366345	Rock Chip	Filsell	Flux 2 mag high	Oct-00
BT457	333649	6364915	Rock Chip	Filsell	Wheal Bassett Cu	Oct-00
BT458	333747	6365030	Rock Chip	Filsell	Wheal Bassett Cu	Oct-00
BT459	321070	6366722	Rock Chip	Filsell	A/cline axis	Oct-00
BT460	321103	6366272	Rock Chip	Filsell	ux 2 Nth grid Au and	Oct-00
BT461	321129	6366251	Rock Chip	Filsell	ux 2 Nth grid Au and	Oct-00
BT462	321130	6366250	Rock Chip	Filsell	ux 2 Nth grid Au and	Oct-00
BT463	321135	6366245	Rock Chip	Filsell	ux 2 Nth grid Au and	Oct-00
BT464	320986	6367623	Rock Chip	Filsell	Old Jasperoid	Oct-00
BT465	320964	6367985	Rock Chip	Filsell	Old Jasperoid	Oct-00
BT466	320975	6365475	Rock Chip	Filsell	Old Jasperoid	Oct-00
BT467	339449	6383238	Rock Chip	Filsell	Grid rhyolite Nth	Oct-00
BT468	339139	6382593	Rock Chip	Filsell	Grid rhyolite Sth	Oct-00

Sample_ID	Notes
BT414	Q-ironstone gossan, 30 cm wide trend 010 deg
BT415	Fractured white bucky Q cemented with MnO
BT416	Fractured white bucky Q cemented with MnO from small pit
BT419	White Q + specularite + minor MnO
BT420	Fg Sltst/SS with biotite rich lenses and streaks. Beds str N-S dip to W
BT421	Slightly ferruginous Sltst/SS
BT422	Boulders of Q-goethite
BT423	MnO cementing granular quartz
BT424	MnO/FeO rich silicified siderite vein
BT425	Fg SS with green sericite. Metamorphic?
BT426	Fg SS with green sericite and lenses streaks of biotite. Metamorphic?
BT427	Q st wk + minor sericite/limonite in moderately silicified SS
BT428	Qv with specularite, limonite ex py/Fe carbonate and abundant sericite in Sltst/SS
BT429	Grab Of FeO rich rock fragments
BT430	Jasperoid replacing dolomite with minor FeO and MnO
BT431	Mal + tenorite + cuprite in siderite vein trending 045 deg through Sltst/SS
BT432	Sericite rich (metamorphic?) Sltst trending 010 deg
BT433	Milky Qv st wk in SS
BT434	Milky Qv st wk in SS
BT435	Milky Qv st wk with massive goethite in SS
BT436	MnO cementing granular quartz
BT437	Q + sericite + tourmaline + specularite cutting phyllic alt intrusion
BT438	Goethite breccia vein cutting phyllic altered intrusion
BT439	Silicified white SS
BT440	Silicified white SS with milky Q and fine hematite banding
BT441	Silicified white SS with milky Q and fine hematite banding
BT442	Ferruginous rock from small pit
BT443	Milky Qv with well terminated crystals hosted in SS
BT444	Milky Qv with well terminated crystals hosted in SS with disseminated fg pyrite
BT445	Fractured white Q cemented by MnO
BT446	Fractured white Q cemented by MnO/FeO with some pitch limonite
BT447	FeO/MnO rich fractured Q with pitch limonite
BT448	FeO-rich fractured Q
BT449	Mostly goethite with only a little pitch limonite
BT450	Massive goethite with core of massive pyrite
BT451	Q-goethite-limonite, red hematite
BT452	Fract Q with goethite, minor pitch limonite
BT453	Fract Q with goethite, some pitch limonite
BT454	060 deg trending white Qv st wk in quartzite
BT455	Dolomitic sltst with siderite st wk
BT456	Sericite + Q + minor FeO on E side of road
BT457	Fault breccia southern end line of lode. No Cu
BT458	Conformable siderite vein in Sltst contains black and red CuO, malachite, azurite
BT459	Qv, gossan and disseminated pyrite in siliceous boulder in Nackara Ck tributary
BT460	Stubby crystalline Q cutting jasperoid after silicified dolomite?
BT461	FeO-sericite rich cg SS
BT462	FeO-sericite rich cg SS
BT463	FeO-sericite rich cg SS
BT464	Q - goethite breccia
BT465	Grey jasperoid with milky Q st wk with stubby well terminated crystals
BT466	Milky Q st wk in white silicified SS. Stubby well terminated crystals
BT467	Flow banded rhyolite with Q-ksp and specularite banding. Slightly sericitized
BT468	Siliceous sediment near rhyolite contact

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT414	0.006			1	140		58	1650
BT415	0.002			7	28		1300	2500
BT416	0.03			5	49		1000	10400
BT419	0.0005			<0.5	2		19	3
BT420	0.003			2	2		10	34
BT421	0.002			1.5	13		9	25
BT422	0.001			0.5	91		21	45
BT423	0.023			<0.5	26		3750	2050
BT424	0.31	0.32		<0.5	59		1050	27
BT425	0.004	0.002		1.5	5		8	31
BT426	0.002			1	8		33	40
BT427	0.003			<0.5	3		36	48
BT428	0.002			<0.5	3		20	15
BT429	0.001			0.5	<1		26	4
BT430	0.002			1	8		26	24
BT431	0.044	0.042		0.5	36		21	14400
BT432	0.001			1	16		17	175
BT433	0.005			<0.5	3		18	14
BT434	0.002			<0.5	<1		27	58
BT435	0.001			<0.5	9		38	2
BT436	0.006	0.013		<0.5	20		2200	2650
BT437	0.003			<0.5	<1		18	29
BT438	0.002			1	12		17	31
BT439	0.001			<0.5	<1		25	33
BT440	0.006			<0.5	<1		3	5
BT441	0.003			<0.5	<1		2	3
BT442	0.002			<0.5	8		55	360
BT443	0.002			<0.5	<1		4	7
BT444	0.002			<0.5	2		13	65
BT445	0.005			<0.5	135		2400	11100
BT446	0.003	0.004		<0.5	320		480	7600
BT447	0.014			<0.5	89		210	3500
BT448	0.003			<0.5	78		40	750
BT449	0.002			<0.5	170		210	950
BT450	0.087	0.1		<0.5	1600		1000	950
BT451	0.003			<0.5	150		150	800
BT452	0.11	0.1		<0.5	260		25	2700
BT453	0.005			<0.5	195		145	1900
BT454	0.001			<0.5	2		3	15
BT455	0.004			1	2		1	51
BT456	0.002			<0.5	5		18	83
BT457	0.003			<0.5	16		15	45
BT458	0.078	0.09		12.5	35		11	100000
BT459	0.036	0.034		2	3		7	40
BT460	0.23	0.23	0.22	0.5	2		1	9
BT461	0.033			<0.5	13		24	230
BT462	0.035			<0.5	4		11	135
BT463	0.032			<0.5	2		19	155
BT464	0.002			<0.5	145		64	105
BT465	<0.001			<0.5	<1		3	5
BT466	0.002			<0.5	1		<1	29
BT467	<0.001			<0.5	5		9	13
BT468	0.002			<0.5	<1		2	1

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT414	283000	600	5	96	32					115
BT415	13500	81600	10	97	18					21
BT416	118000	78700	30	300	28					71
BT419	274000	210	<1	11	4					4
BT420	57100	550	<1	27	<3					76
BT421	52700	185	4	30	18					230
BT422	317000	260	6	37	20					160
BT423	11600	70800	27	2400	48					750
BT424	151000	25900	4	750	14					115
BT425	42100	1850	2	23	<3					130
BT426	27900	2050	2	40	6					49
BT427	41000	1000	<1	39	22					12
BT428	257000	180	11	50	<3					19
BT429	358000	190	<1	15	<3					3
BT430	150000	750	<1	25	<3					13
BT431	127000	1950	3	46	12					12
BT432	59700	185	<1	32	10					14
BT433	64800	310	<1	25	6					6
BT434	37600	460	6	26	<3					4
BT435	168000	650	3	93	6					20
BT436	17000	73100	9	3900	48					2000
BT437	54400	1050	2	40	<3					22
BT438	226000	1450	2	52	4					28
BT439	4300	2000	<1	42	<3					25
BT440	4550	60	7	14	<3					1
BT441	3400	45	5	11	<3					<1
BT442	387000	4200	<1	32	<3					360
BT443	6750	105	6	15	<3					12
BT444	6300	40	7	28	6					11
BT445	221000	67900	25	480	36					91
BT446	431000	44000	9	115	12					140
BT447	320000	10800	5	84	51					55
BT448	161000	1200	3	27	4					13
BT449	307000	26000	6	98	8					37
BT450	405000	250	2	350	14					39
BT451	325000	21500	2	76	8					27
BT452	273000	950	4	110	230					500
BT453	239000	6250	4	59	10					67
BT454	22000	350	<1	5	<3					3
BT455	17400	950	<1	1	4					20
BT456	193000	1100	2	37	10					41
BT457	26600	550	<1	22	22					11
BT458	128000	2700	6	33	56					24
BT459	23100	110	5	13	6					6
BT460	5900	220	<1	3	6					10
BT461	398000	1950	<1	57	<3					155
BT462	165000	800	3	41	4					76
BT463	263000	1050	<1	52	<3					180
BT464	397000	2350	3	68	<3					400
BT465	4450	40	4	11	<3					2
BT466	7550	150	<1	3	6					6
BT467	30700	450	2	9	<3					4
BT468	17000	650	<1	2	<3					<1

Sample_ID	AMG_East	AMG_North	Sample_Type	Company	Prospect	Date
BT469	340424	6383188	Rock Chip	Filsell	Grid rhyolite Sth	Oct-00
BT470	340364	6383096	Rock Chip	Filsell	Grid rhyolite E	Oct-00
BT471	342830	6383516	Rock Chip	Filsell	Mine rhyolite	Nov-00
BT472	343755	6382966	Rock Chip	Filsell	BIF? Hill	Nov-00
BT473	343760	6382970	Rock Chip	Filsell	BIF? Hill	Nov-00
BT474	343765	6382965	Rock Chip	Filsell	BIF? Hill	Nov-00
BT475	322813	6369102	Rock Chip	Filsell	Medina locality	Nov-00
BT476	322810	6369100	Rock Chip	Filsell	Medina locality	Nov-00
BT477	322295	6370118	Rock Chip	Filsell	Medina locality	Nov-00
BT478	322249	6370075	Rock Chip	Filsell	Medina locality	Nov-00
BT479	321836	6370129	Rock Chip	Filsell	Medina locality	Nov-00
BT480	321810	6369899	Rock Chip	Filsell	Mt Helene locality	Nov-00
BT481	321805	6369900	Rock Chip	Filsell	Mt Helene locality	Nov-00
BT482	321670	6369772	Rock Chip	Filsell	Mt Helene locality	Nov-00
BT483	322367	6369455	Rock Chip	Filsell	Mt Helene locality	Nov-00
BT484	320145	6365347	Rock Chip	Filsell	Penn Nth	Nov-00
BT485	320658	6365567	Rock Chip	Filsell	Flux 3 vicinity	Nov-00
BT486	320259	6366192	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT487	320258	6366216	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT488	320293	6366296	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT489	320308	6366458	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT490	320250	6366162	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT491	320248	6366160	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT492	320223	6366079	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT493	320207	6366066	Rock Chip	Filsell	Filsell Grid W	Nov-00
BT494	322014	6370083	Rock Chip	Filsell	Medina locality	Nov-00
BT495	321866	6370343	Rock Chip	Filsell	Medina locality	Nov-00
BT496	321865	6370350	Rock Chip	Filsell	Medina locality	Nov-00
BT497	321595	6370926	Rock Chip	Filsell	Bob J locality	Nov-00
BT498	321595	6370925	Rock Chip	Filsell	Bob J locality	Nov-00
BT499	321564	6370895	Rock Chip	Filsell	Bob J locality	Nov-00
BT500	321507	6370720	Rock Chip	Filsell	Bob J locality	Nov-00
BT501	321544	6370860	Rock Chip	Filsell	Bob J locality	Nov-00
BT502	321571	6370856	Rock Chip	Filsell	Bob J locality	Nov-00
BT503	321571	6370938	Rock Chip	Filsell	Bob J locality	Nov-00
BT506	321344	6366221	Rock Chip	Filsell	Flux 2 mag high	Nov-00
BT515	321733	6361668	Rock Chip	Filsell	Big Bend	Nov-00
BT516	321797	6361651	Rock Chip	Filsell	Big Bend	Nov-00
BT517	321885	6361606	Rock Chip	Filsell	Big Bend	Nov-00
BT518	321777	6361614	Rock Chip	Filsell	Big Bend	Nov-00
BT519	321609	6361453	Rock Chip	Filsell	Big Bend	Nov-00
BT520	321521	6361357	Rock Chip	Filsell	Big Bend	Nov-00
BT521	321545	6361330	Rock Chip	Filsell	Big Bend	Nov-00
BT522	321093	6361285	Rock Chip	Filsell	The Cave	Nov-00
BT523	321358	6362455	Rock Chip	Filsell	Quartz Rise	Nov-00
BT524	321374	6362584	Rock Chip	Filsell	Quartz Rise	Nov-00
BT525	321434	6362621	Rock Chip	Filsell	Quartz Rise	Nov-00
BT526	321434	6362652	Rock Chip	Filsell	Quartz Rise	Nov-00
BT527	321514	6362858	Rock Chip	Filsell	Quartz Rise	Nov-00
BT528	321585	6363176	Rock Chip	Filsell	Quartz Rise	Nov-00
BT529	321255	6362258	Rock Chip	Filsell	Quartz Rise	Nov-00
BT530	322066	6361933	Rock Chip	Filsell	Highway	Nov-00

Sample_ID	Notes
BT469	Strongly carbonated rhyolite
BT470	Red hematitic SS adjacent to rhyolite contact
BT471	Pink rhyolite with abundant banded specularite
BT472	Banded quartzite with disseminated pyrite
BT473	Brecciated banded quartzite with MnO cement
BT474	Brecciated banded quartzite with disseminated pyrite
BT475	FeO and fine Q st wk in fractured sltst
BT476	Brecciated and veined fg dolomitic sltst
BT477	Brecciated sltst with disseminated specularite from hilltop
BT478	Brecciated sltst with disseminated specularite from hilltop
BT479	Conformable Qv + siderite + malachite in sltst
BT480	Massive siderite + Q + trace cpy
BT481	Ferruginous rock from small pit above creek
BT482	Siliceous rock with hematite ex py?
BT483	Siderite with limonite castes ex py?
BT484	Qv with limonite ex py?
BT485	Grey/white Qv float with clean boxwork
BT486	Fractured white Q with goethite cement
BT487	Brecciated silicified SS with vuggy boxwork ex sulphide
BT488	White bucky Q with trace jarosite and cpy
BT489	White bucky Q with trace cpy
BT490	Fractured white Q with goethite cement
BT491	Brecciated siltst with goethite and very little Q
BT492	Fractured Q with goethite replacing pyrite
BT493	Fractured sltst with goethite ex py?
BT494	Fractured green chloritic sltst with limonite ex sulphides?
BT495	Qv in reddish coloured SS
BT496	Sandstone with possible castes ex sulphide
BT497	Tillite with Q veins, sericite and some MnO
BT498	Sericitized tillite, no MnO
BT499	Sericitized Q veined tillitic SS with disseminated specularite
BT500	Reddish black hematitic tillite with abundant castes ex py, minor sericite
BT501	Tillitic SS with sericite and specularite
BT502	Tillitic SS with sericite and specularite
BT503	Contact of Tindelpina shale and tillite. Slightly ferruginous
BT506	Cg sericite + Q on east side of road
BT515	Siderite vein with disseminated FeO ex sulphides
BT516	Breccia with FeO
BT517	Breccia with pink and white minerals, tourmaline and siderite
BT518	Q + cg clots of k-spar
BT519	"Sandy" Q rich rhyolite with MnO cement
BT520	White bucky Q with specularite from small pit
BT521	Rhyolite with MnO staining
BT522	Limonite filled fracture cutting across rhyolite
BT523	Goethite in fractured Q vein
BT524	Fractured white Q with abundant FeO and minor MnO
BT525	Fractured white Q with abundant FeO and minor MnO
BT526	Silicified sediment with minor Qv and minor MnO
BT527	Fract Q with goethite
BT528	Fractured white Q + py + FeO
BT529	Fractured white Q with abundant MnO
BT530	Fault breccia grab

Sample_ID	Au_ppm	Au_R1_ppm	Au_R2_ppm	Ag_ppm	As_ppm	Bi_ppm	Co_ppm	Cu_ppm
BT469	0.003			<0.5	<1		3	12
BT470	<0.001			<0.5	2		5	21
BT471	<0.001			<0.5	<1		7	23
BT472	0.004			<0.5	<1		2	75
BT473	0.019			<0.5	16		1050	2650
BT474	0.021			<0.5	34		8	150
BT475	0.008			<0.5	23		11	55
BT476	0.024			<0.5	165		41	500
BT477	0.011	0.014		<0.5	195		100	600
BT478	0.005			0.5	29		22	22
BT479	0.1	0.074	0.096	<0.5	78		10	9200
BT480	0.013	0.016		<0.5	65		40	11
BT481	0.018			<0.5	850		25	46
BT482	0.004			<0.5	41		10	45
BT483	0.009			<0.5	94		195	32
BT484	<0.001			<0.5	97		40	700
BT485	0.003			<0.5	4		6	27
BT486	0.035			<0.5	450		40	1750
BT487	<0.001			<0.5	3		8	500
BT488	<0.001			<0.5	1		6	17
BT489	<0.001			<0.5	<1		4	29
BT490	0.45	0.37	0.41	<0.5	490		51	3650
BT491	0.013			<0.5	45		15	490
BT492	0.022			0.5	44		26	270
BT493	0.014			<0.5	16		9	240
BT494	0.02			<0.5	36		10	440
BT495	<0.001			<0.5	19		17	11
BT496	0.019			<0.5	115		27	41
BT497	0.003			2.5	12		46	14
BT498	<0.001			<0.5	30		3	4
BT499	0.002			<0.5	4		6	3
BT500	0.96	0.8	0.99	<0.5	26		8	9
BT501	0.016			<0.5	17		32	5
BT502	<0.001			<0.5	5		4	4
BT503	0.005			<0.5	12		21	7
BT506	0.007			<0.5	<1		4	9
BT515	0.027			<0.5	61		950	53
BT516	0.005	0.005		<0.5	90		2000	71
BT517	0.002			<0.5	2		23	10
BT518	<0.001	<0.001		<0.5	<1		19	9
BT519	<0.001			1.5	40		4750	3200
BT520	<0.001			1	4		360	200
BT521	0.009			4	13		1200	700
BT522	<0.001			<0.5	165		93	380
BT523	0.051			1	82		65	2200
BT524	<0.001			<0.5	55		260	1450
BT525	0.012			<0.5	76		86	1450
BT526	0.001			<0.5	15		650	1750
BT527	0.032			<0.5	120		28	2550
BT528	0.002			<0.5	46		21	950
BT529	0.004			1	25		950	10000
BT530	<0.001			<0.5	6		76	42

Sample_ID	Fe_ppm	Mn_ppm	Mo_ppm	Ni_ppm	Pb_ppm	Sb_ppm	Sn_ppm	Te_ppm	W_ppm	Zn_ppm
BT469	19500	750	<1	8	<3					2
BT470	23000	500	<1	10	<3					4
BT471	40700	800	1	13	<3					6
BT472	53400	105	<1	5	<3					7
BT473	27600	32400	3	68	14					40
BT474	121000	100	3	41	<3					10
BT475	67800	5450	<1	30	4					16
BT476	84100	17600	4	48	4					11
BT477	36100	88600	15	11	1350					390
BT478	193000	11200	1	29	10					120
BT479	48500	850	5	34	4					15
BT480	130000	2150	4	195	14					11
BT481	388000	650	2	250	<3					13
BT482	38000	110	7	37	<3					3
BT483	162000	1700	10	320	6					10
BT484	235000	85	<1	54	10					21
BT485	7650	90	8	22	14					3
BT486	410000	250	2	185	22					71
BT487	64900	250	<1	17	6					26
BT488	9700	60	8	20	<3					6
BT489	9900	60	6	17	<3					6
BT490	338000	440	3	240	24					43
BT491	99100	550	1	36	8					27
BT492	62600	85	5	51	8					8
BT493	87600	200	<1	14	10					11
BT494	54100	310	2	57	<3					49
BT495	43700	1000	5	26	<3					6
BT496	83500	700	18	23	6					5
BT497	21800	73700	3	8	10					13
BT498	55900	430	<1	7	<3					6
BT499	106000	250	<1	13	<3					14
BT500	100000	330	3	12	30					20
BT501	43700	145	3	29	4					5
BT502	14900	185	<1	5	<3					3
BT503	140000	220	3	42	6					19
BT506	8400	55	4	15	<3					4
BT515	164000	4150	4	550	20					155
BT516	230000	11400	3	1000	24					26
BT517	14700	1000	<1	14	<3					<1
BT518	8750	165	5	33	<3					6
BT519	28300	87100	6	2600	68					3700
BT520	69100	14300	<1	125	10					230
BT521	19500	93700	26	950	24					440
BT522	491000	3100	5	115	18					370
BT523	280000	20400	<1	59	4					48
BT524	116000	49500	10	21	16					20
BT525	180000	27500	6	25	220					80
BT526	13800	16800	6	135	12					14
BT527	229000	900	5	53	20					54
BT528	102000	460	4	31	16					20
BT529	36300	87300	43	700	22					86
BT530	152000	5850	<1	170	<3					46

DRAINAGE SAMPLE DATA

Sample_ID	AMG_East	AMG_North	Sample_Type	Sample_SubType	Company	Au_ppm	Ag_ppm	Cu_ppm	Pb_ppm	Zn_ppm
BD-F029	319916	6361474	Stream sediment	BCL, -2mm	Anglogold	0.0005	0.0068	1.22		
BD-F030	322261	6361955	Stream sediment	BCL, -2mm	Anglogold	0.06693	0.0141	0.65		
BD-F031	322355	6361850	Stream sediment	BCL, -2mm	Anglogold	0.04441	0.0137	1.36		
BT-BCL-01	320277	6363631	Stream sediment	BCL, -2mm	Filsell	0.002	-0.01	4.00	-0.1	1.1
BT-BCL-02	320072	6363407	Stream sediment	BCL, -2mm	Filsell	0.001	-0.01	6.85	-0.1	1.1
BT-BCL-03	319959	6363319	Stream sediment	BCL, -2mm	Filsell	0.147	-0.01	1.65	-0.1	0.6
BT-BCL-04	320023	6363167	Stream sediment	BCL, -2mm	Filsell	0.002	-0.01	1.50	-0.1	0.5
BT-BCL-05	319925	6362753	Stream sediment	BCL, -2mm	Filsell	0.002	-0.01	2.65	-0.1	0.5
BT-BCL-06	319852	6362571	Stream sediment	BCL, -2mm	Filsell	0.005	-0.01	4.80	-0.1	0.8
BT-BCL-07	319829	6362082	Stream sediment	BCL, -2mm	Filsell	0.001	-0.01	0.40	-0.1	0.8
BT-BCL-08	320273	6362239	Stream sediment	BCL, -2mm	Filsell	0.002	-0.01	0.27	-0.1	0.7
BT-BCL-09	320331	6362387	Stream sediment	BCL, -2mm	Filsell	0.015	-0.01	1.50	-0.1	1
BT-BCL-10	320044	6362708	Stream sediment	BCL, -2mm	Filsell	0.002	-0.01	0.23	-0.1	0.5
BT-BCL-11	320308	6362993	Stream sediment	BCL, -2mm	Filsell	0.003	-0.01	0.29	-0.1	0.4
BT-BCL-12	319853	6360358	Stream sediment	BCL, -2mm	Filsell	0.003	-0.01	0.29	-0.1	0.5
BT-BCL-13	320023	6359852	Stream sediment	BCL, -2mm	Filsell	0.002	-0.01	0.26	-0.1	1.9
BT-BCL-14	329784	6359821	Stream sediment	BCL, -2mm	Filsell	-0.001	-0.01	0.34	-0.1	2
BT-BCL-15	319909	6361480	Stream sediment	BCL, -2mm	Filsell	0.261	0.03	3.40	<0.3	1.9
BT-BCL-16	320516	6361803	Stream sediment	BCL, -2mm	Filsell	0.001	0.03	1.39	0.4	1.6
BT-BCL-17	320611	6361830	Stream sediment	BCL, -2mm	Filsell	0.001	0.02	1.79	<0.3	0.7
BT-BCL-18	322274	6361956	Stream sediment	BCL, -2mm	Filsell	0.664	0.21	0.91	<0.3	2.5
BT-BCL-19	322152	6362004	Stream sediment	BCL, -2mm	Filsell	0.002	0.04	3.95	<0.3	1.4
BT-BCL-20	322601	6362186	Stream sediment	BCL, -2mm	Filsell	0.001	0.04	2.30	<0.3	4.9

SOIL SAMPLE DATA

Sample_ID	AMG_East	AMG_North	Sample_Type	Sample_SubType	Prospect	Date	Au_ppm	Ag_ppm	As_ppm	Ba_ppm	Bi_ppm
OW-01	320600	6360402	Soil	MMI, -2mm	Nackara	Jun-00	0.00207	0.03972	0.0418	0.151	0.00063
OW-02	320805	6360408	Soil	MMI, -2mm	Nackara	Jun-00	0.00119	0.04452	0.1325	0.382	0.00333
OW-03	320981	6360409	Soil	MMI, -2mm	Nackara	Jun-00	0.00151	0.02811	0.0919	0.334	0.00329
OW-04	321196	6360400	Soil	MMI, -2mm	Nackara	Jun-00	0.00327	0.03593	0.0534	0.009	0.00051
OW-05	320808	6360604	Soil	MMI, -2mm	Nackara	Jun-00	0.00302	0.05272	0.0543	0.03	0.00093
OW-06	321006	6360598	Soil	MMI, -2mm	Nackara	Jun-00	0.00047	0.07507	0.1005	0.185	0.00223
OW-07	321119	6360603	Soil	MMI, -2mm	Nackara	Jun-00	0.001	0.04583	0.1008	0.355	0.00296
OW-08	321396	6360596	Soil	MMI, -2mm	Nackara	Jun-00	0.00142	0.07428	0.0562	0.043	0.00076
OW-09	320776	6360812	Soil	MMI, -2mm	Nackara	Jun-00	0.00058	0.02089	0.0936	0.19	0.00138
OW-10	321032	6360802	Soil	MMI, -2mm	Nackara	Jun-00	0.00036	0.04159	0.164	0.305	0.00248
OW-11	321210	6360783	Soil	MMI, -2mm	Nackara	Jun-00	0.00023	0.02858	0.1129	0.443	0.00333
OW-12	321406	6360804	Soil	MMI, -2mm	Nackara	Jun-00	0.00255	0.03766	0.0846	0.113	0.00149
OW-13	321601	6360799	Soil	MMI, -2mm	Nackara	Jun-00	0.0081	0.02921	0.1496	0.205	0.00161
OW-14	321800	6360805	Soil	MMI, -2mm	Nackara	Jun-00	0.005	0.02569	0.2853	0.729	0.00436
OW-15	320588	6360800	Soil	MMI, -2mm	Nackara	Jun-00	0.00025	0.01923	0.1096	0.345	0.00198
OW-16	320397	6360800	Soil	MMI, -2mm	Nackara	Jun-00	0.00057	0.03068	0.0565	0.115	0.00073
OW-17	320208	6360801	Soil	MMI, -2mm	Nackara	Jun-00	0.00097	0.0996	0.0306	0.058	0.00056
OW-18	319984	6360825	Soil	MMI, -2mm	Nackara	Jun-00	0.00047	0.04322	0.0495	0.262	0.00079
OW-19	319795	6360804	Soil	MMI, -2mm	Nackara	Jun-00	0.00117	0.03025	0.0231	0.066	0.0005
OW-20	319598	6360809	Soil	MMI, -2mm	Nackara	Jun-00	0.00214	0.02429	0.0676	0.121	0.00065
OW-21	319798	6360599	Soil	MMI, -2mm	Nackara	Jun-00	0.00043	0.01674	0.0844	0.089	0.00067
OW-22	319632	6360608	Soil	MMI, -2mm	Nackara	Jun-00	0.00029	0.13758	0.1634	0.159	0.00128
OW-23	320001	6360601	Soil	MMI, -2mm	Nackara	Jun-00	0.00037	0.02944	0.0441	0.033	0.00027
OW-24	320199	6360599	Soil	MMI, -2mm	Nackara	Jun-00	0.00093	0.0342	0.0851	1.954	0.00738
OW-25	320401	6360605	Soil	MMI, -2mm	Nackara	Jun-00	0.00089	0.04301	0.0893	0.316	0.00175
OW-26	320601	6360595	Soil	MMI, -2mm	Nackara	Jun-00	0.00038	0.0239	0.0262	0.353	0.00109
OW-27	320401	6360409	Soil	MMI, -2mm	Nackara	Jun-00	0.0008	0.03127	0.031	0.026	0.00006
OW-28	320205	6360399	Soil	MMI, -2mm	Nackara	Jun-00	0.00275	0.04754	0.0363	0.11	0.00086
OW-29	320007	6360394	Soil	MMI, -2mm	Nackara	Jun-00	0.00081	0.01238	0.1155	0.403	0.0026
OW-30	310803	6360382	Soil	MMI, -2mm	Nackara	Jun-00	0.0002	0.02218	0.1037	0.114	0.00072
OW-31	319598	6360400	Soil	MMI, -2mm	Nackara	Jun-00	0.00032	0.01851	0.122	0.111	0.00073
OW-32	319603	6360196	Soil	MMI, -2mm	Nackara	Jun-00	0.00042	0.041	0.0284	0.124	0.00045
OW-33	319804	6360196	Soil	MMI, -2mm	Nackara	Jun-00	0.0005	0.03307	0.1126	0.09	0.00047
OW-34	319998	6360206	Soil	MMI, -2mm	Nackara	Jun-00	0.00065	0.01103	0.1664	0.73	0.00529

Sample_ID	Co_ppm	Cu_ppm	Fe_ppm	Mo_ppm	Ni_ppm	Sb_ppm	Sn_ppm	Zn_ppm
OW-01	0.0267	3.56296	52.7	0.011	0.908	0.00087	0.0009	0.538
OW-02	0.0808	6.59633	435	0.019	1.443	0.00199	0.0099	1.161
OW-03	0.1026	4.16948	140	0.017	1.443	0.00162	0.0064	0.487
OW-04	0.027	4.37682	3	0.01	0.692	0.00031	<0.0005	0.16
OW-05	0.0138	5.32298	15.2	0.005	0.441	0.00016	0.0008	0.372
OW-06	0.0852	5.38373	80.6	0.016	0.54	0.00084	0.0034	0.259
OW-07	0.0551	3.47413	81.8	0.006	1.067	0.00155	0.0036	0.205
OW-08	0.04	4.22186	13.6	0.011	0.597	0.00053	0.0006	0.126
OW-09	0.028	2.50439	35.3	0.005	0.682	0.00059	0.0018	0.148
OW-10	0.0789	3.4926	89.2	0.025	0.699	0.00121	0.0039	0.353
OW-11	0.4206	3.40634	181	0.018	0.911	0.00137	0.0061	0.401
OW-12	0.0828	4.25214	83.6	0.017	2.484	0.00057	0.002	0.343
OW-13	0.07	5.26221	58.6	0.013	2.523	0.00112	0.0017	0.158
OW-14	0.1807	5.29374	385.3	0.043	1.73	0.00257	0.0106	1.141
OW-15	0.1265	4.227	206	0.028	1.43	0.00153	0.005	0.533
OW-16	0.019	2.07819	13.4	0.008	0.825	0.00078	<0.0005	0.115
OW-17	0.0309	3.68096	10.9	0.015	0.941	0.00092	<0.0005	0.123
OW-18	0.0177	2.77062	50.2	0.011	0.995	0.00381	0.0016	0.983
OW-19	0.008	3.71172	6.6	0.013	0.874	0.00049	<0.0005	0.228
OW-20	0.0177	3.9191	53.1	0.005	0.604	0.00055	0.0009	0.45
OW-21	0.1737	3.31682	48.1	0.017	1.172	0.00026	0.0013	0.201
OW-22	0.0453	2.98929	50.3	0.026	0.486	0.00624	0.0026	5.878
OW-23	0.3786	3.06354	6.9	0.01	1.184	0.00027	<0.0005	0.199
OW-24	0.4323	10.29439	508	0.026	1.212	0.00481	0.0146	0.852
OW-25	0.0472	3.53269	79.2	0.014	1.109	0.00076	0.0031	0.16
OW-26	0.0768	4.02565	151	0.003	1.091	0.00089	0.0039	0.479
OW-27	0.214	2.58889	2.1	0.016	1.668	0.00008	<0.0005	0.183
OW-28	0.6817	8.806	79.9	0.018	1.044	0.0004	0.0013	0.186
OW-29	0.0915	3.09949	233	0.015	0.852	0.00169	0.0053	0.419
OW-30	0.0345	3.67951	49.3	0.027	0.677	0.0005	0.0013	0.132
OW-31	0.0449	3.44722	55.1	0.038	0.502	0.00042	0.0015	0.169
OW-32	0.0111	2.56941	6.8	0.012	1.259	0.00133	<0.0005	0.18
OW-33	0.0657	4.51635	37.3	0.028	1.054	0.00049	0.0011	0.13
OW-34	0.1692	3.04911	567.6	0.025	1.022	0.00276	0.0134	0.71

Sample_ID	AMG_East	AMG_North	Sample_Type	Sample_SubType	Prospect	Date	Au_ppm	Ag_ppm	As_ppm	Ba_ppm	Bi_ppm
OW-35	320200	6360199	Soil	MMI, -2mm	Nackara	Jun-00	0.00037	0.01828	0.0829	0.576	0.00179
OW-36	320399	6360202	Soil	MMI, -2mm	Nackara	Jun-00	0.00021	0.0111	0.0934	0.18	0.00132
OW-37	320599	6360201	Soil	MMI, -2mm	Nackara	Jun-00	0.00175	0.02686	0.0509	0.066	0.0004
OW-38	320801	6360202	Soil	MMI, -2mm	Nackara	Jun-00	0.00155	0.05134	0.0365	0.418	0.00112
OW-39	320999	6360200	Soil	MMI, -2mm	Nackara	Jun-00	0.00024	0.04566	0.0461	0.014	0.00016
OW-40	321202	6360199	Soil	MMI, -2mm	Nackara	Jun-00	0.00046	0.0268	0.1721	0.412	0.0019
OW-41	321404	6360198	Soil	MMI, -2mm	Nackara	Jun-00	0.03774	0.04045	0.1743	1.917	0.0062
OW-42	321599	6361401	Soil	MMI, -2mm	Nackara	Jun-00	0.00109	0.0208	0.2362	0.405	0.00186
OW-43	321398	6361409	Soil	MMI, -2mm	Nackara	Jun-00	0.00252	0.0555	0.0711	0.059	0.00033
OW-44	321200	6361403	Soil	MMI, -2mm	Nackara	Jun-00	0.00124	0.02585	0.0735	0.019	0.00023
OW-45	321199	6361200	Soil	MMI, -2mm	Nackara	Jun-00	0.00082	0.05581	0.2872	0.051	0.00068
OW-46	321399	6361193	Soil	MMI, -2mm	Nackara	Jun-00	0.00086	0.01339	0.0499	0.011	0.00027
OW-47	321601	6361200	Soil	MMI, -2mm	Nackara	Jun-00	0.00112	0.01184	0.0868	0.043	0.00029
OW-48	321800	6361208	Soil	MMI, -2mm	Nackara	Jun-00	0.00326	0.01241	0.1687	0.094	0.00114
OW-49	321799	6361405	Soil	MMI, -2mm	Nackara	Jun-00	0.00068	0.00983	0.095	0.473	0.00126
OW-50	321199	6360999	Soil	MMI, -2mm	Nackara	Jun-00	0.00172	0.0445	0.0581	0.036	0.00057
OW-51	319596	6359798	Soil	MMI, -2mm	Nackara	Jun-00	0.00259	0.06778	0.0389	0.037	0.00026
OW-52	319398	6359798	Soil	MMI, -2mm	Nackara	Jun-00	0.00159	0.05914	0.022	0.089	0.00031
OW-53	319195	6359799	Soil	MMI, -2mm	Nackara	Jun-00	0.00167	0.11207	0.0273	0.039	0.00019
OW-54	310005	6360004	Soil	MMI, -2mm	Nackara	Jun-00	0.00127	0.07203	0.1202	0.125	0.0004
OW-55	319194	6359998	Soil	MMI, -2mm	Nackara	Jun-00	0.0018	0.14133	0.0627	0.068	0.00031
OW-56	319397	6359994	Soil	MMI, -2mm	Nackara	Jun-00	0.0003	0.04314	0.0639	0.585	0.00273
OW-57	319608	6359996	Soil	MMI, -2mm	Nackara	Jun-00	0.00145	0.04664	0.0497	0.072	0.00031
OW-58	319396	6360199	Soil	MMI, -2mm	Nackara	Jun-00	0.00071	0.03493	0.0259	0.069	0.00021
OW-59	319199	6360202	Soil	MMI, -2mm	Nackara	Jun-00	0.00143	0.04189	0.1117	0.388	0.00145
OW-60	318949	6360205	Soil	MMI, -2mm	Nackara	Jun-00	0.00063	0.06041	0.1793	0.091	0.00044
OW-61	319212	6360406	Soil	MMI, -2mm	Nackara	Jun-00	0.00255	0.05567	0.0323	0.012	<0.0005
OW-62	319398	6360398	Soil	MMI, -2mm	Nackara	Jun-00	0.00077	0.01954	0.0387	0.333	0.00053
OW-63	318802	6358405	Soil	MMI, -2mm	Nackara	Jun-00	0.00114	0.03765	0.0261	0.039	0.00011
OW-64	318605	6358402	Soil	MMI, -2mm	Nackara	Jun-00	0.0011	0.03599	0.0273	0.038	0.0001
OW-65	318405	6358407	Soil	MMI, -2mm	Nackara	Jun-00	0.00042	0.03533	0.0419	0.056	0.00018
OW-66	318199	6358403	Soil	MMI, -2mm	Nackara	Jun-00	0.00079	0.04433	0.1079	0.059	0.00018
OW-67	318003	6358402	Soil	MMI, -2mm	Nackara	Jun-00	0.00062	0.03403	0.0761	0.386	0.00194
OW-68	317801	6358400	Soil	MMI, -2mm	Nackara	Jun-00	0.00037	0.02144	0.1955	0.916	0.0026

Sample_ID	Co_ppm	Cu_ppm	Fe_ppm	Mo_ppm	Ni_ppm	Sb_ppm	Sn_ppm	Zn_ppm
OW-35	0.0843	3.03319	217	0.013	1.165	0.00101	0.0051	0.34
OW-36	0.1326	3.27955	103	0.037	1.147	0.00079	0.0026	0.17
OW-37	0.1034	4.96004	24.7	0.019	2.211	0.00029	<0.0005	0.15
OW-38	0.1545	3.7958	127	0.019	1.359	0.00066	0.0037	0.242
OW-39	0.218	3.3437	3.8	0.011	1.174	0.00012	<0.0005	0.038
OW-40	0.1006	4.40302	148	0.022	1.098	0.00144	0.005	0.345
OW-41	0.3055	4.4823	794	0.029	2.354	0.00396	0.0173	1.053
OW-42	0.1275	5.06958	165	0.026	0.897	0.00169	0.0056	0.702
OW-43	0.0249	4.96581	8.1	0.01	0.714	0.00237	<0.0005	0.622
OW-44	0.0195	3.66117	10.4	0.008	0.8	0.00057	<0.0005	0.119
OW-45	0.0351	7.08796	26.1	0.011	0.552	0.0014	0.0005	0.404
OW-46	0.0128	1.45666	4.9	0.002	0.89	0.00026	<0.0005	0.046
OW-47	0.0116	5.27397	16.7	0.004	0.589	0.00049	<0.0005	0.077
OW-48	0.0798	3.58168	101	0.013	1.424	0.00078	0.0016	0.169
OW-49	0.1144	4.12004	212	0.011	1.67	0.00119	0.0048	0.288
OW-50	0.0209	3.68064	14.1	0.006	0.568	0.00054	<0.0005	0.087
OW-51	0.0125	3.65401	9.4	0.006	0.425	0.00042	<0.0005	0.102
OW-52	0.0088	3.53526	21.6	0.004	0.335	0.0008	0.0006	0.082
OW-53	0.0103	3.30853	12.1	0.008	0.401	0.00055	<0.0005	0.051
OW-54	0.0608	3.45887	40.9	0.025	0.848	0.00044	0.0012	0.227
OW-55	0.0124	2.87831	23.5	0.002	0.513	0.00019	0.0007	0.112
OW-56	0.1234	4.67762	413	0.039	0.707	0.00185	0.0088	0.837
OW-57	0.0196	3.401	25.4	0.002	0.425	0.00089	0.0007	0.16
OW-58	0.0098	2.60141	9.8	0.003	0.347	0.00066	<0.0005	0.038
OW-59	0.0419	4.11768	185.3	0.02	1.528	0.00112	0.0051	0.579
OW-60	0.0264	4.11527	41.5	0.033	0.479	0.00422	0.0014	0.913
OW-61	0.0087	3.58162	1.7	0.009	0.444	0.00021	<0.0005	0.091
OW-62	0.0209	2.37671	33.9	0.005	0.891	0.0011	0.0008	0.083
OW-63	0.0083	2.67414	<0.1	0.005	0.424	0.00038	<0.0005	0.117
OW-64	0.0082	2.58153	3.3	0.005	0.415	0.00034	<0.0005	0.083
OW-65	0.0107	2.37449	16.2	<0.002	0.368	0.00039	<0.0005	0.055
OW-66	0.0214	3.56911	17.4	0.009	1.069	0.00018	0.0006	0.122
OW-67	0.0391	4.70856	359	0.009	0.917	0.00141	0.006	0.714
OW-68	0.0947	4.60432	419	0.037	0.895	0.0026	0.0109	1.23

Sample_ID	AMG_East	AMG_North	Sample_Type	Sample_SubType	Prospect	Date	Au_ppm	Ag_ppm	As_ppm	Ba_ppm	Bi_ppm
OW-69	317598	6358394	Soil	MMI, -2mm	Nackara	Jun-00	0.00055	0.02396	0.0543	0.075	0.00029
OW-70	317401	6358400	Soil	MMI, -2mm	Nackara	Jun-00	0.00043	0.03995	0.0605	0.145	0.00043
OW-71	318998	6358398	Soil	MMI, -2mm	Nackara	Jun-00	0.00096	0.03148	0.1025	0.028	0.00015
SR-01	321298	6363902	Soil	MMI, -2mm	Nackara	Jun-00	0.00065	0.00904	0.1119	0.394	0.00337
SR-02	321093	6363900	Soil	MMI, -2mm	Nackara	Jun-00	0.00077	0.01836	0.0579	0.102	0.0004
SR-03	320902	6363902	Soil	MMI, -2mm	Nackara	Jun-00	0.02591	0.0285	0.0256	0.176	0.00035
SR-04	320698	6363900	Soil	MMI, -2mm	Nackara	Jun-00	0.00054	0.01948	0.0765	0.239	0.00095
SR-05	320500	6363899	Soil	MMI, -2mm	Nackara	Jun-00	0.00057	0.01993	0.1836	0.208	0.00091
BT142	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.002				
BT143	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.011				
BT144	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.003				
BT145	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.003				
BT146	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.008				
BT147	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.005				
BT148	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.002				
BT149	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.002				
BT150	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		BLD				
BT151	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.002				
BT152	see plan	see plan	Soil	BCL, -2mm	Flux Quarry 2 West		0.007				

Sample_ID	Co_ppm	Cu_ppm	Fe_ppm	Mo_ppm	Ni_ppm	Sb_ppm	Sn_ppm	Zn_ppm
OW-69	0.0182	3.6332	26.6	0.012	0.806	0.00054	0.0007	0.116
OW-70	0.0152	3.47746	35.3	0.003	0.349	0.00082	0.0017	0.182
OW-71	0.0062	4.38409	12.3	0.009	0.077	0.00048	<0.0005	0.056
SR-01	0.1059	7.97871	306.9	0.03	0.676	0.00136	0.0059	0.49
SR-02	0.0118	3.40418	37.5	0.006	0.553	0.00042	0.0011	0.154
SR-03	0.0158	7.94157	11.8	0.016	0.597	0.00104	<0.0005	0.163
SR-04	0.0511	4.1672	96	0.012	0.596	0.00156	0.0025	0.293
SR-05	0.0441	5.99504	100	0.025	0.587	0.00108	0.0027	0.303
BT142								
BT143								
BT144								
BT145								
BT146								
BT147								
BT148								
BT149								
BT150								
BT151								
BT152								

APPENDIX 3: PETROGRAPHIC REPORTS

11

Terry Leach & Co

Exploration Geologists, Petrologists and Consultants

PETROGRAPHIC ANALYSES OF SEVEN OUTCROP SAMPLES FROM MT GRAINGER, SOUTH AUSTRALIA

PREPARED FOR

GOLDSTREAM MINING N.L.

BY

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IN

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1. SUMMARY

- 1 Seven thin sections and their offcuts were supplied by Goldstream Mining N. L. for petrological evaluation.
- 2 The client was interested to test the suggestion that acidic volcanic lithologies and epithermal and surface hydrothermal features were present.
- 3 Four hydrothermal alteration / deposition assemblages were identified.
 - a) Quartz – talc - ?sericite – carbonate ± opaques ± anhydrite ± tourmaline
 - b) Magnetite + tourmaline + talc ± quartz ± calcite ± rutile ± apatite ± k-feldspar ± ?sulphides
 - c) Illitic clay + smectite ± ?very fine-grained quartz ± calcite
 - d) Limonite / Fe oxides
- 4 It is interpreted that the strongly silicified lithologies are replaced carbonates typically brecciated with polyphasal quartz infill. The magnetite-tourmaline –talc lithology is inferred to be a skarn rock formed probably at greater depths or temperatures compared to the siliceous breccias.
- 5 The hydrothermal system is inferred to be related to magmatic intrusion at depth on the basis of tourmaline in the magnetite skarn and tourmaline inclusions in quartz deposition within sandstone sediment.
- 6 It is postulated that a hydrothermal system distal to the magmatic intrusion formed within sediments including limestone / dolomite at mesothermal levels (?upper) where hot upwelling mineralised fluids mixed with cooler descending CO₂-rich fluids within a brittle, silicified, brecciated host to deposit gold and quartz.
- 7 The gold mineralised system at Mt Grainger is re evaluated. A conceptual model based on the Mesel / Carlin-type sediment-hosted replacement gold deposits, is proposed to better explain the field and petrographic observations and to improve understanding of the controls to mineralisation in the area.

2. INTRODUCTION

Seven outcrop samples from The Mt Grainger Prospect were submitted by Goldstream Resources N.L. for petrological evaluation. The aim of the study was to re examine the rocks and discuss the potential for mineralisation following comments from Pontifex and Associates that the sections contained evidence of silicified acid volcanic lithologies and low temperature epithermal alteration.

Seven thin sections, prepared by Pontifex and Assoc. were examined. In addition, four X-Ray diffraction (XRD) analyses were undertaken from two samples to verify the presence of talc and to test for the presence of possible sericite. These two minerals are normally very difficult to distinguish optically in thin sections.

Geological setting (from clients notes). The prospect is located within the Adelaide fold belt consisting of dome and basin structures in a Neoproterozoic sandstone, mudstone, carbonate (dolomitic and calcitic) and tillitic diamictites. These sediments have been intruded by salt – driven diapiric breccias elsewhere in the Flinders Ranges. In the Mt Grainger prospect, however, there is increasing evidence the breccias are of hydrothermal origin, possibly sourced to fractionated Ordovician granitoids. Noted features associated with the breccias include extensive silica-sericite alteration, quartz veining, and local hematite and magnetite alteration.

Gold mineralisation occurs as structure controlled high-grade veins, commonly stratabound and in association with the breccias.

The samples include several silicified rocks, which tend to form massive, very hard outcrops often with a breccia appearance, sometimes with quartz and /or limonite veining. They are spatially associated with massive ironstones (rare pyrite) and locally, with highly altered magnetite-rich rock.

▪ **Table 1:** *Summary Of Lithology, Alteration And XRD Minerals For Outcrop Samples from Mt Grainger Prospect, South Australia*

Sample No.	Lithology	Alteration Replacement	Deposition	XRD
99429	Silicified limestone / dolomite cut by quartz veining and quartz breccia vein	Q (with + Fe ox inclusions) + ?Ser / ?T + Py → Ct	1. fgQ ± ?Ser / ?T (cavities) 2. m-fgQ (with ?Ser/?T + Lim + Cb + Anh microinclusions) (vein) 3. fgQ (with Lim microinclusions) (breccia vein) 4. Cb (veinlets, cavities)	
99471	Polyphasal quartz veining		1. fgQ → Lim (vein) 2. vfgQ → ± Lim (vein, crackle breccia) 3. mxtlQ (veinlets) 4. crsgQ (vughs, vein)	
99495	A fine-grained magnetite-tourmaline-talc-quartz-rutile-apatite-calcite rock	Mt + To → T + Q + Ct ± Ksp + Ap + Rt + ?Py → Hm	1. T (veinlets)	T
99497	A sheared, altered coarse to fine-grained bedded with sandstone with scattered coarse to fine-grained leached clasts	Q (with Anh ± Ap microinclusions) + ?Ser/?T → Sm	1. Q (with sparse To ± Anh ± Ap microinclusions) ± ?Ser/?T ± Fe ox (cavities) → I cy → Lim 2. Vfg?Ser/?T (shear zones)	
99703	Fluidised breccia vein with silicified carbonate clasts in a banded vuggy quartz-sulphides-talc-carbonate-illitic clay-smectite clay matrix.	Clasts: Q (with Cb + Anh + T ± Op) microinclusions)	1. fgQ + T ± Anh ± Cb ± Op (banded veining, cavities) 2. clear fgQ (irregular veinlets, cavities) 3. AmSi ± Sm (vughs) or Sm + Ct	Clasts : Q + T ± Sm Band 1: Q + T + Sm Band 2: Q + T ± Sm
99705	A quartz-?sericite / muscovite (?talc)-altered coarse to fine-grained breccia with late illitic clay deposition	Clasts after ?carbonate : Q (with Cb + Anh + ?Ser/?T microinclusions) + ?Ser/?Ms /?T → Lim	1. Q (vughs) 2. FgQ (prebreccis veins) 3. F-vfgQ(→Lim) (breccia matrix) 4. Crs-fgQ (with Cb + ?Ser/T inclusions) 5. Lim + ?Q + I cy (fractures, local breccia matrix, cavities)	

Sample No.	Lithology	Alteration Replacement	Deposition	XRD
99707	Medium to fine-grained quartz breccia vein with goethite / limonite fracture-fill	M-fg clasts → leached	1. f-vfgQ± Sul (breccia vein matrix) 2. fgQ (cavity-fill) 3. Goe / Lim (fractures)	

Mineral Abbreviations

AmSi Amorphous Silica
 Anh Anhydrite
 Ank Ankerite
 Ap Apatite
 Cb Carbonate
 Ct Calcite

Cy Clay
 Do Dolomite
 Fe ox Iron Oxide
 Hm Hematite
 I cy Illitic clay
 Lm Limonite

Ms Muscovite
 Mt Magnetite
 Op Opaques
 Py Pyrite
 Q Quartz
 Rt Rutile

Ser Sericite
 Sm Smectite
 T Talc
 To Tourmaline

3. PETROLOGY

3.1 Lithologies

Only one primary lithology, sample 99497 a coarse to fine-grained sandstone (?arkose), was clearly identified. In this rock the grains are all altered and lacks primary quartz. The rock's provenance is possibly sourced to andesitic volcanism. No other distinct primary rock types were observed in the other sections. However, ghosted textures within replacement quartz in sample 99429 strongly support a silicified carbonate lithology. The fine granular textures are locally developed around cavity walls to euhedral fine-grained rhombs indicative of dolomite / ankerite. The grains are host to abundant microcrystalline Fe oxides / opaques. In the banded breccia sample 99703, subrounded clasts have a granular mosaic appearance and are host to abundant micro inclusions of carbonate and anhydrite with less common talc and sparse opaques. These clasts appear dark in hand specimen. These clasts are also possible silicified carbonate. The textures of the wallrock in the breccia sample 99705 are not distinctive enough to enable identification of primary lithology but local fragmental textures are apparent. A large mosaic-textured silicified clast in the associated breccia vein is possibly a silicified carbonate. Clasts of unknown type in the breccia vein 99707 have been completely leached and infilled. Sample 99495 is a fine-grained rock with no remnant primary textures. It is completely replaced by the predominant minerals, magnetite-tourmaline and talc

The mosaic-textured rocks were suggested by Pontifex and Assoc to be possibly silicified acid volcanics. However, this study suggests that these rocks are more likely to be silicified carbonate probably after dolomite / ankerite. Support for carbonate replacement is based on the following observations:

1. Relict well developed carbonate crystalline textures in sample 99429 associated with the mosaic granular textures.
2. Common micro inclusions of Fe oxides / limonite / opaques, carbonate, anhydrite and locally talc. These inclusions are interpreted to be products from Fe, Ca, Mg, Mn residues after silica reaction with dolomite / ankerite wallrock.
3. The complete replacement of wallrock by magnetite-tourmaline-talc and subordinate minerals in sample 99495. The well known reactivity of carbonate with hydrothermal fluids associated with skarns also favours a carbonate protolith for this sample.

3.2 Alteration / Deposition

Three hydrothermal alteration / deposition assemblages are identified in the sample suite.

1. Quartz – ?sericite – talc – carbonate $\pm$ opaques $\pm$ anhydrite $\pm$ tourmaline

Talc has been positively identified by XRD analysis in clasts and quartz vein matrix in sample 99703. The habit and optical properties of the talc is very similar to that of sericite which has been reported in the other samples. Until XRD analysis determines the identity of the phyllosilicates in the other samples, the occurrence of sericite rather than talc in some or all of these samples remains in doubt.

Six of the seven samples (the exception is 99495) have been strongly silicified with some also leached and infilled with quartz. The sandstone grains in 99497 are all composed of secondary polycrystalline fine-grained quartz and /or very fine-grained sericite / ?talc. In four of these samples, fine-grained quartz replaces lithologies, which are inferred to be a carbonate protolith, and is typically flecked with sericite / talc (99429, 99495, 99703, 99705). The replacement quartz may contain abundant microscopic inclusions of limonite (99429), talc and /or ?sericite, carbonate, $\pm$ anhydrite $\pm$ opaques $\pm$ apatite (99497, 99703, 99705, 99497). Mosaic-textured quartz $\pm$ talc / sericite is commonly developed as either cavity-fill (99429), or as lithology replacement. This texture has been suggested to be after acid volcanics by Pontifex and Assoc. The quartz matrix of the breccia veining is also host to these inclusions but they are typically much sparser in abundance or absent. Leached fine-grained crystals disseminated through the silicified carbonate in 99429 are possibly after pyrite and have been infilled with polycrystalline clear quartz. Fine-grained leached euhedral pyrite accompanies quartz-talc banded veining in 99703 and are likewise completely leached. The leached clasts in the sandstone host 99497 are traversed by platy quartz deposition which is locally host to very fine tourmaline grains (Plate 4, Appendix II).

Talc in these rocks is considered to be the product of the reaction between dolomitic rocks and silica-rich hydrothermal fluids to produce talc and calcite, ie dolomite + quartz $\rightarrow$ talc + calcite. The presence of talc, ?sericite, apatite and tourmaline associated with quartz alteration /deposition indicates relatively high hydrothermal temperatures, >200-230°C at inferred upper mesothermal levels. Tourmaline, albeit in trace amounts also indicates a magmatic contribution to the fluids. The inferred presence of pyrite supports this conclusion.

Quartz deposition is typically polyphasal with early veining followed by much finer-grained quartz veining or cavity fill (99429, 99471, 99703, 99705, 99707). In sample 99471, the latest veining and cavity-fill consists of coarse-grained quartz (milky white in hand specimen) which is host to both primary and secondary, liquid-rich and vapour-rich fluid inclusions devoid of daughter crystals. The vapour bubbles occupy 30-50% of the cavity space in the liquid-rich type. These observations are interpreted to indicate late dilute boiling fluids at temperatures possibly >200°C.

2. Magnetite + tourmaline + talc $\pm$ quartz $\pm$ calcite $\pm$ rutile $\pm$ apatite $\pm$ k-feldspar $\pm$?sulphides

This assemblage in the fine-grained rock 99495 is a complete replacement assemblage after a strongly reactive rock. No primary textures are preserved. Magnetite replacement is a well documented feature in many skarn assemblages associated with magmatic intrusions within carbonates. The presence of tourmaline, rutile, apatite is consistent with a magmatic contribution to the hydrothermal fluids associated with the intrusion. Talc is interpreted to be the result of dolomite reaction with silica as described above. This relatively high temperature assemblage >230° is indicative of mesothermal levels in the system and is not considered to have an exhalative origin as suggested by Pontifex and Assoc.

3. Illitic clay + smectite ± ?very fine-grained quartz ± calcite

A late low temperature assemblage of clays and /or calcite weakly overprint wallrock or clast lithologies in some samples. Fine-grained calcite locally overprints the silicified carbonate in 99429 and seals small late veinlets and cavities. In the banded breccia vein 99703 calcite overgrows colloform banded smectite lining cavities (Plate 8, Appendix II). Microcrystalline illitic clay overprints quartz in cavities in 99497 and seal thin fractures, local late breccia matrix and cavities in 99705. The illitic clays are indicative of temperatures 100°-200°C at upper epithermal levels. The smectite is possible of hydrothermal origin also. The late calcite is problematical. It may occur as an associated late hydrothermal phase accompanying the clays or may have a supergene origin related to calcrete which is typically developed in arid areas.

4. Limonite / Fe oxides

Limonite / goethite strongly to weakly stains or overgrows replacement and depositional quartz and clays in some of the samples (99429, 99471, 99497; Plate 9) and seals fractures and cavities in 99705 and 99709. In some cases, eg 99707, this limonite appears to be derived from weathered sulphides. In the replacement quartz eg. sample 99429, limonite occurs as minute inclusions in the quartz after inferred ?secondary magnetite / hematite and /or sulphides (Plates 1 and 2).

4. DISCUSSION AND COMMENTS

The petrographic evidence from the seven samples suggests that there has been intense hydrothermal alteration / deposition dominated by quartz within sediments including carbonate and arkosic sandstones. A magmatic contribution to the fluids during the history of the hydrothermal system is presumed on the basis of the occurrence of tourmaline. The silicification of carbonate, associated brecciation and mineralisation in structurally controlled veins which are commonly stratabound are features which have been observed in the sediment-hosted deposits such as Mesel (Sulawesi) and those within the Carlin Trend (Nevada). A re evaluation of the Mt Grainger deposit is required on the basis of the petrographic data. To this end, a conceptual model is presented below which will hopefully advance the understanding of the system at Mt Grainger.

A conceptual alteration / mineralisation model based on the Mesel hydrothermal system

1. Intrusion of magma into or immediately below sediments including carbonate / sandstone / mudstone tillite
2. Formation of a hydrothermal system above the cooling intrusion..
3. Decalcification and dolomitisation of the limestone. Replacement by dolomite adjacent to major faults, in sedimentary breccias and possibly along contacts with impervious lithologies eg igneous compositions. The volume decrease associated with calcite → dolomite creates secondary porosity. Early pyrite is intergrown with dolomite.
4. Intense silicification stage with open space infilling and calcite and dolomite replacement, decreasing away from zones of fluid upflow, localised within structures towards outflow settings. Development of vuggy quartz by leaching of carbonate where fluids have subneutral pH. Silicification forms a brittle host rock that enhances brecciation and fracturing. Magnetite-tourmaline-talc skarns form within reactive carbonate lithologies adjacent to structurally-controlled fluid channelways where temperatures are the hottest, probably at greater depth compared to the silicified lithologies
5. Main mineralisation stage: gold associated with quartz-sulphide deposition during polyphasal brecciation of silicified dolomite and limestone. At Mesel, associated illite indicates temperatures ~200-250°C. Gold at Mesel, declines rapidly from the structurally controlled upflow zones to the lithologically controlled outflow zones.
6. Post mineral calcite veins cut earlier alteration and mineralisation.

At Mesel, gold mineralisation is strongly correlated with arsenical pyrite. This is interpreted to be the result of mixing of upwelling mineralised fluids with oxidised, subneutral pH CO₂-rich fluids. The presence of illitic clays and calcite at Mesel (as also seen in some samples at Mt

Grainger) support the model of CO₂-rich waters descending into the hydrothermal system at shallow levels. The magnetite-rich rocks at Mt Grainger are inferred to be from deeper hotter levels in the system. In general, however, the settings of Carlin-type deposits are distal to the magmatic source and are not conducive to formation of skarn.

General features in sediment –hosted gold deposits include:

- Structural settings characterised by extension, normal faults, common doming and local caps of impermeable units
- Metal association of high fineness gold and enrichment in As, Hg, Sb, Ba and Tl and in some cases in basemetal sulphides (eg. Bau).
- Magmatic association in form of felsic dikes indicative of a distal relationship of gold mineralisation to intrusive source.
- Depth of formation which is inferred to well below epithermal; environments
- Mixing of volatile-rich fluids derived from considerable depth with meteoric fluids to produce gold deposition

Conclusions

The most significant result of this study is the identification of a gold-mineralised, sediment-hosted hydrothermal system with strong magmatic-related characteristics. Similar systems such as Mesel and those in the Carlin Trend are major gold deposits. Testing and developing of the above model by careful field work integrated with ongoing petrological investigations may delineate significant gold targets in future exploration of the Mt Grainger area.

It is recommended that further XRD analyses are run on those samples where sericite / muscovite has been described. This mineralogy may in fact be talc.

APPENDIX I: PETROGRAPHIC DESCRIPTIONS

Sample Number 99429

Mt Grainger

Rock Name:

A silicified limestone / dolomite cut by early quartz veining and a quartz breccia vein.

Hand Specimen Description:

A broadly banded, fine-grained brown to dark brown limonitic fine-grained siliceous lithology is locally sealed with white quartz (-sericite) cavity fill and cut by a breccia zone containing fragmented quartz vein clasts and wallrock clasts set in a fine-grained brown limonitic siliceous matrix. Dilute HCl acid indicates calcite is locally present.

Thin Section Description - Lithology, Textures And Minerals:

Rock is a brecciated, quartz veined, silicified carbonate lithology. The carbonate wallrock is cut by a breccia zone > 30mm wide. The carbonate texture is defined by equigranular subhedral to granular interlocking silicified crystals strongly dusted with microscopic limonite. The primary carbonate protolith is clearly recognised by well developed euhedral silicified rhombs lining common scattered small cavities. The carbonate lithology constitutes 30% of the rock and has a banded appearance due to the increase of limonite dusting forming a darkened selvage ~20mm wide adjacent to the breccia zone. The carbonate is host to scattered fine-grained euhedral shapes inferred to be after pyrite which have been subsequently leached and infilled by fine polycrystalline clear quartz. The carbonate has common elongate narrow irregular cavities with a preferred orientation. Medium to fine-grained subangular to subrounded clasts of the silicified carbonate (10-15%) are also contained within the breccia zone.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Carbonate → Fine-grained Quartz flecked with very fine-grained Sericite and containing abundant microscopic to cryptocrystalline Limonitic inclusions. Microscopic Calcite overprints the lithology locally in small patches.

Pyrite → leached and infilled

Replacement Mineral Abundances

Quartz (40-45%), Limonite 7-10%), Sericite (5-7%), Calcite (3-5%), leached Pyrite (0.3-0.5%)

Deposition:

Sequences Of Deposition

- 1) Cavities in wallrock → sealed with fine equigranular mosaic textured-Quartz flecked with common very fine-grained Sericite. Some of these have been subsequently incorporated as clasts in the breccia. This stage quartz forms locally large clasts up to 1mm across with scattered leached shapes after fine-grained pyrite. It appears that this lithology seals large cavities developed elsewhere in the wallrock and possibly locally replaces the more limonitic silicified carbonate.
- 2) Early veining → sealed by medium to fine granular to stubby prismatic Quartz with sparse to moderate amounts of Sericite + Limonite ± Carbonate ± Anhydrite micro inclusions; leaching of wallrock and St.1 pyrite with infilling by polycrystalline clear Quartz or cavity lining by fine-grained prismatic Quartz.
- 3) Brecciation of wallrock and St.1 veining → sealed by matrix of fine-grained Quartz with common cryptocrystalline Limonitic inclusions.
- 4) Late veinlets, thin elongate cavities in breccia matrix, sealed with dark microcrystalline Carbonate.

Deposition Mineral Abundances

St.2 Quartz (15-20%), St 1 quartz (7-10%), St.2 Quartz (7-10%), Carbonate (3-5%)

Comments:

The abundant limonitic inclusions in the replacive quartz and pseudomorphed rhombs suggests the pre silica carbonate was dolomite / ankerite in composition. However, much of the Fe may have been introduced by the silica-saturated fluids as suggested by the breccia quartz matrix. In carbonate hosted deposits elsewhere, hydrothermal alteration is characterised by early dolomitisation of limestone accompanied by pyrite. The consequent loss of volume increases porosity and promotes silicification replacement and deposition. Accompanying sericite indicates early subneutral pH conditions and temperatures >200-230° C. It is assumed that it is the St.1 deposition that has been mistaken for an acid volcanic lithology. It is clear, in places, however that this stage overgrows early carbonate cavity lining.

Paragenesis

dolomite	---->
pyrite	----->
quartz	----->
Fe oxides	----->
sericite	---->
anhydrite	->
calcite	----->

Sample Number 99471

Mt Grainger

Rock Name:

Polyphasal quartz veining and brecciation

Hand Specimen Description:

Dull yellowish siliceous fine-grained crackle breccia clasts are sealed within a dull brown very fine-grained siliceous matrix. The clasts are developed as orange gossanous finely vuggy patches on the edges of the sample. The breccia is cut by thin grey siliceous veinlets and partly contained within massive milky white quartz deposition, which also seals local cavities in the breccia.

Thin Section Description :

Section is composed of a quartz depositional breccia.

Deposition:

Sequences Of Deposition

1. Early ?deposition of interlocking fine granular and dogtooth-textured Quartz strongly dusted with cryptocrystalline Limonite. The quartz is locally finely and intensely vuggy with vughs locally lined on the edges of the section with fine-grained prismatic Quartz and / or coated with amorphous Limonite. This lithology has no distinctive textures that suggest it may be a replaced lithology.
2. Veining and development of crackle brecciation of St.1 → to form matrix-supported coarse to fine-grained subangular to irregular shaped clasts set in a very fine-grained equigranular clear Quartz matrix. The matrix quartz is weakly dusted by cryptocrystalline Limonite.
3. Minor thin veinlets → sealed with microcrystalline Quartz. This quartz also overgrows St.1 quartz where it becomes locally more open and finely prismatic in texture.
4. Small to large irregular vughs in both St.1 sealed by coarse -grained clear Quartz with abundant primary and secondary fluid inclusions that are barely optically resolvable. Some are seen to be both liquid and vapour-rich with no daughter crystals observed in the former type. The vapour bubbles in the former type occupy 30-50% of cavity volume. This quartz is related to vein / deposition of the massive milky white quartz observed in hand specimen. The quartz displays deformational strain features such as undulose shadowy extinction within subdomains and is cut by micro fractures.

Deposition Mineral Abundances

St 1 Quartz (55-65%), St.2 Quartz (30-35%), St.3 Quartz (5-7%), St.4 Quartz (3-5%)

Comments:

Polyphasal quartz veining and brecciation. It is not possible to easily infer the level in the hydrothermal system for this sample. The relatively large vapour bubbles in the liquid-rich fluid inclusions of the late coarse-grained quartz however, suggest that conditions were not upper epithermal temperatures.

Sample Number 99495

Mt Grainger

Rock Name:

A fine-grained magnetite-tourmaline-talc-quartz-rutile-apatite±calcite rock.

Hand Specimen Description:

A dark heavy rock composed of abundant fine-grained opaques including magnetite with small subparallel lenses, cavities and vague banding defined by fine-grained dark tourmaline and white soft ?clay /?talc.

Thin Section Description - Lithology, Textures And Minerals:

The section consists of abundant fine equigranular finely vuggy opaques inferred to be dominated by magnetite with scattered Tourmaline, Rutile, Apatite, Quartz and Talc, and common scattered medium to fine sized Tourmaline-Rutile-Quartz-Talc patches, lenses and band. The patches / lenses are typically elongate in shape (up to 6mm in length) and subparallel to each other and a band (>4mm wide). Both patches and band are composed of well-developed Tourmaline grains and laths up to 2mm in length intergrown by occasional fine-grained subhedral Rutile <0.3mm, subhedral to anhedral Apatite <0.3mm and overgrown by interstitial fine-grained granular Quartz and Talc. Patches are also composed of the latter assemblage only. The tourmaline commonly forms radiating aggregates and is strongly pleochroic from pale brown to deep olive green indicative of a Fe-rich composition ie. schorlite. Rutile is brown yellow in colour. Rare Opaque subhedral grains up to 1.3mm across overgrow tourmaline and are partly, if not completely replaced by Hematite. These grains may be after sulphides (?pyrite).

In places, late well crystalline Calcite is interstitial to tourmaline or quartz and is locally intergrown with rare tabular K-feldspar.

Limonite weakly stains talc in places.

The assemblage is probably a replacive one but the original protolith cannot be determined on the basis of relict textures, which are absent.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

As described above

Hematite alteration (as indicated by red internal reflections) is noted on the edges of inferred magnetite and possible pyrite.

Replacement Mineral Abundances

Opaques (35-40%), Talc (25-30%), Tourmaline (15-20%), Quartz (7-10%), Calcite (3-5%), Rutile (3-5%), Apatite (2-3%), K-feldspar (0.1-0.3%)

Deposition:

Sequences Of Deposition

1. Weak veinlets → Talc (1-2%)

Comments:

A fine-grained magnetite-tourmaline-talc-quartz-rutile-apatite±calcite rock. The original protolith of this probable replacive mineralogy is unknown. In the context of the present sample suite, it is suggested that the talc has been derived from siliceous dolomite / ankerite with tourmaline, apatite and rutile resulting from relatively high temperature magmatic-derived fluids interacting with reactive carbonate at mesothermal levels. The presence of schorlite rather than Mg-rich dravite which is more typical with dolomite alteration is possibly explained by a Fe contribution from the magma-derived fluids. The mineralogy is not exhalative as previously suggested. The magnetite-rich composition of the rocks suggests the rock may be a magnetite skarn but lack of typical skarn minerals such as garnet, pyroxene or wollastonite suggest the fluids were not immediately proximal to the intrusive and were probably weakly acidic (no epidote).

Paragenesis

magnetite	---->
tourmaline	---->
rutile	---->
apatite	---->
?pyrite	---->
quartz	---->
talc	---->
calcite	---->
k-feldspar	---->

Sample Number 99497

Mt Grainger

Rock Name:

A sheared, pervasively quartz-sericite altered coarse to fine-grained bedded sandstone with scattered coarse to fine-grained leached clasts.

Hand Specimen Description:

A pale quartz-sericite altered, coarse to fine-grained bedded sandstone with thin sericite-rich shear zones and coarse to fine-grained leached clasts <10mm across that are traversed by thin platy quartz.

Thin Section Description - Lithology, Textures And Minerals:

A sheared, clast-supported, mainly fine-grained fragmental lithology with sandstone textures, composed predominantly of silicified or sericite-altered subrounded equant or elongate grains and minor amounts of altered matrix. Scattered through the rock are also coarse to fine-grained blocky shaped leached ?clasts up to 7mm across of unknown origin. The size and distribution of the ?clasts has no relation to the grain size grading of the rock. The ?clasts have an apparent pumiceous character with dominant platy $\pm$ cellular open textured quartz spanning the cavity. But the platy quartz in all clasts has the same orientation throughout the rock indicating the 'cellular' character is not a primary pumiceous one. Small equant fine-grained altered euhedral to subhedral crystals are also disseminated through the rock in minor amounts possibly after Fe Ti oxides or pyrite grains.

The rock has a rough banding / bedding defined by coarse sandstone layer ~10mm wide bordered by medium to fine-grained sandstone.

No primary quartz was observed in the section.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Sandstone sized clast grains $\rightarrow$ polycrystalline fine-grained Quartz $\pm$ overgrowing very fine-grained Sericite, or very fine-grained Sericite. Much of this polycrystalline quartz is possibly infill after leaching. Smectite weakly overprints the sericite. The polycrystalline Quartz is typically host to micro inclusions of Anhydrite $\pm$ Apatite.

Blocky ?clasts $\rightarrow$ leached

Small Fe Ti oxides / ?pyrite $\rightarrow$ leached

Matrix $\rightarrow$ very fine-grained Sericite

Replacement Mineral Abundances

Quartz (65-70%), Sericite (25-30%)

Deposition:

Sequences Of Deposition

1. Some of the small rounded grains are clearly leached and sealed with polycrystalline Quartz $\pm$ Sericite. The vuggy blocky shaped cavities are spanned by thin platy Quartz $\pm$ Sericite with a preferred orientation throughout the rock. Locally cellular textures are present and locally infilled with polycrystalline Quartz. Quartz is host to sparse granular inclusions of Tourmaline and micro inclusions of Anhydrite $\pm$ Apatite.

The infill quartz is locally overgrown by pockets of microcrystalline Illitic clay.

The sericite is locally stained with amorphous Limonite.

The small leached crystals after Fe Ti oxides or pyrite are also spanned by the platy quartz in places and coated with cryptocrystalline Fe-Opaques.

2. Rock is cut by two narrow shear zones 3 and 1mm wide composed of sheared elongate wallrock grains set within common very fine-grained Sericite matrix. The sericite has a preferred orientation in the direction of shear.

Deposition Mineral Abundances

Quartz (>10%), Sericite (2-3%)

Comments:

A sheared, pervasively phyllic quartz-sericite altered coarse to fine-grained bedded sandstone with scattered coarse to fine-grained leached clasts. The sandstone is possibly has an epiclastic origin. Tourmaline, apatite and anhydrite associated with replacement / depositional quartz suggest a mesothermal environment with magmatic input.

Paragenesis

quartz ---->
sericite ---->
tourmaline - ->
apatite - ->
anhydrite - ->
illitic clay - - - ->
smectite - - - ->

Sample Number 99703

Mt Grainger

Rock Name:

Fluidised breccia veining with silicified clasts set in a banded vuggy quartz- sulphides-talc-carbonate- clay matrix

Hand Specimen Description:

A banded breccia composed of bands 3 to <10mm wide consisting of pale to beige to dark coloured fine vuggy quartz matrix studded with dark medium to fine-grained subrounded clasts, bands with clast-poor beige coloured siliceous matrix and pale bands with relatively common white clay –calcite fill.

Thin Section Description:

Deposition:

A banded fluidised breccia veining. Scattered silicified subrounded clasts (<2mm, 20-25%, dark spots in hand specimen) composed of mosaic-textured fine granular Quartz with abundant micro inclusions of Carbonate + Anhydrite ± minor Talc flakes are scattered in variably fine-grained to very fine-grained vuggy granular Quartz breccia matrix. The quartz matrix is typically host to moderate to sparse inclusions of Talc, Anhydrite, Carbonate and Opaques. Fine-grained leached sulphides are disseminated through the matrix.

Sequences Of Deposition

1. The siliceous bands, varying from ~3mm to 10mm wide, are defined by talc-poor, relatively talc-rich and carbonate- smectite- rich mineralogy, flecking and infilling the vuggy quartz breccia matrix.
2. Some of the cavities appear to be the result of clast leaching and are locally lined or sealed with fine-grained polycrystalline Quartz ± Talc, Anhydrite, Carbonate and Opaques. The leached sulphides are commonly coated with microcrystalline Opaques.
3. Irregular veining, common residual cavities, openings in the quartz matrix are sealed with mostly clear granular Quartz.
4. In a carbonate- clay band, pale brown Smectite infill a few vughs and is overgrown by fine-grained Calcite

Deposition Mineral Abundances

Quartz matrix (60-70%), St 2 Quartz (10-15%), Talc (5-7%), Carbonate (2-3%), Anhydrite (1-2%)

XRD minerals

Analysis a: mosaic-textured clasts : quartz, talc

Analysis b: quartz-clay band: quartz, talc, smectite

Analysis c: quartz-talc band : quartz, talc, trace smectite

Comments:

Fluidised breccia veining with silicified clasts set in a banded vuggy quartz- sulphides-talc-carbonate- clay matrix. The surprising XRD analysis of talc in the clasts rather than sericite is supportive of a dolomite protolith. The micro inclusions of carbonate and anhydrite were apparently of insufficient volume for XRD identification. The clasts are possibly silicified dolomite. The common carbonate and anhydrite inclusions in the quartz matrix indicate the presence of bicarbonate –sulphate-rich hydrothermal fluids which are inferred to have mixed with hotter upwelling quartz-saturated fluids to produce quartz and sulphide deposition. Smectite indicates a change of conditions to much lower temperatures ~ <100-150°C at shallow levels.

Paragenesis

quartz	----->
anhydrite	- - ->
carbonate	- - - - ->
sericite	----->
sulphides	- - ->
smectite	----->

Sample Number 99705

Mt Grainger

Rock Name:

A quartz-sericite/muscovite altered coarse to fine-grained clast to matrix-supported breccia with late illitic clay deposition

Hand Specimen Description:

Coarse to fine-grained silicified clasts stained medium brown are set within a fine-grained brown intensely limonitic matrix which also contains scattered pale coarser quartz grains / ?cavity-fill. A thin fracture is lined with vuggy white calcite.

Thin Section Description - Lithology, Textures And Minerals:

A silicified fine granular mosaic textured lithology of unknown origin is cut by a large breccia vein (30-40% of section). The wallrock lithology appears to be a medium to fine-grained fragmental with ghosted primary textures somewhat modified within the replacement quartz. These textures are defined by medium to fine-grained clastic shapes, matrix-supported within a fine-grained limonitic matrix.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Wallrock → ?Clasts → silicified to fine granular Quartz and /or fine-grained Sericite + local stubby laths of fine-grained Muscovite. Quartz is moderately to weakly dusted with orange cryptocrystalline Limonite. The fine-grained Quartz matrix is strongly clouded by Limonite. The quartz is host to sparse to common micro inclusions of Carbonate + Anhydrite ± Sericite. The lithology is locally finely vuggy possibly due to leaching.

Replacement Mineral Abundances

Quartz (50-55%), Sericite (5-7%), Muscovite (2-3%)

Deposition:

A breccia vein >20mm wide, contains a large subangular clast >20mm in length and common small subrounded clasts, matrix to clast-supported in a fine-grained coarse to finely vuggy quartz-sericite matrix, strongly clouded by cryptocrystalline limonite. The large clast is composed of a fine equigranular mosaic textured silicified lithology of unknown origin. Most of the smaller clasts are composed of wallrock fragments, a lithology with similar alteration textures and coarse to fine subangular quartz vein fragments <15mm in length. A few are completely replaced by fine-grained sericite.

Sequences Of Deposition

1. Vughs in the wallrock are locally sealed with clear well crystalline prismatic and granular Quartz.
2. Prebreccia veining of large breccia clast terminating at clast boundary → sealed with clear fine-grained prismatic and granular Quartz.
3. Breccia matrix → composed of fine to very fine-grained Quartz which is very strongly stained by dark cryptocrystalline Limonite. The matrix is locally finely and intensely vuggy with fine-grained prismatic Quartz developed in the matrix. Cores of the quartz are typically clouded by Limonite.
4. Residual large to small cavities in the matrix → sealed with relatively clear coarse to fine-grained Quartz with trace inclusions of Carbonate and Sericite. In places it is difficult to distinguish between this quartz and early St. 1 quartz clasts
5. Fine fracturing, local brecciation of breccia, small cavities in St.3 matrix → sealed with very dark Limonite + ? Quartz + Illitic clay with Illitic clay locally lining residual cavities and sealing micro veinlets.

Deposition Mineral Abundances

St.3 Quartz (15-20%), St.3 Quartz (15-20%), St3 Illitic clay / Limonite / ? Quartz (3-5%), St.1 Quartz (3-5%)

Comments:

A silicified quartz-sericite/muscovite altered medium to fine-grained ?fragmental lithology of unknown origin cut by a coarse to fine-grained breccia vein with late illitic clay deposition. Some of the clasts are possibly silicified carbonate. The presence of muscovite indicates early alteration occurred within a mesothermal environment with temperatures attaining >250°C and subneutral pH fluids. Late cool epithermal conditions >100-200°C are indicated by the microcrystalline illitic clay deposition. The limonite associated with breccia matrix is possibly derived from sulphides whose textures are obscured by the intense limonite.

Paragenesis

quartz	----->	----->
muscovite	----->	
sericite	----->	
anhydrite	----->	
carbonate	----->	
brecciation	----->	
illitic clay		----->
limonite		----->

Sample Number 99707
Mt Grainger

Rock Name:

A medium to fine-grained quartz breccia vein cut by a network of fractures sealed with goethite / limonite.

Hand Specimen Description:

A grey to dull coloured fine-grained siliceous rock with minor scattered fine-grained leached crystals probably after sulphides, cut by an open fracture network sealed with dark brown supergene Fe oxides including goethite and limonite.

Thin Section Description:

Deposition:

Rock sample appears to be quartz breccia vein with scattered medium to fine-grained leached clasts set in a fine-grained quartz matrix

Sequences Of Deposition

1. Quartz vein breccia → Scattered medium to fine-grained subrounded clasts are set in a variably fine to very fine-grained clear Quartz matrix. The clasts are leached and together with openings and residual cavities are infilled with clear polycrystalline fine-grained granular Quartz. Sparse leached euhedral fine-grained sulphides are disseminated through the matrix. Another form of cavity fill is composed of variably medium to fine-grained granular Quartz distinguished from the former type by hosting sparse to minor amounts of thin Sericite flakes and Anhydrite micro inclusions.
2. A few leached clasts are lined with fine-grained stubby prismatic Quartz. Rarely this quartz overgrows fine-grained subhedral Goethite possibly after Sulphides lining the cavity.
3. The breccia vein is cut by an open network of rectilinear fractures >2mm wide → sealed with dense supergene Goethite / Limonite possibly after Sulphides enclosing scattered fine-grained wallrock Quartz fragments.

Deposition Mineral Abundances

Quartz matrix (80-85%), Quartz infill type 1 (5-7%), type 2 (5-7%), Fe oxides (3-5%), Sericite (<0.005%), Anhydrite (<0.001%)

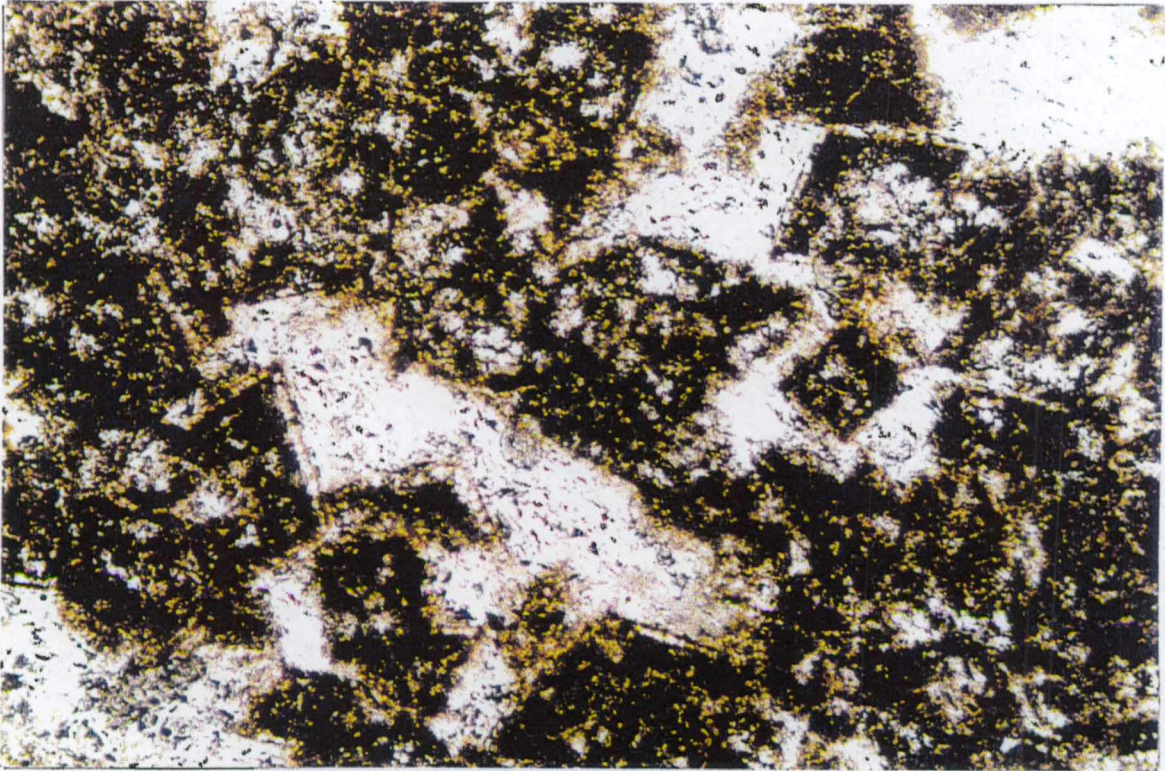
Comments:

A medium to fine-grained quartz breccia vein cut by a network of fractures sealed with goethite / limonite. The presence of sericite (albeit sparse) suggests the early quartz-sulphides deposition occurred at temperatures >200-230°C ie. at upper mesothermal / lower epithermal levels in the system.

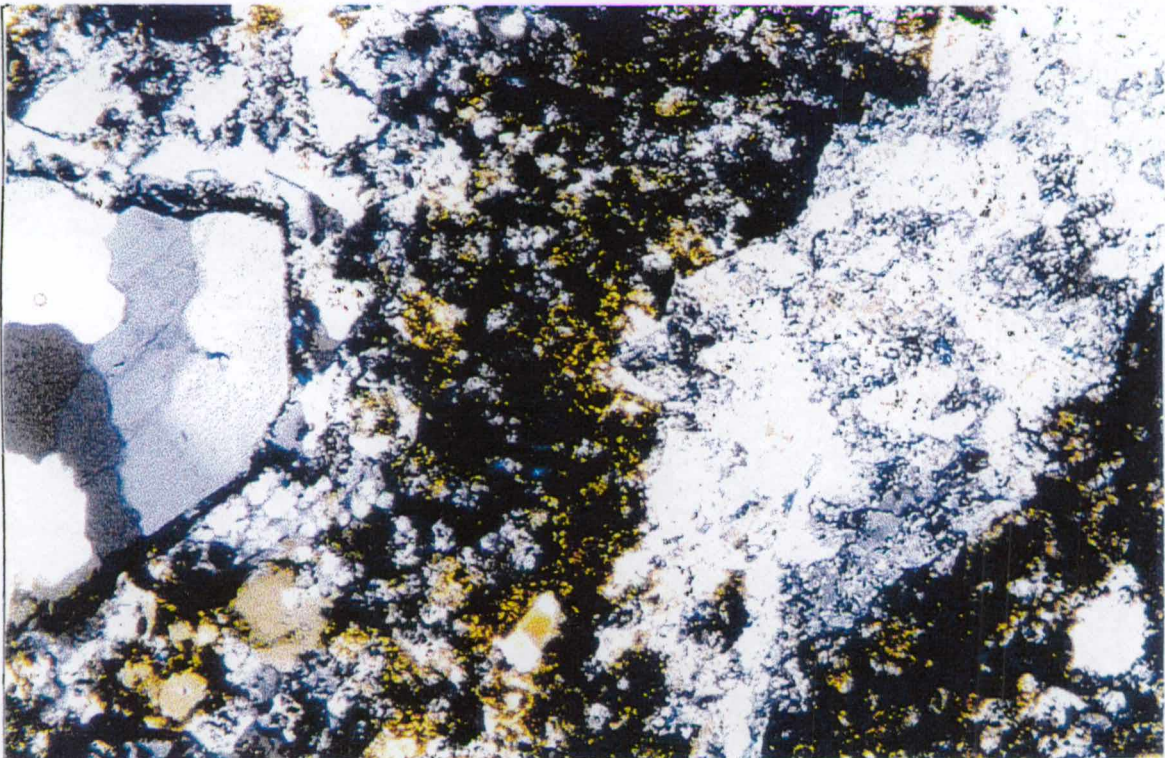
Paragenesis

quartz	----->----->
sericite	?- -->
?sulphides	----->
goethite /	
limonite	----->

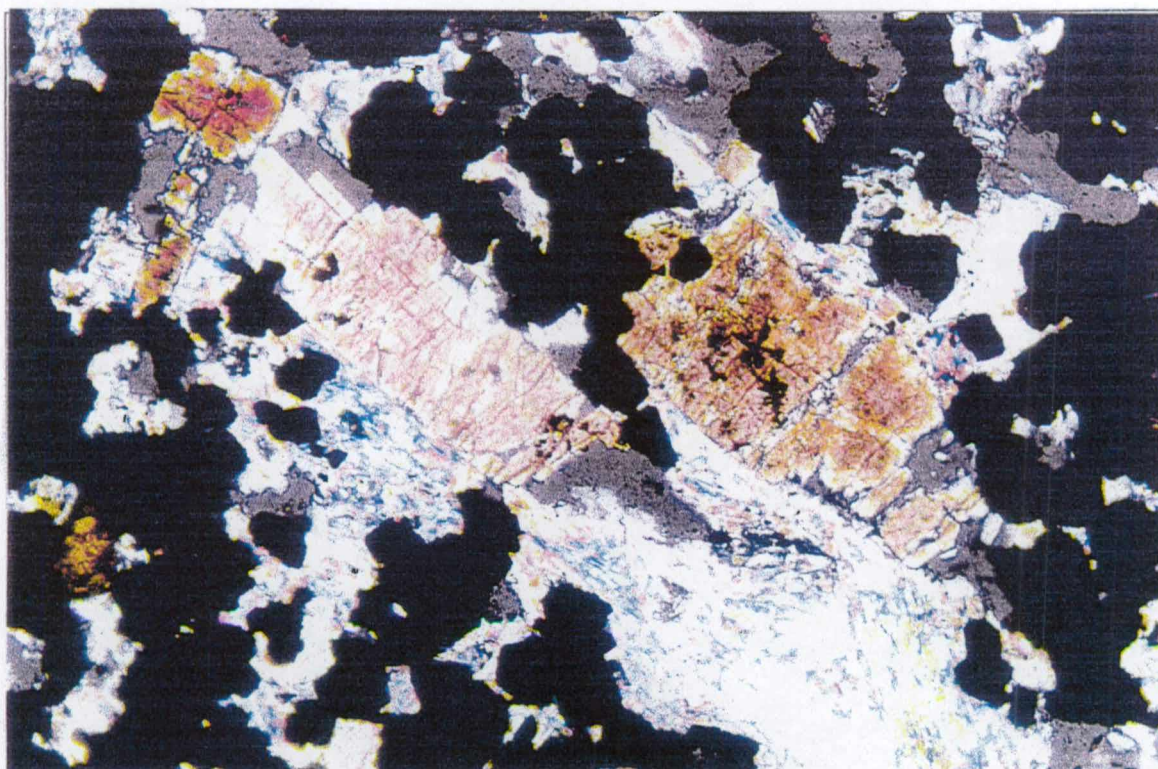
APPENDIX II: PHOTOMICROGRAPHS



■ **Plate 1, Sample 99497 :** *Silicified dolomite / ankerite rhombs with abundant limonite microinclusions and cavities sealed with quartz + ?sericite /?talc. Field of view 1.3mm (PPL).*



■ **Plate 2, Sample 99497 :** *Large cavity sealed with mosaic-textured quartz and sericite /?talc within silicified dolomite (with limonite inclusions) at contact with quartz breccia vein containing early clear quartz ?vein clast. Field of view 1.3mm (XPL).*



■ *Plate 3, Sample 99495 : Fine-grained opaques dominated by magnetite and laths of tourmaline overgrown by talc. Rock is finely vuggy. Field of view 0.7 mm (XPL).*

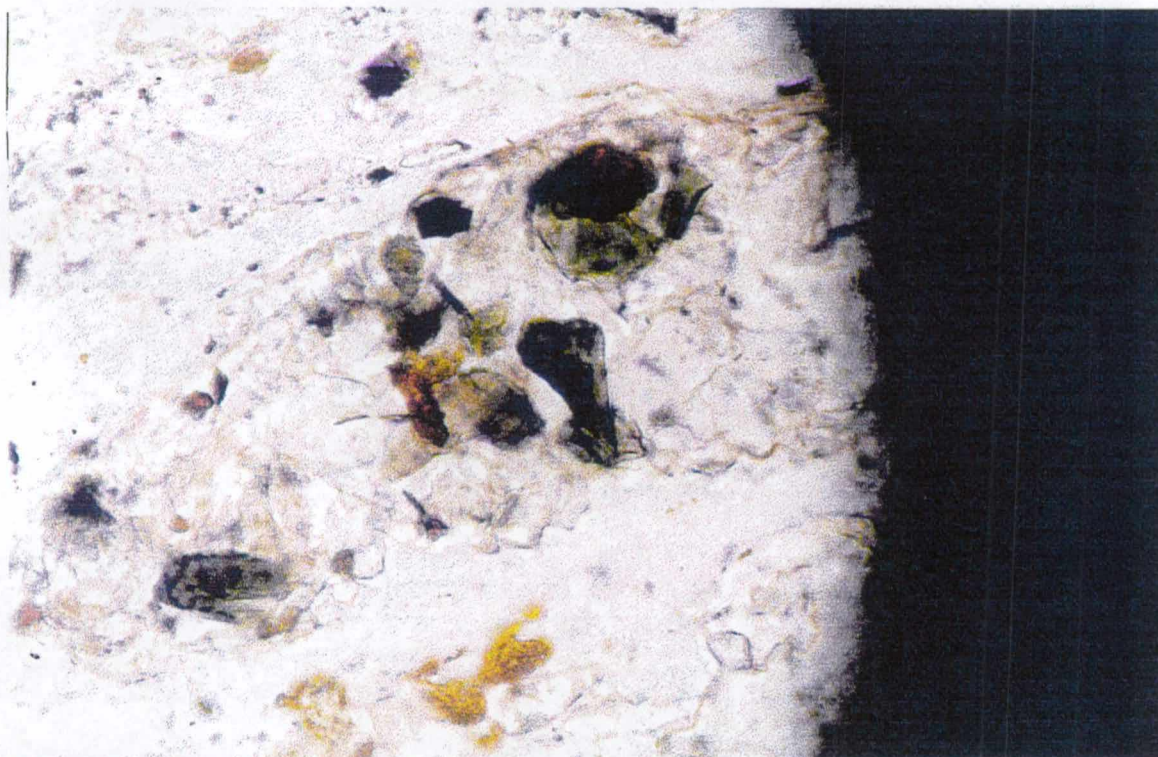
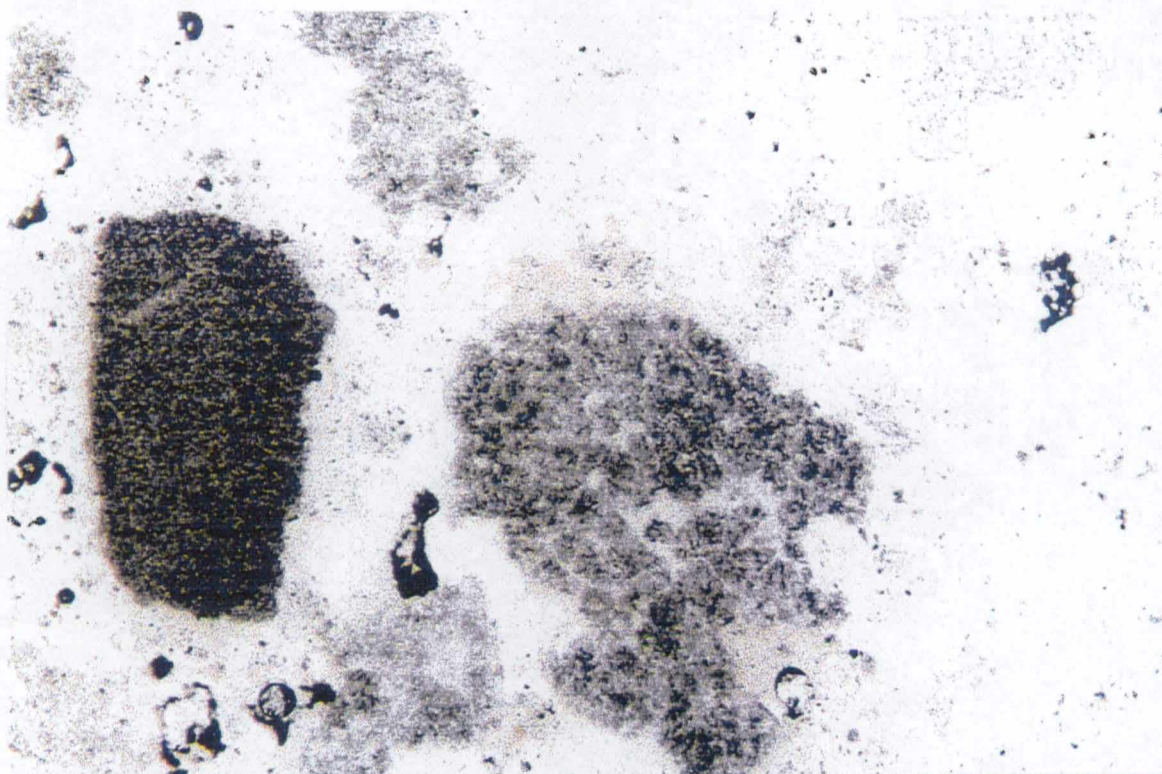
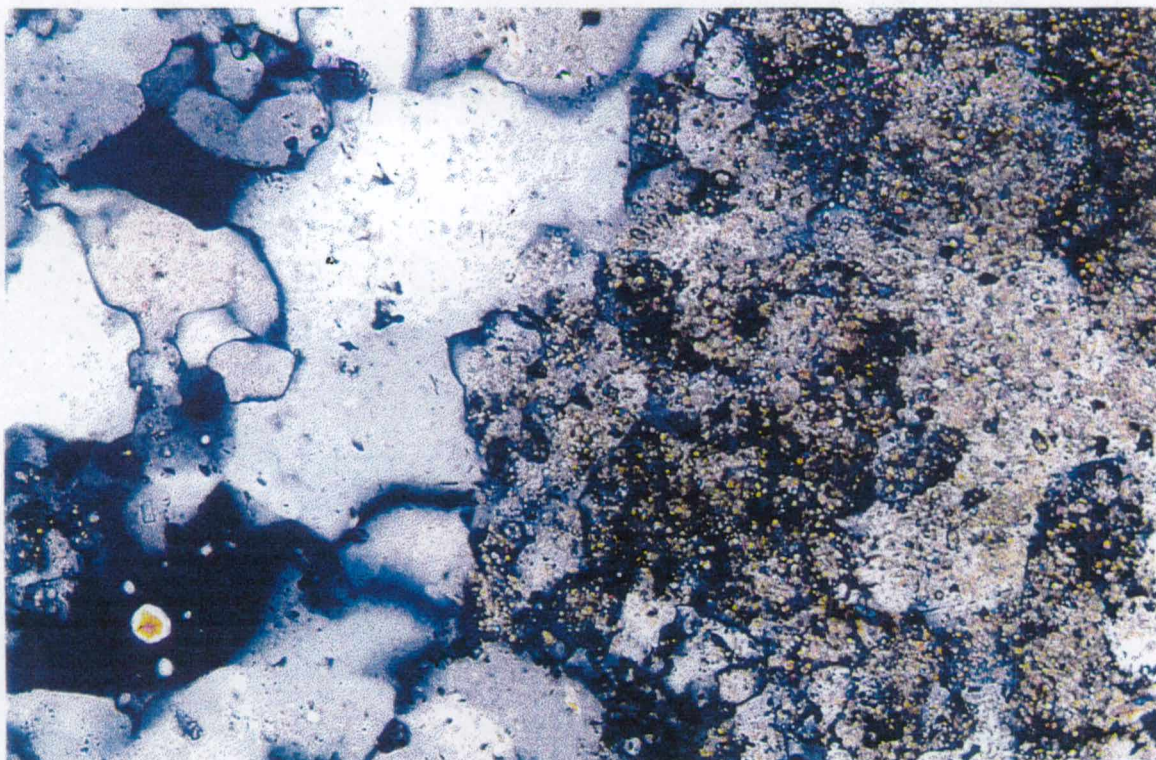


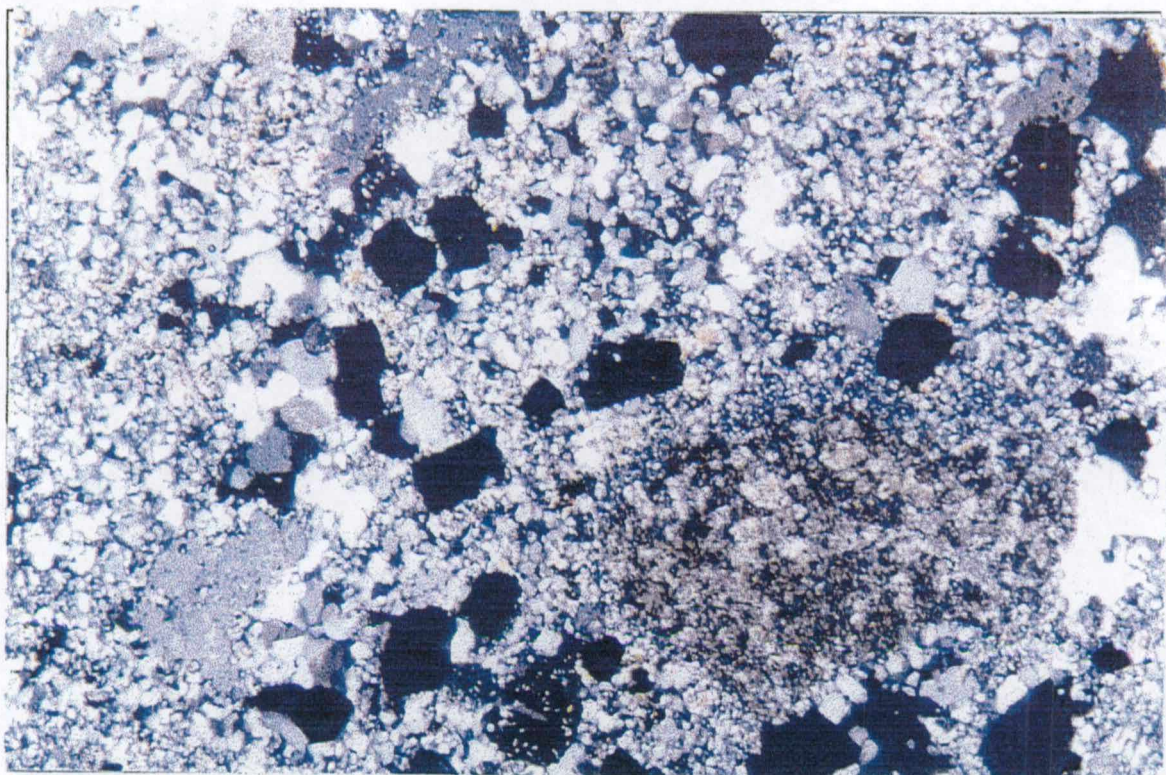
Plate 4, Sample 99497 : Fine-grained tourmaline within platey quartz spanning large leached clast in sandstone. Field of view 1.3mm (XPL).



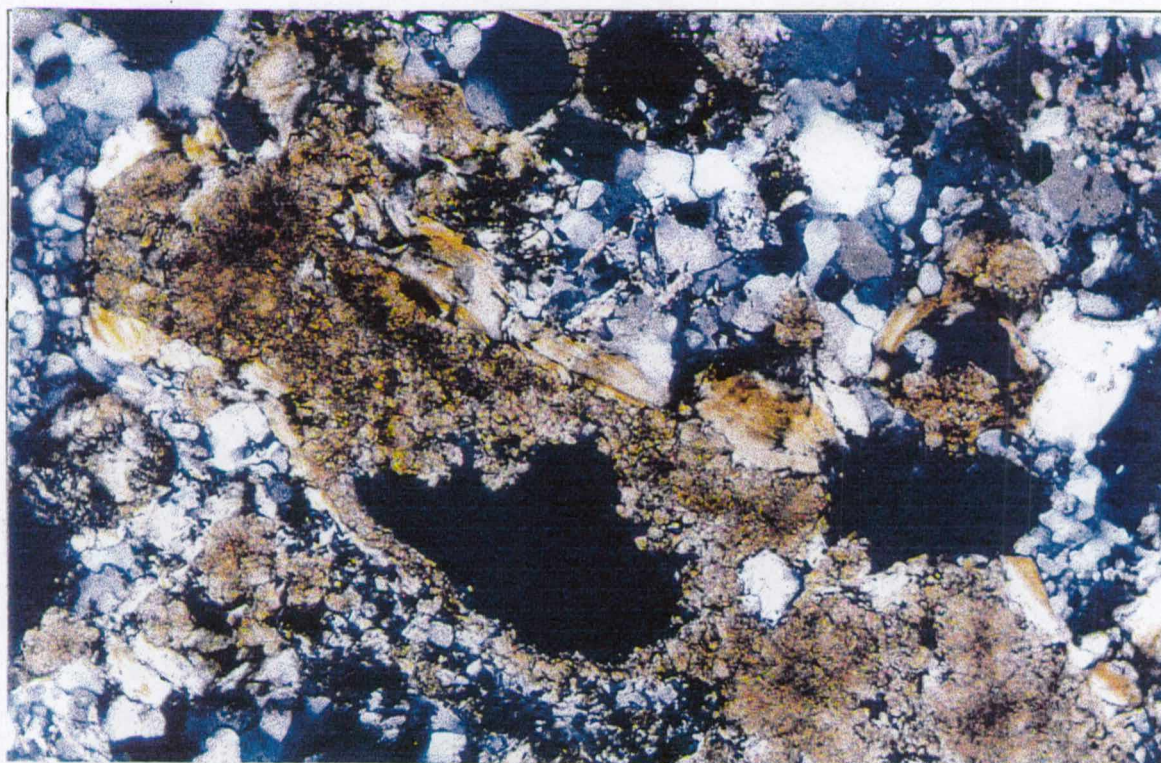
■ *Plate 5, Sample 99703 : Silicified ?carbonate clasts with abundant micro inclusions of carbonate / anhydrite and talc in quartz breccia vein. Field of view 2.0mm (PPL).*



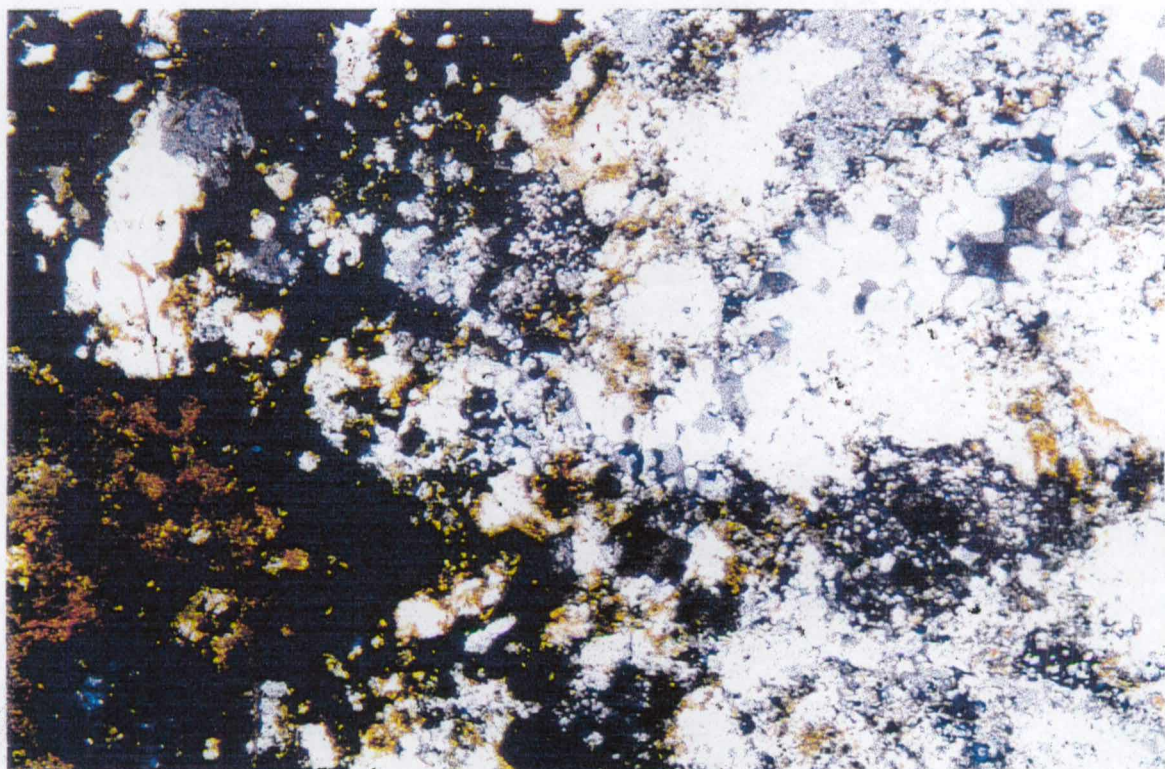
■ *Plate 6, Sample 99703 : A silicified mosaic-textured clast with micro inclusions of carbonate, anhydrite and talc in granular quartz matrix with sparse inclusions of anhydrite and possible carbonate. Field of view 0.7mm (XPL).*



- **Plate 7, Sample 99703 :** *Silicified clast in variably fine-grained quartz band and minor fine-grained talc with leached euhedral crystals probably after pyrite. A few cavities are sealed with anhedral quartz with carbonate /talc inclusions.. Field of view 2.0mm (XPL).*



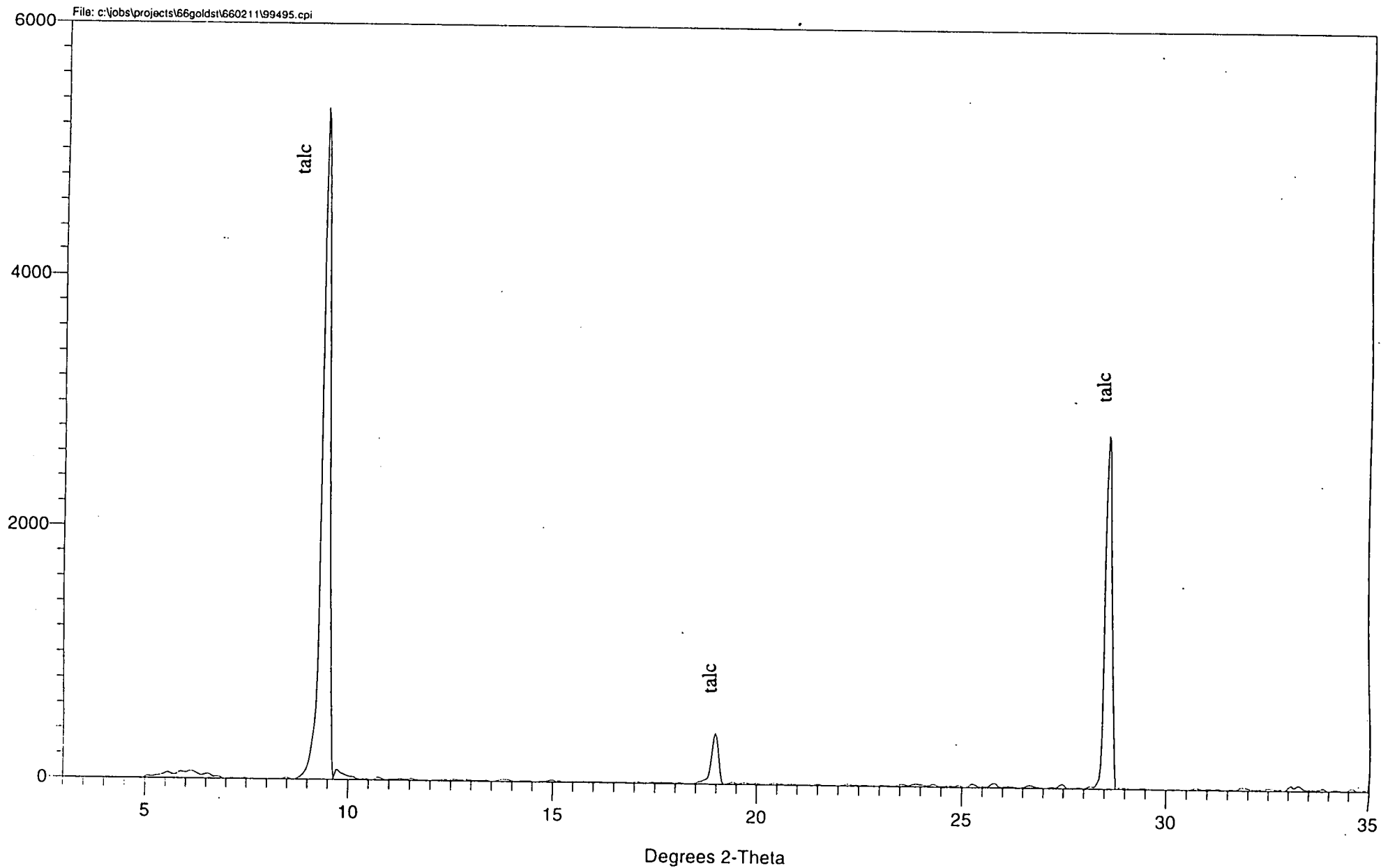
- **Plate 8, Sample 99703 :** *Cavity in vuggy quartz -talc band lined with colloform banded smectite and sealed with fine-grained calcite. Field of view 0.7mm (XPL).*



■ *Plate 9, Sample 99705 : Silicified mosaic-textured quartz clast (?after carbonate) cut by clear quartz veinlet and rimmed by dark limonite-stained illitic clay + ?fine-grained quartz + limonite in late breccia matrix. Field of view 2.0mm (XPL).*

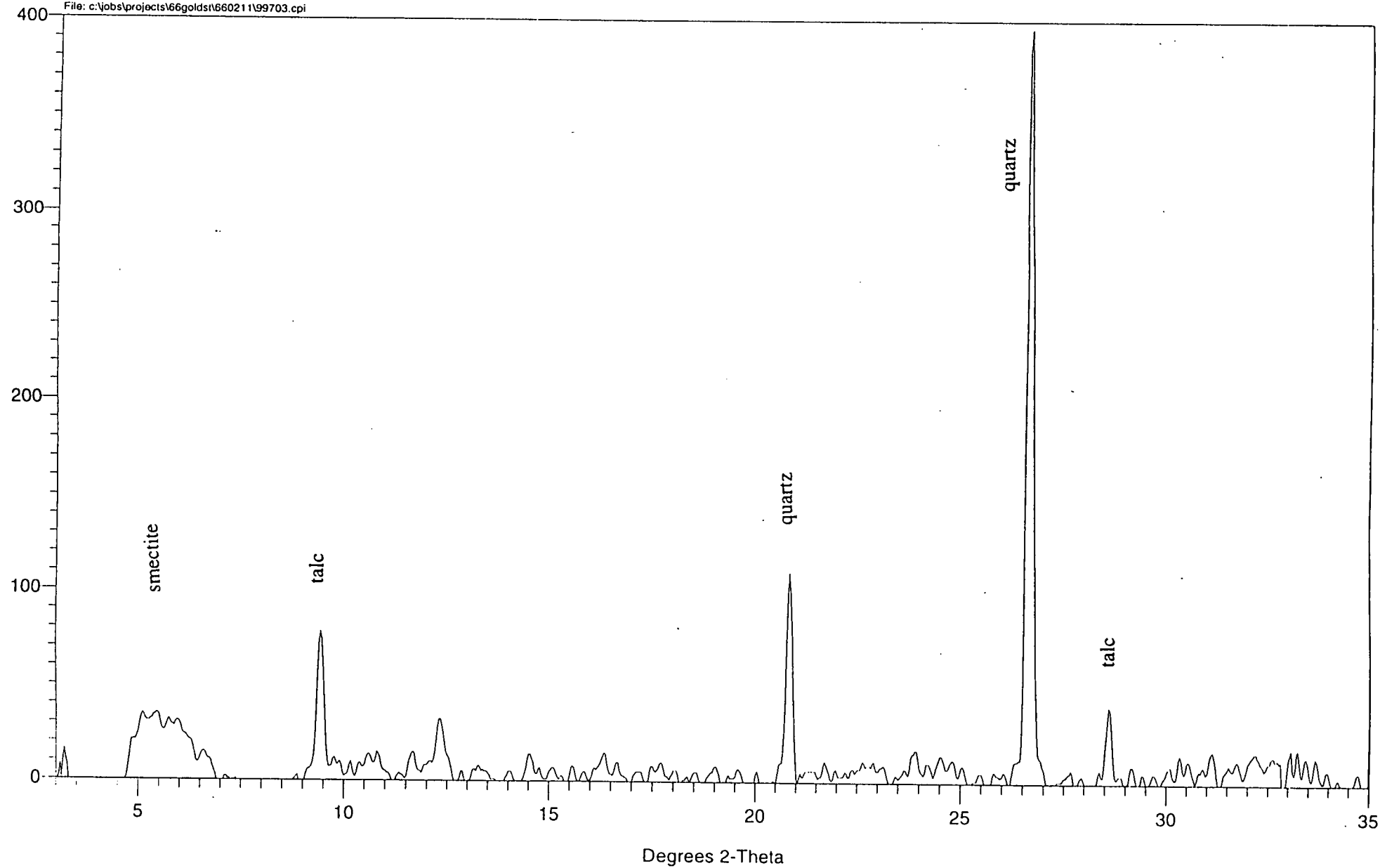
APPENDIX III: XRD TRACES

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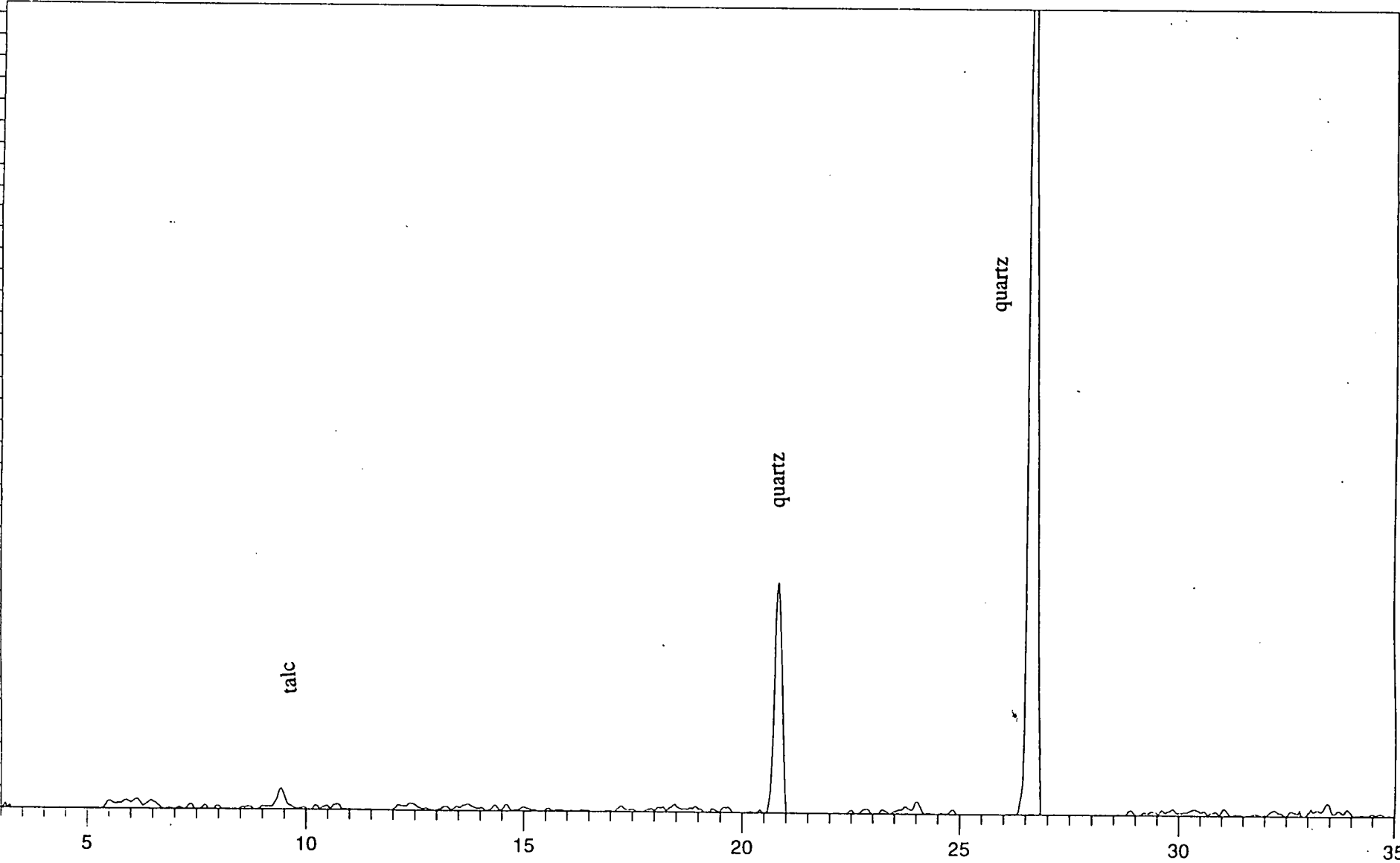
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quartz

30

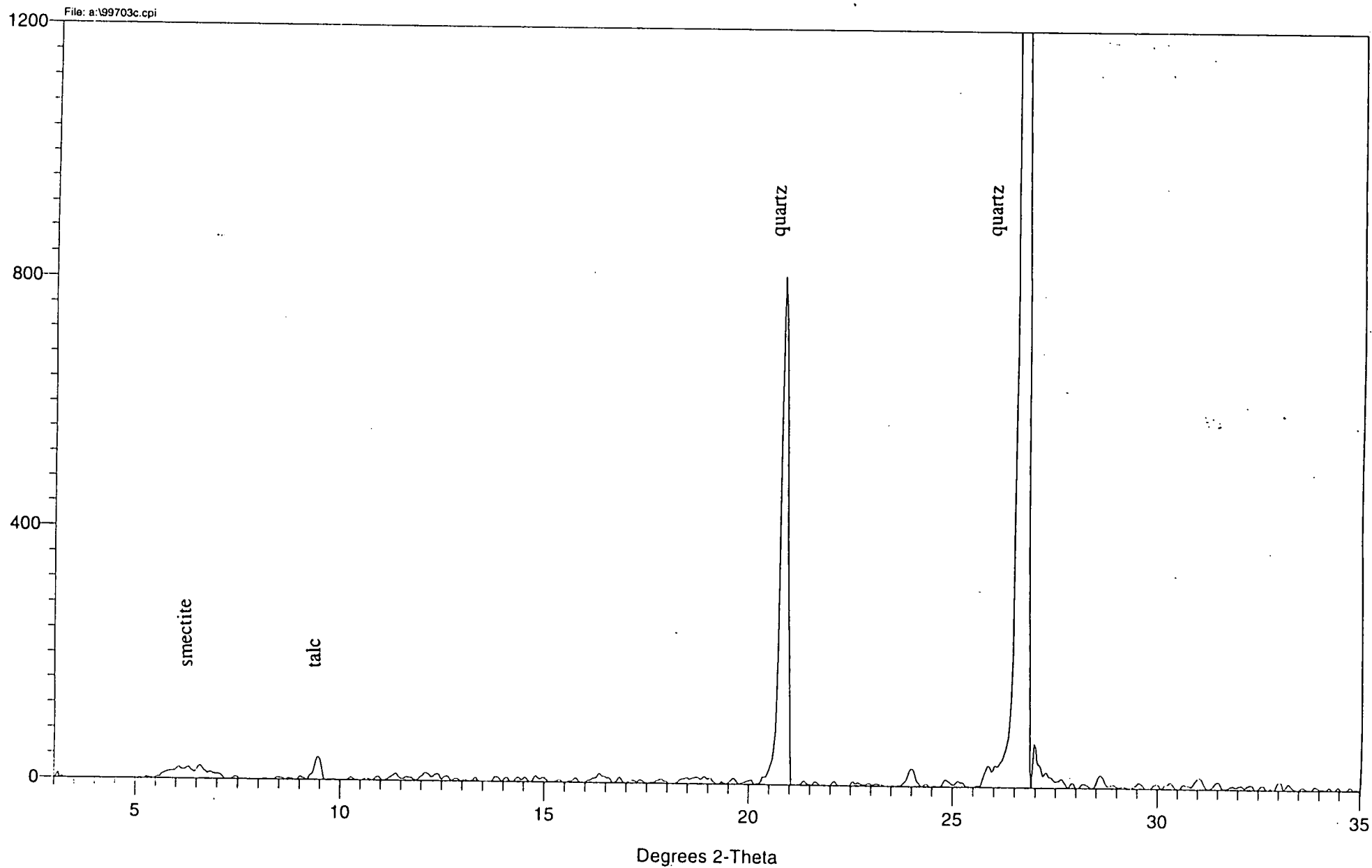
35

Degrees 2-Theta



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APPENDIX IV: CLIENT DATA



GOLDSTREAM MINING N.L.

A.C.N. 009 129 560

24th November 1998

Mr. Terry Leach
Terry Leach & Co.
Level 1
54 Ponsonby Road
AUCKLAND NEW ZEALAND

Dear Terry,

Enclosed with this note are sections & offcuts from our Mount Grainger prospect, located approximately 240kms north of Adelaide. Also attached in a note to us from Ian Freytag re – the samples and petrographic description by Pontifex and Associates.

The regional setting is typical Adelaide fold belt – elongate dome and basin structure in sequence of Neoproterozoic sandstone, mudstone, carbonate (dolomitic and calcitic) and various tillitic diamictites. Conventional wisdom has it that sequence is intruded by sediment (salt) driven diapiric breccias (which do occur elsewhere in the Flinders Ranges). However our field work has found increasing evidence that the breccias are of hydrothermal origin, speculatively sourced from fractionated Ordovician granitoids. We note extensive silica-sericite alteration, quartz veining, local haematite and magnetite alteration.

Gold mineralisation occurs in the area as structure controlled high grade veins, commonly stratabound, and in association with the breccias. In the latter we have found extensive (but always shallow) old time workings suggesting the prospectors never found enough grade (or a vein they could focus on). Regionally there is some evidence of fairly high temperature high salinity alteration associated with the auriferous veins but we do not have data specific to Grainger.

As noted in Ian Freytag's letter, Pontifex have identified or speculated on evidence for low temperature hydrothermal origins for alteration / mineralisation. We would like you, as experts on these sorts of systems, to take this work a step further. If we are on track that we may be dealing with potentially large mineralising system then there is a lot of blue sky in this region.

We look forward to your comments in relation to the alteration and potential mineralisation.

Regards

per David Edgecombe
Encl.

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MEMORANDUM for:

Mr Phil Greenhill
Goldstream Mining N.L.

18 November 1998

ROCK SAMPLES, EXPLORATION LICENCE No.2222

I have received the petrographic report from Pontifex and Associates on the remaining batch of rock samples from this area.

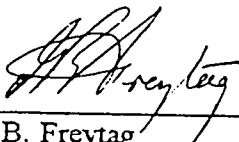
One of the more interesting aspects of these and previous descriptions is the evidence of alteration and prevalence of quartz of "low temperature hydrothermal origin" and, where it is seen to be replacive, "no clear identifiable protolith" has been reported.

In several samples in which fine grained quartz + sericite $\pm$ limonite are described (sometimes in clasts), a possible acid volcanic precursor has been suggested. In this geological environment as we know it, high-level intrusive would be more likely and, if confirmed, of special interest.

In the field, the silica-rich rocks tend to form massive, very hard outcrops often with a breccia appearance, sometimes with quartz and/or limonite veining. Spatially, they are closely associated with massive limonitic ironstones (rare pyrite), and in the case of location 99495, with a highly altered magnetite-rich rock.

We discussed the possibility of obtaining further opinion on these rocks, particularly with respect to alteration and silica varieties which might give us a lead on the local hydrothermal environment.

I enclose seven selected thin sections and corresponding rock slabs for that purpose.



I.B. Freytag
Consulting Geologist
19.11.98

Encl. Sample Nos. 99429, 99471, 99495, 99497, 99703, 99705, 99707

(2)

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PETROGRAPHIC ANALYSES OF FOURTEEN ROCK SAMPLES AND XRD ANALYSES OF THREE ROCK SAMPLES FROM MT GRAINGER AREA, SOUTH AUSTRALIA

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1. SUMMARY

- The sample suite is comprised of a variety of lithologies including; medium-grained mafic and intermediate intrusive rocks, an andesite, a lamprophyre, possible endoskarns, a fine grained sediment, inferred silicified carbonates, a hydrothermal breccia and two unknown lithologies.
- Secondary assemblages identified in the samples define the following alteration styles;
 1. Potassic style: defined by the presence of biotite with associated quartz – k-feldspar – calcite $\pm$ albite – tourmaline – magnetite – sulphides; formation of endoskarns at Mt Grainger is also in this category.
 2. Propylitic style: albite – actinolite / tremolite – tourmaline – epidote / clinozoisite – chlorite – sericite – zeolite – magnetite – hematite
 3. Phyllic-style: characterised by strong silicification and veining; quartz – sericite – sulphides $\pm$ hematite $\pm$ carbonate; replacement of calcareous lithologies, andesite; hydrothermal breccia
 4. Argillic-style: pervasive kaolinite replacement / deposition $\pm$ gypsum veinlets + ?hydrothermal microcrystalline calcite
 5. Supergene alteration: goethite / limonite, hematite, smectite, ? microcrystalline calcite, ?kaolinite, ?gypsum
- Mineralisation is either sparse or is masked by weathering. Chalcopyrite and pyrite occur with the endoskarn, and leached or supergene altered sulphides are recognised in a silicified carbonate. Brecciated quartz – sericite veining, a hydrothermal breccia and phyllic-altered andesite are also described.
- One sample (14) is pervasively replaced by talc possibly after hydrothermally altered serpentinite or dolomite
- The rock suite includes a combination of features similar to those observed of Carlin-type alteration / mineralisation, i.e; presence of mafic to intermediate intrusive lithologies, skarns, lamprophyre, silicified carbonate lithologies, pervasive quartz—sericite alteration, intense argillic alteration, Au mineralisation and associated anomalous As and Sb.
- It is recommended that an evaluation of the alteration styles and spatial distribution be conducted in order to develop;
 1. Inferred alteration zones and their relationship to geochemistry and lithology
 2. Models for fluid controls on mineralisation
 3. Fluid- flow models utilising alteration / mineralisation distribution integrated with structural analysis as an aid to future exploration.

2. INTRODUCTION

Ian and Mark Filsell submitted fifteen rock samples from the Mt Grainger area in South Australia for petrological evaluation. Ten of the samples were prepared as thin sections for petrographic study and four of the samples were prepared as polished thin section for combined mineragraphic-petrographic study. Three of the samples were selected for X-Ray Diffractometry (XRD) to identify clay species.

A summary of the results is given in Table 1.

Photomicrographs illustrating salient textural and mineralogical features in the samples are presented in Appendix II.

Petrographic reports, XRD charts and client data are presented in Appendices I, III and IV respectively.

Sample No.	Lithology	Alteration Replacement	Deposition	Mineralisation	XRD
1	Medium-grained ?endoskarn	1. Q → Ksp + Ct + To + Sul → Ct 2. ±Ch 3. Goe + ?Hm + Cv	1. Q (+ inclusions of Bio + To + Ct ± Py ± Cpy ± Rt) ± Ksp ± Bio → Ct + Sul (stockwork veinlets) 2. Ct (veinlet cavities in St.1, microfractures)	Cpy, Cv > Py	
2	Medium-grained intrusive ?porphyry endoskarn	1. Ksp + Q + Bio + To + Ct + Mt + ?Hm → Ct 2. Lim/ Goe + ?Hm	None observed		
3	Silicified carbonate lithology	1. Q (+ inclusions of Cb + Ser + Fe ox) 2. Fe ox + Jar; leaching	1. Q (cavities) 2. Jar + Lim (cavities)		
4	Coarse to fine-grained siliceous phyllic-altered, hydrothermal breccia	1. Q (+ Cb inclusions) + ferrug. ChcdQ + Ser + Cb 2. Hm + Lim/Goe	1. ChcdQ (vughs in clasts) 2. Q (+ inclusions of Cb + Ser ± Op) + Ser (hbx matrix) 3. Goe/Lim (fractures)		
5	Sheared, weakly vuggy, crenulated quartz-sericite altered rock	1. Q + Ser + Sul → deformation 2. Fe ox + mxlt Ct	1. A) Q ± Ser + Sul (veinlets) B) Q (vughs) 2. MxltCt (coatings to vughs, tension gash infill)		
6	Sparsely porphyritic k-feldspar – biotite plagioclase lamprophyre	1. Ab + Ct + Ch + Hm 2. Goe / Lim + ?Hm	1. Bio → Ms → Ct (vein, cavity fill) 2. Q ± Ms ± Mt → Hm + Ct (cavities) 3. Ct + Op (→ Goe/Lim) ± Ch → ± Hm (breccia matrix, fractures, veinlets)	Hm , Mt	
7	Sheared, tourmaline-actinolite-quartz-calcite-magnetite-hematite altered rock	1. To ± Act → Q → Mt → Ct + Hm 2. Lim	1. Ser + Ct → Ch (shear-related veinlets, fractures) 2.	Mt >> Hm	
8	Propylitic-altered medium-grained clinopyroxene-hornblende diorite / gabbro	1. Act + Ep + ?Op 2. Ser + Opaq 3. Ch → Ch-Sm 4. Goe / Lim	1. Ep (microveinlets) 2. Ch → Zeo (Heu) (microveinlets)		
9	Propylitic-altered medium to fine-grained gabbro	1. Trem ± Bio → Clz + Rt 2. Ser 3. Zeo	None observed		

3. LITHOLOGIES

3.1 Lithologies

The sample suite is comprised of a variety of lithologies including; medium-grained mafic and intermediate intrusive rocks, an andesite, a lamprophyre, possible endoskarns, a fine grained sediment, inferred silicified carbonates, a hydrothermal breccia and two unknown lithologies. Strong alteration masks primary textures and mineralogy in many samples.

3.1.1. Intrusive lithologies

Clinopyroxene hornblende gabbro (samples 8, 9 and 11).

The mafic compositions of the samples are inferred by the abundance of mafic minerals and in the case of sample 8 by the more defining plagioclase composition. Primary textures in sample 8 are principally defined by interlocking medium-grained andesine/labradorite tablets and laths intergrown with medium-grained subhedral to anhedral clinopyroxene >20vol% and a fox-red coloured hornblende, >20vol%. The relict textures in sample 9 indicate common medium to fine-grained mafic minerals after inferred clinopyroxene and hornblende typically poikilitically enclosing medium to fine-grained laths of plagioclase >25vol%. Sample 11 has coarser grained textures defined by common coarse-grained hornblende <7mm, 35-40vol% and medium-grained plagioclase (35-40vol%) with subordinate inferred clinopyroxene (<2.5mm, 15-20vol%). Fe Ti oxides are accessory in all samples.

Diorite (sample 10).

A medium-grained rock composed predominantly of interlocking laths and tablets of plagioclase (<3mm, 65-70vol%) with subordinate mafic crystals including probable hornblende (<7mm). Accessory Fe Ti oxides and occasional sphene accompany smaller plagioclase and mafic crystals within interstitial sites.

Lamprophyre (sample 6)

A sparsely porphyritic subvolcanic lithology with primary textures characterised by a few medium-grained plagioclase laths (<2mm, 2-3vol%) scattered within a pilotaxitic-textured groundmass defined by abundant slender laths of plagioclase intergrown with subordinate subhedral tablets of biotite. Fine-grained primary magnetite (3-5vol) and sparse zircon occur in interstitial sites.

Intrusive porphyries / endoskarns (samples ?1, 2)

Relict textures in sample 2 indicate altered tablets of feldspar inferred to be after plagioclase in a completely altered groundmass defined by fine-grained secondary minerals dominated by calcite. Sample 1 is almost completely replaced by secondary minerals. In sample 1, only a few relict medium-grained tabular plagioclase tablets enveloped mostly within secondary quartz and calcite suggest an igneous origin.

3.1.2 Volcanic lithology

Andesite (sample 15)

Porphyritic textures are defined by moderately common slender medium-grained laths to 2mm in length and finer-grained tablets set in a fine grained silicified groundmass.

3.1.3 Sedimentary lithology

Siltstone / very fine-grained sandstone (sample 13)

The rock consists of common silt to very fine-grained sand size, angular well sorted quartz and altered grains with altered matrix.

Breccias

?Silicified carbonate hydrothermal breccia (sample 4)

Coarse to fine-grained angular dark clasts of an indeterminate lithology are matrix-supported in a pale fine granular depositional quartz-sericite matrix. The clasts consist of fine equigranular quartz that may be in a fine-grained chalcedonic quartz matrix. Carbonate inclusions in the quartz suggest the quartz is either a carbonate replacement phase or has deposited from a CO_2 -rich fluid. The matrix in the clasts appears to be both replacement and depositional in character; in places the chalcedonic quartz dusted with cryptocrystalline hematite forms colloform banding overgrowing the quartz grains. The hydrothermal matrix equigranular quartz is similar to clast quartz and contains carbonate inclusions but lacks chalcedonic quartz. A tentative interpretation of the rock is a silicified brecciated carbonate in a quartz-sericite depositional matrix.

Oxidised brecciated quartz-sericite-pyrite-hematite veining (sample 12)

A brecciated polyphasal vein consisting of early coarse quartz deposition with clay altered inclusions, and tourmaline, apatite and sericite inclusions. The coarse quartz is overgrown by fine granular quartz + sericite + pyrite fractured and brecciated and infilled with sericite and dense limonite altered material and cut by late calcite fracture veinlets.

3.1.4 Unknown lithologies

Sample 3 is a rich reddish pink coloured rock composed of medium granular strained quartz enclosing and rimmed by crenulated sericite. The quartz is strongly dusted by cryptocrystalline hematite. The non definitive textures prevent identification of primary rock type.

Sample 7 consists of medium to fine-grained tourmaline and subordinate actinolite, quartz and magnetite with interstitial calcite and hematite. These minerals appear to constitute a replacement assemblage but have obliterated primary textures. The rock was sampled from an intrusive complex and may be a pervasively altered intrusion. Some of the tabular shapes defined by magnetite aggregates may be after relict primary crystal forms.

4. ALTERATION/DEPOSITION/ MINERALISATION

Alteration assemblages include potassic and propylitic style alteration and strongly silicified rocks.

1. Potassic-style alteration (quartz-biotite-calcite-actinolite): (samples 1, 2, 11)
This stage is defined by the presence of secondary biotite. Alteration intensity is strong in all samples. Green fine-grained biotite accompanies quartz, k-feldspar and coarse-grained calcite in samples 1 and 2 as replacement of the igneous host rock and in sample 1 as a stockwork veinlet system. K-feldspar and surrounding quartz partly to completely replaces plagioclase in these samples. Quartz, feldspar and calcite are host to small inclusions of biotite and tourmaline. The strong quartz-calcite replacement of these two rocks suggests they are possible endoskarns. A later phase of well crystalline calcite in both samples clearly partly replaces secondary k-feldspar. Minor fine-grained pyrite and chalcopyrite grains overgrow quartz and calcite alteration and veinlets in sample 1.
In sample 11, a gabbro, masses of fine-grained biotite and actinolite replace mafic phases and dusty albite replaces plagioclase.
2. Propylitic-style alteration (albite-actinolite-tremolite-epidote/clinozoisite-tourmaline-k-feldspar-magnetite-chlorite-sericite-calcite-zeolite) (samples 7, 8, 9, 10, 11)
Alteration intensity is moderately strong to complete. Albite typically replaces plagioclase in the igneous rocks, and actinolite or tremolite (sample 9) and epidote or clinozoisite (sample 9) strongly to completely replace the mafic phases. In some of these samples sericite replaces epidote and is fringed with chlorite after inferred clinopyroxene. Epidote is intergrown with and overgrows actinolite. K-feldspar alteration is minor and is related to a k-feldspar $\pm$ opaque-filled veinlet in sample 10. Zeolite of uncertain type locally replaces plagioclase in sample 8 and heulandite laths seal small occasional vughs in sample 9. Sample 7 is completely replaced by well-developed tourmaline with subordinate actinolite, quartz, fine-grained magnetite aggregates and interstitial calcite. This rock has been subsequently sheared and cut by shear-related veinlets and microfractures sealed with sericite and calcite.

3. Phyllic-style alteration / deposition : (quartz-chalcedonic quartz-sericite-sulphides) (samples 3, 4, 5, 12, 16)

All samples are pervasively altered. Sample 16 is a silicified andesite in which phenocrysts and groundmass are replaced by fine granular quartz, subordinate fine tabular sericite and disseminated pyrite. The strongly deformed siliceous sample 5 consists of strained granular quartz domains incorporating bent sericite flakes and locally crenulated sericite bands. The quartz is strongly dusted by red cryptocrystalline hematite. This sample lacks distinctive textures suggestive of a replaced lithology and may be quartz veining. Sample 3 is identified as a silicified marly carbonate on the basis of fine equigranular textures defined by replacement quartz which are host to inclusions of carbonate and sericite. A weathered band of leached pyrite is included within the silicification. The hydrothermal breccia sample 4 contains angular clasts of fine equigranular quartz enclosed in microcrystalline, ferruginous chalcedonic quartz. This chalcedonic quartz appears to be both replacement and depositional in cavities where it forms fine colloform bands. The clast quartz and the breccia quartz host microgranular inclusions of carbonate and sericite. The identity of the clast lithology is enigmatic. It is possibly a fine-grained sandstone or a silicified carbonate. The carbonate inclusions in clast quartz and matrix certainly indicate a significant bicarbonate component in the hydrothermal fluid. Sample 12 is a brecciated polyphasal quartz vein with an early stage of coarse quartz deposition with inclusions of tourmaline, apatite, sericite, an overgrowing finer grained quartz-sericite-pyrite assemblage followed by strong brecciation. The quartz-sericite fragments are sealed with limonite after an unknown phase, well-developed sericite flakes and sericite bands and pseudomorphed pyrite and occasional bladed hematite.

4. Argillic-alteration / deposition (kaolinite-gypsum) (sample 5, sample 12, sample 13)

Sample 13, a siltstone / very fine-grained sandstone is strongly overprinted by kaolinite and microcrystalline calcite. Fracture cavities sealed with kaolinite and traversed by gypsum microfractures are cut by a pervasive network of veinlets sealed with microcrystalline calcite + opaques of uncertain mineralogy. The kaolinite, which is locally well developed and which gives a sharp peak in the XRD chart, indicative of high crystallinity, is tentatively interpreted as a low-temperature hydrothermal phase although a supergene origin for some if not all of the clay cannot be excluded. Microcrystalline calcite also appears in vugs and tension gash infill in sample 5 and as a fracture veinlet in sample 12. The origins of microcrystalline calcite and gypsum are uncertain. Both minerals are possibly supergene alteration / deposition features which are common in arid climates.

5. Supergene alteration (goethite-limonite-hematite-smectite-?kaolinite-?calcite-?gypsum)

Opaques after sulphides or magnetite in weathered samples are typically replaced by goethite / limonite and hematite. Covellite and goethite strongly replaces chalcopyrite in sample 1. Much of the hydrothermal calcite in the endoskarns is strongly dusted with limonite. Strong hematite dusting of quartz in sample 5 strongly colours the rock to a distinctive reddish pink colour. As discussed in the previous section, the conditions of formation (ie low temperature hydrothermal versus supergene), of kaolinite and gypsum in sample 13 and microcrystalline calcite in several samples remains uncertain.

5. COMMENTS

5.1 Comments

Most of the rocks were sampled from two areas separated by 25-30km. The potassic / propylitic-altered intrusive rocks comprised of gabbros and diorite and the strained quartz-sericite ?vein sample are located to the northeast of Mt Grainger. Another gabbroic rock, sample 9 similar in texture to sample 8 is located 30km to the south south east of this intrusive group. The rest of the samples, from Mt Grainger, include a variety of lithologies and alteration styles including high-temperature-altered endoskarns, silicified carbonate with pyrite, quartz-sericite-altered hydrothermal breccia, lamprophyre and andesite and kaolinite altered fine-grained sediments. A pervasively talc-altered sample (XRD sample 14) inferred to be after a hydrothermally altered sheared serpentine or dolomite is also located proximal to the siliceous quartz-sericite samples.

The variety of lithologies and alteration assemblages requires detailed lithological and alteration mapping in order to understand the geological and hydrothermal history of the area. The inferred presence of a carbonate protolith suggests the possibility of skarn mineralisation proximal to magmatic heat / mineralising source (biotite – tourmaline) and disseminated gold mineralisation in a more distal setting (sericite, kaolinite). The common presence of carbonate inclusions in secondary quartz implies either a) relict carbonate from the replaced host rock, eg calcareous lithologies and possibly earlier calcite-altered rocks eg phyllic-altered andesite, sample 15; or b) a siliceous fluid with a carbonate component introduced from a more distal source by fluid interaction with calcareous rocks.

A number of petrological features considered significant in future modelling of the Mt Grainger system, include;

1. Presence of high temperature endoskarn alteration at Mt Grainger inferred to be early in the sequence of alteration events. Biotite indicates temperatures $>300^{\circ}\text{C}$ and near neutral pH conditions indicative of a porphyry-related environment; tourmaline implies a significant magmatic contribution to the fluids.
2. Distribution and extent of inferred silicified carbonate and hydrothermal brecciation. The ferruginous chalcedonic quartz with well-developed sericite indicates moderate temperatures and weakly acidic fluids. Quartz-sericite-pyrite alteration is associated with disseminated gold mineralisation in deposits within the Carlin Trend. The well crystalline habit of the sericite associated with chalcedonic quartz is unusual and suggests possible reheating of an earlier ?argillic event.
3. Presence of an ultramafic unit (altered to talc) possibly located within a ?thrust zone that may have acted as a deep-seated, structurally-controlled channelway to fluids. The talc, on the other hand, may be a product of hydrothermally altered dolomite.

4. Relationship of the igneous rocks, which include an phyllic-altered andesite and a chlorite-calcite-altered lamprophyre to other lithologies particularly to the silicified carbonates. These igneous lithologies are genetically and structurally significant in the disseminated gold deposits in Mesel (andesite) and within the Carlin trend (lamprophyres).
5. Determination of the relationship between distant intrusive group and the Mt Grainger rocks. The presence of tourmaline in both areas suggest a genetic link in the early alteration stages at least. Disseminated gold mineralisation at Mercur in Utah occurs in the peripheral zone of the large Bingham porphyry deposit 20km distant from its centre. The Battle Mountain deposit in the Carlin Trend is 1500m from the main copper deposits associated with granodiorite.
6. Determination of the origin of the microcrystalline calcite - gypsum overprint. This possible hydrothermal low temperature phase may be an important late mineralising event as tentatively suggested in one sample.

5.2 Discussion

Petrological observations of the present rock suite from Mt Grainger reveal a number of features that have also been observed in the disseminated gold mineralised deposits within the Carlin Trend in Nevada. These common features include the presence of skarns, silicified carbonate lithologies, pervasive quartz—sericite alteration, intense argillic alteration and anomalous As and Sb (I. Filsell, pers. comm.). Development of a paragenetic sequence of geological events, alteration and mineralisation at Mt Grainger remains elusive until a program integrating geological and structural mapping, alteration studies and geochemical characterisation of the area is undertaken. A sequence of geological events at Goldstrike in the Carlin Trend is given below as a possible aid to the understanding of the Mt Grainger system as exploration data becomes available;

Stage 1: Jurassic magmatism; diorite to granodiorite intrusions focussed in structures within calcareous units; and formation of zoned alteration skarns

Stage 2: Jurassic – Cretaceous; lamprophyre dykes:

Stage 3: Retrograde alteration / veining: quartz – sericite- chlorite – epidote $\pm$ dolomite + Cu + Pb + Zn + Cd + Ni $\pm$ trace Au; carbonate-quartz veining

Stage 4: Eocene magmatism: rhyolite dykes and sills and associated hydrothermal systems that exhibit a paragenetic sequence of

- i) decalcification of calcareous units with associated collapse and dissolution breccias
- ii) dolomitisation with associated volume loss and increased porosity
- iii)
 - a) silicification by cooling of upwelling fluids
 - b) argillisation by mixing of upwelling fluids and surficial fluids : kaolinite (at higher levels) – illitic clays – illite / sericite at deeper levels) $\pm$ quartz $\pm$ barite – realgar – orpiment – stibnite

Gold mineralisation is associated with arsenian pyrite / marcasite at interface of silicification and argillic alteration; associated geochemistry; anomalous Sb, As, Hg, Tl, Ag.

Note: two mineralisation events are identified; i) an early basemetal event associated with retrograde quartz-sericite-chlorite ($\pm$ epidote) $\pm$ calcite alteration / deposition and ii) the later main Au mineralisation event associated with silicification and argillisation. In the early stages of exploration, the two events were not clearly distinguished and caused some confusion. Pathfinder elements used for exploration were; As, Sb and Hg at shallow levels of the system $\rightarrow$ As, Sb Ag $\rightarrow$ As – Au at deeper levels.

5.3 Recommendations

An understanding of alteration mineralogy in terms of its distribution in space and time is an important strategy for targeting potential gold ore grade mineralisation. It is recommended that an evaluation of the alteration styles and distribution be conducted in order to develop;

1. inferred alteration zones and their relationship to geochemistry and lithology
2. models for fluid controls on mineralisation
3. fluid flow models utilising alteration / mineralisation distribution integrated with structural analysis as an aid to future exploration.

APPENDIX I: PETROGRAPHIC DESCRIPTIONS

Sample Number: 1

Rock Name:

A possible medium-grained endoskarn

Hand Specimen Description:

A part mottled, pale to siliceous rock and part beige to pale calcite-rich rock with sparse disseminated fine-grained pyrite and chalcopyrite, separated by locally limonite-stained fine-grained quartz $\pm$ calcite band and veinlets.

Thin Section Description - Lithology, Textures And Minerals:

The section is composed of an intensely altered lithology possibly after an intrusive rock and is distinguished by two distinct alteration areas. One part, Area 1, is composed of scattered tablets of partly altered multiply-twinned plagioclase isolated within quartz-k-feldspar alteration and veinlets and later calcite replacement. In a few places, the secondary calcite appears to have completely replaced other tabular crystals which are defined within fine-grained secondary quartz also. These relict primary textures suggest a strongly replaced intrusive texture possibly after an intermediate composition (?diorite). The other part, Area 2, is an intensely silicified and locally disrupted rock again with vague textures defined by very fine-grained quartz after tabular shapes enclosed in somewhat coarser grained quartz again suggestive of an intrusive rock. It must be noted that these inferred primary relict textures are poorly defined so the identification as an ?intermediate intrusive lithology is tentative.

Alteration:

Alteration Intensity: Very strong

Replacement Mineralogy

Area 1:

Plagioclase $\rightarrow$ partly replaced along crystal margins by a border of secondary K-feldspar + fine grained Quartz $\pm$ fine-grained Pyrite $\rightarrow$ overgrown by fine-grained spotting of Calcite. It is inferred that some plagioclase and inferred mafic crystals have been completely replaced by fine-grained equigranular Calcite $\pm$ Quartz $\pm$ minor overgrowing fine-grained Chalcopyrite and sparse orange-yellow Rutile.

Interstitial to primary minerals $\rightarrow$ fine-grained Quartz $\pm$ minor intergrown K-feldspar $\pm$ fine-grained Tourmaline $\pm$ Biotite $\rightarrow$ spottily overgrown by fine-grained Calcite. It is difficult in places to distinguish this quartz from an apparent fine-grained stockwork quartz veinlet system.

Both quartz and k-feldspar are host to occasional small inclusions of anhedral Tourmaline, pale green Biotite and Calcite. The pleochroic colours of tourmaline are typically pale olive green to pale indicative of Fe-rich schorlite. Biotite is locally replaced by poorly crystalline Chlorite.

The sulphides are strongly replaced by supergene minerals Goethite (after pyrite) and goethite + Covellite (after chalcopyrite). A few small Hematite grains with calcite and are probably after pyrite and / or magnetite.

Area 2:

Inferred tabular feldspar and mafic crystals $\rightarrow$ silicified to very fine-grained Quartz enclosed in minor interstitial relatively coarser grained Quartz. Both quartz types are host to microcrystalline Calcite + rare Tourmaline and Biotite. Occasional broad tabular and subrhombic Calcite crystals to 3mm (with inclusions of Quartz $\pm$ Biotite $\pm$ Sulphides) are enclosed in the quartz (within ?cavities).

Replacement Mineral Abundance

Calcite (40-50% of lithology), Quartz (35-40%), K-feldspar (7-10%), Biotite (0.1-0.3%), Tourmaline (0.07-0.1%), Pyrite (0.07-0.1%), Chalcopyrite (0.03-0.05%), Rutile (0.03-0.05%)

Deposition:

Sequences Of Deposition

- 1) Area 1 and Area 2 : cut by stockwork veinlets (15-20% of the area) sealed with fine granular Quartz (with inclusions of Biotite + Tourmaline + Calcite $\pm$ Pyrite $\pm$ Chalcopyrite $\pm$ Rutile). In Area 1 the quartz is also intergrown with minor intergrown K-feldspar. A broad band $\sim$ 0.5mm wide which defines the contact between the two alteration areas is composed of fine equigranular Quartz (+ common Calcite inclusions $\pm$ Biotite $\pm$ Sulphides $\pm$ Rutile) $\pm$ minor intergrown Biotite $\pm$ common interstitial Fe-oxide stained Calcite locally developed to coarse rhombs 3mm across + minor overgrowing Sulphides. Calcite inclusions in quartz are more common on the calcite-altered side suggesting the band is silicification front.
- 2) Veinlet cavities in quartz veinlets in Area 1 and microfractures cutting both areas are sealed with fine-grained Calcite.

Deposition Mineral Abundances

Quartz (25-30%), Calcite (5-7%), Biotite (0.03-0.05%), Tourmaline (0.007-0.01%)

Mineralisation

Pyrite Forms fine to very fine grains with k-feldspar and quartz alteration / veinlets; pyrite is locally completely replaced by goethite.

Chalcopyrite Occurs generally as occasional small subequant grains <0.5mm and very fine grains disseminated within calcite alteration and quartz in area 1; in fine-grained quartz alteration in area 2 and in quartz veinlets. Chalcopyrite is typically strongly replaced by covellite along (111) and/or goethite.

Mineral abundances

Chalcopyrite (→ Covellite, 0.3-0.5%), Pyrite (0.1-0.3%)

Comments:

Rock is interpreted as a strongly altered medium-grained intrusive lithology with strong silicification in part and quartz-k-feldspar-calcite replacement and deposition in part accompanied by minor sulphides. The silicification is interpreted to postdate quartz-kfeldspar-calcite alteration / veinlets. The intense calcite replacement is suggestive of skarn alteration, ie the rock is possibly an endoskarn. The presence of biotite and tourmaline indicate proximity to source intrusion.

Paragenesis

1. A) Calc-silicate alteration: quartz + k-feldspar ± biotite + coarse-grained calcite (with biotite inclusions) + tourmaline + sulphides → calcite
B) Silicification; quartz ± calcite + biotite ± tourmaline
2. minor chlorite
3. supergene overprinting; goethite + ?hematite + covellite

Sample Number: 2

Rock Name:

A possible medium-grained intrusive ?porphyry endoskarn.

Hand Specimen Description:

An orange-brown limonite-stained strongly calcite-altered porphyritic ?intrusive lithology with occasional tabular ?feldspar phenocrysts.

Thin Section Description - Lithology, Textures And Minerals:

An intensely altered rock with local relict primary intrusive textures evident. Scattered altered tablets to 2mm across (10-15%) after inferred plagioclase are enclosed with secondary mineralogy. In places, the distribution of secondary minerals suggests an intrusive porphyritic texture but this feature may be an artefact of alteration.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Plagioclase → completely replaced by poorly crystalline K-feldspar flecked with very fine-grained Biotite with small inclusions of Tourmaline ± fine-grained Opaques (Magnetite + Hematite) and fine-grained Calcite.

Rest of lithology → replaced by fine granular secondary Quartz + subequal amounts of fine-grained K-feldspar ± minor intergrown green Biotite locally developed into with patches + common euhedral tablets and rhombs of well developed Fe-stained Calcite to 3mm across. A clear coarser grained Calcite locally forms a matrix to these minerals. Quartz is host to small inclusions of biotite and tourmaline. The Fe stained calcite typically contains small inclusions of Biotite, anhedral Quartz and Opaques.

K-feldspar is commonly partly replaced by Calcite. Aggregates of medium to fine-grained Opaques (Magnetite + Hematite blades) locally form irregular streaks bordering quartz-rich patches.

Replacement Mineral Abundances

Calcite (45-50%), K-feldspar (20-25%), Quartz (15-20%), Biotite (5-7%), Opaques (3-5%), Tourmaline (0.03-0.05%)

Deposition:

None observed

Comments:

Inferred primary textures and alteration minerals and abundance suggest rock is a medium-grained intrusive ?porphyry endoskarn.

Paragenesis

1. Secondary k-feldspar + quartz + biotite + tourmaline + calcite + magnetite + ?hypogene hematite → calcite
2. Supergene limonite / goethite + ?hematite

Sample Number: 3

Rock Name:

A silicified carbonate lithology.

Hand Specimen Description:

A mottled pale to pale brown coloured fine-grained quartz rock with local red hematitic staining. a weathered band of leached fine-grained sulphides and occasional vughs to 3mm across.

Thin Section Description - Lithology, Textures, Minerals And Alteration:

Rock is composed almost exclusively of variably medium to fine-grained Quartz. The quartz crystals vary in shape with subequant granular to subrounded forms intergrown with subhedral prismatic forms. Both types contain common Carbonate and Sericite micrograins and locally, cryptocrystalline Fe oxides, and are rimmed by fine granular aggregates of clear Quartz ± occasional euhedral fine-grained Opakes (cubic pyrite, locally leached). Fine to medium-size shapes defined by the distribution of inclusions locally indicate intergrown textures inferred to after a carbonate protolith. In places, areas of clear quartz locally optically continuous with inclusion-rich quartz appear to rim or seal cavities and suggest recrystallisation of an earlier form of quartz. A curvilinear vuggy band with the quartz ~3mm wide is characterised by relatively common leached fine-grained Sulphides and red limonitic staining of adjacent quartz.

The rock appears to be a silicified carbonate rock.

Replacement Mineral Abundances

Quartz (90-95%), Limonite (2-3%), Carbonate (0.7-1%), Sericite (0.1-0.3%), Opakes (0.07-0.1%)

Deposition:

Sequences Of Deposition

- 1) Cavities (3-5%) → sealed with medium to fine-grained recrystallised granular, dogtooth and subhedral prismatic Quartz with occasional residual cavities.
- 2) Cavities within leached sulphide bands → sealed with microcrystalline aggregates of Jarosite and Limonite.

Comments:

Common carbonate and sericite inclusions within secondary quartz suggest rock was a marly carbonate lithology.

Paragenesis

1. quartz + sericite + carbonate → quartz + sulphides
2. Supergene Fe oxides, jarosite, leaching

Sample Number: 4

Rock Name:

A coarse to fine-grained siliceous hydrothermal breccia with quartz-sericite alteration / deposition.

Hand Specimen Description:

A siliceous crackle breccia composed of coarse to fine-grained dark to dark red hematitic angular siliceous clasts in a strongly orange-coloured limonite-stained quartz matrix.

Thin Section Description - Lithology, Textures, Minerals And Alteration:

A coarse to fine-grained hydrothermal breccia. Coarse to fine-grained angular blocky to sliver shaped clasts are matrix-supported within a siliceous hydrothermal breccia matrix. Crackle textures are locally developed in the breccia clasts. The clasts are composed of fine-granular subangular Quartz + scattered fine-grained flakes of well crystalline Sericite in a matrix of microcrystalline Chalcedonic Quartz typically dusted by cryptocrystalline Fe oxides ± Sericite flakes. The quartz grains locally host subrounded microgranular inclusions of Carbonate. The quartz in some clasts is rimmed by Limonitic staining. The ferruginous chalcedonic quartz is locally colloform banded as overgrowing rims to the quartz grains. In some clasts the chalcedonic quartz forms narrow bands. Rare goethite-altered ?sulphides are disseminated within the clasts.

The original clast lithology is uncertain; the quartz grains are possibly of sedimentary origin; the chalcedonic quartz is possibly after altered grains ie clasts are a fine-grained well sorted sandstone. The common carbonate inclusions however suggest a possible carbonate protolith. The clasts are distinguished in HS as very dark / dark red coloured.

?Replacement Mineral Abundances

Quartz (50-60% of clasts), Chalcedonic Quartz (25-30%), Sericite (7-10%), Fe oxides (2-3%)

Deposition:

Sequences Of Deposition

- 1) A few small vughs in the clasts are lined with clear fine-grained Chalcedonic Quartz locally overgrowing alteration ferruginous Chalcedonic Quartz.
- 2) Extensive hydrothermal breccia matrix (45-50% of section) distinguished in HS as orange coloured, limonite-stained) → composed of granular mostly equigranular Quartz rimmed by and host to scattered well developed Sericite flakes (7-10%). Quartz is occasionally host to small inclusions of Carbonate, less common Sericite and rare Opauques and dusted with cryptocrystalline Hematite / Limonite. It is locally fractured in places and stained strongly by microcrystalline Goethite / Limonite especially adjacent to some clasts.

Comments:

A coarse to fine-grained siliceous hydrothermal breccia with quartz-sericite alteration / deposition. Primary lithology of clasts is uncertain; possible a fine-grained sandstone. Angular clasts with local crackle breccias suggest only limited movement of breccia.

Paragenesis

1. Alteration / deposition; quartz + chalcedonic quartz + sericite + carbonate
2. Supergene overprinting; hematite + limonite / goethite

Sample Number: 5

Rock Name:

A strongly sheared, weakly vuggy, crenulated, pervasively altered quartz-sericite altered lithology of unknown primary lithology

Hand Specimen Description:

A reddish pink coloured hematitic-stained siliceous rock with common fibrous pale sericite, small fine sized vughs and cut by two thin dark quartz veinlets. <1mm wide.

Thin Section Description - Lithology, Textures, Minerals And Alteration:

An intensely sheared altered rock with primary textures and mineralogy completely obliterated by alteration, deformation and recrystallisation. The section is composed predominantly of intergrown granular medium to fine-grained domains ~1- 1.5mm across composed of strained Quartz rimmed by and hosting fibrous locally well developed Sericite ± minor disseminated altered fine-grained Sulphides. The quartz is locally recrystallised to small domains of unstrained subhedral prismatic aggregates. The sericite typically defines a crenulated cleavage, which is not persistent through the section but is discontinuous and usually limited to its granular quartz host. A few elongate ?primary opaques altered to hematite have been fractured and cemented by recrystallised quartz.

The sericite is locally replaced by pale Chlorite or partly replaced by microcrystalline Calcite adjacent to vughs.

The quartz is strongly dusted by cryptocrystalline Fe oxides. Small vughs (1-2%) of regular tabular to irregular shape are scattered through the rock. Sulphides are altered to Fe oxides.

Replacement Mineral Abundances

Quartz (75-85%), Sericite (10-15%), Calcite (1-2%), Fe oxides (2-3%), Chlorite (0.7-1%), Sulphides (→ Fe oxides (0.7-1%))

Deposition:

Sequences Of Deposition

- 1) A) Two subparallel Quartz veinlets ~0.8mm wide are sealed with fine granular clear unstrained Quartz + occasional fine-grained disseminated altered Sulphides. Minor fibrous Sericite traverse the quartz suggesting the veinlets formed near the end of deformation event.
B) Vughs locally lined or sealed with clear Quartz
- 2) Minor coatings to some vughs and infill to small tensions gashes orthogonal to veinlets composed of microcrystalline Calcite (2-3%).

Comments:

A strongly sheared, pervasively altered quartz-sericite altered lithology of unknown primary lithology. The granular textures of the quartz may be partly due to hornfels metamorphism as well as deformation. No k-feldspar was observed in this rock.

Paragenesis

1. alteration quartz + sericite + sulphides → deformation;
2. quartz ± sericite ± sulphides veinlets;
3. supergene overprinting; Fe oxides + microcrystalline calcite



Sample Number: 6

Rock Name:

A sparsely porphyritic biotite-plagioclase lamprophyre (kersantite)

Hand Specimen Description:

Grey-green feldspar fine-grained biotite-feldspar ?subvolcanic rock ?lamprophyre cut locally by dense network of orange-stained calcite veinlets and veins.

Thin Section Description - Lithology, Textures And Minerals:

A weakly altered, medium to fine-grained, sparsely porphyritic-textured, fine-grained subvolcanic lithology. The primary textures are principally defined by abundant flow-aligned, slender, multiply-twinned plagioclase laths intergrown with subordinate subhedral tablets of fine-grained biotite. Somewhat larger laths (phenocrysts) of plagioclase (<2mm in length, 2-3%) are sparsely distributed through the rock. Interstitial sites are composed of subhedra to granular feldspar + biotite and fine-grained primary magnetite grains (3-5%). Sparse zircon micro prisms occur within the interstitial sites.

Alteration:

Alteration Intensity: Weak to moderate

Replacement Mineralogy

Plagioclase → unaltered or locally replaced by dusty Albite → and locally flecked with Chlorite.

Biotite → unaltered or partly replaced by Quartz along cleavage or partly to completely replaced by Chlorite ± Calcite

Magnetite → partly to completely replaced by Hematite

Interstitial sites → locally replaced by Calcite and / or Chlorite.

Calcite is locally strongly stained by cryptocrystalline Fe oxides (Goethite).

Replacement Mineral Abundances

Calcite (7-10%), Chlorite (7-10%), Hematite (2-3%)

Deposition:

Sequences Of Deposition

- 1) An irregular vein <2mm wide → sealed with aggregates of fine tabular Biotite followed by Sericite by Calcite; the vein has been strongly disrupted by later Calcite-filled fractures / veinlets.
- 2) Several small cavities (0.3-0.5%) → sealed with fine-granular Quartz ± Muscovite ± fine granular Magnetite (strongly altered to Hematite) ± overgrowing bladed Hematite + Calcite stained with cryptocrystalline Limonite. The quartz is host to secondary and possible primary fluid and liquid-rich fluid inclusions.; the latter contain halite daughter crystals.
- 3) Brecciation, fractures, veinlets (5-7%) → sealed with Calcite ± altered disseminated fine-grained Opaques (altered to Goethite / Limonite probably after Magnetite) ± Chlorite. Calcite is typically overprinted by cryptocrystalline Limonite / Goethite which forms bands of fine fibrous Limonite following the calcite. In places, aggregates of curved bladed Hematite overgrown the calcite. Small angular host rock fragments are matrix-supported in the calcite in places.
- 4) Late irregular calcite veinlets crosscutting St. 3 Fe-calcite deposition (1-2%) → sealed with clear Calcite with minor host rock fragments.

Mineralisation

Magnetite It is difficult to distinguish primary and inferred secondary magnetite within the wallrock. Secondary magnetite is inferred where it is associated with quartz and calcite infill.

Hematite Bladed aggregates overgrow quartz and calcite. No relict magnetite was observed with the hematite and is it inferred that the latter is hypogene associated with calcite.

Mineral abundances

hypogene Hematite (1-2%), secondary magnetite (?1-2%)

Comments:

The rock is identified as a lamprophyre with a dominant plagioclase-biotite mineralogy and is thus classified as a kersantite. Kersantites are commonly associated with diorite and occasionally with granodiorite and monzonites. Early biotite veining is followed by quartz-muscovite deposition and later calcite-chlorite-hematite alteration / deposition. The biotite in the wallrock appears to be all primary. The tabular form of the vein biotite is very similar to the primary biotite; the biotite-quartz-muscovite is possibly a late magmatic phase.

Paragenesis

1. ?late magmatic veining / cavity-fill; biotite→ muscovite-quartz-magnetite
2. Alteration / veining/ brecciation: albite + calcite + chlorite + hematite
3. Supergene overprinting: goethite / limonite + ?hematite

Sample Number: 7

Rock Name:

A tourmaline-actinolite-quartz-calcite-magnetite-hematite replaced rock with shear-related sericite-calcite fractures and veinlets.

Hand Specimen Description:

A dark brown to grey sheared rock of medium-grained tourmaline, magnetite and calcite cut by abundant wavy shear fractures / veinlets sealed with pale sericite-calcite.

Thin Section Description - Lithology, Textures, Minerals And Alteration:

Section is composed of a variety of secondary minerals with no relict primary textures and mineralogy recognised. The principal mineralogy consists of well crystalline aggregates of prismatic and granular Tourmaline (Schorl) and minor acicular Actinolite, typically enclosed by patches of Quartz, fine-grained aggregates of Magnetite and/or Calcite (strongly dusted with cryptocrystalline Limonite). Magnetite is locally overgrown by well-developed aggregates of bladed Hematite. Hematite also typically partly replaces Magnetite. Calcite is host to common microlaths of Rutile.

Replacement Mineral Abundances

Tourmaline (30-40%), Magnetite (15-20%), Quartz (7-10%), Calcite (7-10%), Actinolite (3-5%), Hematite (1-2%), Rutile (0.7-1%)

Deposition:

Sequences Of Deposition

- 1) Rock cut by common subparallel shear veinlets, fractures (7-10%) sealed with Sericite and/or Calcite. Shearing has formed micro boudinage textures with elongate tourmaline-quartz-magnetite bodies to 5mm enveloped with the sericite-calcite veinlets/ fractures. Fracturing has locally finely brecciated tourmaline and quartz in places. Sericite is commonly partly to completely replaced by Chlorite (3-5%).

Mineralisation

Magnetite Occurs as fine-grained aggregates to 3mm across, overgrowing tourmaline and quartz or as dense patches with fine-grained interstitial calcite. Magnetite is partly replaced by hematite

Hematite Medium to fine-grained blades of hematite locally overgrow tourmaline and magnetite.

Mineral abundances

Magnetite (15-20%), Hematite (0.7-1%)

Comments:

A tourmaline-actinolite-quartz-calcite-magnetite-hematite replaced rock with shear-related sericite-calcite fractures and veinlets. No evidence of a primary igneous lithology was recognised.

Paragenesis

1. tourmaline ± actinolite → quartz → magnetite → calcite + hematite
2. shearing; fractures / veinlets; sericite + calcite → chlorite
3. supergene overprinting; limonite

Sample Number: 8

Rock Name:

A propylitic-altered medium-grained clinopyroxene / hornblende diorite / gabbro

Hand Specimen Description:

A medium-grained intermediate to mafic rock with pale feldspar laths and tablets, enclosed in subequal amounts of broad aggregates of brown to dark green mafic minerals

Thin Section Description - Lithology, Textures And Minerals:

A medium-grained intermediate to mafic intrusive lithology. Primary textures are defined by interlocking tablets and slender laths of multiply-twinned plagioclase (andesine/labradorite, 1-7 mm in length, 45-50%) intergrown with and overgrown by subhedral to anhedral clinopyroxene (<4mm, >20%) and subhedral to anhedral fox-red hornblende (<5mm, >20%). Smaller plagioclase is poikilitically enclosed within the mafic minerals. Fe Ti oxides are accessory.

Alteration:

Alteration Intensity: Moderate to strong

Replacement Mineralogy

Plagioclase → partly replaced by alteration veinlets and small aggregates of fine-grained well crystalline Epidote = Chlorite

Clinopyroxene / Hornblende → a) partly to completely replaced by Actinolite + Epidote ± occasional violet Piedmontite → Chlorite or b) partly to completely replaced by well crystalline Sericite/Muscovite + fine-grained Opaques (?Magnetite) enclosing Epidote-altered cores; sericite is fringed on rims by an inner band of fine-grained pale Chlorite and outer band of green Chlorite-Smectite. Sericite is also stained with cryptocrystalline Limonite / Goethite after weathered opaques.

Fe Ti oxides → some grains are replaced by microcrystalline Epidote ± Actinolite with Opaque lamellae

Replacement Mineral Abundances

Actinolite (20-25%), Epidote (20-25%), Sericite (20-25%), Chlorite (7-10%), Chlorite-Smectite (5-7%), Piedmontite (0.7-1%)

Deposition:

Sequences Of Deposition

- 1) Microveinlets (1-2%) → sealed with very fine-grained Epidote
- 2) Microveinlets (1-2) → sealed with Chlorite with local infill by fine-grained laths of Zeolite (Heulandite).

Comments:

A propylitic-altered medium-grained clinopyroxene / hornblende diorite / gabbro

Paragenesis

1. actinolite + epidote + piedmontite + ?opaques
2. sericite + opaques alteration
3. chlorite alteration / deposition → zeolite deposition
4. chlorite-smectite
5. Fe oxides

Sample Number: 9

Rock Name:

A propylitic-altered medium to fine-grained mafic intrusive lithology; gabbro

Hand Specimen Description:

A medium-grained intermediate / mafic intrusive rock with relict greenish coloured feldspar enclosed in common broad aggregates of brown/green coloured mafic minerals.

Thin Section Description - Lithology, Textures And Minerals:

A medium to fine-grained mafic intrusive rock with primary textures strongly masked by alteration. Relict textures are mostly defined by secondary minerals which indicate broad subhedral to anhedral crystals of mafic crystals (<5mm across, 70-75%) after inferred pyroxene and/or hornblende intergrown with and poikilitically enclosing medium to fine-grained euhedral laths of partially altered plagioclase (>25%). Fe Ti oxides are accessory (2-3%).

The rock is identified as a gabbro on the basis of abundance of mafic minerals.

Alteration:

Alteration Intensity: Very strong

Replacement Mineralogy

Plagioclase → strongly to completely replaced by fine-grained well crystalline Clinozoisite ± pale green Tremolite.

Trace Sericite locally overgrows clinozoisite. Small areas of anhedral Zeolite locally replaces some plagioclase.

Mafic crystals → completely replaced by medium to fine-grained aggregates of pale green Tremolite ± Clinozoisite.

Fe Ti oxides → completely replaced by Tremolite with Rutile micrograins along exsolution lamellae.

Replacement Mineral Abundances

Tremolite (60-65%), Clinozoisite (30-35%), Rutile (0.3-0.5%), Sericite (0.1-0.3%)

Deposition:

None observed

Comments:

A propylitic-altered medium-grained mafic intrusive lithology; gabbro. The rock is possibly co magmatic with sample 8.

Paragenesis

1. tremolite + clinozoisite + rutile → sericite
2. zeolite

Sample Number: 10

Rock Name:

A strongly propylitic-altered, medium-grained diorite

Hand Specimen Description:

A strongly altered medium-grained intermediate / mafic intrusive rock with relic pale plagioclase and strong pistachio-green-coloured epidote and dark green actinolite replacement of plagioclase and mafic minerals: rock cut by thin Fe-stained veinlet (k-feldspar with minor opaques).

Thin Section Description - Lithology, Textures And Minerals:

A medium-grained, intermediate intrusive lithology. Rock consists of interlocking laths, (some slender) and tablets of plagioclase (<3mm, (65-70%)), enclosed within subhedral to anhedral altered mafic crystals (<7mm) including probable hornblende. Occasional interstitial sites consist of fine grained intergrowths of plagioclase and mafic crystals. Fe Ti oxides are accessory. Small sphene grains are present in sparse amounts within interstitial sites.

Rock is identified as a medium-grained ?hornblende diorite

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Plagioclase → completely replaced by dusty Albite, spotted with fine-grained well crystalline Epidote and flecked with Chlorite. Crystals near a k-feldspar veinlet are partly replaced by secondary K-feldspar.

Mafic crystals → locally altered to pale green Actinolite / Tremolite ± Epidote or mostly by well crystalline aggregates of Epidote and minor Chlorite. Epidote forms broad patches to 7mm across possibly developed from mafic crystal aggregates. In places chlorite strongly overprints epidote.

Replacement Mineral Abundances

Albite (50-55%), Epidote (35-35%), Chlorite (10-15%), Actinolite/Tremolite (5-7%), K-feldspar (3-5%)

Deposition:

Sequences Of Deposition

- 1) Veinlet 1mm wide (1-2%) → sealed with fine-grained K-feldspar + minor overgrowing weathered Opaques (→ hematite). K-feldspar lining vughs within the veinlet are stained on crystal margins by amorphous red Fe oxides derived from the weathered opaques. Veinlet is followed by a weak narrow k-feldspar alteration selvage developed within wallrock plagioclase.

Comments:

A strongly propylitic-altered (albite, actinolite, epidote, k-feldspar, chlorite) medium-grained diorite. No shearing or deformation was evident in this sample (see field description)

Paragenesis

1. Albite + actinolite + epidote → chlorite
2. K-feldspar ± opaques
3. Hematite + amorphous Fe oxides

Sample Number: 11

Rock Name:

A potassic / propylitic-altered, coarse to fine-grained clinopyroxene hornblende diorite / gabbro.

Hand Specimen Description:

A strongly altered medium-grained intermediate / mafic intrusive rock with relic pale plagioclase and strong pistachio-green-coloured epidote, brown biotite and dark green chlorite replacement of plagioclase and mafic minerals;

Thin Section Description - Lithology, Textures And Minerals:

A strongly altered, coarse to fine-grained intermediate / ?mafic intrusive lithology. Textures are characterised by medium to fine-grained laths of plagioclase (<3mm, 35-40%) intergrown with possible medium-to fine-grained subhedra to anhedral clinopyroxene (<2.5mm, 15-20%); both these minerals are overgrown by and locally poikilitically enclosed within coarse to medium-grained euhedral tablets and broad anhedral patches of hornblende (<7mm, 35-40%). Interstitial sites are sealed with fine-grained secondary minerals. Fe Ti oxide grains to 1.5mm across are accessory.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Plagioclase → completely replaced by dusty Albite with minor to strong fine-grained Epidote and Chlorite overprinting. Sericite locally accompanies chlorite in some grains.

Clinopyroxene → completely replaced by fine granular aggregates of well crystalline Epidote.

Hornblende → partly to completely replaced by fine-grained aggregates of green secondary Biotite ± Actinolite ± Epidote; biotite is locally replaced by Chlorite.

Interstitial sites → composed of fine-grained Epidote ± bladed Chlorite.

Fe Ti oxides → replaced by Leucoxene

Replacement Mineral Abundances

Chlorite (35-40%), Albite (25-30%), Biotite (15-20%), Epidote (15-20%), Actinolite (5-7%), Leucoxene (1-2%)

Deposition:

Sequences Of Deposition

- 1) Small rare cavities (0.3-0.5%) lined with Epidote ± Chlorite.

Comments:

A potassic / propylitic-altered (albite, biotite; actinolite, epidote, chlorite, leucoxene) coarse to fine-grained clinopyroxene hornblende diorite / gabbro. The abundance of mafic minerals suggests a gabbro composition. Textural and mineralogical similarities with sample 8 suggest these rocks are either from the same magmatic event or co magmatic.

Paragenesis

1. albite + biotite
2. actinolite + epidote + chlorite + leucoxene

Sample Number: 12

Rock Name:

Weathered, brecciated quartz-sericite-pyrite-hematite deposition with late calcite fracture veining.

Hand Specimen Description:

Pale angular to subangular, coarse to fine-grained angular quartz clasts are matrix-supported in a dense limonite-altered matrix with sericite; the matrix is cut by dense brown-orange calcite fracture / veinlet.

Thin Section Description – Lithology:

Rock consists entirely of depositional minerals

Deposition:

Sequences Of Deposition

- 1) Early coarse to medium-grained strained Quartz crystals some with pyramidal terminations; quartz is host to minor very small prisms of Tourmaline, Apatite and Sericite. Some quartz also is host to tabular and subhedral crystals to 1mm across completely altered to Kaolinite + Smectite. Quartz is also host to abundant trains of secondary liquid-rich fluid inclusions. The coarse quartz is locally recrystallised to finer grained subdomains.
- 2) Overgrowths to St.1 ; fine-granular Quartz ± altered pyritohedral Pyrite + fibrous Sericite.
- 3) Brecciation and fracturing of St 1/2 → clasts of St.1 and 2 to 15mm across and fine fractures cutting the clasts are sealed within dense microcrystalline Goethite after unknown massive mineral which is host to scattered Pyrite + fibrous Sericite and Sericite veinlets. In places, sericite is intergrown by aggregates of bladed hypogene Hematite.
- 4) Fracture veinlet (2-3%) → small fragments of earlier stages are supported within strongly limonite stained microcrystalline Calcite.

Deposition Mineral Abundances

Goethite / Limonite (55-60%), Quartz (35-40%), Sericite (7-10%), Pyrite (→ Goethite, 1-2%), Calcite (2-3%), Hematite (0.1-0.3%)

Mineralisation

Pyrite Fine euhedral pyritohedral grains, completely altered to goethite, are intergrown with St.2 quartz and sericite and are enclosed in the St.3 goethite matrix.

Hematite Sparse bladed aggregates are associated with sericite in goethite matrix

Mineral abundances

Altered pyrite (1-2%), Hematite (0.1-0.3%)

XRD Minerals:

Quartz, sericite, smectite, goethite

Comments:

Weathered, brecciated, quartz-sericite-pyrite-hematite deposition. The well developed sericite and presence of tourmaline and apatite indicate early moderately high hydrothermal temperatures. The microcrystalline character of calcite in fracture suggests it is possibly supergene in origin.

Paragenesis

1. Coarse-grained quartz ± tourmaline ± apatite deposition
2. Fine-grained quartz + sericite + pyrite overgrowths'
3. Deformation, fractures, brecciation; unknown phase (→ goethite) + sericite + hematite + pyrite
4. Fracture veinlet; calcite
5. Supergene overprinting; goethite / limonite ± kaolinite / smectite.

Sample Number: 13

Rock Name:

Strongly-argillic-altered siltstone, very fine-grained sandstone

Hand Specimen Description:

A white, pervasively, kaolinite-altered very fine-grained ?sediment with kaolinite fracture-cavity fill (cut by gypsum veinlets) and common late brown limonite-stained calcite microveinlets / microfractures.

Thin Section Description - Lithology, Textures And Minerals:

An altered siltstone. very fine-grained sandstone. Common angular, well sorted, silt to very fine sand-size (0.01-0.1mm) quartz grains and altered grains mostly after inferred feldspar, are matrix-supported with a microcrystalline altered matrix. A few multiply-twinned plagioclase grains were observed.

Alteration:

Alteration Intensity: Very strong

Replacement Mineralogy

Altered grains / matrix → replaced by secondary K-feldspar strongly overprinted by microcrystalline Kaolinite = Smectite. Parts of the sediment are also flooded with microcrystalline Calcite related to veining.

Replacement Mineral Abundances

Kaolinite (40-50% of sediment), Calcite (15-20%), K-feldspar (15-20%), Smectite (5-7%)

Deposition:

Sequences Of Deposition

- 1) Fracture cavities, veinlets (10-12%) → sealed with both very fine-grained well-developed Kaolinite and more common microcrystalline Kaolinite dusted with microcrystalline Smectite.
- 2) Minor microveinlets cutting St.1 kaolinite (0.5-0.7%) → sealed with fibrous Gypsum
- 3) Extensive network of anastomosing vuggy veinlets ((15-20%) cutting both St 1/ 2 → sealed with finely banded crustiform and colloform microcrystalline Calcite with trace small bodies of cryptocrystalline fine-grained Opaque material (altered to ?Fe / manganese oxide staining) lining the veinlets or locally sealing the central parting of the veinlets. The calcite veinlets are distinctly, weakly stained by red amorphous Fe oxides possibly derived from the associated opaques,

XRD Minerals:

Kaolinite, quartz, calcite, k-feldspar, smectite

Comments:

A k-feldspar-altered siltstone / very fine-grained sandstone lithology overprinted by intense argillic-alteration (kaolinite, ?calcite) and cut by pervasive network of calcite veinlets. Kaolinite is possibly both argillic and supergene in origin. The origin of calcite veinlet network within the sediment remains equivocal. The microcrystalline calcite and vuggy nature of the veinlets suggests that the veinlets are possibly related to shrinkage cracks within the intense kaolinite alteration and have been infilled by supergene calcite / calcrete -type deposition. The selective Fe staining of veinlets and fine grained opaque material however suggest possible sulphides (weathered) associated with low temperature calcite deposition. The origin of gypsum is likewise uncertain ie ?hydrothermal versus supergene deposition.

Paragenesis

1. k-feldspar
2. kaolinite → gypsum veinlets
3. calcite → ± opaques (?Fe / manganese oxide)
4. supergene overprinting ?smectite

Sample Number: 15

Rock Name:

A pervasively phyllic-altered (quartz, sericite) medium to fine-grained porphyritic ?andesite volcanic rock.

Hand Specimen Description:

A buff coloured, pervasively silicified, porphyritic volcanic rock characterised by a set of moderately common, medium-grained slender laths and a finer-grained set of tabular laths set in a fine-grained groundmass.

Thin Section Description - Lithology, Textures And Minerals:

An intensely silicified, medium to fine-grained, porphyritic intermediate volcanic rock. Relict primary textures are defined by a distinct bimodal phenocryst assemblage consisting of common silicified pseudomorphed slender laths (15-20%) to 2mm in length and finer grained tablets (15-20%) set in a fine granular silicified groundmass. A few scattered vughs with irregular shapes to 4mm are possibly primary or the result of leaching and textural destruction..

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocryst → replaced by clear fine grained Quartz ± fine-grained tabular Sericite.

Groundmass → replaced by fine granular Quartz + intergrown fine-grained tabular Sericite ± disseminated fine-grained cubic shaped Pyrite (altered to Limonite); quartz is strongly dusted with cryptocrystalline brown Limonite + ? Smectite.

Quartz is host to occasional small inclusions of Carbonate and Sericite.

Replacement Mineral Abundances

Quartz (80-85%), Sericite (10-15%), Limonite / ? smectite (3-5%)

Deposition:

Sequences Of Deposition

- 1) Several veinlets < 0.5-1mm wide (1-2%) → sealed with mainly clear fine granular Quartz ± fine tabular Sericite intergrowths. Quartz is host to occasional small inclusions of Carbonate and Sericite.

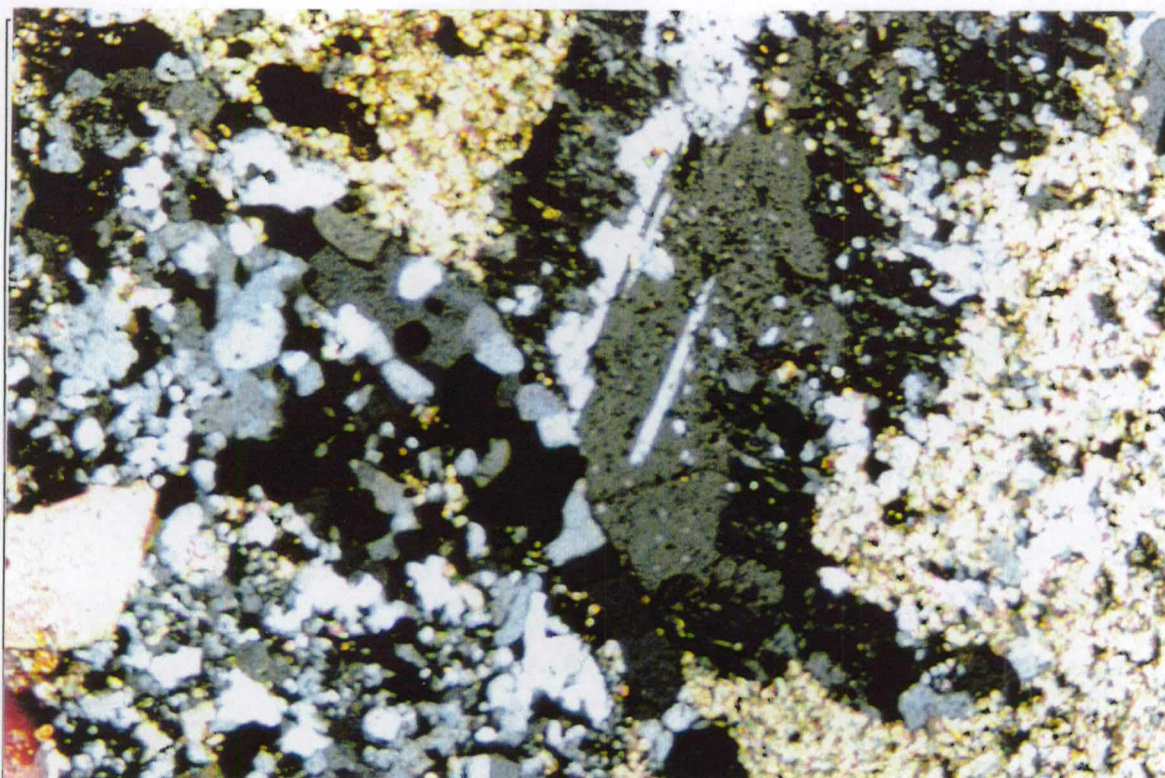
Comments:

A pervasively phyllic-altered (quartz, sericite) medium to fine-grained porphyritic ?andesite volcanic rock.

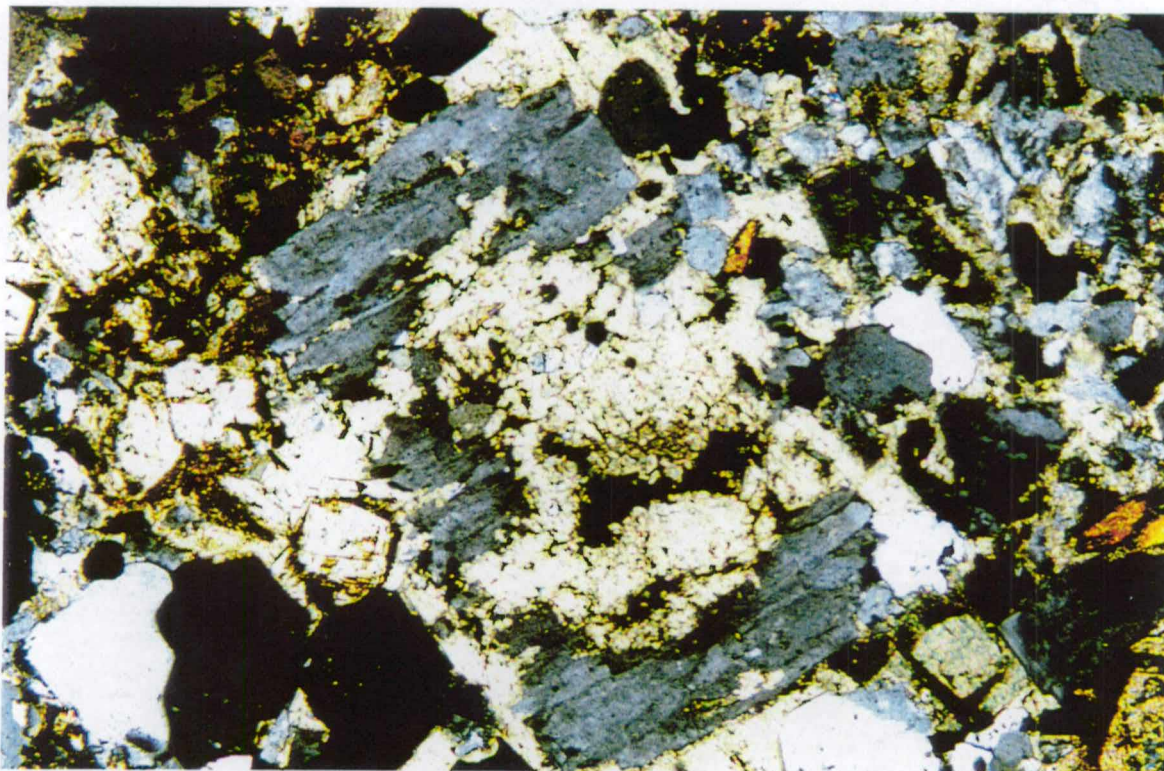
Paragenesis

1. Quartz + sericite + pyrite ± carbonate.
2. Supergene limonite + ?smectite

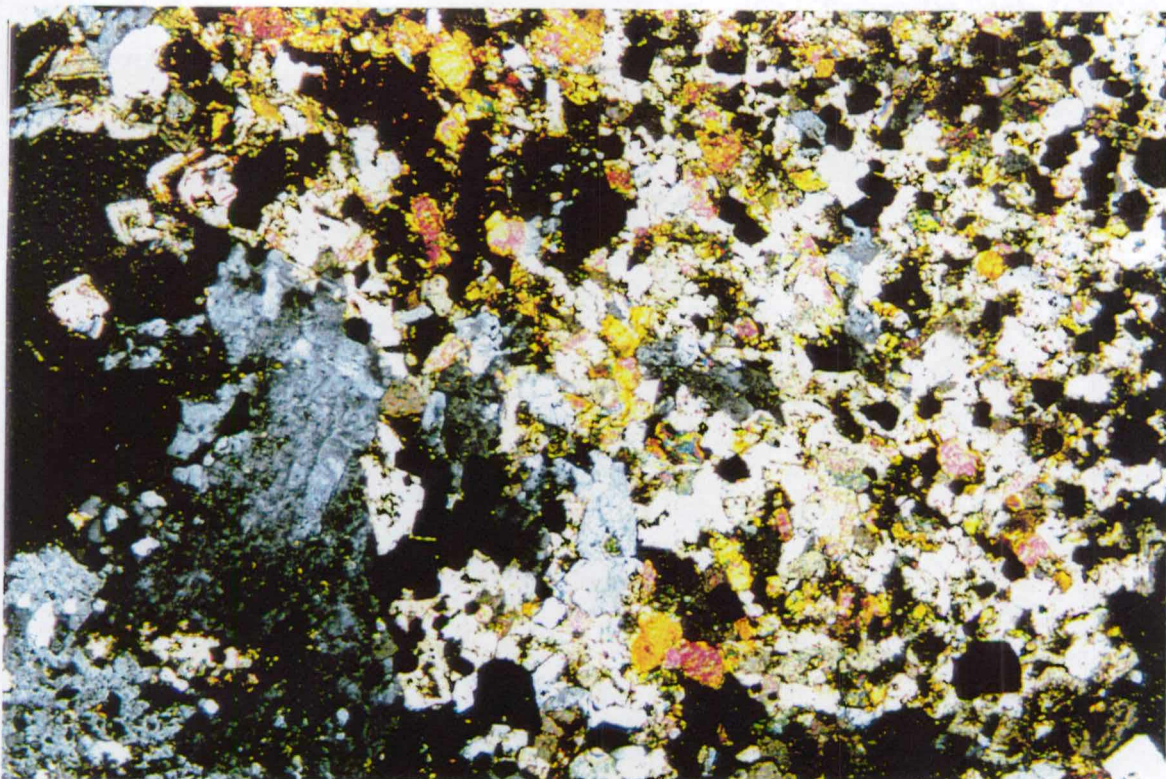
APPENDIX II: PHOTOMICROGRAPHS



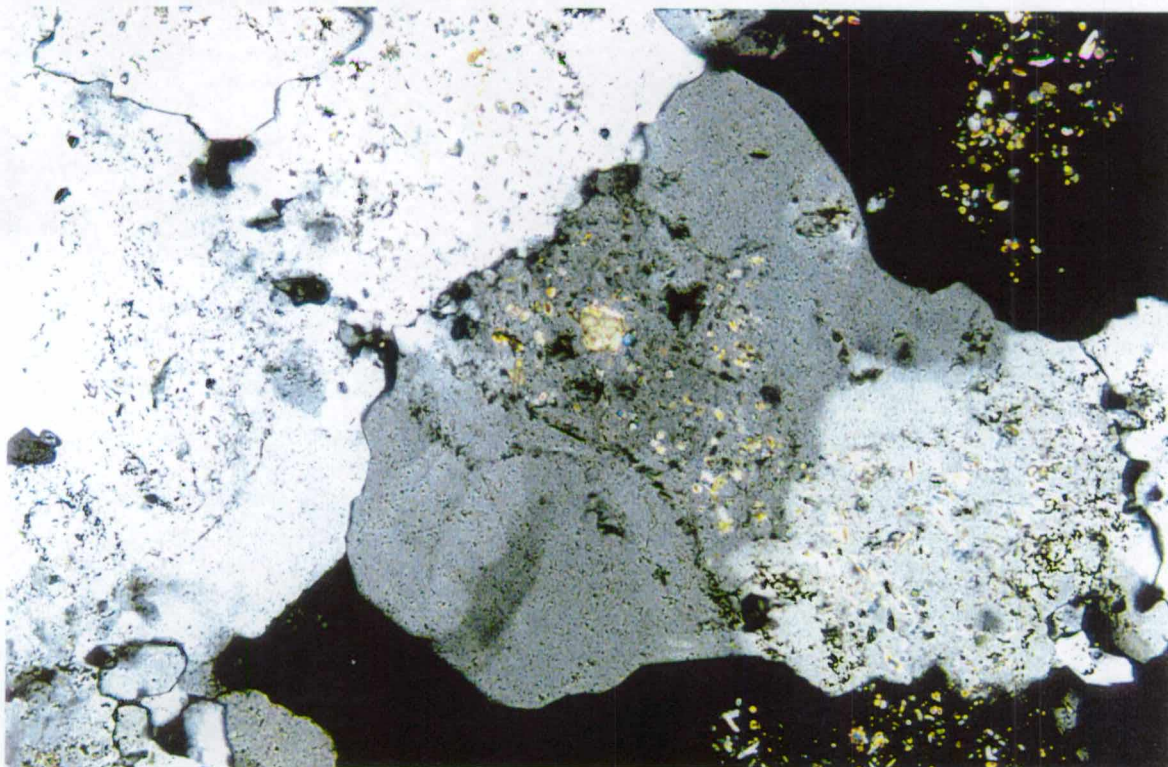
- **Plate 1, Sample 1 :** Relict twinned plagioclase tablet in area 1 partly replaced along margins by k-feldspar flecked with fine-grained biotite and calcite, rimmed locally by quartz and enclosed in fine-grained calcite. Contact between Area 1 and siliceous Area 2 with coarse calcite rhomb and fine-grained calcite is followed by narrow part of quartz banding with fine-grained calcite, and cut by quartz stockwork veinlet. Field of view 2.0mm (XPL).



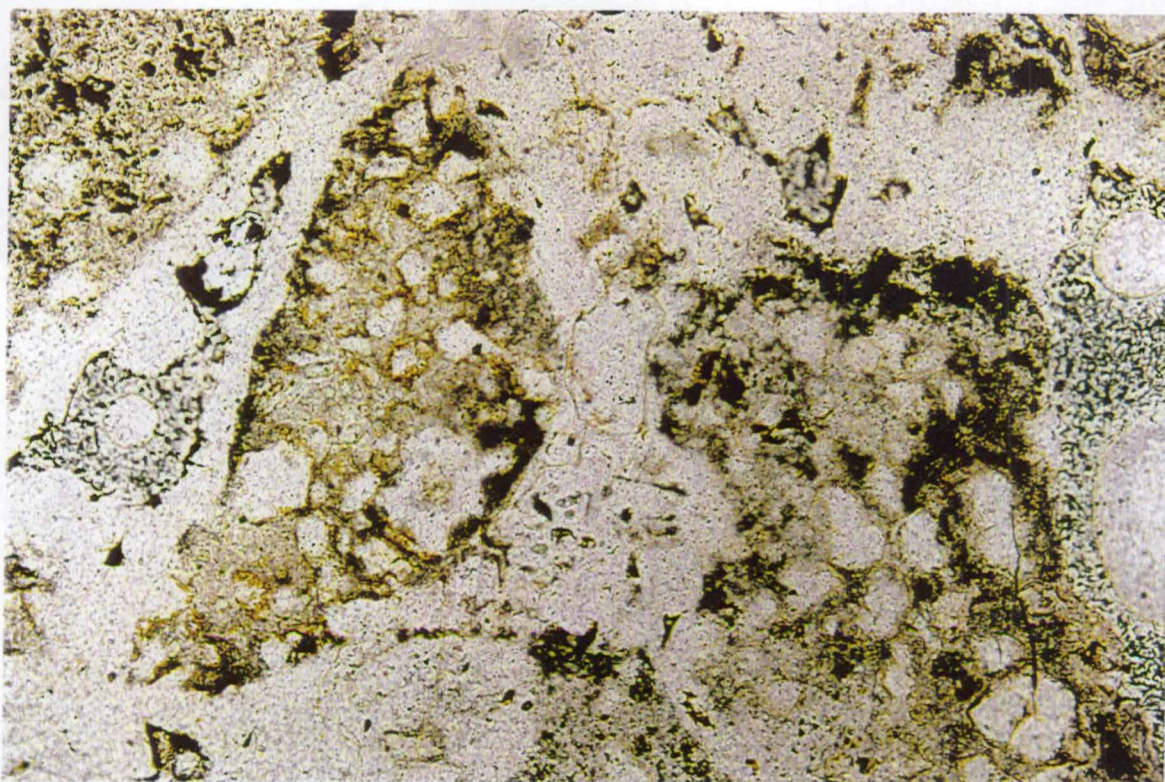
- **Plate 2, Sample 2 :** Plagioclase tablet in ?intermediate porphyry endoskarn replaced by secondary k-feldspar $\pm$ biotite and later calcite in altered groundmass of quartz $\pm$ biotite $\pm$ k-feldspar + calcite . Field of view 2.0mm (XPL).



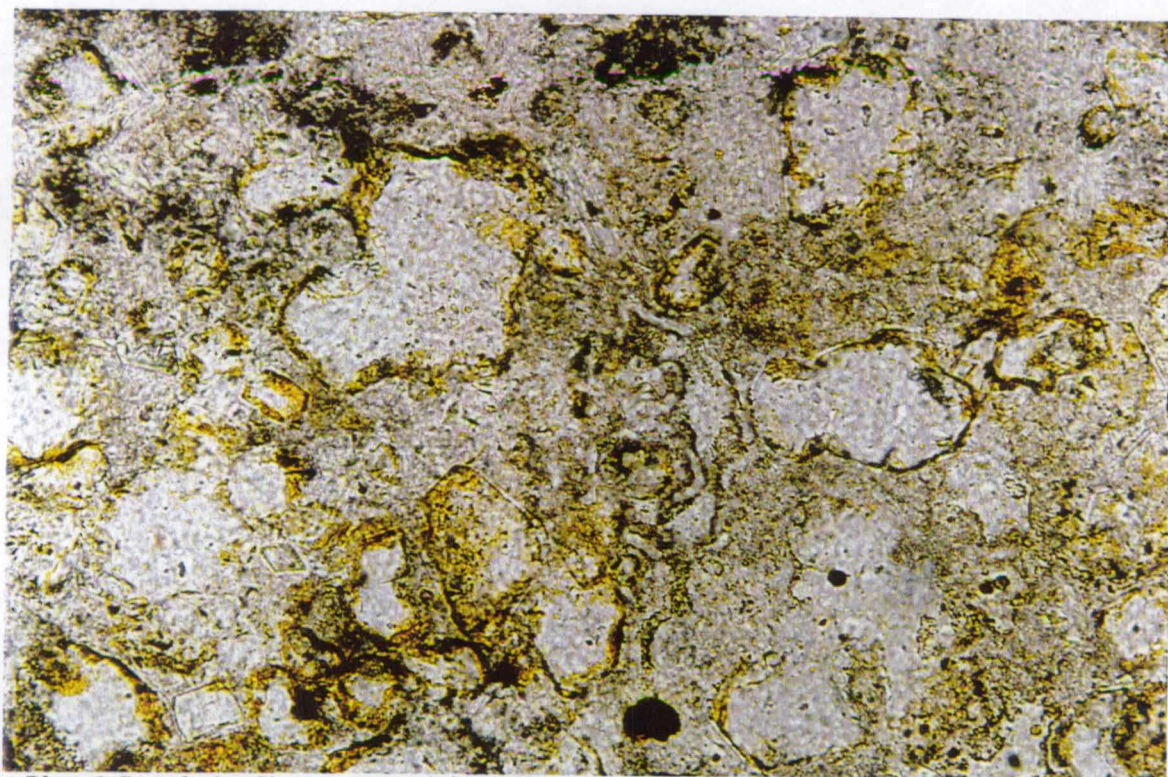
▪ **Plate 3, Sample 2 :** Replacement of groundmass by fine-grained calcite + biotite $\pm$ quartz + opaques (magnetite). Field of view 2.0mm (XPL).



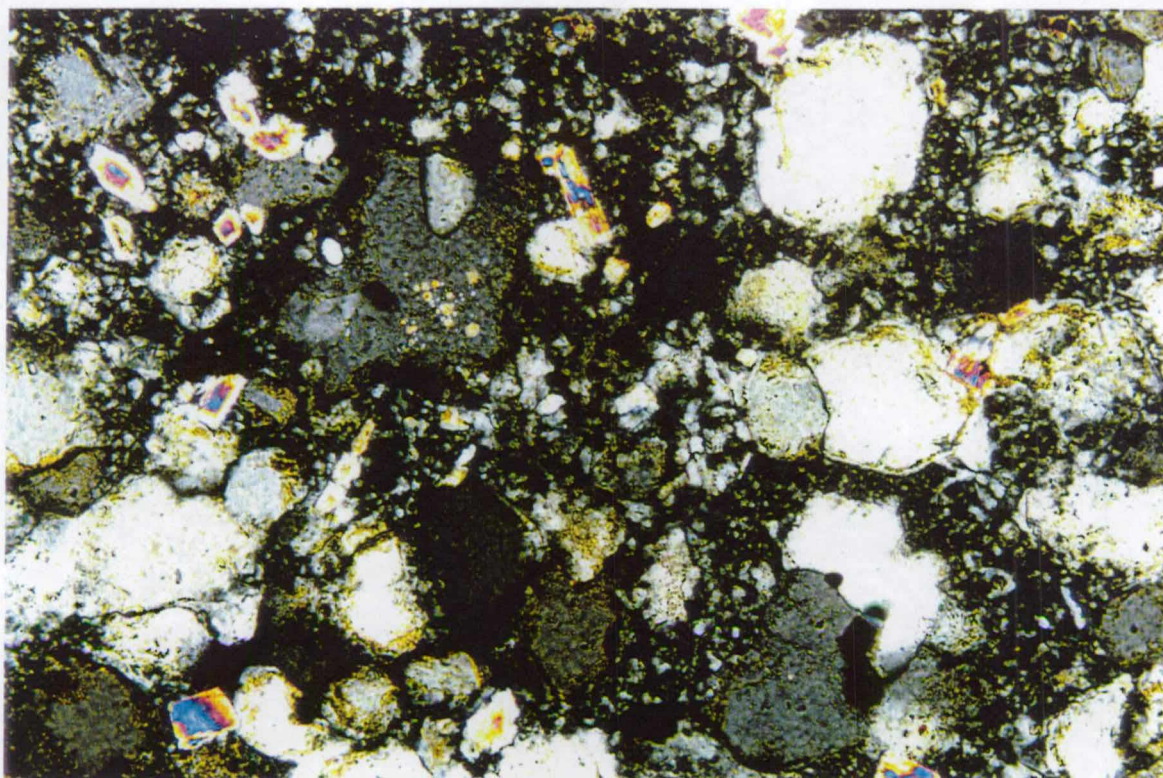
▪ **Plate 4, Sample 3 :** Silicified ?carbonate with fine granular quartz hosting inclusions of carbonate + sericite, overgrown by clear quartz locally lining vughs. Field of view 1.3mm (XPL).



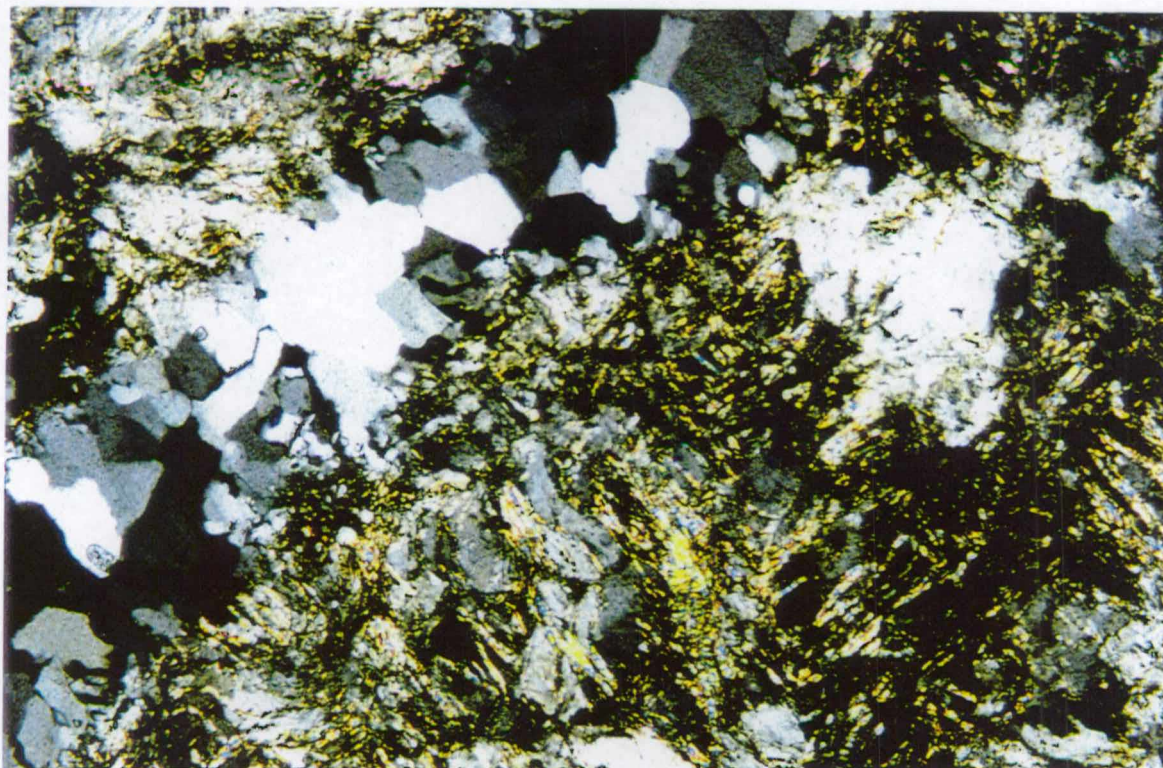
▪ **Plate 5, Sample 4 :** Small angular clasts of quartz $\pm$ sericite + dusty chalcedonic quartz within hydrothermal matrix of fine granular quartz $\pm$ sericite . Field of view 1.3mm (PPL).



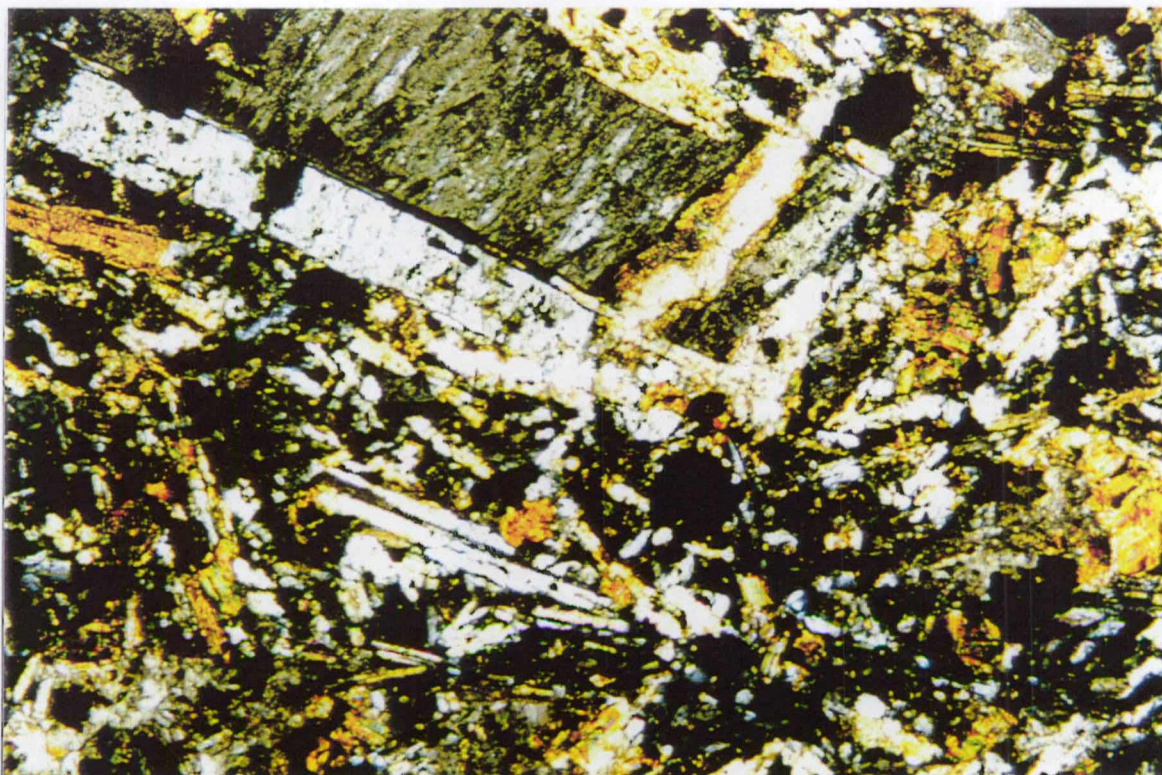
▪ **Plate 6, Sample 4 :** Close-up view of clast with granular quartz (with limonitic stained rims) + chalcedonic quartz ?replacement and local colloform banding. Field of view 1.3mm (PPL).



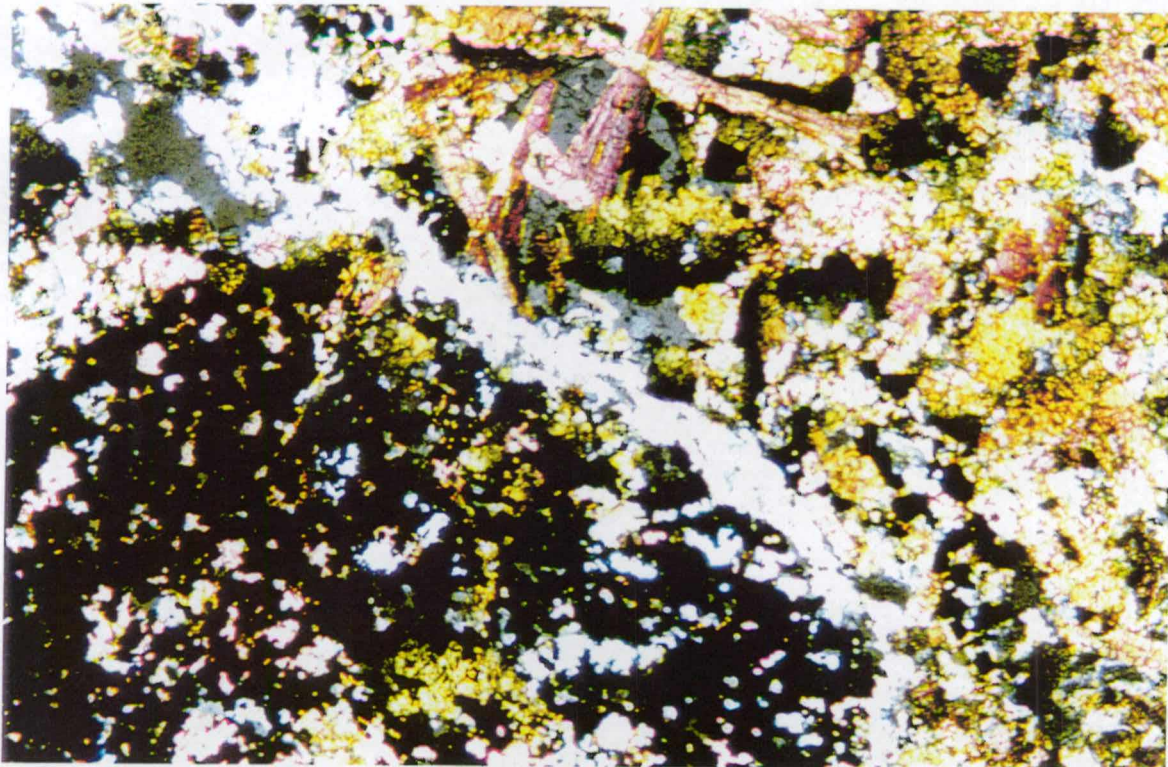
▪ *Plate 7, Sample 4: As above with crossed polars showing well developed sericite flakes.. Field of view 1.3mm (XPL).*



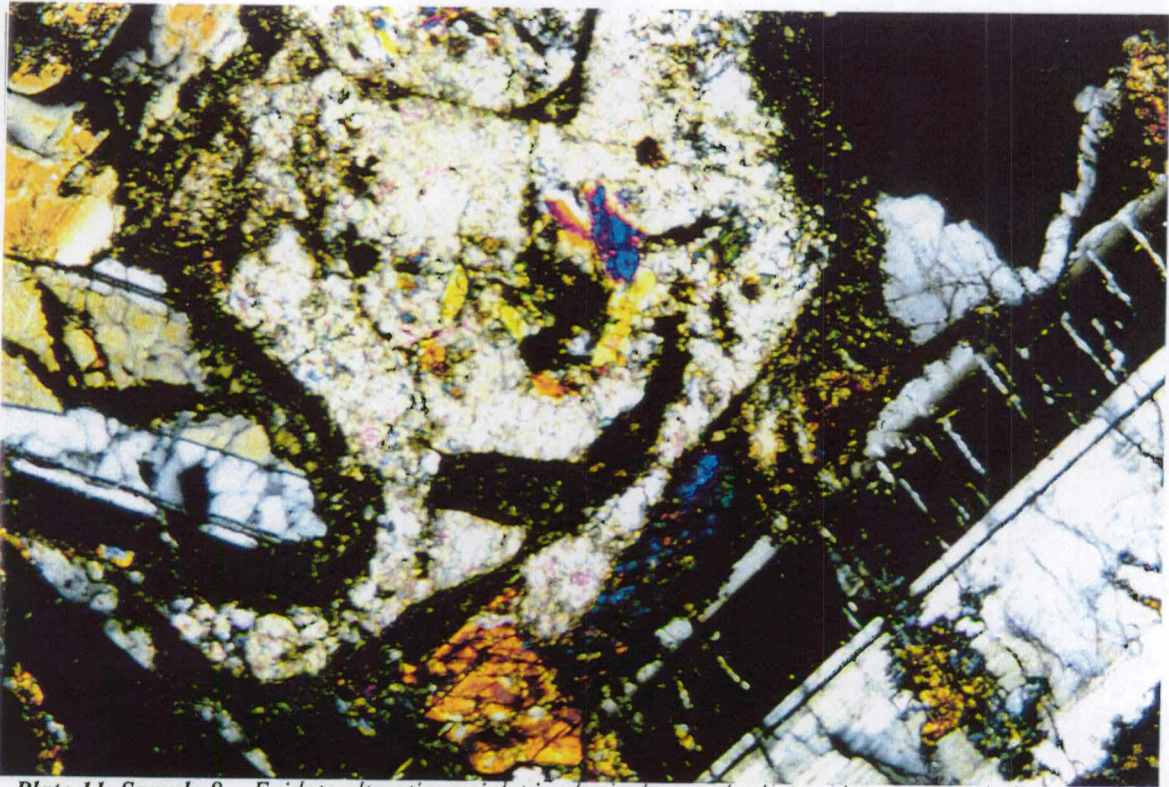
▪ *Plate 8, Sample 5 : Strained granular quartz domains hosting common fine fibrous sericite cut by clear granular quartz veinlet. Field of view 2.0mm (XPL).*



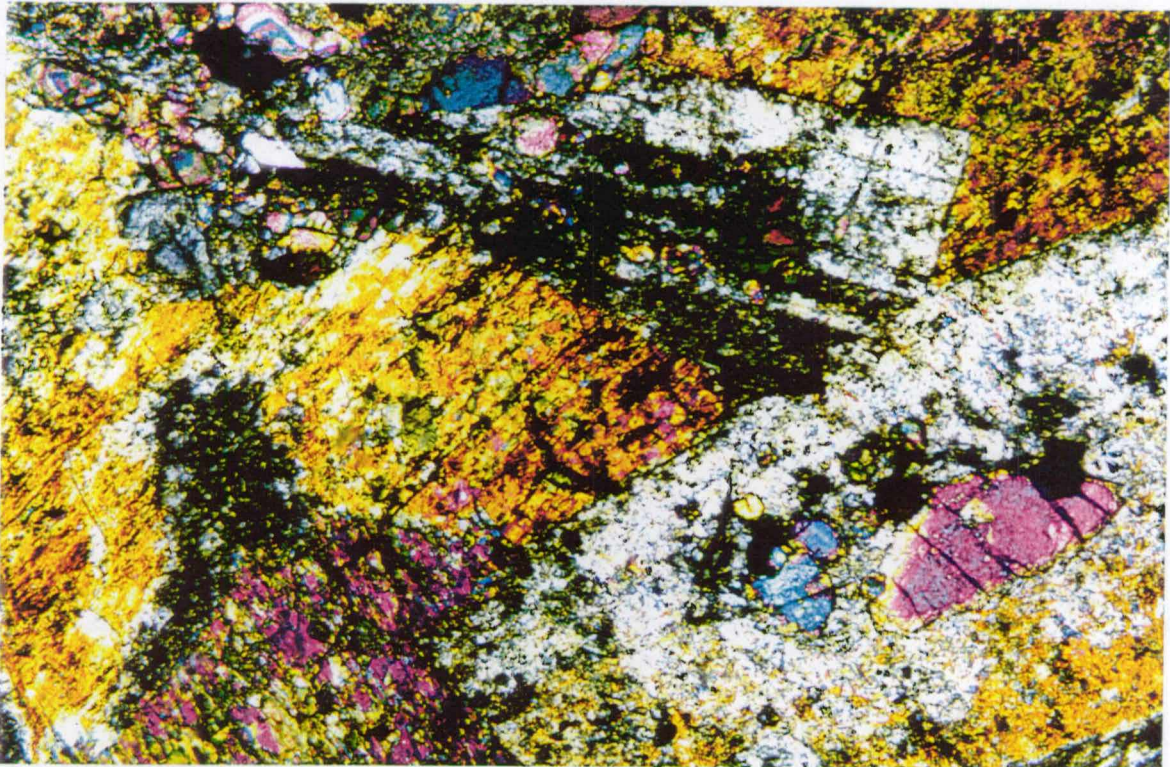
■ *Plate 9, Sample 6 : Lamprophyre with a sparse medium-grained plagioclase phenocryst flecked with chlorite in groundmass of slender plagioclase laths and fine subhedral primary biotite flecked with calcite and chlorite. Field of view 1.3mm (XPL)*



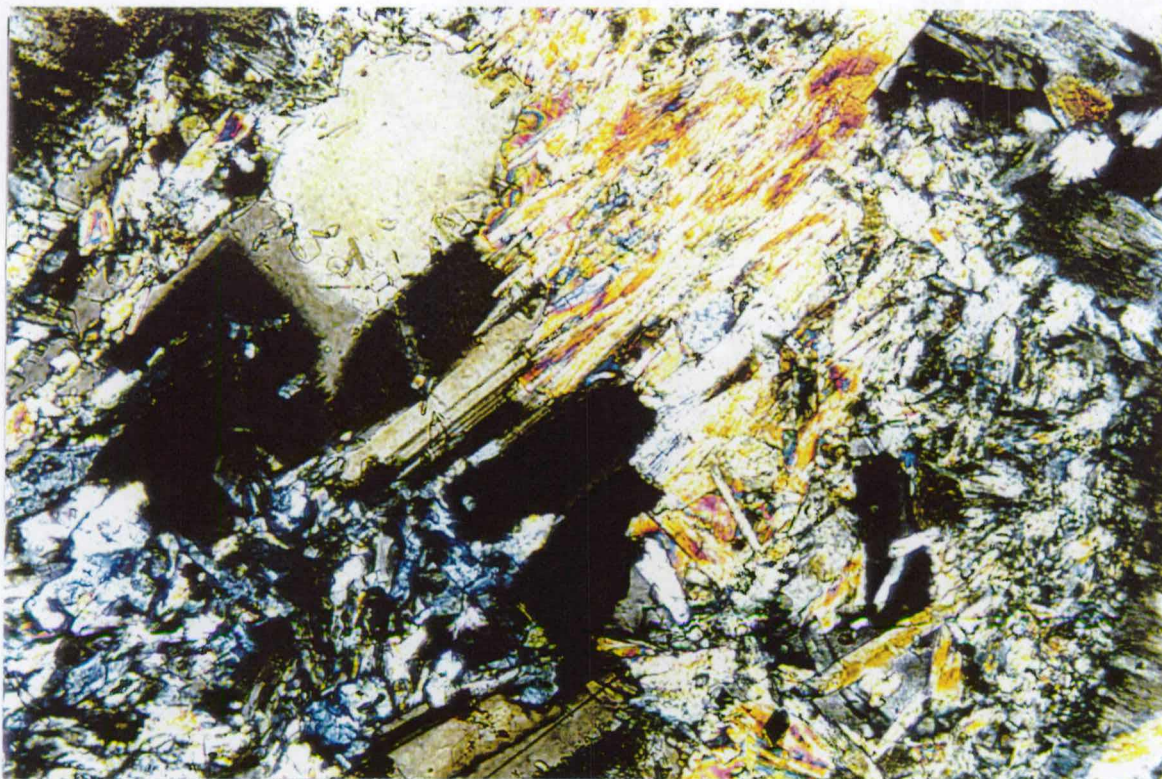
■ *Plate 10, Sample 7: Tourmaline laths and granules with interstitial quartz and part of tabular-shaped aggregate of fine-grained magnetite with interstitial quartz and calcite cut by sericite + calcite veinlet. Field of view 2.0mm (XPL).*



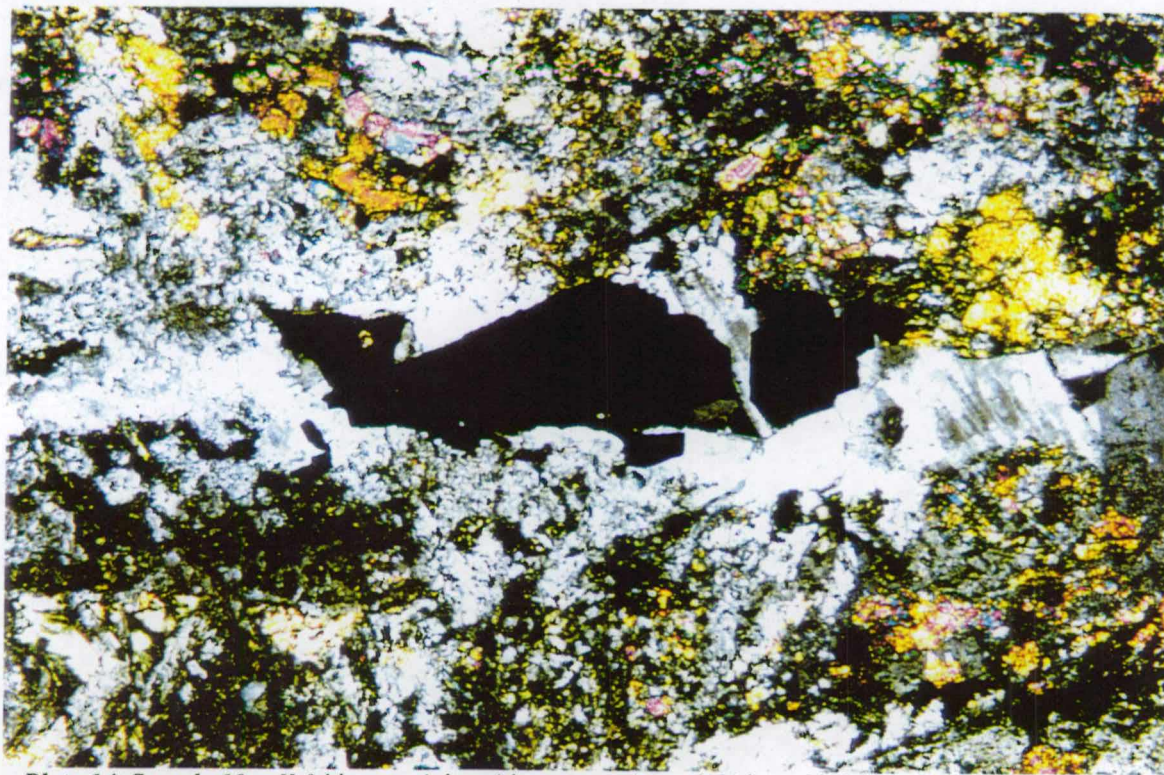
■ **Plate 11, Sample 8 :** Epidote alteration veinlet in plagioclase and relict epidote in core of altered mafic mineral (?clinopyroxene/hornblende) strongly replaced by sericite fringed with chlorite in gabbro. Field of view 2.0mm (XPL).



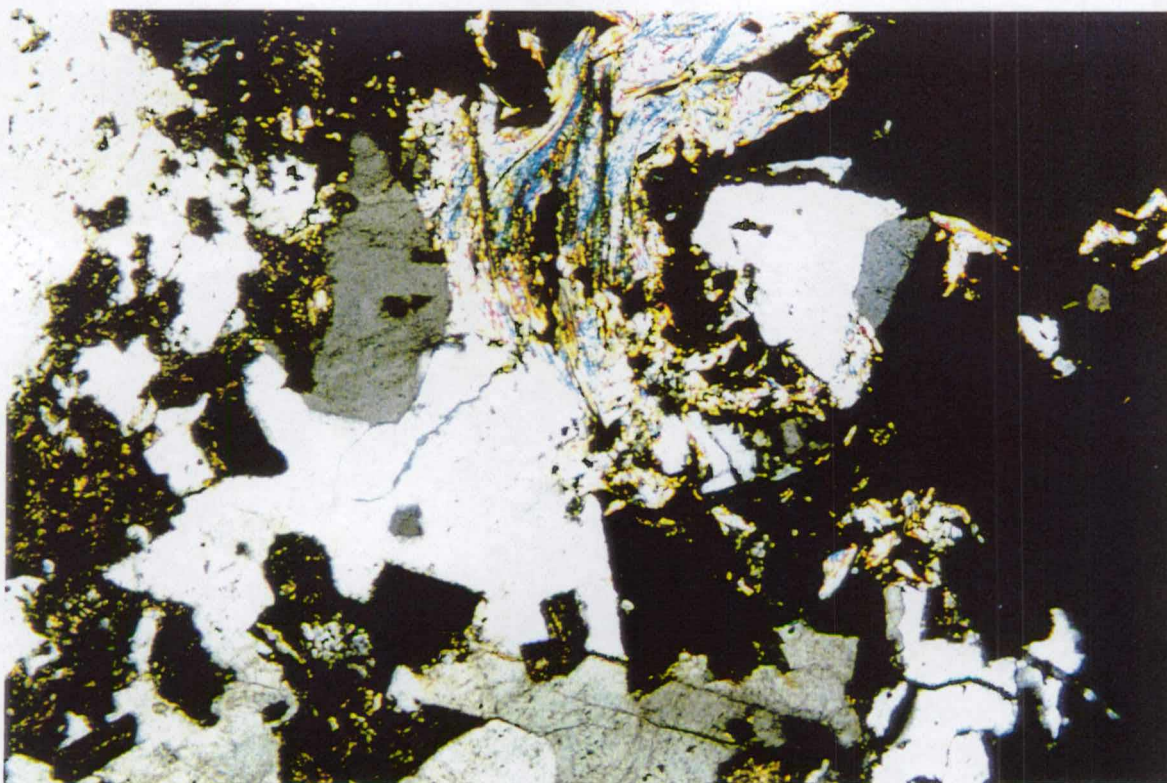
■ **Plate 12, Sample 11 :** Albite-altered plagioclase partly replaced by epidote and fine-grained secondary biotite and later chlorite replacing mafic minerals in gabbro. Field of view 2.0mm (XPL).



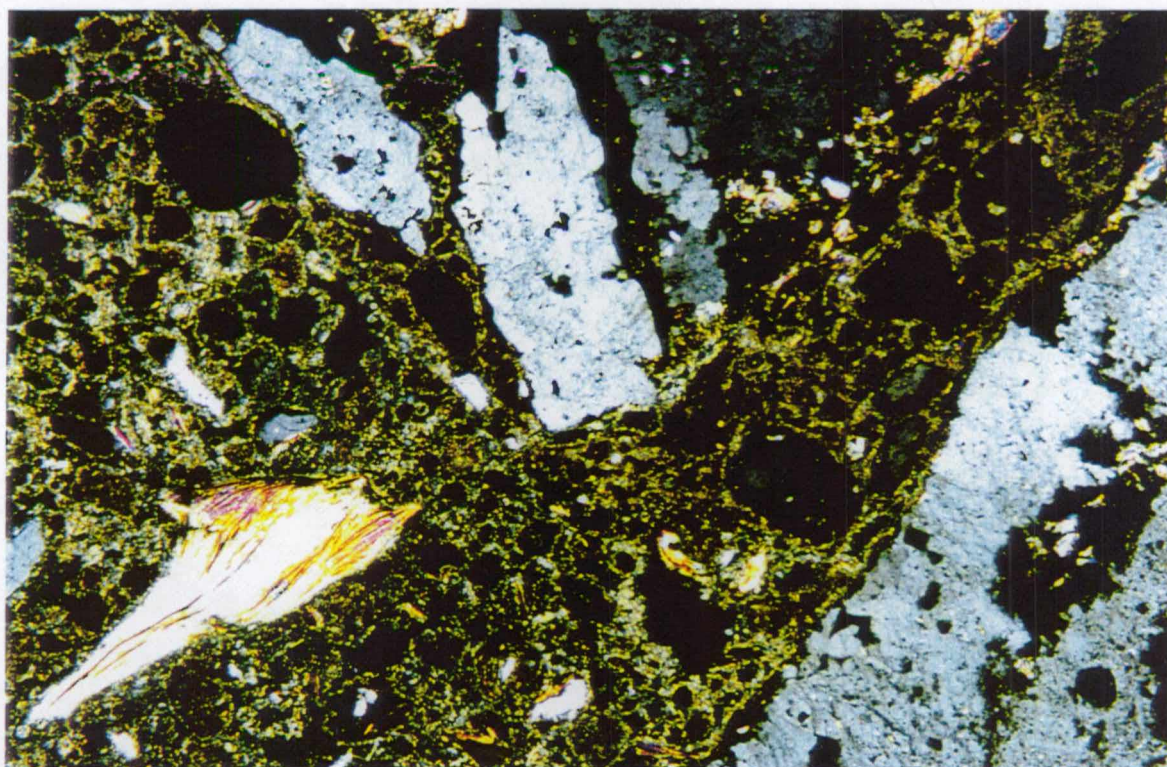
▪ *Plate 13, Sample 9 : Tremolite extending from altered mafic site into relict plagioclase partly altered to clinozoisite. Field of view 2.0mm (XPL).*



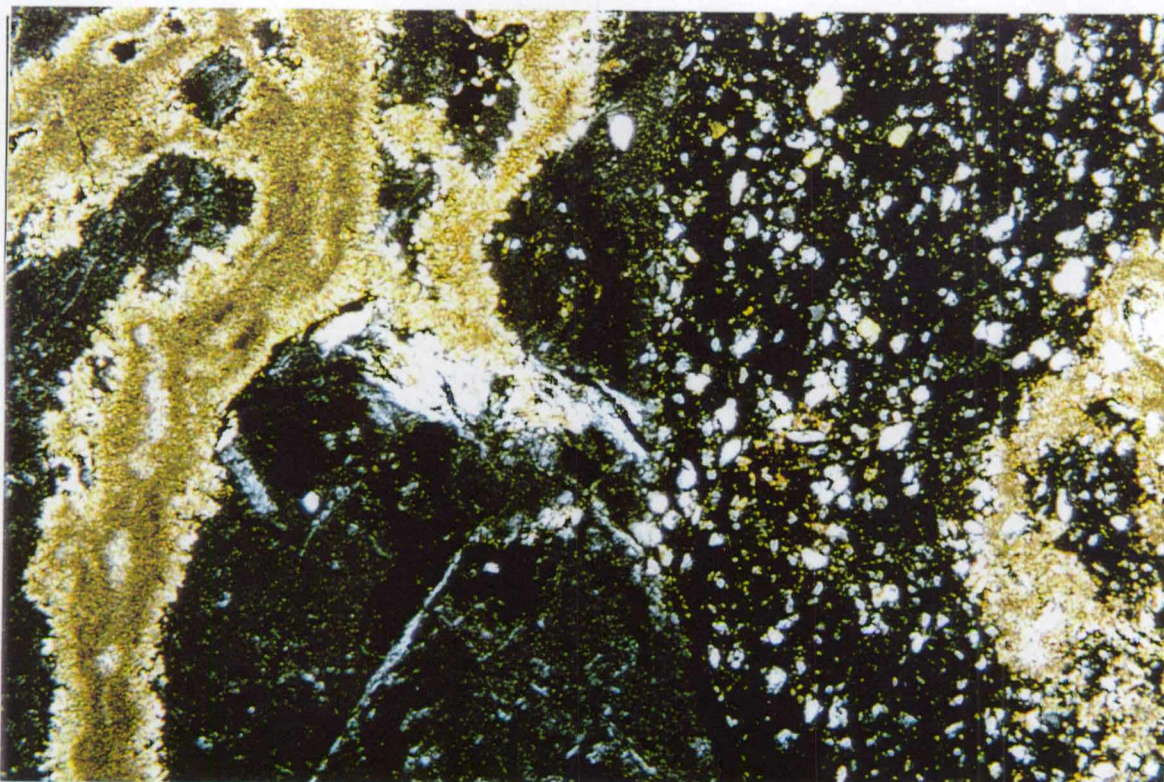
▪ *Plate 14, Sample 10 : K-feldspar veinlet with overgrowing sulphide and k-feldspar selvage in albite-epidote-chlorite-altered plagioclase Field of view 1.3mm (XPL).*



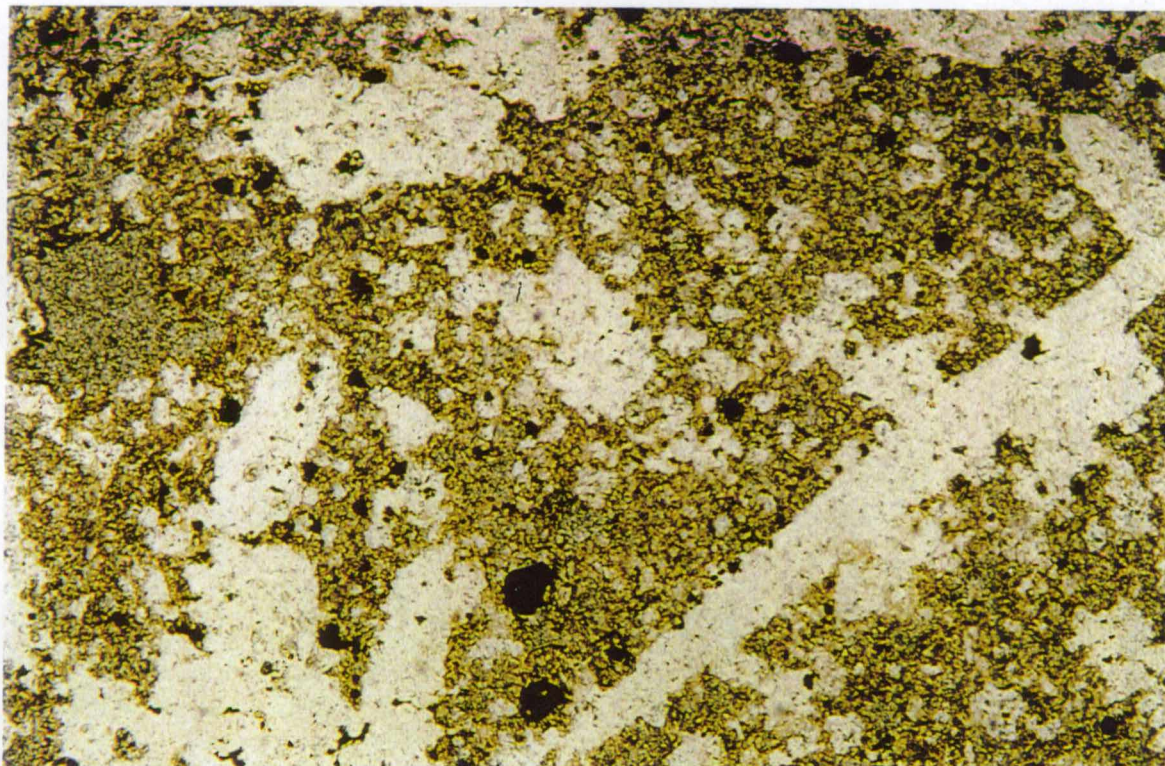
■ **Plate 15, Sample 12:** Coarse quartz with smectite-altered inclusions enclosed in limonite-fine-grained quartz-sericite breccia matrix. Field of view 2.0mm (XPL).



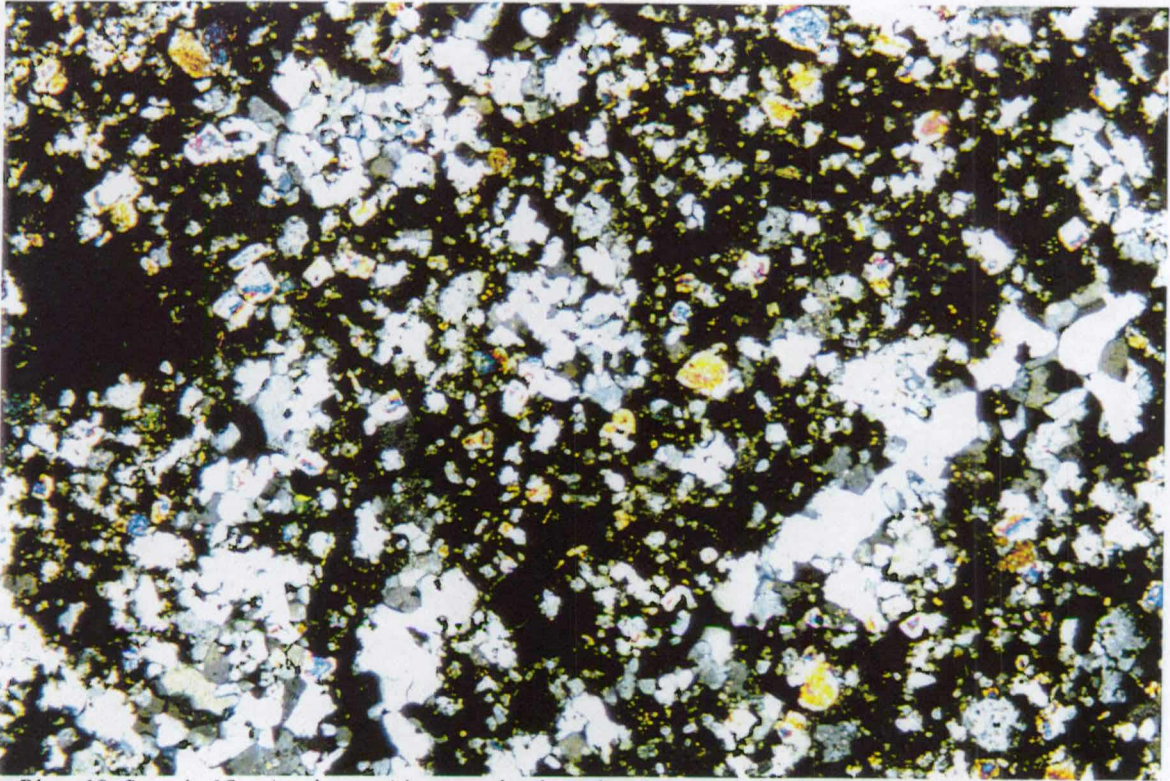
■ **Plate 16, Sample 12 :** Microcrystalline calcite fracture vein cutting quartz and with fragments of limonite-sericite breccia matrix. . Field of view 2.0mm (XPL).



- *Plate 17, Sample 13 : Siltstone / very fine-grained sandstone altered to k-feldspar and overgrowing kaolinite with fracture-fill of kaolinite cut by microveinlets of gypsum and late veinlets sealed with microcrystalline calcite. Field of view 2.0mm (XPL).*



- *Plate 18, Sample 15 : Porphyritic textures of an inferred andesite defined by pseudomorphed slender medium-grained laths and fine-grained crystals in a silicified groundmass. Field of view 2.0mm (PPL).*

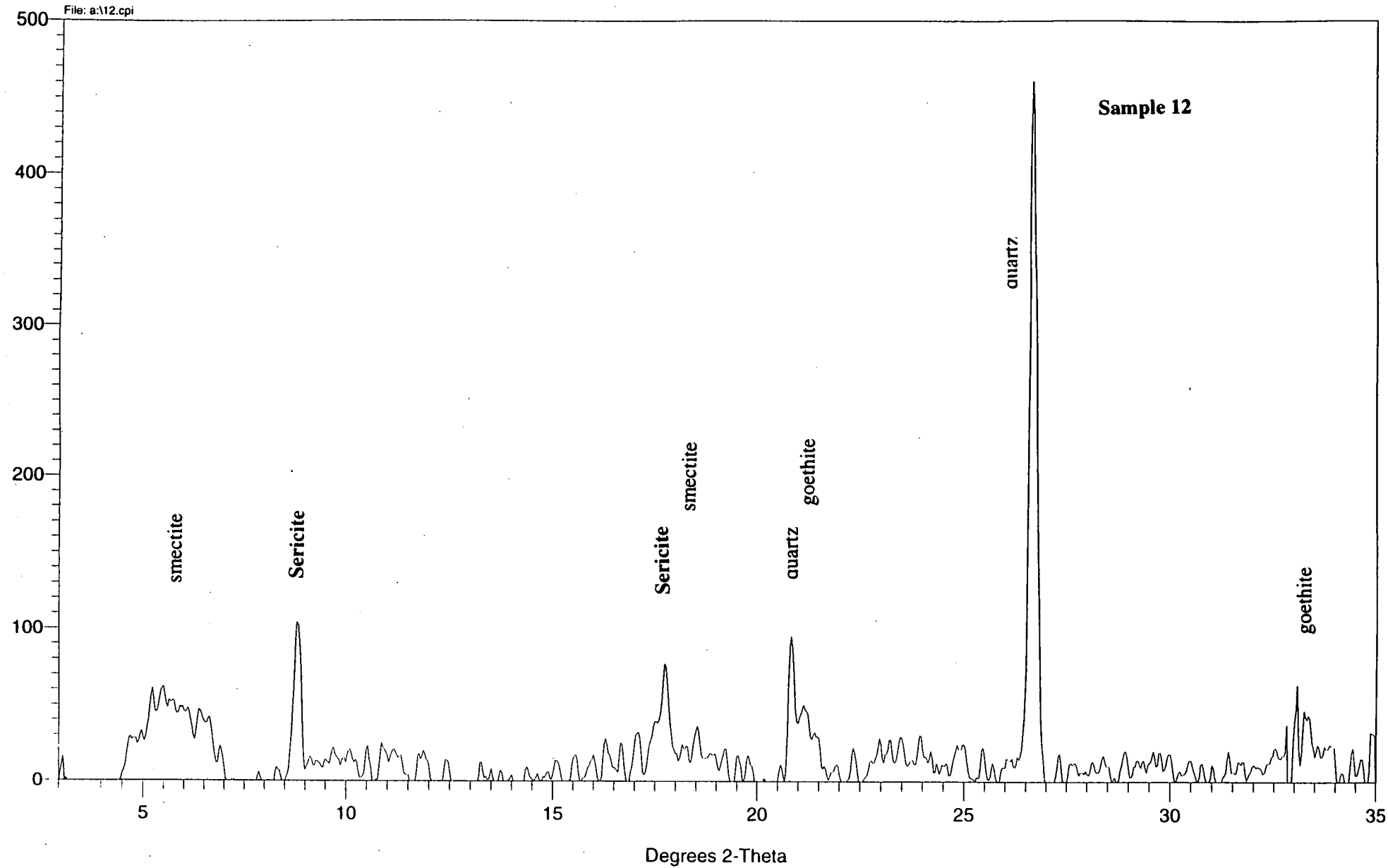


■ Plate 19, Sample 15 : As above with crossed polars showing pervasive quartz + sericite replacement of phenocrysts and groundmass. Field of view 2.0mm (XPL).

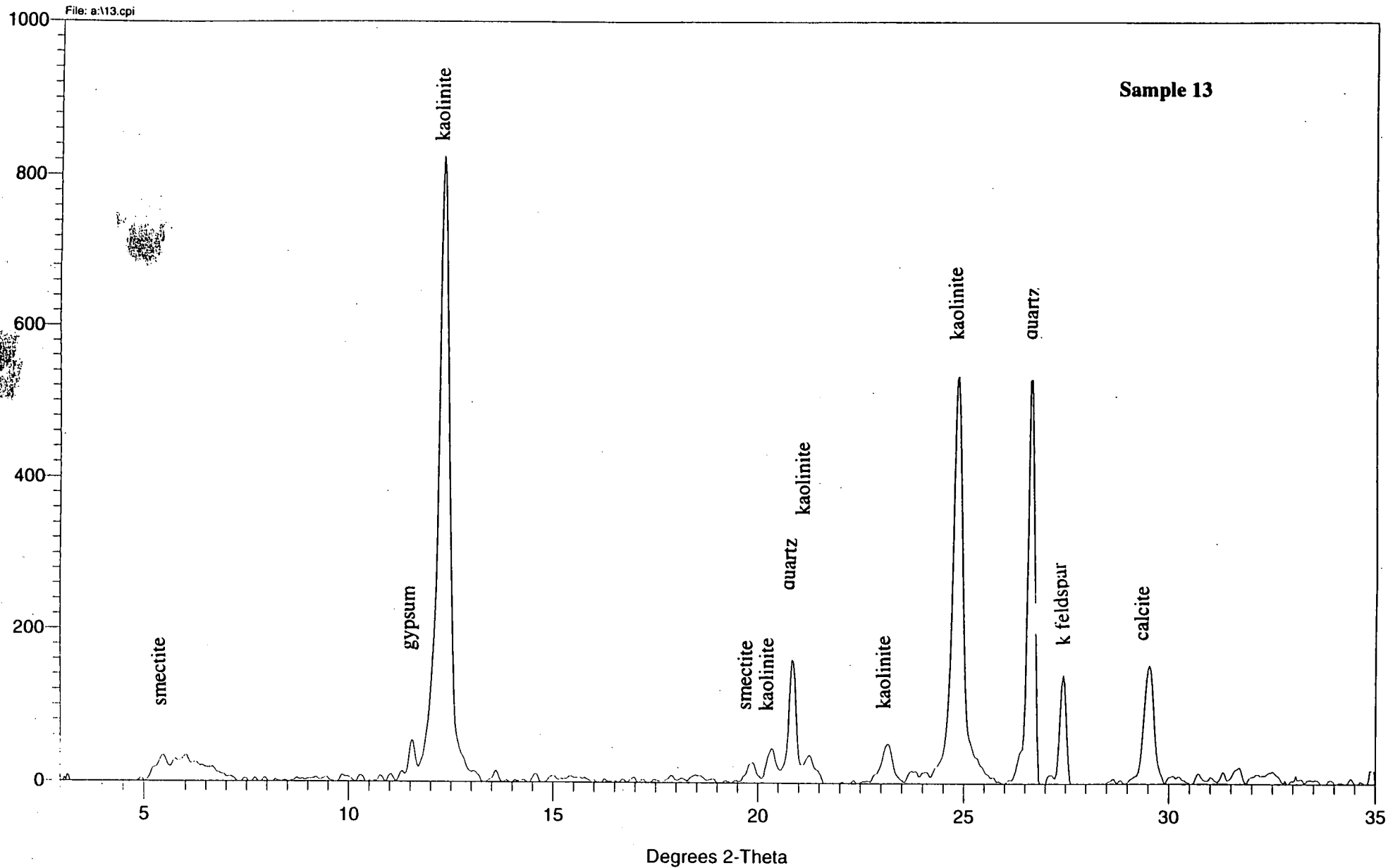
APPENDIX III: XRD TRACES

Counts

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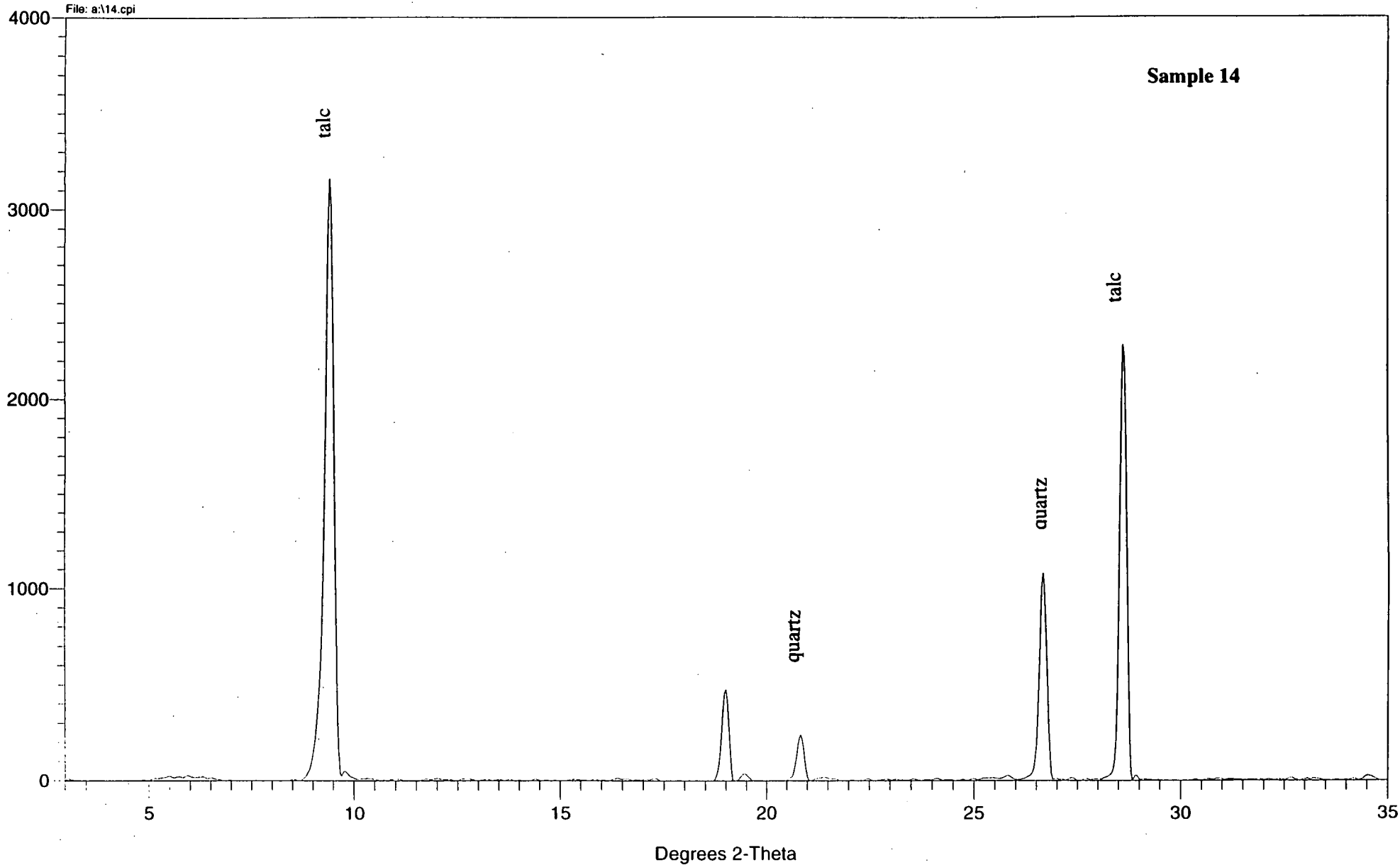
Counts



Counts

File: a:\14.cpi

Sample 14



APPENDIX IV: CLIENT DATA

PH 088 3898249

Fax 088 3898150

P.O. Box 26

FOREST RANGE

S.A. 5139

3/1/99

Hi Terry,

Herewith 13 rock samples from the same general area that you examined rocks from in your Mt Granger report No. 98034 for Goldstream dated Dec '98. Please prepare a petrological report on each rock. Sample 12/13 requires XRD to determine the clay type.

Skarn x 2 ①. recrystallized c.g. carb. (calcite/ankerite?) + Q + f.g. cpy +
②. recrystallized f.g. brown ferrous carbonates + limonite
casts ex cpy?

Jasperoids x 2 ③. light coloured, wuggy 'jasperoid' + 'garnet'

④. grey jasp. bx yw pink Q matrix

Igneous x 7 ⑤. pink k-spar + musc. from sheared intrusive

⑥. grey/green andesite + secondary bi from intrusive dyke

⑦. dark grey iq. rock with abundant tourmaline " "

⑧. trachytic intrusion - white/dark x bds.

⑨. relatively fresh mafic igneous rock

⑩. igneous rock + epidote + tourmaline (c.g.) - strongly sheared &

⑪. c.g. igneous rock with act + secondary? biotite "

Alteration x 4 ⑫. musc/ quartz / lim ex carbonate - contains Au

⑬. clay alt siltstone from near jasperoids.

⑭. sericite clay alteration between Jasperoid units

⑮. buff coloured - jasp? - + ex carbonate

The jasperoids, skarns and altered rocks are associated spatially with the igneous suite. Please post your report to Ian and Mark Filsell at the above address.

P.S. Could you please Fax the results as soon as they are finished.

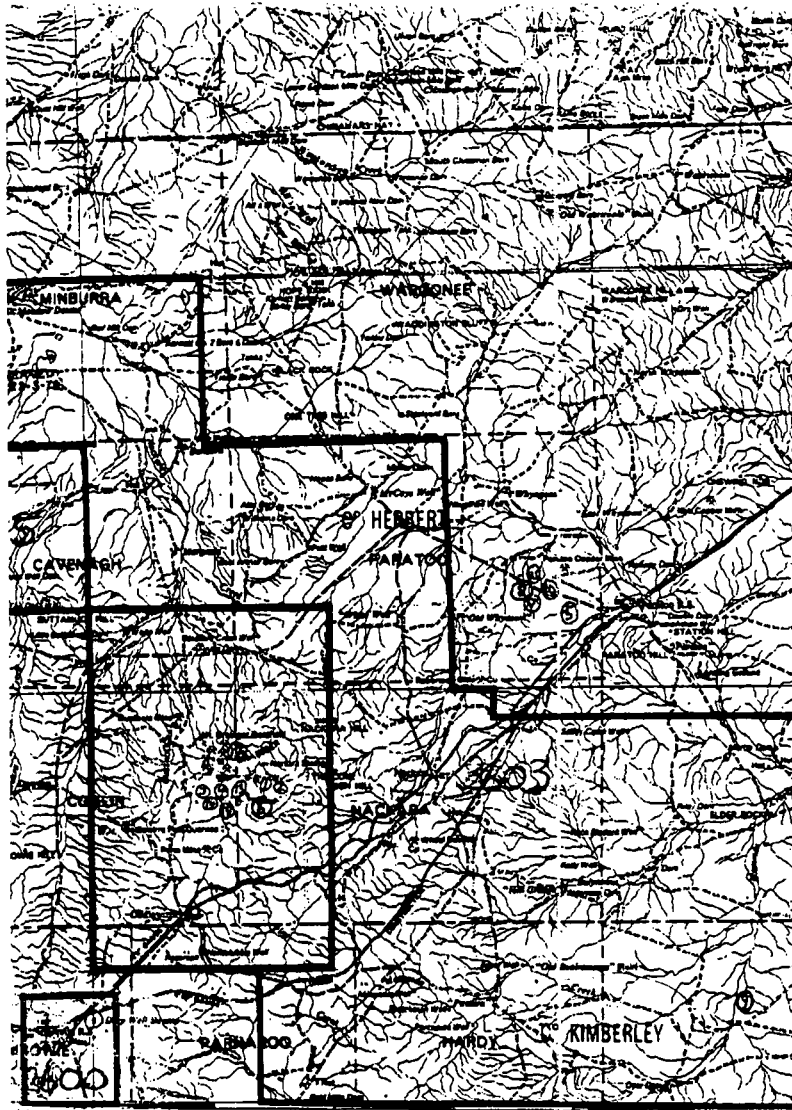
Regards Ian Filsell

Cheers

Bob Burke

for I & M Filsell

Yes - it is the same Bob Burke from Laos.



Mt Goring Area.

① Police Sample Locations

From Ian F. Hall

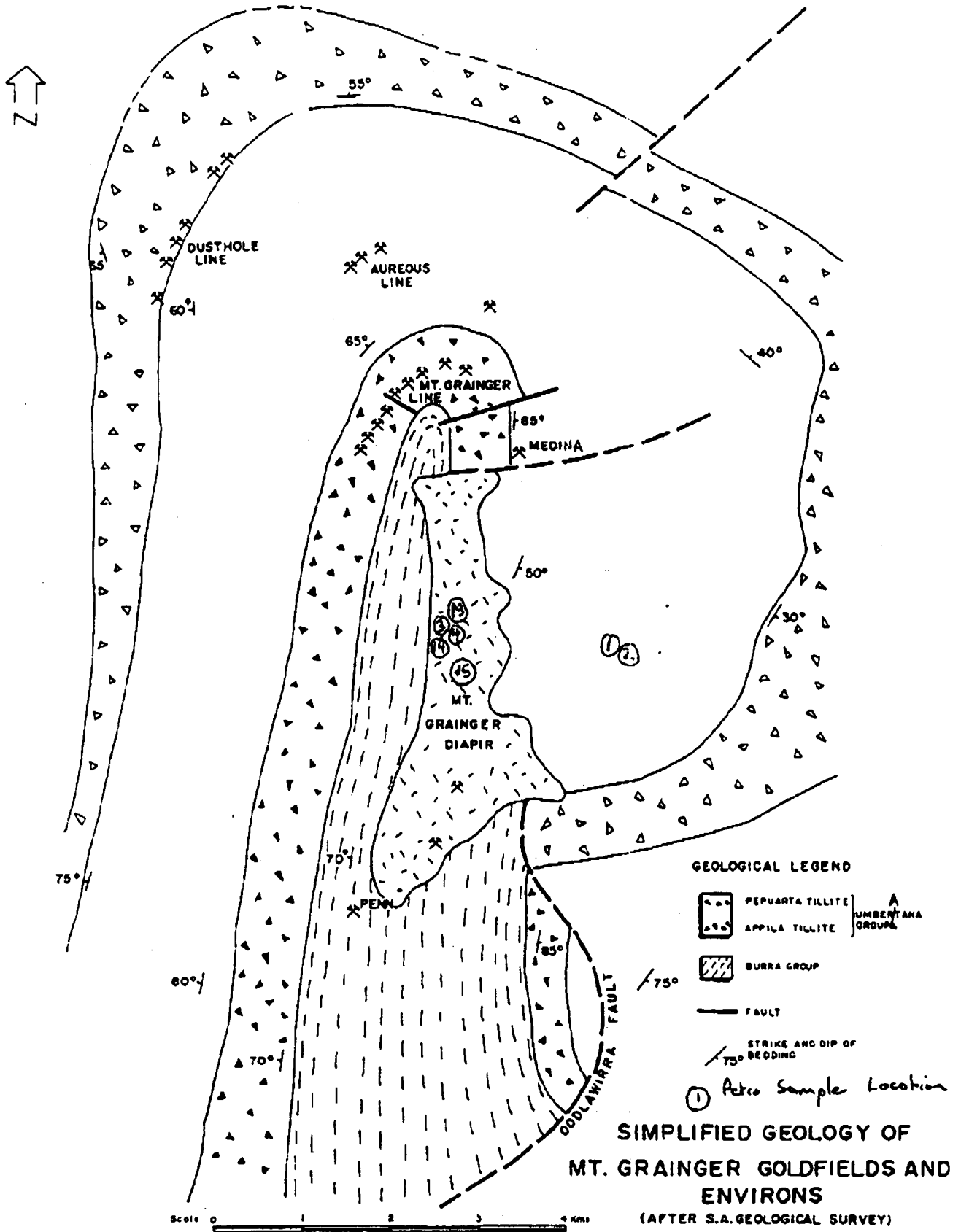


FIGURE 2

From Ian Filsell

Terry Leach & Co

Exploration Geologists, Petrologists and Consultants

PETROGRAPHIC ANALYSES OF SEVENTEEN ROCK SAMPLES FROM THE MT GRAINGER AREA, SOUTH AUSTRALIA

PREPARED FOR

IAN AND MARK FILSELL

BY

GRAEME CORLETT

IN

JULY 2000

TLC REPORT NUMBER:00022

(TLC REFERENCE NUMBER: 1270202)

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6.1 General Discussion	11
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TABLE

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▪ Table 1: Summary Of Lithology, Alteration, Mineralisation And XRD Minerals For Rocks From The Mt Grainger Area, South Australia	3

1. SUMMARY

- Most of the seventeen outcrop samples studied, are altered, medium to fine-grained porphyritic rhyolites. Also identified are altered, foliated, medium to fine-grained porphyritic intermediate / mafic volcanic/subvolcanic lithologies, hydrothermal tourmaline breccias, a porphyritic microtonalite, porphyritic microdiorites, and sandstones.
- Three hydrothermal alteration assemblages and a weak supergene overprint are distinguished in these rocks. These are
 - 1) A *potassic-style alteration*; quartz + biotite + albite ± tourmaline developed in a polymict hydrothermal breccia and in a microdiorite.
 - 2) A *phyllic-style alteration*; of early quartz + sericite and later quartz + tourmaline ± pyrite; accompanied by strong leaching in the rhyolite rocks and deposition. In one case a monomictic hydrothermal breccia that has phyllic-altered rhyolite clasts is sealed exclusively with tourmaline. Primary fluid inclusions in quartz which infills vugs are liquid-rich and contain daughter minerals (salt crystals) indicative of hypersaline fluids.
 - 3) A *propylitic-style alteration* of early actinolite/tremolite + epidote and later chlorite ± adularia; was observed in a microdiorite..
 - 4) A *supergene overprinting* of kaolinite + smectite + Fe oxides + calcite (calcrete); kaolinite locally seals vugs with smectite and calcite; calcite seals fractures vugs and coats fracture surfaces. Fe oxides (limonite/goethite and hematite) replace Fe Ti oxides and replaces possible secondary magnetite, and minor sulphides.
- The alteration mineral assemblages present indicate that they were developed at mesothermal levels in a hot near-porphyry environment; >300°, near neutral pH (potassic); >250°-300°C, mildly acidic (phyllic); 230-300°C, near neutral pH (propylitic)
- No mineralisation was observed, however relict pyrite occurs as inclusions in quartz with the phyllic alteration and in vugs in two phyllic-altered rocks. Lack of mineralisation may indicate that the fluids were too hot for deposition and / or that the fluid source was deficient in metals. There is little or no evidence that the magmatic-sourced, vapour-dominated hydrothermal fluids interacted with meteoric fluids during the phyllic alteration stage.
- There is no evidence from this study that the widespread silicification and weak gold mineralisation of the anticlinal rocks is related to the presence of the phyllic-altered rhyolite.
- On the basis of the present study, it is considered that the potential for discovering mineralised carbonate rocks at depth below the rhyolite in the lower parts of The Burra Group, is reduced, however areas along strike may still be prospective.

2. INTRODUCTION

Bob Burke and the Filsell Brothers submitted seventeen outcrop rock samples from the southern part of the Mt Grainger area in South Australia for petrological evaluation. These rocks are mainly from a previously unmapped 'dacite intrusion' located in the south of the Mt Grainger anticline. The clients requested, that in addition to preparing a standard petrographic report, consideration also be given to integrating the observed alteration with that seen throughout the district.

Thirteen of the samples were prepared as thin sections for petrographic study. Another four were prepared as polished thin sections for additional study of possible mineralisation in the rocks. In addition, nine samples were selected for X-Ray Diffractometry (XRD) to identify clay species and in some samples, test for the possible presence of fine-grained k-feldspar.

A summary of the petrological results is given in Table 1.

Petrographic reports, labelled XRD charts and client data are included in Appendices I, III and IV respectively.

Photomicrographs illustrating salient mineralogical and textural features from selected samples are presented in Appendix II.

Brief Geology:

The Mt Grainger anticline is a relatively small, localised structural feature located within the regional fold belt of the Proterozoic age Adelaidean Geosyncline. The anticline is mapped as the upper part of the Burra Group which consists of a sequence of sandstones, siltstones, quartzites and dolomite beds. Tillite beds (Appila Tillite) from the lowermost part of the overlying Umberatana Group are exposed in the north, western and southern areas of the anticline. The tillites in the northern part are cut by gold-bearing quartz veins. The southern and eastern margin of the anticline is mapped as a major thrust zone that separates the older Burra Group rock from the younger Wilpena Group sedimentary sequence. The axial zone of the anticline is extensively altered to jasperoid and sericite. Samples hosting this alteration have been previously described in TLC Report No. 0004. Weak mineralisation characterised by anomalous Au, Co and As is mainly hosted within late brecciated structures cutting the otherwise barren jasperoid rocks.

The so called "dacites" included in the present study occur in a small circular magnetic low anomaly nested within an elongated magnetic high orientated in a NE-SW direction located at the southern end of the anticline. Some of the petrological samples are from the vicinity of these dacites.

▪ **Table 1: Summary Of Lithology, Alteration, Mineralisation And XRD Minerals For Rocks From The Mt Grainger Area, South Australia**

Sample No.	Lithology	Alteration Replacement	Deposition	Mineralisation	XRD
Bob-1	Phyllic-altered medium-grained rhyolite	1. Q + Ser + ?Py 2. Q + To	1. Q + Ser + ?Py (leached crystals) 2. To $\pm$ Q or Q (leached crystals, vughs) 3. Q $\pm$ To (weak veinlets) 4. K $\pm$ Sm (local overgrowths to St 2)		
Bob-2	Phyllic-altered medium-grained rhyolite	1. Q + Ser 2. Q + To	1. Q + Ser (leached crystals, vugh) 2. A) To $\pm$ Q (leached crystals, vughs) B) To (fractures) 3. Q $\pm$ To (veinlets) 4. K + Lm (pockets in groundmass and Sty3 veinlets)		
Bob-3	Phyllic-altered medium-grained rhyolite	1. Q + Ser 2. Q + To	1. Q + Ser (leached crystals, vughs) 2. A) To $\pm$ Q (leached crystals, vughs) B) To (fractures) 3. Q $\pm$ To (veinlets) 4. K (pockets in earlier deposition)		
Bob-4	Phyllic-altered medium-grained rhyolite	1. Q 2. Q + To 3. Sm + Lm	1. Q + To + ?Ksp (leached crystals, vughs) 2. To $\rightarrow$ Q (vughs, openings)		
Bob-5	Crushed, crackle-brecciated, Phyllic-altered medium to fine-grained rhyolite	1. Q $\pm$ Ser 2. To	1. Q $\pm$ Ser (leached crystals, vughs) 2. To (leached crystals, vughs) 3. To ($\rightarrow$ Sm / K) (breccia matrix, fractures) 4. Ct (calcrete veinlet)		Q, To, Ser (2M), K, Sm
Bob-6	Phyllic-altered medium to coarse-grained sandstone	1. Q + To 2. Goe / Lm + Sm	1. To (cavities) 2. Q (opening) 3. Lm (microfractures)	None observed	

Sample No.	Lithology	Alteration Replacement	Deposition	Mineralisation	XRD
Bob-7	Phyllic-altered medium to fine-grained grained rhyolite	1. Q + Ser 2. To 3. K + Sm	1. Q + Ser (leached crystals) 2. Q $\pm$ Ser + To ($\rightarrow$ K / Sm) (tensional shear band) 3. Q + To ($\rightarrow$ Ct + K) (leached crystals, vughs, tension gashes) 4. A) K (vughs) B) Ct (sample surface)		Q, To, K, Ser, Sm
Bob-8	Phyllic-altered medium to fine-grained grained dacite / rhyolite	1. Q + Ser 2. To	1. Q + Ser (tectonic brecciation) 2. Q + Ser + ?Ksp / ?Py $\rightarrow$ MxtlQ $\rightarrow$ To (leached crystals, vughs) 3. Q (weak veinlets, thin openings)		
Bob-9	Schistose, phyllic-altered medium-grained intermediate / mafic porphyritic volcanic rock	1. Q + Ser + Cb + ?Sul 2. Lm	1. A) Cb + ?Ksp $\rightarrow$ Q + Ser $\rightarrow$ Q (with Fl hosting halite daughter crystals) (elongate vugh postdating deformation) B) Q $\pm$ Ser (cavities) 2. Lm (coating to St. 1 Q,, microfractures)		
Bob-10	Phyllic-altered medium to fine-grained porphyritic mafic volcanic lithology	1. Ser + Q $\pm$ To 2. Sm + Lm / Goe	1. Ser $\pm$ Q $\rightarrow$ Q (veinlets) 2. A) Cb $\rightarrow$ Q + Ser + Ksp $\pm$ To $\rightarrow$ Q (with Fl hosting halite daughter crystals) (large vugh) B) Q + ?Cb $\rightarrow$?Py $\rightarrow$ K $\pm$ Ct (vugh) 3. Q $\pm$ Ser (leached crystals)		Ser (2M), Q, trace Sm
Bob-11	Phyllic-altered, weakly foliated, medium to fine-grained porphyritic volcanic rock	1. Q + Ser + Leu 2. Lm	1. Q $\pm$ Ser $\rightarrow$ Lm (vughs, ?leached crystals) 2. Q $\pm$ Ser (microveinlets) 3. Ct (calcrete rind to rock)		
Bob-12	Phyllic-altered fine-grained porphyritic microtonalite	1. Q + Ser $\pm$ To + ?Mt/Py + Rt / Leu 2. Goe/Lm + Hm + Sm + K	1. K (some leached crystals)	Possible Mt and /or Py (altered to Fe ox)	Q, Pl, Ser, Sm

Sample No.	Lithology	Alteration Replacement	Deposition	Mineralisation	XRD
Bob-14	Phyllic-altered coarse to fine-grained tourmaline hydrothermal breccia with porphyritic rhyolite clasts	1. Q + Ser + Rt 2. To 3. Hm	1. Q $\pm$ Ser $\rightarrow$ To (leached crystals, vughs in clasts) 2. A) To $\rightarrow$ Lm (breccia matrix) B) To $\rightarrow$ Q $\pm$ Py ($\rightarrow$ K) / Sm (leached crystals, vughs in breccia matrix) 3. K $\pm$ Sm (cavities)	Py	Breccia zone; Q + K, To, trace Ser, trace Sm
Bob-15	Potassic-altered, polymict coarse to fine-grained hydrothermal breccia	1. Q + Ab + Bio $\pm$ To + Rt 2. Ch 3. Sm	1. Bio + mxltlQ (breccia matrix) 2. Bio $\rightarrow$ Q + Ab (cavities in matrix)	None observed	Bio, Q, Pl, Ch
BT-16	Potassic-altered porphyritic microdiorite	1. Bio + Rt 2. Ch 3. Sm + Lm + Hm	1. Q $\pm$ Bio $\pm$ Cb (small cavities) 2. Lm (coatings to cavities of leached crystals)		Bio, Pl, Ch
BT-17	Propylitic-altered, sparsely porphyritic microdiorite	1. Act/Trem + Ep 2. Ch $\pm$ Ad 3. Ch / Ch cy + Hm + Lm	1. Hm (coating to open microfracture)		Pl, Amp, Ch, Ch-Sm
BT-207	Phyllic-altered, banded, very fine to coarse-grained sandstone	1. Q + To + Py	1. Q $\pm$ To (veinlets) 2. Ct (calcrete, cavities, microfractures)	Py	Q, Ksp, To, trace Sm

Mineral Abbreviations

Ab	Albite	Cb	Carbonate	Ep	Epidote	Leu	Leucoxene	Q	Quartz
Act	Actinolite	Ch	Chlorite	Fe ox	Iron Oxide	Lm	Limonite	Rt	Rutile
Ad	Adularia	Ch-Sm	Interlayered Chlorite-Smectite	Hm	Hematite	Mt	Magnetite	Ser	Sericite
Amp	Amphibole	Ct	Calcite	K	Kaolinite	Pl	Plagioclase	Sul	Sulphides
Bio	Biotite			Ksp	K-feldspar	Py	Pyrite	To	Tourmaline

3. LITHOLOGIES

The sample suite includes altered mafic / intermediate and felsic volcanic or shallow subvolcanic rocks, deeper level intrusive rocks, hydrothermal breccias and sedimentary lithologies.

1. Felsic volcanic / subvolcanic rocks

Medium to fine-grained porphyritic rhyolite; (samples Bob-1, Bob-2, Bob-3, Bob-4, Bob-5, Bob-7, Bob-8). This lithology, which was identified as a dacite in the field, is characterised by common medium to fine-grained phenocrysts of quartz and leached crystals after inferred feldspar and mafic minerals. The quartz phenocrysts, which generally constitute 15-25 vol.% of the sections, are typically 1-2mm across with squat prismatic and square euhedral shapes often modified by magmatic corrosion to form delicate lobate or subhedral forms. The feldspar and mafic phenocrysts (~25-30%) are lath to subequant in shape typically 1-2mm but occasionally to 4mm with weak to strong modification of primary shapes due to textural destruction by leaching. The groundmasses of the samples are replaced by fine to very fine-grained secondary minerals, which are presumed to reflect a primary fine-grained texture. This is indicative of a volcanic or subvolcanic origin. The samples are identified as rhyolite on the basis of the abundance of the quartz phenocrysts. In sample Bob-8 the quartz phenocrysts are notably lower in abundance (5-7 vol.%) than the other felsic samples and finer grained (0.7-1mm) suggesting this sample may have been possibly less silica-rich than the others, (? dacite / rhyodacite).

2. Intermediate / mafic volcanic / subvolcanic rocks

Medium to fine-grained porphyritic? andesite / basalt (samples Bob-9, Bob-10, Bob-11). Intense alteration and weak (Bob-11) to strong deformation (Bob-9) has masked the primary textures of these rocks. In Bob-9 and Bob-11, medium to fine-grained, altered, tabular to subhedral phenocrysts (20-30-vol.%, <3mm across) inferred to be after feldspar and mafic crystals are distinguished within a microgranular groundmass. Tectonic deformation has produced a fine sericitic foliation through the rocks, which is pervasive in Bob-9 and weakly developed in Bob-11. The primary lithologies of these two rocks appear very similar. In Bob-10, scattered leached or altered, euhedral lath to subhedral shapes after inferred feldspar and mafic phenocrysts (15-20 vol.%, <2mm) are set in a groundmass mostly flooded with a green sericite which also occurs in Bob-9 and Bob-11. The green sericite alteration suggests a chromium or vanadium-rich phyllosilicate species (fuchsite/mariposite and roscoelite respectively) that is typically developed within intermediate to mafic rocks.

Fine-grained porphyritic microtonalite (sample Bob-12). Leached fine-grained euhedral to subhedral phenocrysts (10-15 vol.%, 0.5-1mm) with square, tabular and rhombic prismatic shapes after inferred feldspar and hornblende are set in a fine granular intergrowth of primary quartz and plagioclase (0.05-0.1mm) overgrown by secondary minerals. The quartz-rich nature of the rock, and lack of k-feldspar indicates the shallow intrusive rock is a microtonalite.

Medium to fine-grained porphyritic microdiorite (sample BT-16, BT-17). Although the 'groundmass' of the two samples is generally similar mineralogically and texturally, the two samples differ in their phenocryst content and size. BT-16 is characterised by leached tabular and subequant medium to fine-grained phenocrysts (15-20 vol.%, 1-3mm), compared to BT-17 where phenocrysts are sparse and developed to 4mm. The rest of the rock in both samples consists typically of interlocking twinned plagioclase laths with common interstitial subhedral laths and tablets after inferred mafic minerals and accessory Fe Ti oxide grains. The plagioclase laths in BT-16 are on average somewhat coarser in size than those in BT-17.

3. Hydrothermal breccias

Bob-14 is a monomictic breccia composed of angular, subangular and subrounded altered porphyritic rhyolite fragments set in a depositional hydrothermal matrix of fine-grained tourmaline.

Bob-15 is a polymict breccia composed of a variety of altered, coarse to fine-grained angular to subangular, lithic fragments including the following;

- dacite/rhyodacite,
- silicified volcanic groundmass,
- igneous fragments characterised by myrmekitic intergrowths of quartz and plagioclase,
- mudstone, siltstone and sandstone
- phenocryst crystal separates of plagioclase and quartz.

The clasts are set in a depositional matrix of very fine-grained biotite and quartz.

4. Sediments

Sandstone (samples Bob-6, BT-207), Bob-6 is an altered, well-sorted, immature, medium to coarse-grained sandstone composed of abundant subangular detrital quartz grains (0.3-1.2mm) with subordinate amounts of altered minerals (25-30 vol.%). BT-207 consists of well-sorted bands of very fine and coarse-grained sandstone. The relic immature primary detrital grains are composed of subangular quartz and microcline (0.05-0.2mm in diameter; average ~0.1mm) with common altered interstitial minerals. The bands are typically buckled and contorted.

Altered mudstone, siltstone and sandstone clasts occur in the polymict breccia described above

4. ALTERATION/DEPOSITION

The sample suite includes three distinct hydrothermal mineral assemblages characteristic of potassic, phyllic and propylitic-style alteration. Supergene overprinting of variable weak to moderate intensity is observed in the rocks,

1. Potassic-style alteration

This alteration is observed in only two samples (Bob-15, BT-16), occurs with moderate intensity and is characterised by the assemblage of

biotite + quartz $\pm$ albite $\pm$ tourmaline + rutile

In the polymict hydrothermal breccia, Bob-15, the clasts are partly to strongly replaced by quartz and albite with sparse to moderate amounts of secondary biotite + trace tourmaline and rutile.

The depositional matrix is composed of very fine granular biotite + quartz with residual cavities in the matrix sealed with well crystalline biotite masses overgrown by quartz and albite. In the microdiorite, secondary biotite completely replaces mafic minerals, seals interstitial pockets between the major minerals and weakly flecks plagioclase.

The assemblage is typical of those, that develop in mesothermal porphyry environments characterised by temperatures exceeding 300°C and near-neutral pH conditions.

2. Phyllic-style alteration

This stage is characterised by

quartz + sericite + tourmaline $\pm$ carbonate $\pm$ k-feldspar $\pm$ pyrite + rutile

and is present in all the rhyolite and intermediate / mafic volcanic / subvolcanic samples and in the microtonalite and sandstone lithologies.

In the rhyolite rocks, phyllic alteration is characterised by two distinct phases of alteration / deposition.

Stage 2a: Quartz + sericite is the initial assemblage and is associated with strong leaching in the rhyolites but with only minor textural destruction; phenocrysts are typically leached and infilled with quartz hosting sericite inclusions. The groundmass is replaced by fine to very fine-grained quartz + sericite often with a typical tabular crystal shape. Some small cavities associated with quartz and sericite may be after leached pyrite. Quartz + sericite also seals small dilatant fractures in Bob-7.

This stage is also present in the foliated, intermediate / mafic rocks where leaching is less pronounced and deformation is displayed by development of sericite foliation and ribbon textured or recrystallised secondary quartz. In the latter rocks, an early carbonate mineral, possibly siderite is present in vughs and is replaced and overgrown by quartz accompanied by sericite and local k-feldspar (mostly leached but relict in Bob-10). XRD analysis reveals the sericite is the well ordered 2M type indicative of sustained high temperatures.

Phenocrysts in the microtonalite (Bob-12) are mainly leached and empty; the groundmass is partly replaced by secondary quartz and flecked with sericite. In addition, minor amounts of a green subequant fine-grained tourmaline are present.

Primary fluid inclusions in quartz-cavity fill in samples Bob-9 and Bob-10 are liquid-rich with daughter crystals of halite and another salt possibly sylvite. These inclusions indicate that the fluids were hypersaline.

Stage 2b: Quartz + tourmaline $\pm$ pyrite follow stage 2a after further strong leaching of the rhyolite rocks causing textural destruction and the formation of coarse to fine -sized vughs. In some samples, the earlier stage sericite is almost absent. Tourmaline typically overgrows quartz in the groundmass and seals leached phenocrysts and vughs with or without quartz. In some samples, tourmaline locally floods the groundmass. The tourmaline in the rhyolites typically forms small rosettes of slender radiating prismatic crystals and is pale green to colourless in thin section suggesting it is the lithium-rich variety elbaite.

The two sandstone samples (Bob-6, BT-207) are replaced by quartz and common tourmaline with sericite absent. The tourmaline in Bob-6 is similar to that observed in the rhyolite ie. common pale coloured rosettes whereas the tourmaline in BT-207 is pleochroic green (possibly Fe-rich schorl) and forms small subequant crystals, lacking the slender prismatic habit.

The hydrothermal breccia matrix in Bob-14, is composed exclusively of prismatic tourmaline and follows an earlier pre breccia tourmaline stage which was associated with quartz deposition in vughs and leached crystal sites.

Trace amounts of relict microgranular pyrite is preserved as inclusions within quartz-vugh-fill in Bob-14 and with replacement quartz in BT-207.

A late phase of quartz deposition with or without tourmaline seals weakly developed veinlets in some of the rhyolites.

Strong leaching and common tourmaline indicate the phyllic-altered rocks were strongly corroded by hot acidic vapour-dominated fluids at temperatures $>250-300^{\circ}\text{C}$ at mesothermal levels.

3. Propylitic-style alteration

The mineral assemblage of

actinolite / tremolite + epidote + chlorite $\pm$ adularia

occurs in the microdiorite BT-17. Pale fibrous actinolite / tremolite completely replaces a primary fine-grained mafic mineral possibly after pyroxene. The amphibole is partly to completely replaced by chlorite. Well crystalline fine-grained epidote partly replaces plagioclase, which is also traversed by small rare alteration veinlets of adularia. The presence of the amphibole and well-developed crystallinity of the epidote reflect moderately high temperatures $>230-280^{\circ}\text{C}$, and near neutral pH conditions. It is inferred that chlorite and adularia formed at somewhat lower temperatures.

4. Supergene overprinting

kaolinite + smectite + calcite + Fe oxides (limonite / goethite + hematite)

Residual open space within vughs in the phyllic-altered rocks is locally filled with kaolinite occasionally spotted by microcrystalline calcite. Smectite and or kaolinite weakly dusts tourmaline in some rocks. Microcrystalline calcite (calcrete) locally lines vughs, seals occasional veinlets and forms coatings on some sample surfaces. Fe oxides replace primary Fe Ti oxides, inferred pyrite and secondary magnetite (Bob-12) and locally coat vugh and late microfracture surfaces. Strong amorphous to cryptocrystalline hematite stains quartz in Bob-8. The hematite may possibly be derived from the weathering of sulphides intergrown with quartz-fill of leached crystals and vughs.

5. MINERALISATION

No mineralisation was noted in the four polished sections. The only opaque minerals observed are a few relict grains of pyrite preserved with quartz in two samples (Bob-14, BT-207). Leached cavities in some phyllic-altered samples are suggestive of possible sulphide sites but these were ambiguous and not common. It appears that the rocks are poorly mineralised.

6. DISCUSSION AND COMMENTS

6.1 General Discussion

The rock suite is dominated by medium to fine-grained quartz-sericite-tourmaline-altered rhyolites. There is evidence of intense leaching and deposition of tourmaline occurred within vughs. There are high temperature mineral alteration and depositional phases in the matrix in the hydrothermal breccia, and it is likely that these rocks were in contact with hot acidic fluids derived from a nearby cooling magmatic source. Alteration in the two potassic-altered rocks indicates that they were even closer to that source. It appears that, because of the paucity of mineralisation, that either the conditions were not conducive to mineralisation, eg too hot, or, that the cooling intrusion supplying heat and fluids was poor in metals. It is inferred from the presence of hypersaline hydrothermal fluids that little or no interaction with meteoric fluid has occurred. Such mixing would have favoured metal deposition. The strong leaching of the rocks would have liberated considerable silica that would have been precipitated at higher levels or in zones peripheral to the phyllic-altered, tourmalised rocks. This silica may possibly be associated with the silica flooding event seen in the field in rocks within the Mt Grainger anticline.

6.2 Conclusions

From the work done here, it is probable that the phyllic-altered rhyolites are not directly related to the widespread silicification and weak gold mineralisation seen in the anticlinal rocks. It is suggested that the tourmaline-altered-rhyolites and breccias, are located close to, and above, the magmatic fluid source. They may in fact be apophyses from the main intrusion at depth.

The potential for mineralised carbonate rocks at depth below the rhyolite within the lower parts of The Burra Group, is downgraded because it is here suggested that the fluids were either too hot, or the system was insufficiently mineralised. The distal jasperoids do not show any evidence of alteration by vapour-dominated, boron-rich fluids, and it may be that there is more potential in areas along strike from the high temperature zones, especially in major structures, where mixing may have occurred.

From this, and previous reports, it is clear that the area has had a protracted magmatic history incorporating mafic to felsic magmatism, and just because one centre is considered no longer attractive, it does not mean that others are also non- prospective.

A better understanding of mineralisation at Mt Grainger can only be acquired (at the present level of exploration) with continued detailed mapping integrated with petrology. This will enable development of paragenetic histories relating lithologies, alteration and mineralisation and their geometric distribution. These paragenetic histories can then be used to develop mineralisation models to assist in assessing future exploration strategies.

APPENDIX I: PETROGRAPHIC DESCRIPTIONS

Sample Number: Bob-1

Central area

Rock Name:

A leached, pervasively phyllic-altered (quartz, sericite, tourmaline) medium-grained porphyritic rhyolite.

Thin Section Description - Lithology, Textures And Minerals:

An altered, leached medium-grained porphyritic rhyolite rock. Phenocrysts consist of abundant euhedral quartz (1.2-2mm across, 15-20%) and leached tabular and lath shaped crystals after inferred feldspar and mafic minerals (25-30%, to 5mm in length) set in a very fine-grained groundmass. The quartz crystals typically have euhedral square to squat prismatic shapes; some have delicate protuberances or are embayed due to magmatic resorption. The other phenocrysts are completely leached with associated textural destruction causing considerable loss of euhedral forms of many crystals; some, which are infilled with polycrystalline quartz, retain their euhedral crystal shapes. Intense alteration has obliterated primary groundmass textures.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; → a) leached and infilled

Groundmass → replaced by microcrystalline Quartz + abundant very fine-grained subequant Sericite with scattered small clusters of prismatic pale green Tourmaline rosettes.

Replacement Mineral Abundances

Quartz (30-40%), Sericite (15-20%), Tourmaline 10-12%)

Deposition:

Sequences Of Deposition

- 1) Euhedral leached crystals (7-10%) → sealed with polycrystalline fine granular to squat prismatic Quartz intergrown with or hosting fine squat laths and tablets of well crystalline Sericite. The quartz locally lines residual open space. Enclosed within some of the quartz, there are cubic shaped cavities suggestive of leached fine-grained Pyrite.
- 2) Subhedral to anhedral leached crystals and vughs to 9mm in length in groundmass (20-30%) → sealed with spherulitic aggregates (rosettes) of fine-grained prismatic pale green Tourmaline ± interstitial Quartz; some of the cavities are locally lined with fine granular Quartz. Some of these tourmaline-filled vughs enclose St. 1 quartz infill of crystals.
- 3) Rare weak veinlets (0.7-1%) cutting tourmaline deposition and groundmass → sealed with fine grained Quartz ± fine-grained prismatic Tourmaline.
- 4) Local overgrowths to St 2 tourmaline and infill of irregular vughs to 8mm across (3-5%) → composed of Kaolinite ± microcrystalline ?Smectite.

Comments:

A leached pervasively phyllic-altered (quartz, sericite, tourmaline) medium-grained rhyolite. The pale green to colourless tourmaline suggests it is the Li-rich elbaite variety. The preserved euhedral phenocryst shapes which are typically infilled with quartz ± sericite suggest the more textural destructive leaching followed quartz-sericite alteration / deposition and preceded tourmaline alteration / deposition.

Paragenesis

1. Phyllic alteration, leaching; quartz + sericite + ?pyrite
2. Further strong leaching; textural destruction; tourmaline + quartz deposition and alteration
3. Veinlets; quartz ± tourmaline
4. Vugh infill; kaolinite + smectite

Sample Number: Bob-2

Central area

Rock Name:

A leached, phyllic-altered (quartz, sericite, tourmaline) medium-grained porphyritic rhyolite

Thin Section Description - Lithology, Textures And Minerals:

An altered, leached medium-grained porphyritic rhyolite rock. Primary relict textures are very similar to sample Bob-1. Phenocrysts consist of abundant euhedral quartz (1.-1.8mm across, 15-20%) and leached tabular and lath shaped crystals after inferred feldspar and mafic minerals (30-35%, to 5mm in length) set in a very fine-grained groundmass. The quartz crystals typically have euhedral square to squat prismatic shapes; some have delicate protuberances or are embayed due to magmatic resorption. The other phenocrysts are completely leached with associated textural destruction causing modification of former euhedral phenocryst shapes; however, some which are infilled with composite quartz retain their euhedral crystal shapes. Intense alteration has obliterated primary groundmass textures.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; → a) leached and infilled

Groundmass → replaced by very fine granular to microcrystalline Quartz (~0.025-0.05mm) + minor very fine-grained subequant to tabular Sericite followed by local flooding of very fine grained pale green prismatic Tourmaline.

Replacement Mineral Abundances

Quartz (30-40%), Tourmaline (15-20%), Sericite (3-5%),

Deposition:

Sequences Of Deposition

- 1) Euhedral leached crystals and local lining to large vugh 25mm across with groundmass (7-10%) → sealed with polycrystalline medium to fine granular to squat prismatic Quartz intergrown with or hosting fine squat tablets and laths of well crystalline Sericite. The sericite locally forms circular zones within the quartz. The quartz + sericite lining the vugh locally overprints adjacent wallrock engulfing phenocrysts and is host to small pockets of overgrowing fine to very fine-grained Tourmaline.
- 2) A) Subhedral leached crystals and irregular vughs including large vugh described in St.1 in groundmass (20-30%) → sealed with spherulitic aggregates (rosettes) of fine-grained prismatic pale green Tourmaline ± interstitial Quartz. Some of these tourmaline-filled vughs enclose St.1 quartz infill of crystals.
B) Narrow fractures and fracture cavities (5-7%) → are sealed with Tourmaline.
- 3) Irregular veinlets (3-5%) cutting tourmaline veinlets and groundmass → sealed with fine granular Quartz ± fine-grained prismatic Tourmaline.
- 4) Local pockets within groundmass and St 3 quartz veining (1-2%) → sealed with Kaolinite dusted with Limonite.

Comments:

The rock is similar in lithology and alteration to Bob-1 but tourmaline overprinting is more intense in the groundmass at the expense of sericite.

Paragenesis

1. Phyllic alteration, leaching; quartz + sericite
2. Further strong leaching; textural destruction, fractures; tourmaline + quartz deposition and alteration
3. Veinlets; quartz + tourmaline
4. Vugh infill; kaolinite + limonite

Sample Number: Bob-3

Central area

Rock Name:

A leached, phyllic-altered (quartz, sericite, tourmaline) medium -grained porphyritic rhyolite

Thin Section Description - Lithology, Textures And Minerals:

An altered, leached medium-grained porphyritic rhyolite rock. Primary relict textures are very similar to sample Bob-1 / 2. Phenocrysts consist of abundant euhedral quartz (1-2mm across, 15-20%) and leached tabular and lath shaped crystals after inferred feldspar and mafic minerals (25-30%, to 5mm in length) set in a very fine-grained groundmass. The quartz crystals typically have euhedral square to squat prismatic shapes with local minor magmatic resorption along grain boundaries. The other phenocrysts are completely leached with associated textural destruction causing modification of former euhedral phenocryst shapes; however, some which are infilled with composite quartz retain their euhedral crystal shapes. Intense alteration has obliterated primary groundmass textures. A zoned prismatic zircon crystal 0.2mm in length was observed in the groundmass.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; → a) leached and infilled

Quartz phenocrysts; some have been fractured

Groundmass → replaced by very fine granular to microcrystalline Quartz (~0.025-0.05mm) + very fine-grained to microgranular Sericite + overgrowing Tourmaline. The tourmaline occurs as scattered fine-grained prismatic crystals within the quartz or locally floods the groundmass typically as radiating rosettes enclosing phenocrysts quartz and infilled leached crystals to form irregular patches up to more > 20mm across.

Replacement Mineral Abundances

Tourmaline (25-30%), Quartz (30-40%), Sericite (7-10%)

Deposition:

Sequences Of Deposition

- 1) Euhedral leached crystals and irregular vughs (15-20%) → sealed with polycrystalline medium to fine granular Quartz intergrown with or hosting fine squat tablets and laths of well crystalline Sericite.
- 2) A) Subhedral leached crystals and irregular vughs including large vugh described in St.1 in groundmass (20-30%) → sealed with spherulitic aggregates (rosettes) of fine-grained prismatic pale green Tourmaline ± interstitial Quartz. Some of these tourmaline-filled vughs enclose St.1 quartz infill of crystals. The tourmaline masses are cut by hairline microfractures outlined by cryptocrystalline Kaolinite / Smectite clay dusting.
B) Narrow fractures and fracture cavities (5-7%) → are sealed with Tourmaline.
- 3) Weak vuggy irregular veinlets < 0.1mm wide (1-2%) cutting earlier deposition and groundmass; local residual space in vughs → sealed with fine granular clear Quartz with or without minor fine-grained prismatic Tourmaline.
- 4) Rare pockets within earlier deposition (1-2%) → sealed with Kaolinite.

Comments:

The rock is similar in lithology and alteration to Bob-3 with somewhat more common sericite.

Paragenesis

1. Phyllic alteration, leaching; quartz + sericite
2. Further strong leaching; textural destruction; tourmaline + quartz deposition and alteration
3. Veinlets; quartz ± tourmaline
4. Vugh infill, microfractures; kaolinite / smectite + limonite

Sample Number: Bob-4

Central area

Rock Name:

A vuggy, leached phyllic-altered (quartz, tourmaline) medium-grained porphyritic rhyolite.

Thin Section Description - Lithology, Textures And Minerals:

An altered, leached medium-grained porphyritic rhyolite rock. Primary relict textures are very similar to previous samples. Phenocrysts consist of abundant euhedral quartz (1-2mm across, 15-20%) and leached tabular and lath shaped crystals after inferred feldspar and mafic minerals (25-30%, to 5mm in length) set in a very fine-grained groundmass. The quartz crystals typically have euhedral square to squat prismatic shapes with local minor magmatic resorption along grain boundaries. The other phenocrysts are completely leached with some associated textural modification to the primary shapes. Intense alteration has obliterated primary groundmass textures. Several very fine-grained squat prismatic zircon crystals to 0.15mm are present in the groundmass. Several medium sized subrounded and elongate shapes some with scattered siltsize quartz grains are inferred to be altered xenocrysts after a microgranular lithologies (siltstone and mudstone).

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; → a) leached with a few infilled

Quartz phenocrysts; some have been fractured

Groundmass → replaced by very fine granular to microcrystalline Quartz (~0.025-0.05mm) + abundant fine to very fine-grained prismatic Tourmaline typically disposed as small rosettes. Tourmaline is patchily dusted by brown cryptocrystalline Smectite and ?Limonite.

?Xenocrysts → replaced by equi microgranular Tourmaline.

Replacement Mineral Abundances

Quartz (30-40%), Tourmaline (20-25%), Smectite / Limonite (1-2%)

Deposition:

Sequences Of Deposition

- 1) Some leached crystals, regular to irregular vughs up to 10mm across (15-20%) → sealed with medium to fine granular Quartz typically hosting or rimmed by small Tourmaline rosettes. The quartz is commonly intergrown with medium to fine-grained lath shaped crystals (possibly k-feldspar) which have been completely leached; the resultant cavities are locally lined with tourmaline. The quartz itself is locally partly resorbed. Very rare Sericite laths occur as micro inclusions in the quartz in places.
- 2) Late vugh infill, openings (5-7%) → locally lined with prismatic fine-grained Tourmaline and sealed with medium to fine-granular clear Quartz.

Comments:

Rock has been intensely leached with quartz and tourmaline replacement and cavity-fill. Only trace sericite is present within some quartz vugh infill crystals. The intense leaching suggests the sample is proximal to main channelways (?structurally prepared) hosting ascending vapour-rich fluids.

Paragenesis

1. Phyllic alteration, leaching; quartz
2. Further strong leaching; textural destruction; tourmaline + quartz ± sparse sericite deposition and alteration
3. Supergene overprint; smectite, limonite.

Sample Number: Bob-5

"Off centre" area

Rock Name:

A crushed, crackle-brecciated, leached, phyllic-altered (quartz, sericite, tourmaline) medium to fine-grained porphyritic rhyolite

Thin Section Description - Lithology, Textures And Minerals:

A crushed, altered medium to fine-grained porphyritic rhyolite lithology. Relict primary textures and minerals are similar to those described for the previous samples ie common medium-grained phenocrysts of quartz and leached crystals are set in a silicified microgranular groundmass.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; → a) leached and commonly infilled

Groundmass → replaced by very fine granular to microcrystalline Quartz (~0.025-0.05mm) + very minor very fine-grained to microgranular Sericite + overgrowing Tourmaline. The tourmaline occurs as scattered fine-grained prismatic crystals within the quartz typically as small rosettes.

Replacement Mineral Abundances

Quartz (30-40% of rhyolite), Tourmaline (10-15%), Sericite (2-3%)

Deposition:

Sequences Of Deposition

- 1) Leached crystals, vughs (15-20%) → sealed with medium to fine granular Quartz hosting Sericite laths and micro tablets.
- 2) Leached crystals and vughs (15-20%) → sealed with fine grained prismatic Tourmaline occurring as abundant small rosettes.
- 3) Crushing of rock to crackle breccia textures and fractures cavities → medium to fine-grained subangular to subrounded wallrock clasts including brecciated earlier quartz and tourmaline deposition are sealed with by dense very fine-grained masses of Tourmaline.
- 4) A) Tourmaline breccia matrix is dusted with brown cryptocrystalline Smectite / Kaolinite and / or stained with Limonite.
B) Veinlet (0.1-0.3%) → sealed with microcrystalline Calcite

XRD Minerals:

Quartz, tourmaline, sericite (2M), kaolinite, smectite

Comments:

A crushed, crackle-brecciated, phyllic-altered (quartz, sericite, tourmaline) medium to fine-grained rhyolite. The subrounding of many altered grains indicate some movement of clasts. The microgranular tourmaline matrix post dates earlier stage of prismatic tourmaline. The calcite is inferred to be calcrete.

Paragenesis

1. Phyllic alteration, leaching; quartz ± sericite
2. Further strong leaching; textural destruction; tourmaline + quartz deposition and alteration
3. Brecciation; tourmaline matrix deposition
4. Supergene overprint; smectite + kaolinite + limonite + calcite (calcrete)

Sample Number: Bob-6
Pit near tank

Rock Name:

A phyllic-altered (quartz, tourmaline) medium to coarse-grained sandstone with patchy limonite staining.

Hand Specimen Description:

A greenish grey medium-grained well-sorted quartz-rich sandstone with occasional subrounded medium-sized vugs infilled with pale quartz (not included in TS). Rock rind is strongly stained by irregular orange brown limonite staining.

Thin Section Description - Lithology, Textures And Minerals:

An altered well sorted medium to coarse-grained sandstone. The sediment is composed of abundant clast to matrix-supported subangular clear quartz grains in the size range of 0.3 to 1.2mm diameter with subordinate amounts (25-35%) of altered interstitial minerals and microcrystalline matrix.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Altered interstitial minerals / matrix → almost completely replaced by fine granular Quartz (commonly hosting small prismatic Tourmaline rosettes) + prismatic fine-grained Tourmaline rosettes and microgranular Tourmaline; some detrital quartz grains are rimmed by thin overgrowths of Quartz + Tourmaline. A few minerals are leached. The detrital and replacement quartz, tourmaline and interstitial matrix is strongly stained by Limonite / Goethite in places; tourmaline is dusted locally by brown cryptocrystalline Smectite.

Replacement Mineral Abundances

Quartz (20-25%), Tourmaline (7-10%), Limonite / Goethite (5-7%), Smectite (3-5%)

Deposition:

Sequences Of Deposition

- 1) Occasional small open cavities (0.1-0.3%) → lined sporadically with fine-grained prismatic Tourmaline.
- 2) A regular narrow discontinuous opening 1mm wide (0.1-0.3%) → sealed with fine granular clear Quartz.
- 3) Microfractures (0.1-0.3%) → sealed with Limonite.

Mineralisation

No primary mineralisation was observed; limonite / goethite in the rock does not appear to replace possible primary sulphides.

Comments:

A phyllic-altered (quartz, tourmaline medium to coarse-grained sandstone with patchy limonite staining.

Paragenesis

1. Phyllic alteration / leaching; quartz + tourmaline → minor quartz deposition
2. Supergene overprinting; limonite / goethite + smectite.

Sample Number: Bob-7

"Off centre" area

Rock Name:

A leached, phyllic-altered (quartz, sericite, tourmaline) medium to fine-grained porphyritic rhyolite.

Thin Section Description - Lithology, Textures And Minerals:

A leached, altered medium-grained porphyritic rhyolite rock. Relict primary textures and mineralogy are very similar to those described for the previous rhyolite samples; ie common euhedral to subhedral phenocrysts of quartz (1-2mm; 15-20%) and leached crystals to 3mm (15-20%) are set in a microgranular silicified groundmass.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; → a) leached and commonly infilled

Groundmass → replaced by very fine granular to microcrystalline Quartz (~0.025-0.05mm) + very fine-grained to microgranular Sericite + overgrowing Tourmaline. The tourmaline occurs as scattered fine-grained prismatic typically as small rosettes.

Microcrystalline kaolinite and smectite replace sericite and some tourmaline in the groundmass

Replacement Mineral Abundances

Quartz (30-35%), Tourmaline (7-10%), Kaolinite (7-10%), Sericite (5-7%), Smectite (2-3%)

Deposition:

Sequences Of Deposition

- 1) Leached crystals, vughs (20-25%) → sealed with fine granular Quartz with very fine-grained Sericite inclusions
- 2) Weak tensional shear band, 3mm wide (3-5%, white in HS due to clays) → defined by abundant fine granular Quartz somewhat larger in size to groundmass quartz and includes some grains with slightly elongated shapes + sparse microgranular Sericite tablets + overgrowing prismatic Tourmaline rosettes → strongly dusted by supergene cryptocrystalline Kaolinite / Smectite. Leached crystals within the zone are infilled with non fractured quartz and local tourmaline indicating deposition post dates the shear zone. Thin openings within the zone are sealed with fine-granular Quartz.
- 3) Leached crystals, vughs (including several elongate vughs possibly tension gashes subparallel and proximal to shear band) (15-20%) → sealed with fine granular Quartz with prismatic Tourmaline rosettes as inclusions or overgrowths to the quartz. The tension gashes are lined with quartz and tourmaline and sealed with microcrystalline Calcite and / or Kaolinite.
- 4) A) Several small vughs (locally lined with tourmaline (2-3%) → sealed with Kaolinite.
B) Edge of part of section (rind of sample) coated with microcrystalline Calcite (Calcrete).

XRD Minerals:

Quartz, tourmaline, kaolinite, sericite, trace smectite

Comments:

A leached, phyllic-altered (quartz, sericite, tourmaline) medium to fine-grained porphyritic rhyolite.

Paragenesis

1. Phyllic alteration, leaching, local tensional shear; quartz + sericite alteration / deposition
2. Leaching; → quartz + tourmaline
3. Supergene overprint; kaolinite + smectite alteration / deposition + calcite deposition

Sample Number: Bob-8
"Off centre" towards pits

Rock Name:

A leached, brecciated, phyllic-altered (quartz, sericite, tourmaline) medium to fine-grained dacite / rhyolite with strong staining by supergene hematite.

Thin Section Description - Lithology, Textures And Minerals:

A leached, altered medium to fine-grained porphyritic dacite / rhyolite lithology. Phenocrysts consist of leached laths and prisms (0.8 to 3mm, 20-25%) after inferred feldspar and mafic crystals and euhedral to subhedral fine-grained quartz (0.7-1mm, 5-7%) set in a microgranular silicified groundmass. The leached phenocrysts have generally been strongly modified by textural destruction. A large elongate shape 9mm in length with curved margins is possibly a leached xenolith. The minor amount of small quartz phenocrysts suggests the rock may be a dacite or rhyodacite.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts / ?xenoliths → mostly completely leached; a few are replaced by very fine Sericite ± prismatic Tourmaline. Fine grains replaced by supergene hematite within some sericite are possibly after pyrite.

Quartz phenocrysts; some are rimmed by overgrowths of fine granular Quartz with Sericite inclusions.

Groundmass → replaced by fine-granular Quartz (0.025-0.1mm) + abundant microtabular Sericite + minor fine-grained prismatic Tourmaline → overgrown by patchy microcrystalline Quartz in places. Groundmass is leached to form common small vughs.

Replacement Mineral Abundances

Fine grained quartz (30-40%), Sericite (15-20%), microcrystalline Quartz (5-7%), Tourmaline (3-5%)

Deposition:

Sequences Of Deposition

- 1) Local tectonic brecciation of wallrock to form coarse to fine grained subangular clasts → sealed with very fine granular to microcrystalline Quartz + microgranular Sericite (7-10%); the breccia textures are generally indistinct due to matrix having similar textures with groundmass
- 2) Leached crystals, vughs, ?xenoliths (25-30%) sealed with medium to fine-granular Quartz with scattered Sericite laths, fibres and tablets locally overgrown by dense patches of microcrystalline Quartz. Minor prismatic colourless Tourmaline overgrows the quartz in places extending into open space. Some quartz is intergrown with small leached crystals laths and subequant crystals with resultant cavities coated with hematite. These leached crystals may be after k-feldspar or sulphides.
- 3) Weak veinlets locally cutting St.2 quartz, thin openings (3-5%) → lined or sealed with clear fine granular Quartz.
- 4) Vuggy microfractures, local coatings to earlier quartz deposition or cavities of leached crystals (3-5%) → composed of amorphous Hematite ± Kaolinite

Comments:

A leached, brecciated, phyllic-altered (quartz, sericite, tourmaline) medium to fine-grained dacite / rhyolite with strong staining by supergene hematite. This lithology differs from the previously described rhyolite samples in having less common and smaller quartz phenocrysts.

Paragenesis

1. Brecciation → phyllic alteration, leaching; quartz + sericite → minor tourmaline
2. Veinlets, vughs → quartz
3. Supergene alteration; hematite + kaolinite

Sample Number: Bob-9

Peripheral pits

Rock Name:

A schistose, phyllic-altered (quartz, sericite, ?sulphides, carbonate) medium-grained porphyritic volcanic rock.

Thin Section Description - Lithology, Textures And Minerals:

An altered schistose medium-grained porphyritic volcanic rock possibly a rhyolite. Altered tabular to subhedral phenocrysts (1-3mm in diameter, 20-30%) are set in a microgranular altered groundmass. The primary textures are strongly modified by alteration and deformation. The phenocrysts are replaced, mostly by ribboned quartz or recrystallised quartz indicative of deformational strain. The rock has been partly disaggregated by a pervasive fine foliation resulting from shear deformation.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts → replaced by ribboned or fibrous textured Quartz flecked with minor fine-grained Sericite and typically dusted with cryptocrystalline Limonite. Some of the quartz is host to small discrete rhombs inferred to be after carbonate that have been silicified and dusted with microcrystalline Limonite.

Groundmass → silicified to very fine granular Quartz + common very fine-grained Sericite. The groundmass is cut by a pervasive fine foliation defined by quartz and sericite generally aligned in the direction of foliation. Square, rhombic and subhedral-shaped grains of a common quartz-limonite phase possibly after sulphides and/or carbonate are disseminated throughout the groundmass. Minor small disseminated subhedral grains replaced by Limonite are inferred to be after primary Fe Ti oxides.

Replacement Mineral Abundances

Quartz (50-60%), Sericite (30-40%), Limonite (5-7%)

Deposition:

Sequences Of Deposition

- 1) Elongate vugh on edge of section (2-3%) postdating deformation;
 - a) lined with fine-grained rhombs after Carbonate (replaced by Quartz with fibrous Sericite inclusions + Limonite) and leached prisms possibly after k-feldspar laths (defined within quartz + sericite) + several fine euhedral Limonite-altered grains possibly after sulphides.
 - b) overgrown by medium to fine-granular Quartz. The quartz in a) and b) is host to common primary liquid-rich fluid inclusions containing daughter crystals of halite + another salt phase ?sylvite. Stage 1b quartz which extends into open space is also host to sparse inclusions of euhedral tabular anhydrite and anhedral carbonate (?calcite).
 - c) small occasional cavities in groundmass (1-2%) lined or sealed with fine granular Quartz ± sparse Sericite.
- 2) Limonite (2-3%) coats commonly coats St1 quartz and seals common irregular microfractures (2-3%)

Comments:

A schistose, phyllic-altered (quartz, sericite, ?sulphides, carbonate) medium-grained porphyritic volcanic rock. Salt daughter crystals in fluid inclusions indicate hydrothermal fluid was hypersaline.

Paragenesis

1. Phyllic alteration; quartz + sericite + carbonate + ?sulphides → deformation
2. Deposition; quartz + carbonate + sulphides + ?k-feldspar
3. Supergene alteration, leaching; limonite

Sample Number: Bob-10
Peripheral pits

Rock Name:

A phyllic-altered (sericite, quartz, tourmaline, k-feldspar, carbonate) medium to fine-grained porphyritic mafic volcanic lithology.

Thin Section Description - Lithology, Textures And Minerals:

An altered leached fine-grained lithology of uncertain primary composition, probably a porphyritic volcanic rock. Most of the rock is composed of dense fine-grained sericite $\pm$ quartz. Scattered euhedral lath to anhedral shapes (15-20%, <2mm) which are leached or which are characterised by relatively more quartz than the enclosing sericite and dusted by smectite, appear to be phenocrysts conferring a medium to fine-grained porphyritic volcanic texture. Lack of quartz phenocrysts indicates the rock is intermediate or mafic composition. Altered fine-grained laths and grains replaced by limonite / goethite and commonly modified in shape by alteration are inferred to be accessory Fe Ti oxides.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts $\rightarrow$ leached with some shapes modified; or replaced by microcrystalline Quartz + Sericite $\rightarrow$ weakly overprinted by Smectite.

Groundmass $\rightarrow$ replaced by abundant well crystalline Sericite + microcrystalline Quartz + sparse green squat prismatic to subhedral Tourmaline.

Fe Ti oxides $\rightarrow$ replaced by Goethite / Limonite $\pm$ Sericite and / or Leucoxene.

Sericite proximal to vugh-quartz-fill is strongly replaced by well crystalline Kaolinite.

Replacement Mineral Abundances

Sericite (80-90% of lithology), Quartz (7-10%), Fe oxides (1-2%), Tourmaline (1-2%)

Deposition:

Sequences Of Deposition

- 1) Two veinlets $\sim$ 2mm wide (3-5%) $\rightarrow$ sealed with well crystalline Sericite + minor fine granular Quartz with small residual cavities sealed with fine granular Quartz.
- 2) A) Large vugh (which cut across St.1 veining, (7-10%) $\rightarrow$ lined locally with vuggy supergene Limonite-altered rhombs after inferred Carbonate overgrown by medium to fine-grained Quartz (hosting small Limonitised rhombs $\pm$ Sericite) + Sericite + minor relic K-feldspar laths $\pm$ minor fine-grained Tourmaline $\rightarrow$ overgrown by clear medium to fine-granular Quartz (hosting rare anhedral Carbonate inclusions, ?calcite) Quartz is host to common primary liquid-rich fluid inclusions containing daughter crystals of halite + another salt phase ?sylvite. Rhombic and lath shaped cavities within the quartz-sericite and quartz deposition are inferred to be leached sites after carbonate and k-feldspar. The clear quartz locally displays ribboned textures indicative of weak deformation strain.
B) Vugh (2-3%) lined with granular Quartz + minor leached fine-grained rhombs overgrown by several fine rectangular to subhedral Limonitised grains probably after Sulphides $\rightarrow$ enveloped in well crystalline Kaolinite + sparse microcrystalline Calcite (calcrete).
C) Leached crystals (3-5%) $\rightarrow$ some are sealed with fine granular Quartz $\pm$ Sericite.

XRD Minerals:

Sericite (2M), quartz, trace smectite

Comments:

A phyllic-altered (sericite, quartz, tourmaline, k-feldspar, carbonate) medium to fine-grained porphyritic mafic volcanic lithology. The green sericite is inferred to be a Cr or V-rich variety i.e. fuchsite / mariposite or roscoellite respectively, indicative of hydrothermal fluid interaction with a mafic composition.

Paragenesis

1. Phyllic alteration / deposition, leaching; ; sericite + quartz $\pm$ tourmaline + k-feldspar + carbonate + leucoxene + ?sulphides
2. Supergene overprint; kaolinite + smectite + limonite + calcite

Sample Number: Bob-11

Peripheral Pits

Rock Name:

A phyllic-altered, weak foliated, (quartz, sericite, leucoxene) medium to fine-grained porphyritic volcanic rock.

Thin Section Description - Lithology, Textures And Minerals:

An altered, finely foliated, medium to fine-grained porphyritic volcanic lithology. Moderately common altered tabular, lath-shaped and subhedral phenocrysts (25-30%, <3mm) are distinguished in a very fine-grained altered matrix. The combination of alteration and strong deformation strongly masks relic primary textures. Altered Fe Ti oxide grains are accessory.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts → completely replaced by a) fine-grained Quartz ± subequal amounts of Sericite and commonly dusted with thin lineations of cryptocrystalline Limonite and b) fine-grained Quartz with only minor Sericite. Some crystals are outlined with a thin Limonitic rim.

Fe Ti oxides → replaced by Leucoxene + Limonite ± Sericite

Groundmass → replaced by fine grained Quartz + subequal amounts of Sericite with Limonite dusting.

Sericite and larger quartz grains have a rough preferred orientation in the direction of principal stress. Rock is traversed by a thin weakly developed, somewhat irregular, foliation consisting of very fine-grained sericite.

Replacement Mineral Abundances

Quartz (45-55%), Sericite (35-40%), Limonite (3-5%), Leucoxene (0.7-1%)

Deposition:

Sequences Of Deposition

- 1) Vugs and possibly some leached phenocrysts (3-5%) → sealed with fine granular Quartz dusted with Limonite ± minor Sericite. The quartz commonly has a weak developed ribbon texture indicative of deformation strain and which is outlined by thin lineations of dusty Limonite.
- 2) Weak developed discontinuous microveinlets, small openings which cut across deformation foliar textures (1-2%) → lined or sealed with fine grained Quartz ± Sericite.
- 3) Rind of rock, parting surface, on edge of section (1-2%) → composed of microcrystalline Calcite (calcrete) with associated minor calcite overprinting of adjacent wallrock.

Comments:

A phyllic-altered, weak foliated, (quartz, sericite, leucoxene) medium to fine-grained porphyritic volcanic rock.

Paragenesis

1. Phyllic alteration; quartz + sericite + leucoxene → deformation
2. Deposition; quartz + sericite
3. Supergene alteration / deposition ; limonite + calcite

Sample Number: Bob-12
Dryblower Hill Creek Pit

Rock Name:

A leached, oxidised, phyllic-altered (quartz, plagioclase, sericite, tourmaline, ?magnetite/?pyrite, rutile) fine-grained porphyritic microtonalite.

Thin Section Description - Lithology, Textures And Minerals:

An altered, fine-grained, porphyritic, subvolcanic intermediate lithology. Moderate amounts of fine-grained euhedral to subhedral leached phenocrysts (10-15%, 0.5-1mm) are set in a fine equigranular altered groundmass. The phenocrysts have square, tabular, rhombic prismatic and subhedral shapes partly modified by leaching after inferred feldspar and hornblende. The groundmass textures are defined by a fine equigranular intergrowths (~0.05-0.1mm), dominated by subhedral to anhedral quartz and subequal amounts of tabular to subhedral twinned plagioclase. Any mafic crystals associated with the quartz and feldspar have been leached or altered. Altered Fe Ti oxide grains to 1mm are accessory. Sparse zircon micro prisms are present within the altered groundmass. The rock is identified as a microtonalite on the basis of the subequal content of fine-grained primary quartz and plagioclase and lack of k-feldspar.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts → leached

Fe Ti oxides → replaced by poorly crystalline Goethite / Hematite ± Rutile / Leucoxene.

Groundmass → plagioclase; dusted weakly by cryptocrystalline Smectite; much of the microcrystalline quartz interstitial to primary quartz and plagioclase is inferred to be secondary (it is locally intergrown with sericite); the other secondary minerals include minor well crystalline flakes of Sericite + trace green subhedral fine-grained subequal Tourmaline + disseminated fine-grained Goethite / Hematite-altered opaques (3-5%) (possibly after magnetite or pyrite). Small aggregates of Rutile are sparsely scattered within quartz and plagioclase.

Microcrystalline to cryptocrystalline Kaolinite / Smectite locally replaces plagioclase and sericite in small, scattered patches. Well crystalline fine-grained Hematite locally overgrows quartz-plagioclase-sericite.

Replacement Mineral Abundances

Quartz (? 15-20%), Sericite (7-10%), Hematite / Goethite (5-7%), Kaolinite / smectite (5-7%), Tourmaline (0.01-0.03%)

Deposition:

Sequences Of Deposition

1) Some leached crystals (1-2%) → sealed with Kaolinite.

Mineralisation

No primary opaque phases remain. Fine-grained disseminated opaques possibly after magnetite and /or pyrite are completely replaced by hematite and /or goethite.

Mineral abundances

Opaques (3-5%)

XRD Minerals:

Quartz, plagioclase, sericite, smectite

Comments:

A n oxidised, leached, phyllic-altered (quartz, sericite, tourmaline, ?magnetite/?pyrite, rutile) fine-grained porphyritic microtonalite

Paragenesis

1. Phyllic alteration, leaching; quartz + sericite ± tourmaline + ?magnetite/ pyrite + rutile / leucoxene
2. Supergene overprint; goethite + hematite + smectite + kaolinite

Sample Number: Bob-14

1 km north of rhyolite, south end of silica ridge

Rock Name:

A poorly sorted, leached, phyllic-altered (quartz, sericite, tourmaline, pyrite, rutile) hydrothermal breccia with porphyritic rhyolite clasts.

Thin Section Description - Lithology, Textures And Minerals:

An altered, coarse to fine-grained hydrothermal fragmental lithology. Clasts consist of a coarse subrounded porphyritic rhyolite clast >35mm across and smaller medium-grained to fine-grained angular to subangular fragments and crystal separates of the same lithology mostly matrix-supported in a tourmaline breccia matrix. The relic primary textures of the rhyolite are defined by euhedral square-shaped to subhedral phenocrysts of quartz (1-1.8mm, 5-7%) and leached tablets and laths after inferred feldspar and mafic crystals (1-3mm, 7-10%) set in a fine granular silicified groundmass. A few ghosted silicified microlaths are recognised in the groundmass in plane polarised light. Evidence of primary Fe Ti oxides has been eliminated by the pervasive alteration.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Phenocrysts; leached and infilled

Groundmass / microphenocrysts; silicified to fine granular Quartz (~0.1-0.2mm across) with minor microinclusions of Sericite and sparsely overgrown by small prismatic rosettes of colourless Tourmaline. Sparse rutile micrograins are present in the groundmass. The quartz is weakly dusted by cryptocrystalline Fe oxides (?hematite).

Replacement Mineral Abundances

Quartz (80-85%), Sericite (2-3%) Tourmaline (1-2%), Fe oxides (1-2%), Rutile (<0.001%)

Deposition:

Sequences Of Deposition

- 1) Leached phenocrysts, small vughs in groundmass of clasts (10-15%) → sealed with fine granular Quartz (with sparse Sericite inclusions) locally overgrown by prismatic Tourmaline rosettes.
- 2) A) Hydrothermal brecciation with local crackle breccia textures (30-40% of section) → angular, subangular, and subrounded rhyolite clasts, variably subequant to elongate in shape, and phenocryst quartz separates are mainly matrix-supported within a hydrothermal breccia matrix. The matrix is composed exclusively fine-grained prismatic colourless Tourmaline (locally stained with amorphous Limonite).
B) Leached crystals, vughs in matrix (5-7%) → lined with prismatic Tourmaline and sealed with overgrowing granular Quartz (with prismatic tourmaline and rare fine-grained Pyrite inclusions). Tourmaline is locally overgrown by microcrystalline Kaolinite / Smectite.
- 3) A) Residual cavities in clasts and matrix (5-7%) → sealed with Kaolinite ± Smectite.
B) Microfractures in tourmaline matrix (1-2%) stained with amorphous Limonite.

Mineralisation

Pyrite Sparse unaltered euhedral fine-grained pyrite occurs as inclusions in some quartz cavity fill within the breccia.

Mineral abundances

Pyrite (<0.001%)

XRD Minerals:

Breccia zone; quartz, kaolinite, tourmaline, trace sericite, trace smectite

Comments:

A leached, tourmaline hydrothermal breccia with phyllic-altered (quartz, sericite, tourmaline, rutile) coarse to fine-grained porphyritic rhyolite clasts.

Paragenesis

1. Phyllic alteration, leaching; quartz + sericite replacement / deposition
2. Hydrothermal brecciation; tourmaline matrix → tourmaline → quartz ± tourmaline ± pyrite cavity-fill
3. Supergene overprint; kaolinite + smectite + limonite

Sample Number: Bob-15

Rock Name:

A potassic-altered (quartz, albite, biotite, tourmaline, rutile) hydrothermal polymict coarse to fine-grained breccia with dacite / rhyolite and fine-grained sediment clasts.

Thin Section Description - Lithology, Textures And Minerals:

An altered, coarse to fine-grained polymict hydrothermal breccia. Angular to subangular clasts consist of;

1. Felsic ?dacite/?rhyodacite; porphyritic volcanic / subvolcanic clasts; sparse phenocrysts of medium-grained laths of plagioclase and subequant quartz are set in a fine-grained intergrowth of ?recrystallised quartz + plagioclase.
2. Fine grained altered fragments possibly after volcanic groundmass or siltstone.
3. Occasional igneous fragments consisting of myrmekitic intergrowths of fine-grained quartz + plagioclase with rare square-shaped fine-grained quartz phenocrysts.
4. Mudstone, siltstone and banded siltstone / fine-grained recrystallised sandstone composed of quartz and plagioclase; earlier breccia fragments are composed of siltstone enclosed in a fine equigranular quartz matrix (the quartz is host to rare microinclusions of biotite and very rare carbonate).
5. Occasional angular phenocryst crystal separates of plagioclase and quartz, all matrix-supported in a biotite depositional matrix.

Alteration:

Alteration Intensity: Pervasive

Replacement Mineralogy

Groundmass and sediment clasts are replaced or recrystallised to intergrowths of Quartz + twinned Albite ± sparse to moderate amounts of fine-grained subhedral to anhedral secondary Biotite ± very fine-grained prismatic Tourmaline + acicular Rutile micrograins.

Minor Smectite locally replaced biotite.

Replacement Mineral Abundances

Quartz (50-55% of clasts), albite (30-40%), biotite (5-7%), smectite, (2-3%), tourmaline (0.3-0.5%), rutile (0.01-0.3%),

Deposition:

Sequences Of Deposition

- 1) Hydrothermal breccia (35-40%) → clasts sealed with very fine granular Biotite + microcrystalline Quartz; elongate cavities within the matrix are sealed with well crystalline granular masses of Biotite overgrown by granular Quartz ± twinned Albite. Other cavities defined within biotite are sealed with granular Quartz. Biotite is locally replaced by pale green Mg-rich Chlorite (3-5%).

Deposition Mineral Abundances

Biotite (20-25%), Quartz (15-20%), Albite (1-3%)

Mineralisation

None was detected.

XRD Minerals:

Biotite, quartz, plagioclase, chlorite

Comments:

A potassic-altered (quartz, albite, biotite, tourmaline, rutile) hydrothermal polymict coarse to fine-grained breccia.

Paragenesis

1. Hydrothermal brecciation, alteration, deposition; quartz + albite + biotite ± tourmaline + rutile → quartz
2. Weak supergene overprinting; smectite

Sample Number: BT-16

Rock Name:

A leached, potassic-altered (biotite, quartz) medium-grained porphyritic microdiorite

Thin Section Description - Lithology, Textures And Minerals:

An altered medium to fine-grained, porphyritic, intermediate intrusive lithology. Leached tabular and subequant phenocrysts (1-3mm, 15-20%) after inferred feldspar and /or mafic crystals are set within an interlocking matrix of multiply-twinned slender plagioclase laths (0.5-1mm in length, 40-50%) and intergrown and interstitial altered mafic crystals (25-30%); minor subhedral subequant k-feldspar (3-5%) and ?primary / secondary fine granular quartz (2-3%) is interstitial to plagioclase in sparse amounts. A few relic altered Fe Ti oxides are present; some appear to have been leached or partly leached. The rock is identified as a porphyritic microdiorite.

Alteration:

Alteration Intensity: Variably weak to strong

Replacement Mineralogy

Phenocrysts → leached; some cavities are traversed by intersecting lamellae of Limonite which appear to outline cleavage of former hornblende

Plagioclase / k-feldspar; → weakly flecked with fine-grained secondary Biotite

Mafic minerals, interstitial sites to plagioclase → composed by fine-grained masses of secondary Biotite. Fine granular quartz at interstitial sites is possibly primary and/or secondary.

Fe Ti oxides → replaced by supergene Fe oxides including hematite or partly to completely leached.

Biotite is locally replaced by well crystalline pale Chlorite. Red brown Rutile micrograins are disseminated in minor amounts at interstitial sites.

Replacement Mineral Abundances

Biotite (30-35%), chlorite (5-7%), Fe oxides (2-3%), Rutile (0.3-0.5%)

Deposition:

Sequences Of Deposition

- 1) Small cavities; rarely sealed with well developed granular Quartz (0.1-0.3%) with inclusions of Biotite + Rutile and very rare Carbonate.
- 2) Leached sites; locally coated with Limonite (2-3%)

XRD Minerals:

Biotite, plagioclase, chlorite

Comments:

A leached, potassic-altered (biotite, quartz) medium-grained porphyritic microdiorite. Leaching is possibly due to weathering rather than hydrothermal dissolution.

Paragenesis

1. Potassic alteration; biotite ± rutile ± ?quartz → quartz + rutile + biotite ± carbonate deposition
2. Chlorite overprint
3. Weak supergene overprinting; smectite + limonite + hematite

Sample Number: BT-17

Rock Name:

A propylitic-altered (actinolite/ tremolite, epidote, magnetite; adularia, chlorite) microdiorite with sparse medium-grained plagioclase phenocrysts

Thin Section Description - Lithology, Textures And Minerals:

An altered, fine-grained intrusive lithology of intermediate composition. Primary rock textures are characterised by interlocking fine-grained laths and less common but slightly larger subhedral tablets of twinned plagioclase (0.2-1mm in length, 50-55%) with common interstitial subhedral laths and tablets of an altered fine-grained unidentified mafic mineral (possibly pyroxene, 35-40%) and disseminated accessory altered Fe Ti oxide grains. Several rare subequant medium-grained plagioclase phenocrysts to 4mm are present.

Alteration:

Alteration Intensity: Variable weak to strong

Replacement Mineralogy

Plagioclase; partly studded with fine granules of well crystalline Epidote and traversed in places by rare thin alteration veinlets of Adularia → locally overgrown by well crystalline Chlorite.

Mafic minerals, interstitial sites → completely replaced by pale Actinolite / Tremolite with weak to locally strong overprinting by pale green Chlorite. The amphibole is typically accompanied by common disseminated fine-grained euhedral grains of altered Magnetite (3-5%), → supergene Fe oxides. Well crystalline pale Chlorite locally overgrows plagioclase, actinolite and epidote at interstitial sites. The chlorite is typically spotted with red amorphous Hematite staining.

Fe Ti oxides → replaced by supergene Fe oxides (goethite / limonite).

Actinolite and epidote are locally overprinted by a poorly crystalline Chlorite / Chloritic clay.

Replacement Mineral Abundances

Actinolite / tremolite (40-45%), Epidote (10-15%), Chlorite (7-10%), Chloritic clay (3-5%), Fe oxides (5-7%)

Deposition:

Sequences Of Deposition

1) A open microfracture (0.07-0.1) → coated with amorphous Hematite.

XRD Minerals:

Plagioclase, amphibole, chlorite, chlorite-smectite

Comments:

A propylitic-altered (?actinolite/ tremolite, epidote, magnetite; adularia, chlorite) microdiorite with sparse medium-grained plagioclase phenocrysts. The rock is similar to sample BT 16 but is generally finer grained with less common phenocrysts. The two samples are possible lamprophyres. The primary identity of the mafic crystals is difficult to determine but is possibly pyroxene. The origin of the fibrous amphibole replacement is also uncertain; it may possibly be a deuteric product of a late fluid-rich magmatic stage rather than a propylitic-related phase.

Paragenesis

1. Propylitic alteration; actinolite / tremolite + epidote → chlorite + adularia
2. Supergene overprint; chloritic clay + hematite / limonite

Sample Number: BT-207

Rock Name:

A leached, phyllic-altered (quartz, tourmaline, rutile, pyrite) banded very fine to coarse-grained sandstone.

Thin Section Description - Lithology, Textures, Minerals And Alteration:

A finely banded, very fine to coarse-grained well sorted sandstone. The thin bands defined by grain size distribution are typically buckled and contorted. The sediment grains are composed of angular to subangular quartz and subordinate microcline (~ 0.05-0.2mm, average diameter ~0.1mm) with common interstitial altered fine grained matrix consisting of microgranular Quartz and squat euhedral to anhedral pleochroic green fine-grained Tourmaline (Schorl) + minor Rutile micrograins. Some of the coarser grained bands are almost devoid of matrix and thus lack tourmaline. Common subequant grains of unknown mineralogy (plagioclase and /or pyrite) have been leached.

Replacement Mineral Abundances

Quartz (30-35%), tourmaline (20-25%)

Deposition:

Sequences Of Deposition

- 1) Sediment is cut by irregular veinlets with local fracturing (3-5%) → sealed with fine-grained squat prismatic and dogtooth, cockscomb textured Quartz + minor fine-grained Tourmaline.
- 2) Some cavities within St.1 quartz deposition and coarser grained sandstone, microfractures (1-2%) → sealed with microcrystalline Calcite (calcrete).

Mineralisation

Pyrite Trace very fine euhedral grains <0.001%) are preserved as inclusions in some interstitial quartz.

XRD Minerals:

Quartz, microcline, tourmaline, trace smectite

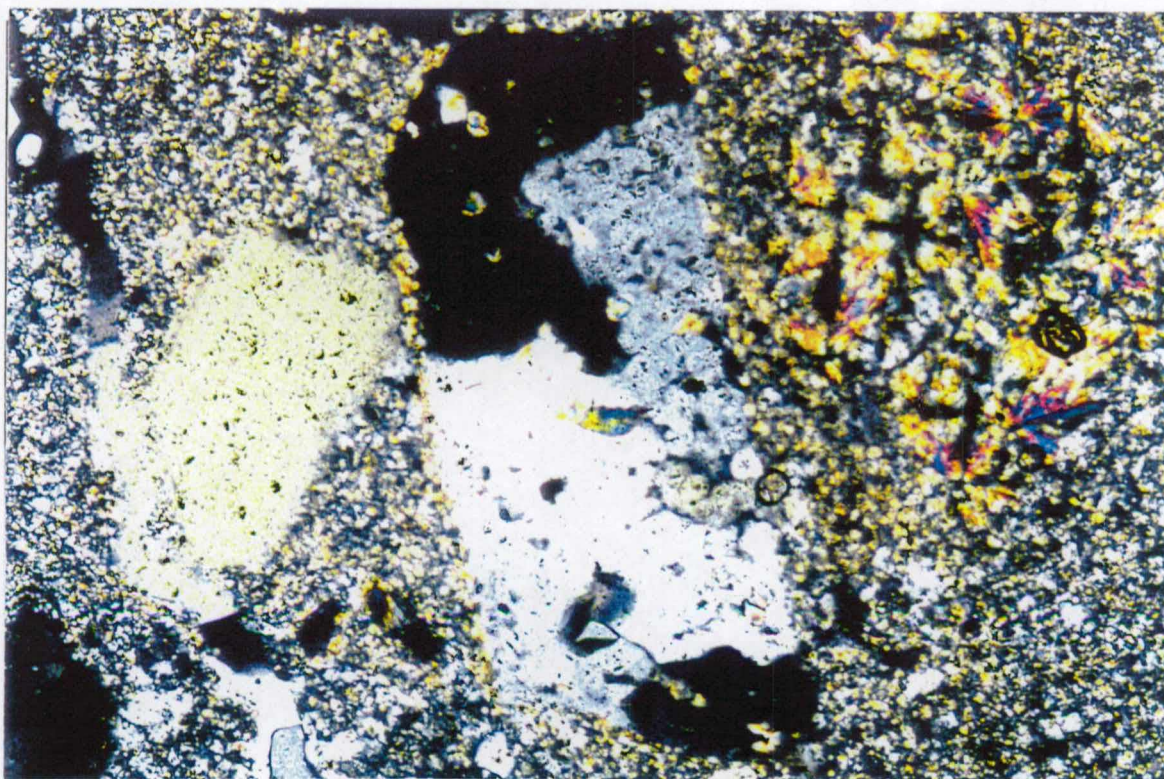
Comments:

A leached, phyllic-altered (quartz, tourmaline, rutile, pyrite) banded very fine to coarse-grained sandstone.

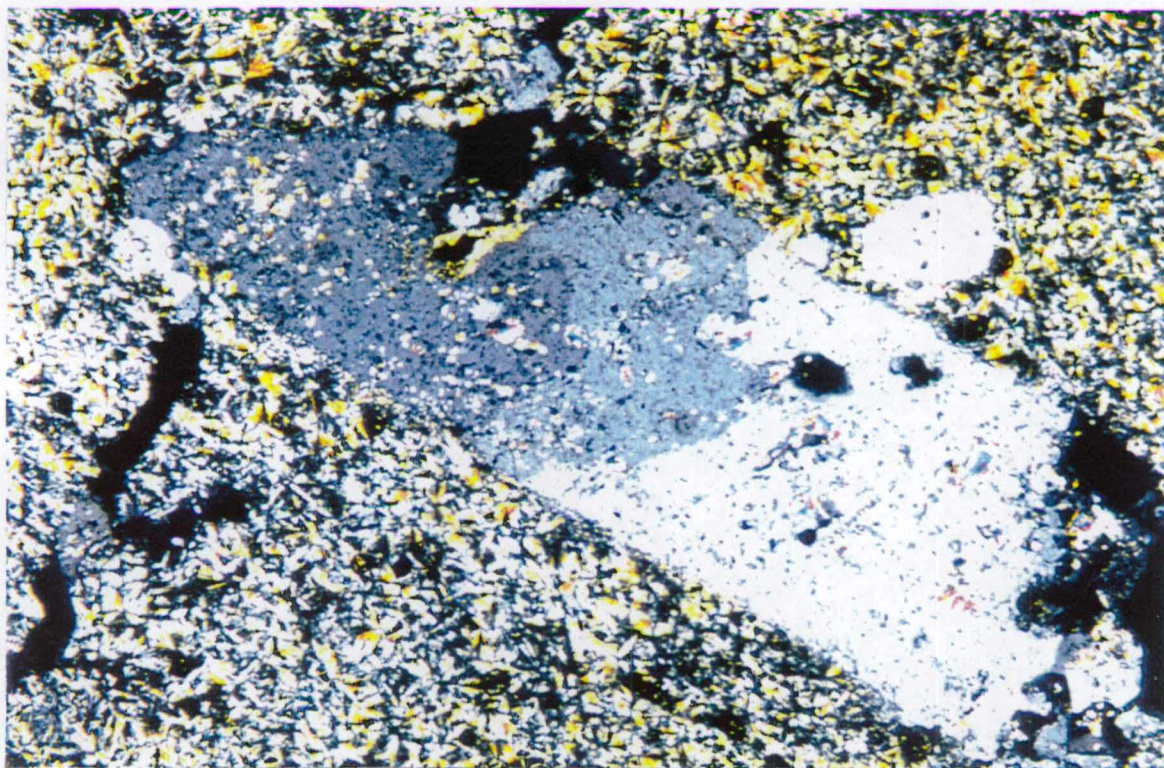
Paragenesis:

1. Phyllic alteration; quartz + tourmaline + pyrite; quartz ± tourmaline veinlets, fractures
2. ?Leaching of ?pyrite
3. Calcrete deposition.

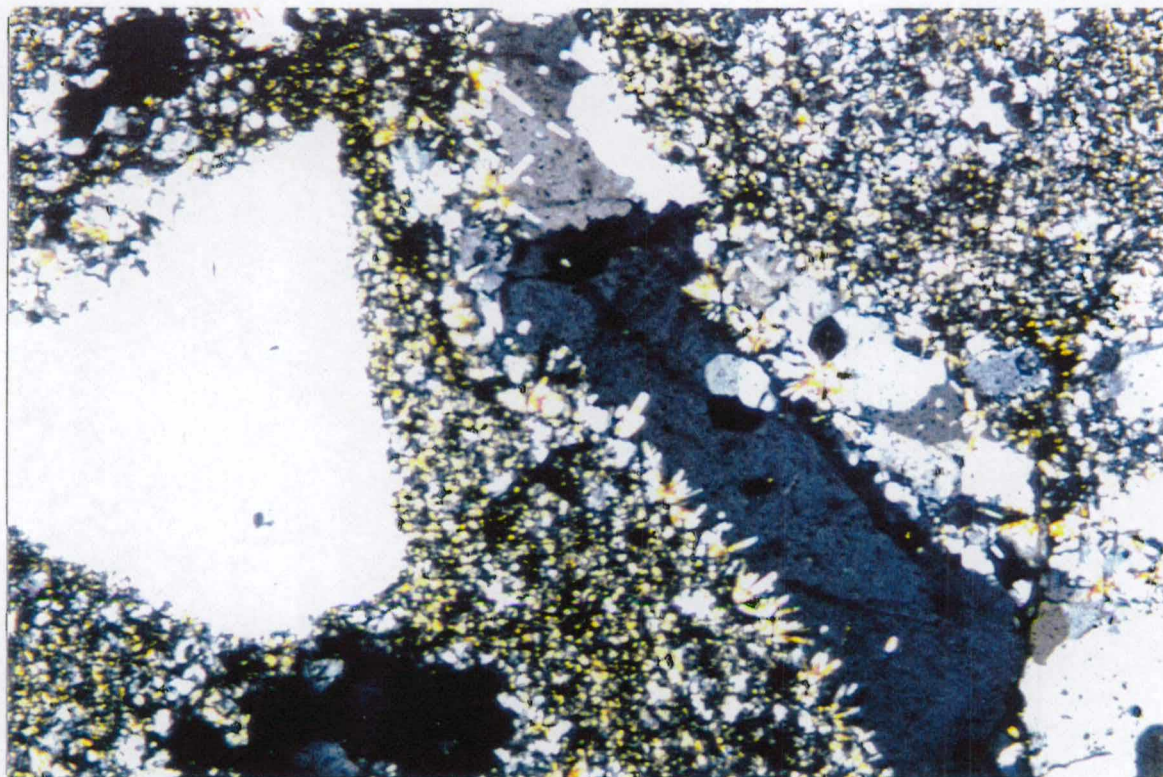
APPENDIX II: PHOTOMICROGRAPHS



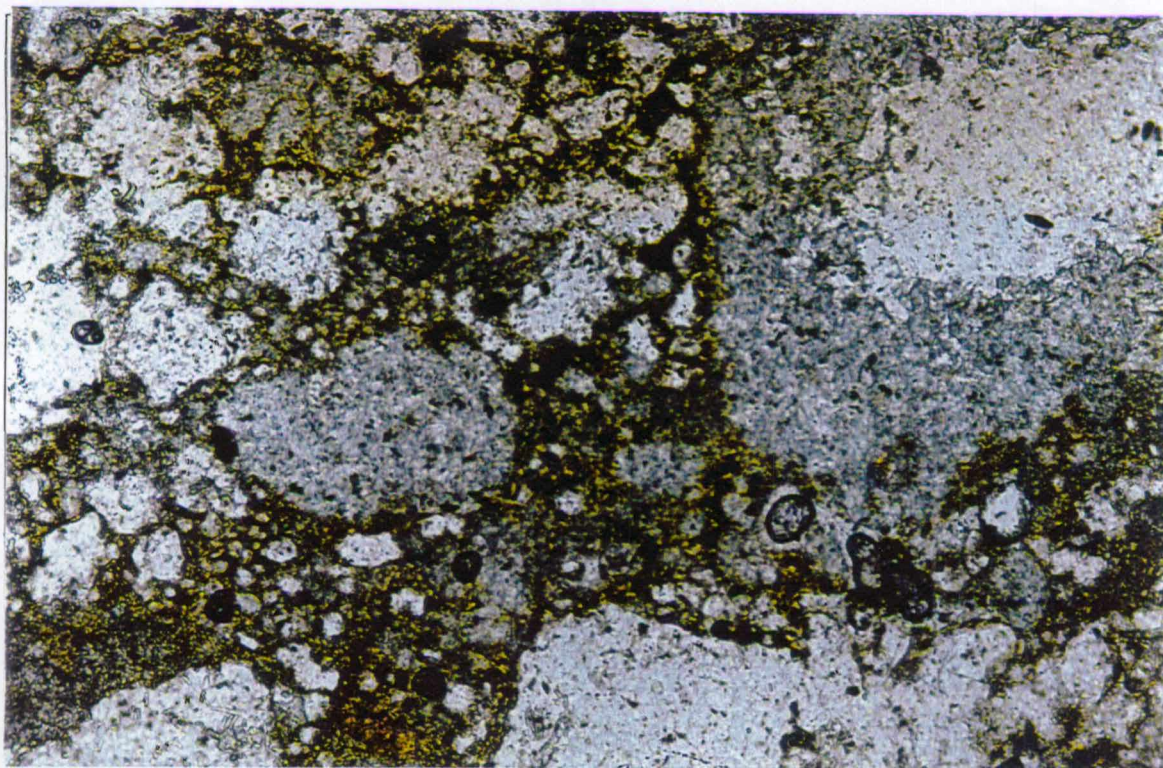
- *Plate 1, Sample Bob-1 : Quartz phenocryst, leached feldspar lath infilled with quartz with sericite inclusions and leached crystals infilled with prismatic tourmaline; groundmass replaced by quartz + sericite in porphyritic rhyolite. Field of view 1.3mm (XPL).*



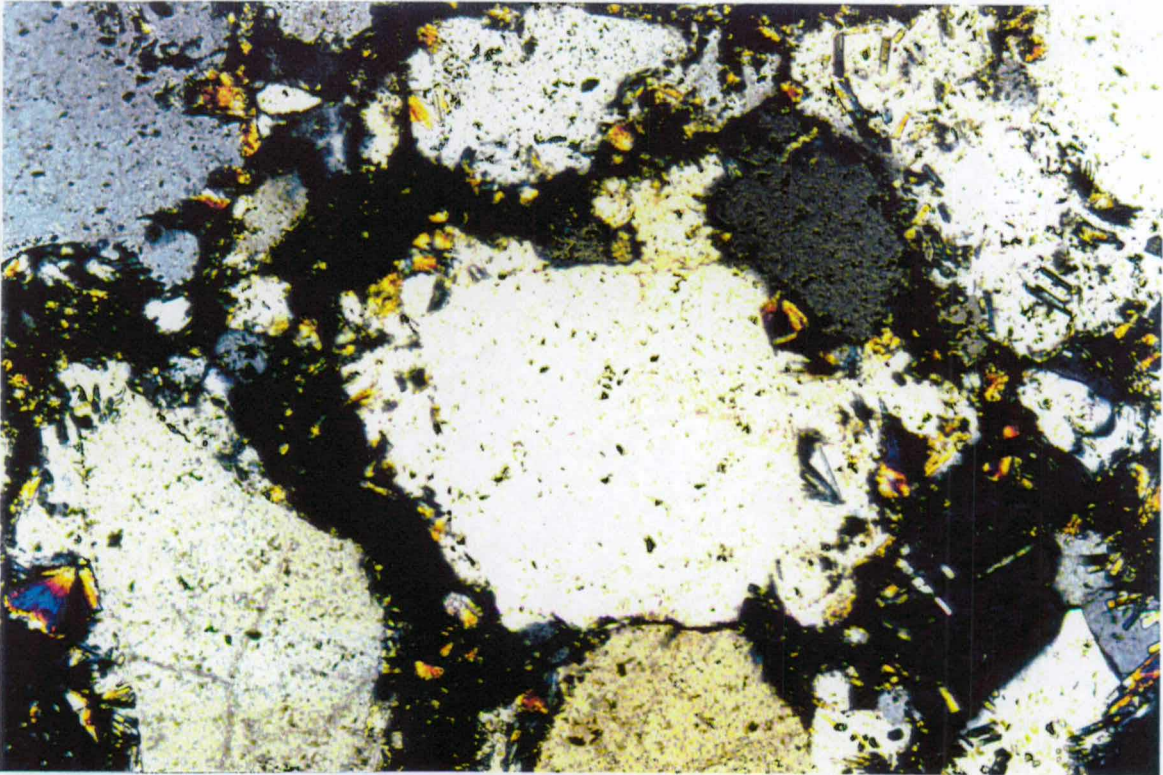
- *Plate 2, Sample Bob-2 : Quartz with sericite inclusions infilling leached feldspar phenocryst, enclosed in prismatic fine-grained tourmaline flooding the groundmass. Medium grained porphyritic rhyolite. Field of view 2.0mm (XPL).*



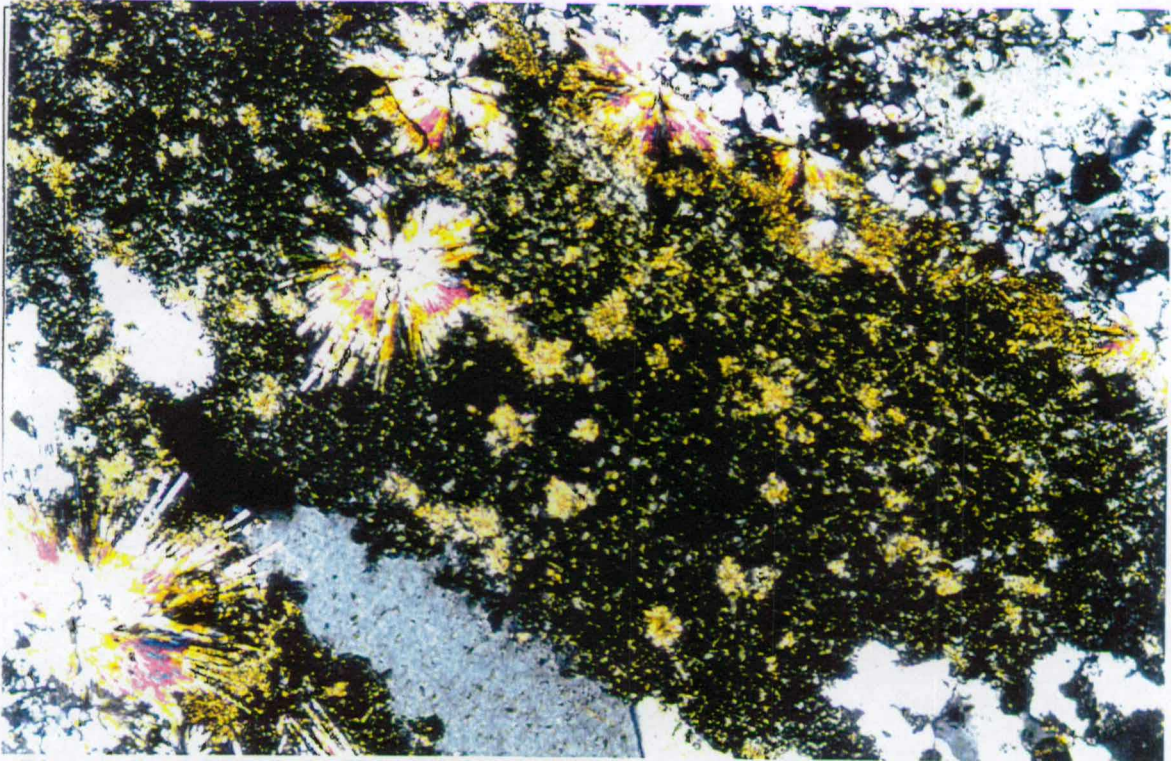
- *Plate 3, Sample Bob-4: Opening lined with tourmaline rosettes and sealed with quartz; also leached phenocryst and quartz phenocryst in altered groundmass of quartz and tourmaline dusted with smectite. Medium-grained porphyritic rhyolite. Field of view 1.3mm (XPL).*



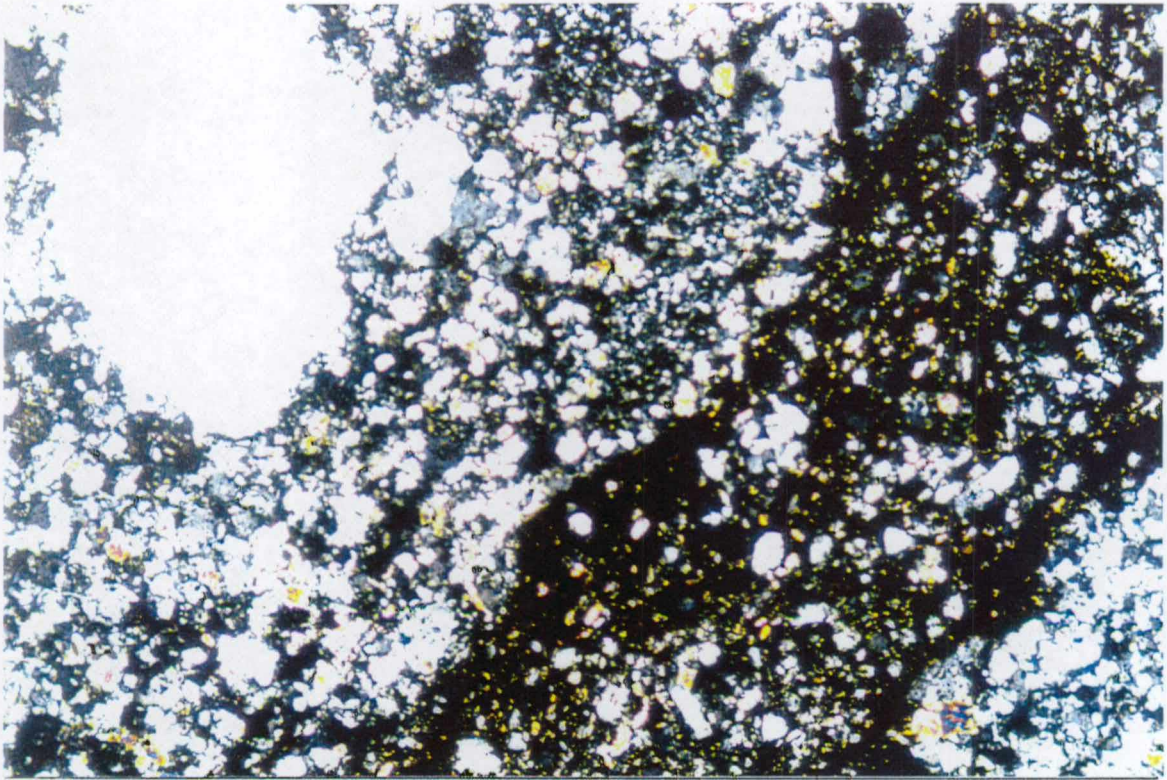
- *Plate 4, Sample Bob-5: Crushed and brecciated tourmaline and quartz-altered rhyolite fragments infilled with limonite-stained microcrystalline tourmaline matrix. Field of view 1.3mm (PPL).*



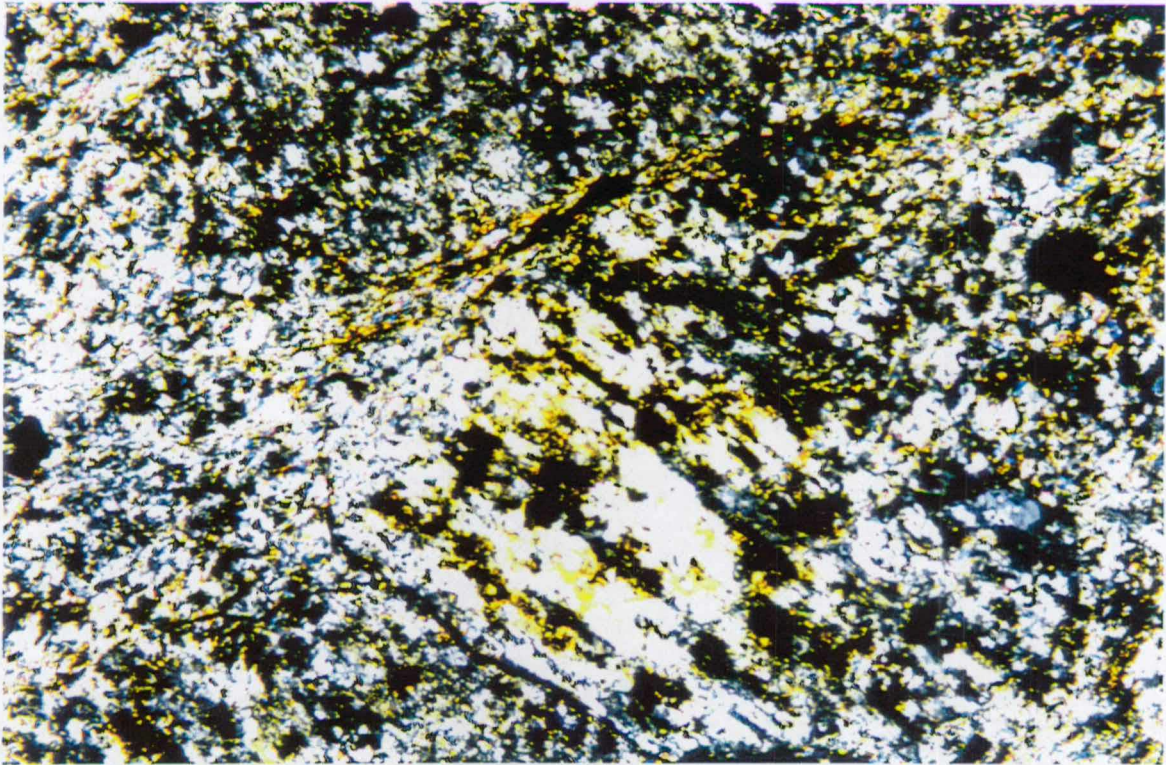
- *Plate 5, Sample Bob-6 : Quartz grains in medium to coarse-grained sandstone rimmed by quartz + tourmaline alteration and minor overgrowing smectite and limonite. Field of view 1.3mm (XPL).*



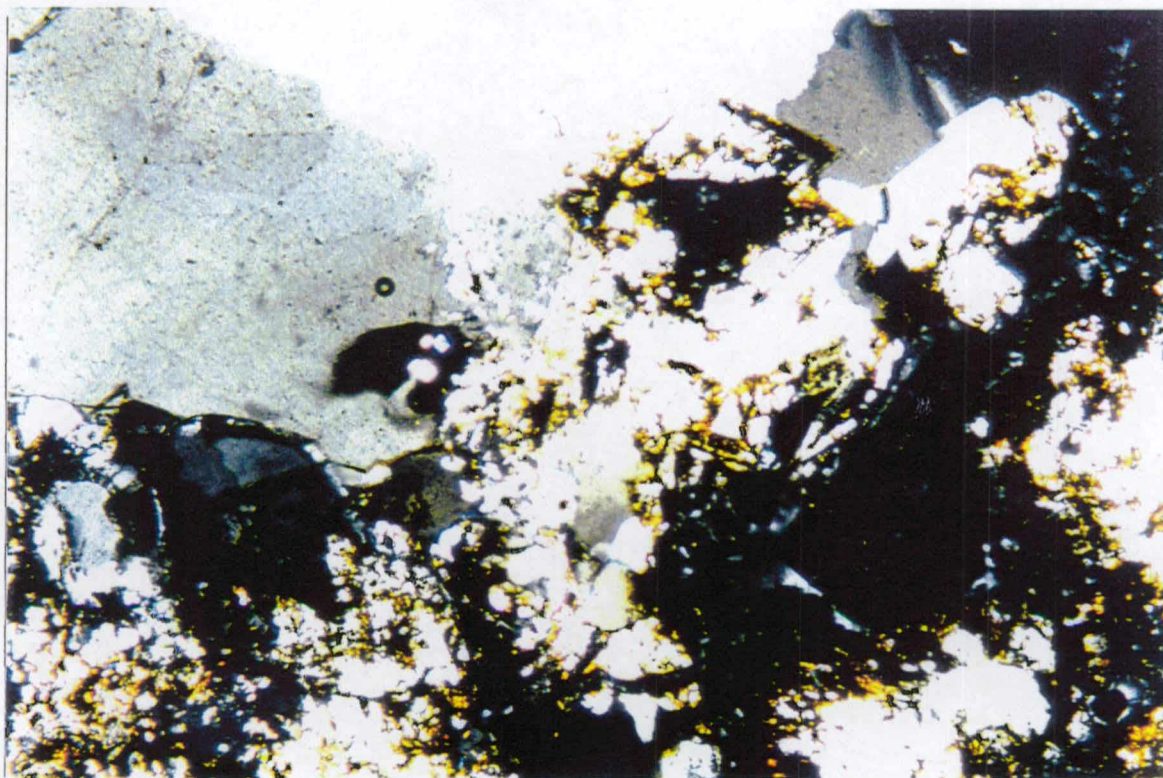
- *Plate 6, Sample Bob-7: Tensional opening lined with quartz and tourmaline rosettes sealed with supergene kaolinite studded with pockets of microcrystalline calcite. Field of view 1.3mm (XPL).*



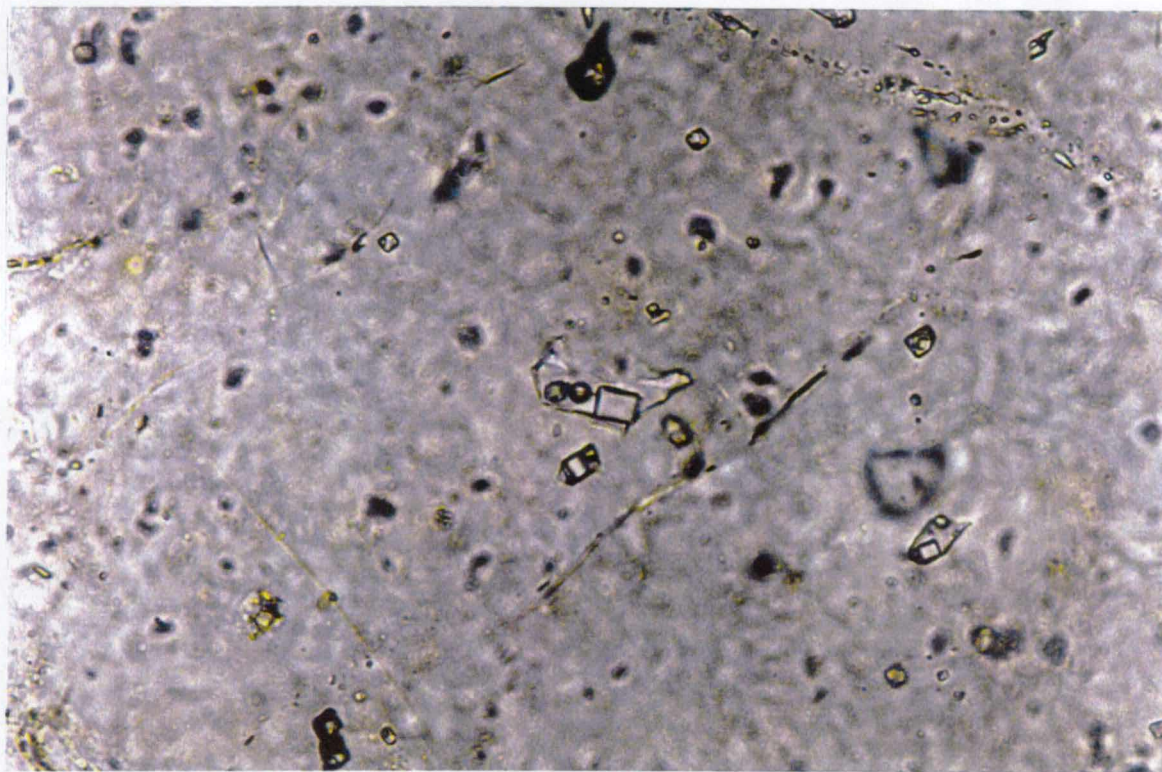
- **Plate 7, Sample Bob-8:** Rhyolite with quartz phenocryst replaced by quartz + sericite cut by breccia veinlet sealed with microcrystalline quartz + sericite and strongly stained by cryptocrystalline hematite. Field of view 1.3mm (XPL).



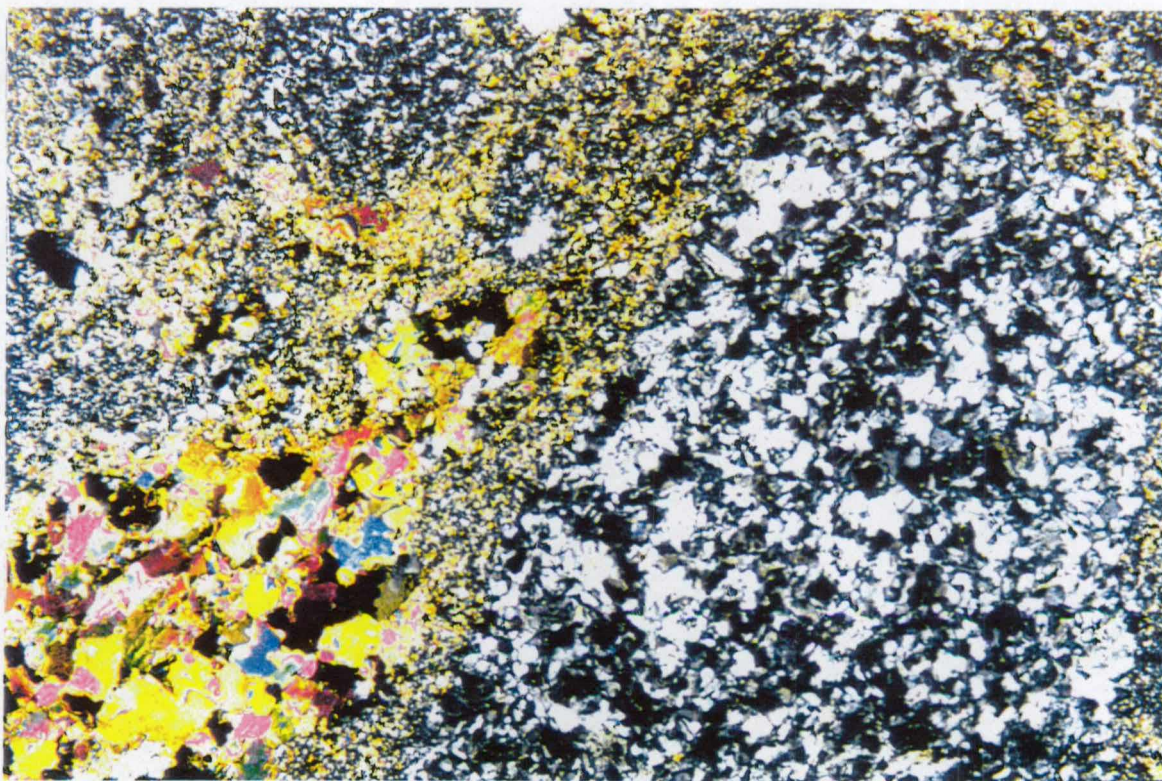
- **Plate 8, Sample Bob-9:** Ribbon quartz $\pm$ sericite stained by limonite replacing partly deformed phenocryst in quartz + sericite-altered groundmass cut by sericite microveinlets / foliation. Schistose porphyritic intermediate volcanic rock. Field of view 2.0mm (XPL).



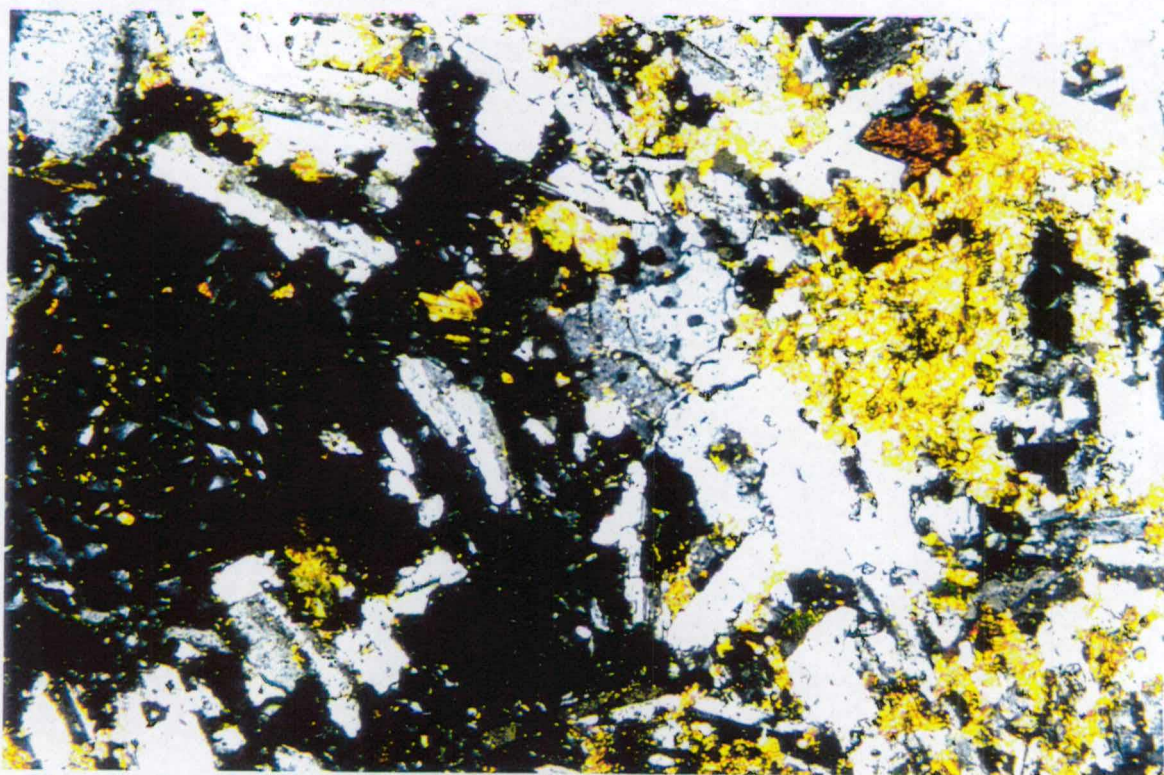
- **Plate 9, Sample Bob-9:** Carbonate (?siderite) rhombs outlined by microcrystalline Fe oxides replaced by granular quartz hosting sparse anhydrite, sericite and carbonate (?calcite) inclusions. The quartz is also host to fluid inclusions with halite daughter crystals. Vugh lining in porphyritic intermediate volcanic rock. Field of view 2.0mm (XPL).



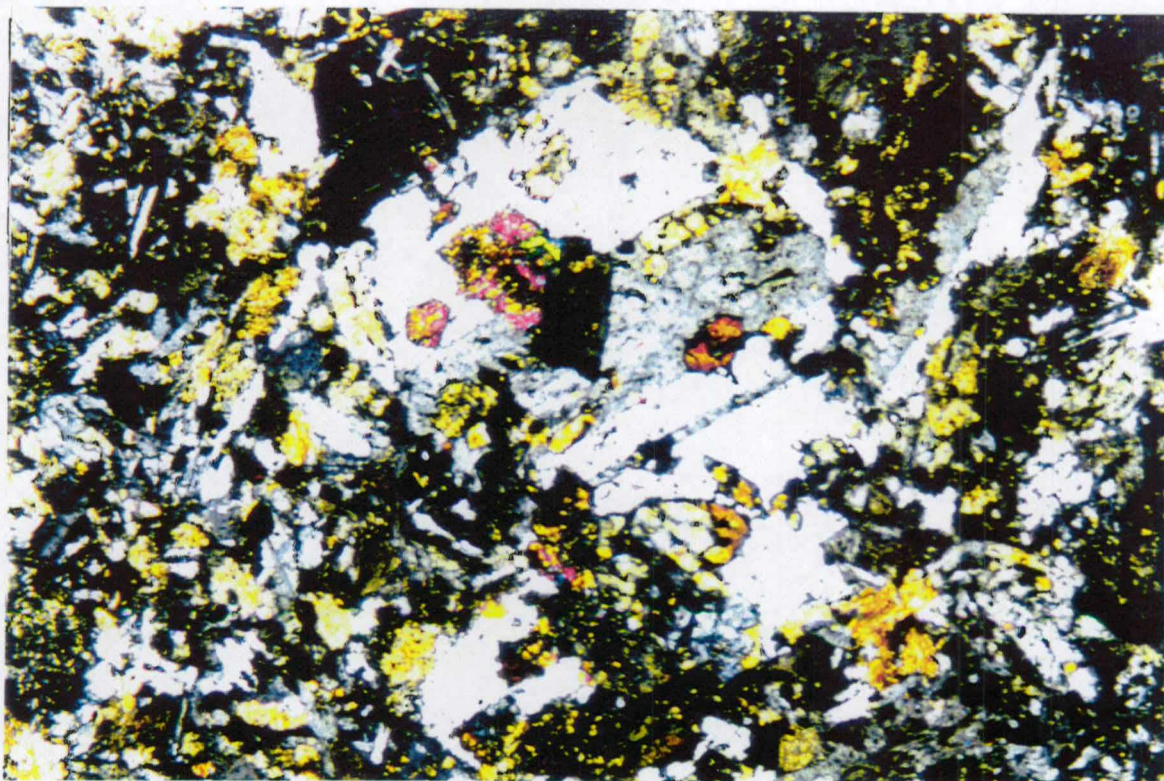
- **Plate 10, Sample Bob-9:** Primary liquid-rich fluid inclusions in quartz (see above plate) with daughter crystals of halite and another salt (?sylvite). Field of view 0.2mm (PPL).



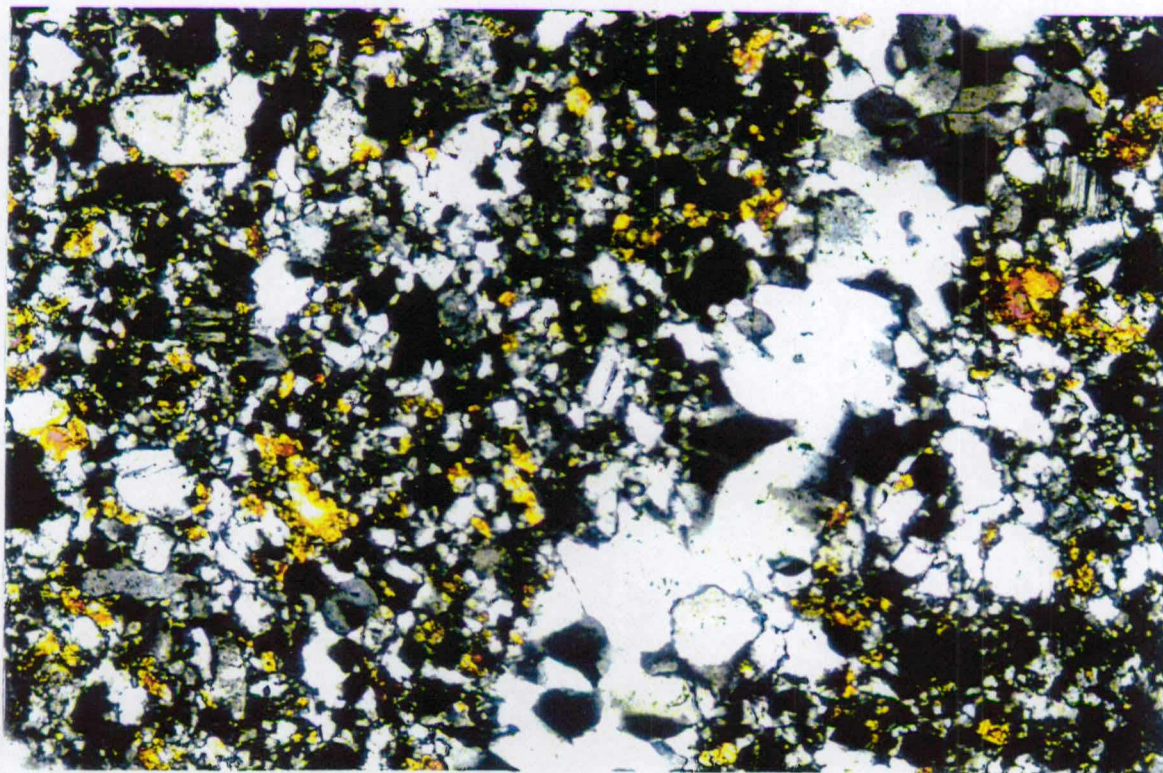
- **Plate 11, Sample Bob-15:** Clast of myrmekitic intergrowths of quartz and plagioclase enclosed in microcrystalline hydrothermal breccia matrix of quartz and biotite with development of well crystalline biotite in residual open space. Field of view 2.0mm (XPL).



- **Plate 12, Sample BT-16.** Leached hornblende with limonite following former cleavage, interlocking plagioclase laths and interstitial biotite in porphyritic microdiorite. Field of view 2.0mm (XPL).



- *Plate 13, Sample BT-17: Twinned plagioclase phenocryst overgrown by actinolite and epidote enclosed in interlocking plagioclase laths and actinolite after mafic minerals possibly pyroxene. Porphyritic microdiorite / ?dolerite. Field of view 2.0mm (XPL).*

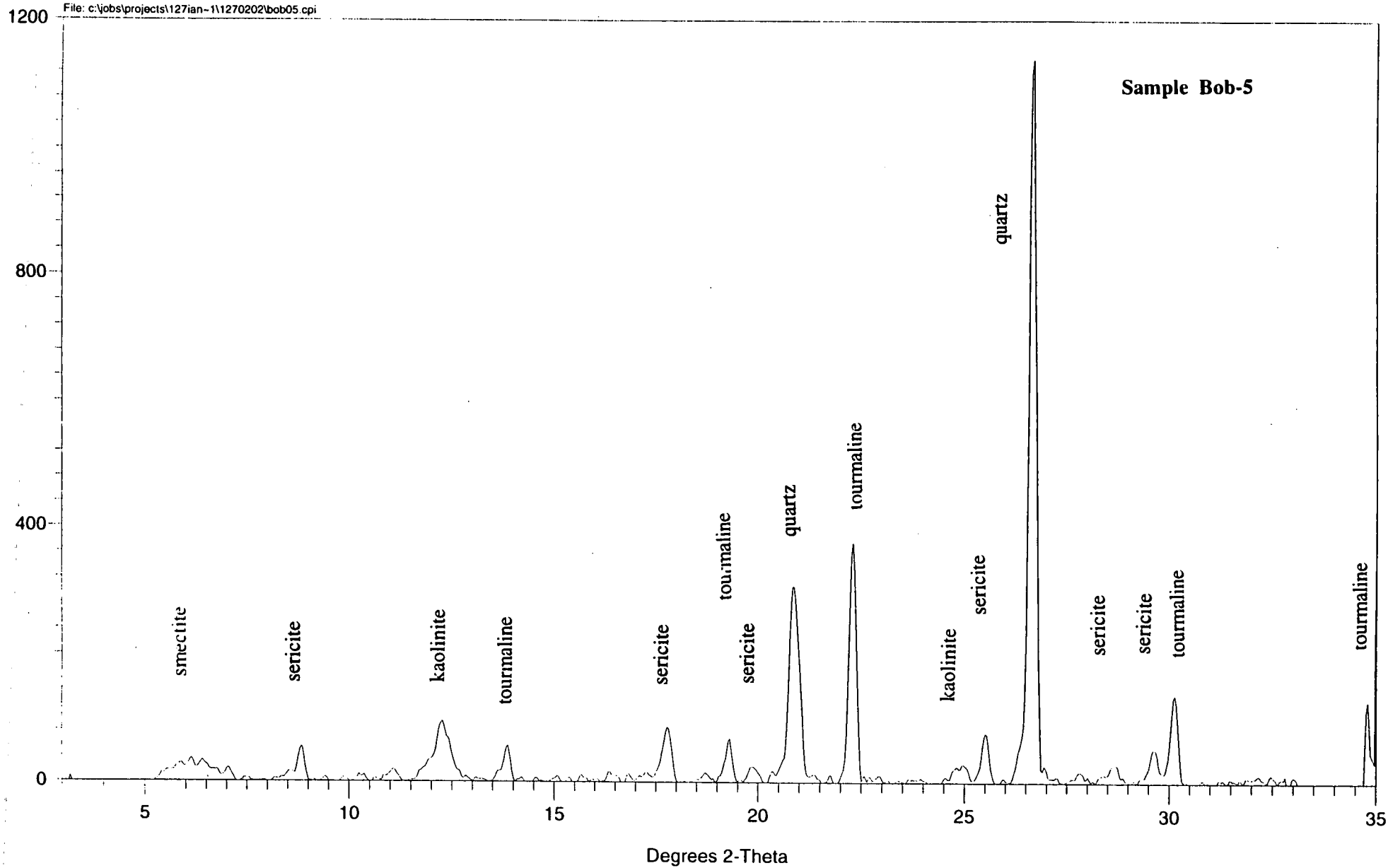


- *Plate 14, Sample BT-207: Sandstone grains of twinned microcline and quartz + altered grains of fine-grained quartz + tourmaline cut by quartz veinlet. Banded sandstone. Field of view 1.3mm (XPL).*

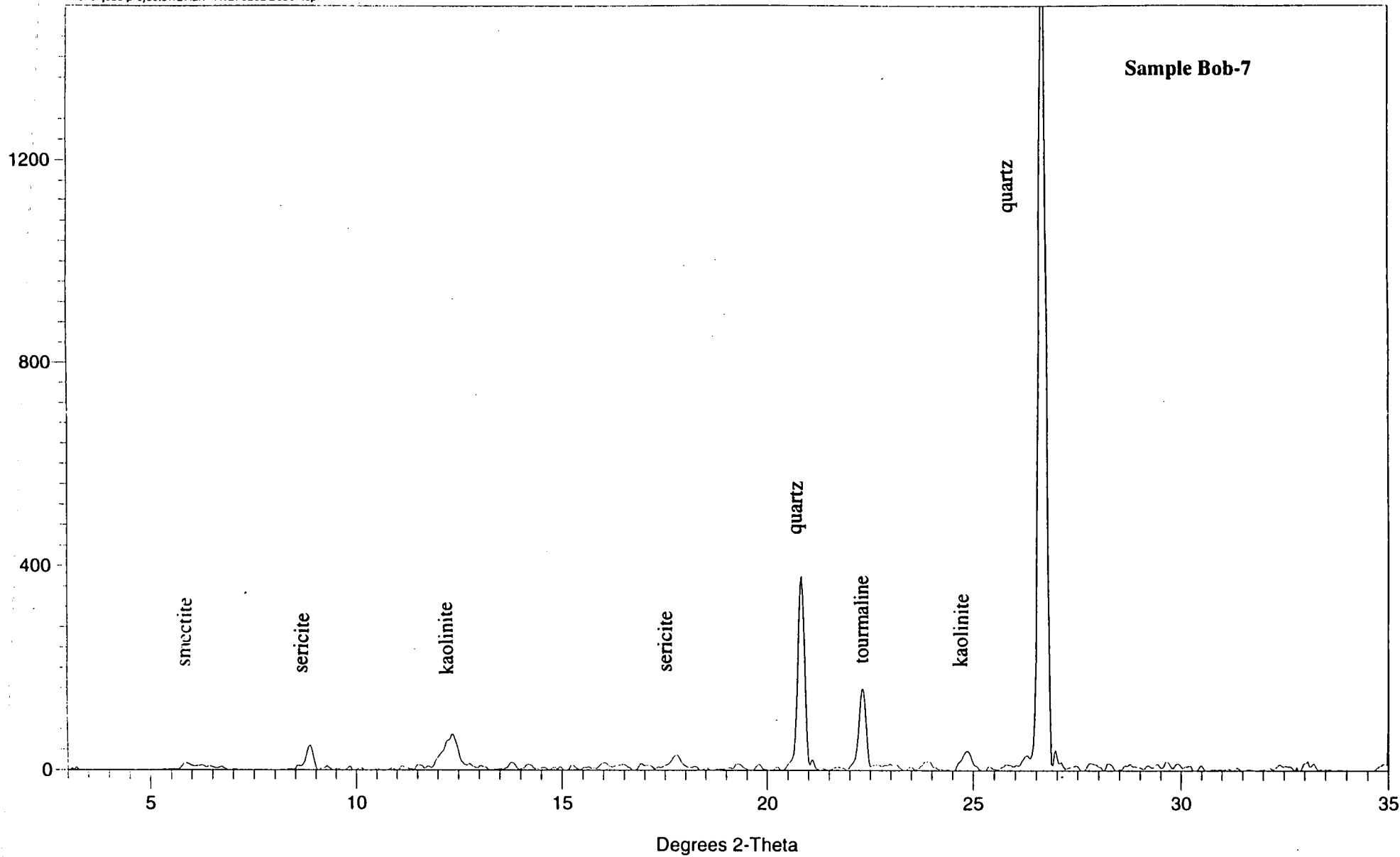
APPENDIX III: XRD TRACES

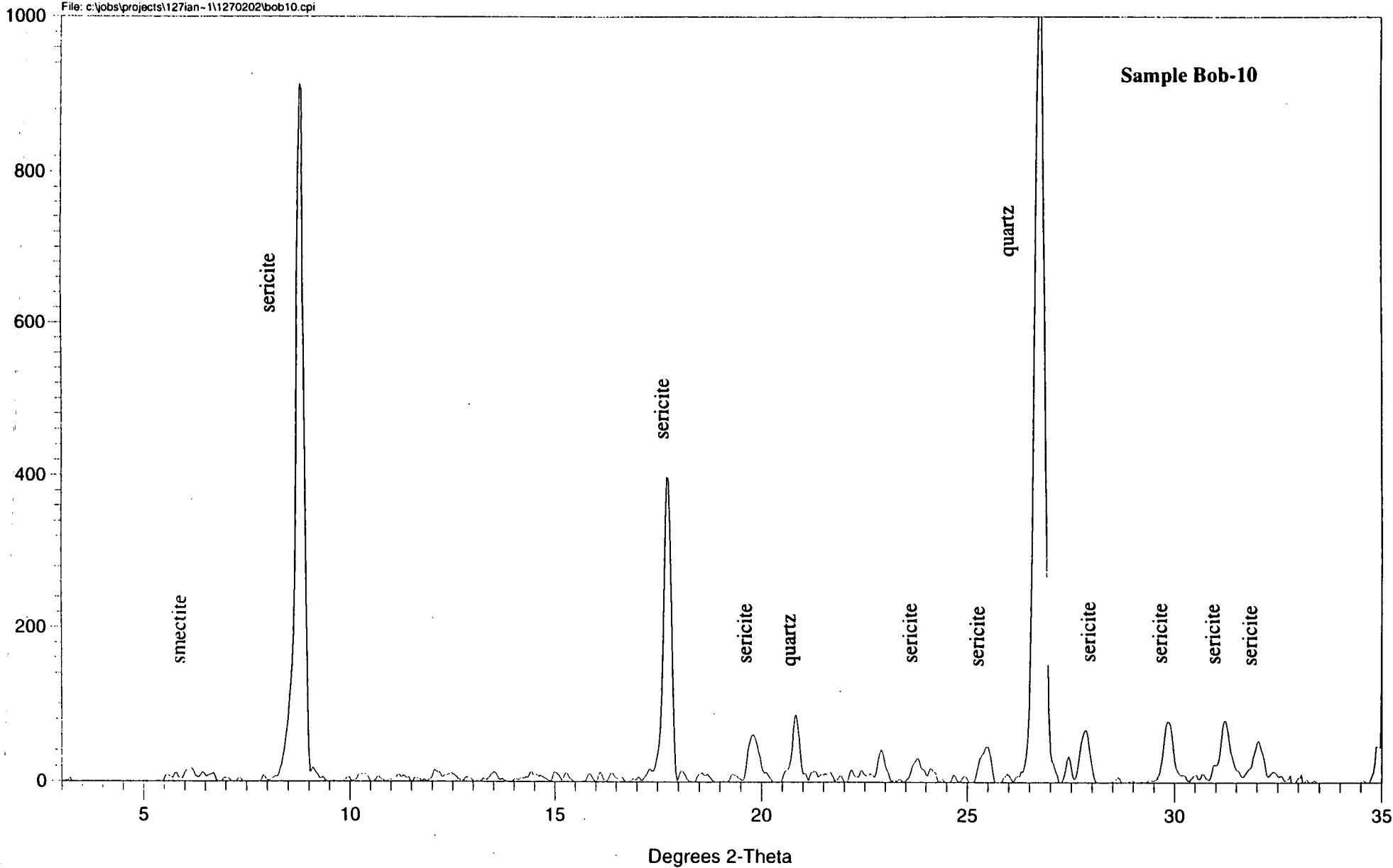
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File: c:\jobs\projects\127ian-1\1270202\bbob05.cpi



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1200

Sample Bob-12

quartz

plagioclase

800

400

smectite

sericite

plagioclase

sericite

sericite

quartz

plagioclase

plagioclase

plagioclase

plagioclase

0

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10

15

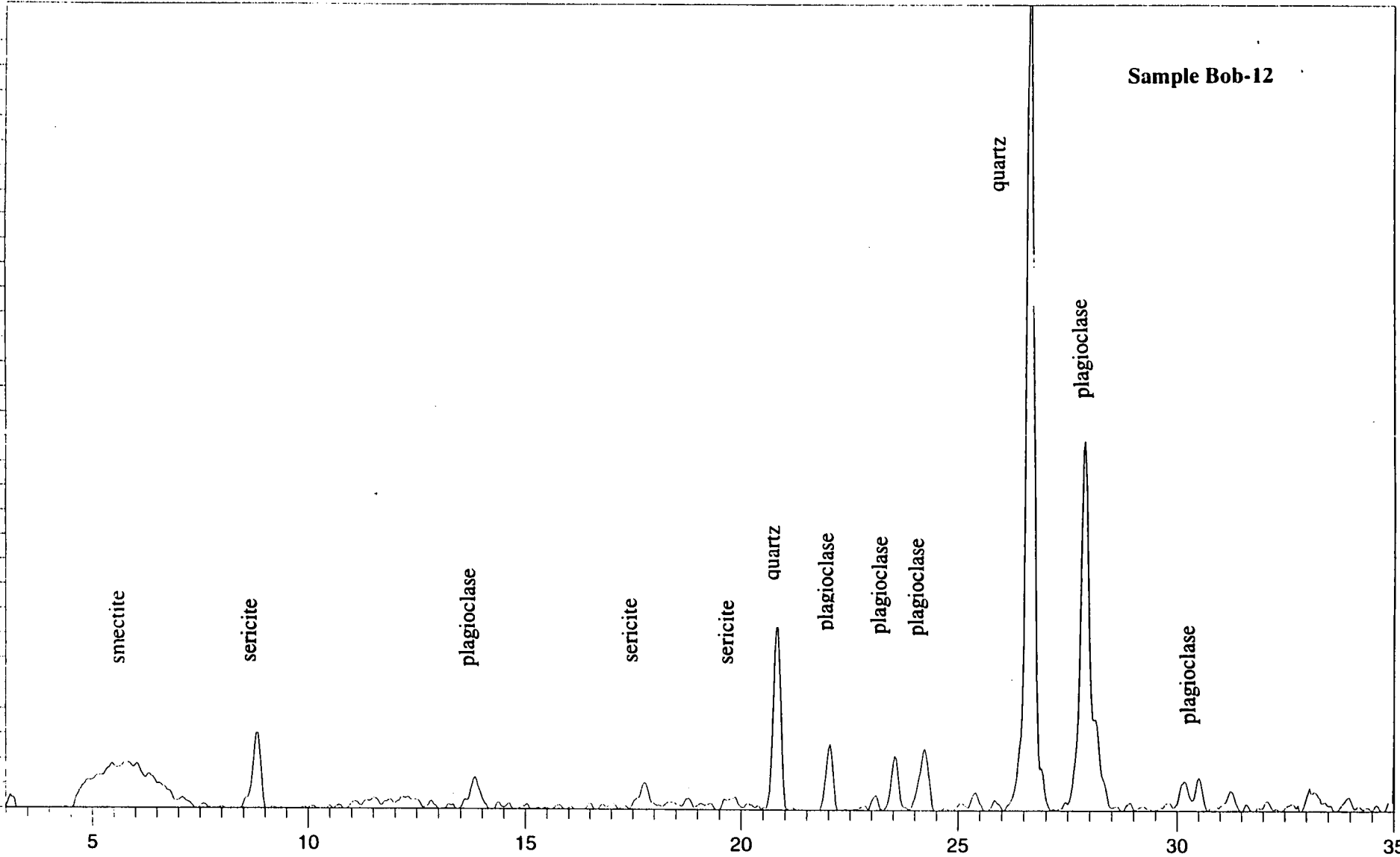
20

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30

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Degrees 2-Theta



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1200

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400

0

Sample Bob-14

smectite

sericite

kaolinite

sericite

quartz

tourmaline

kaolinite

quartz

tourmaline

tourmaline

Degrees 2-Theta

5

10

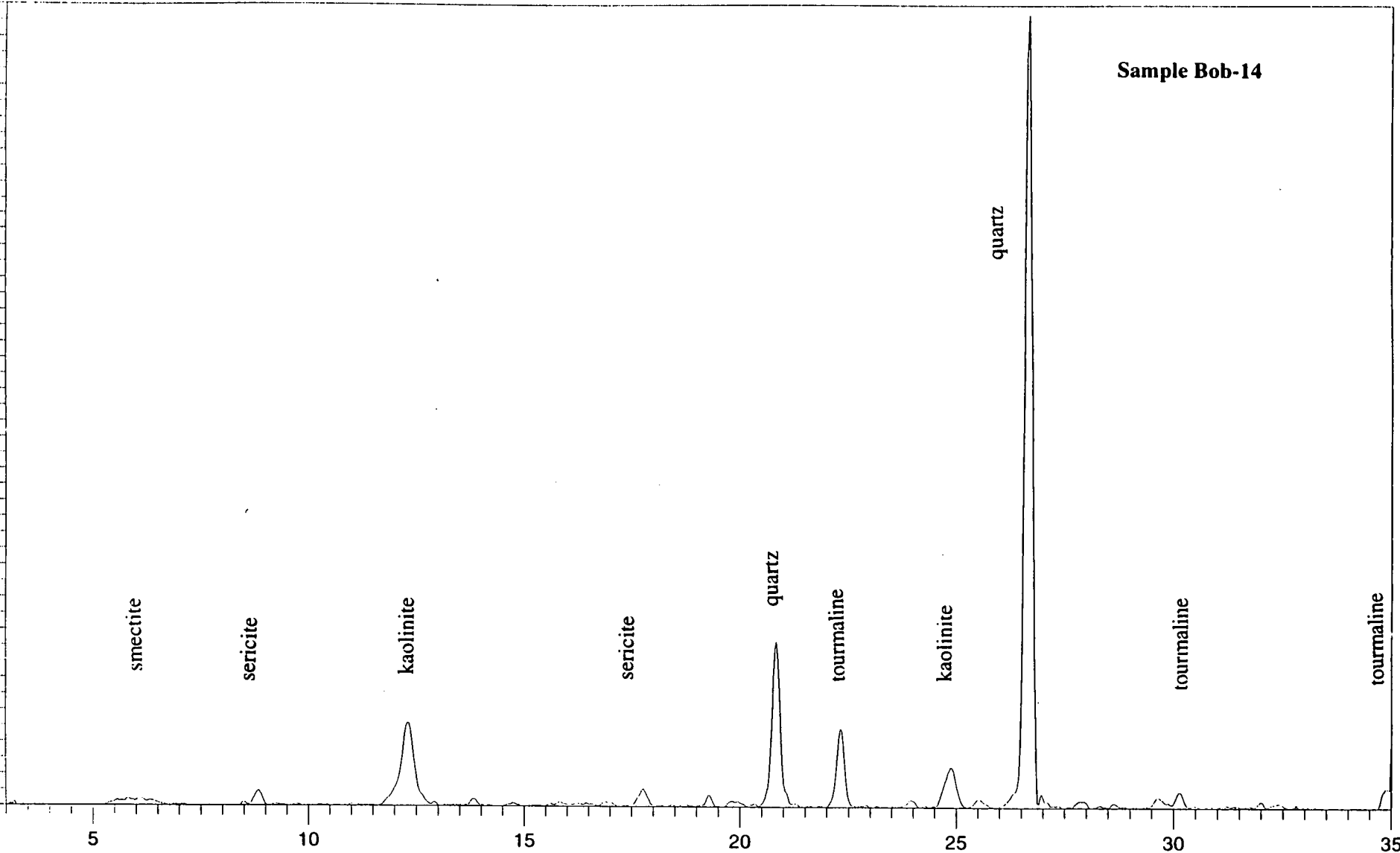
15

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Counts

1600

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Degrees 2-Theta

Sample Bob-15

chlorite

biotite

chlorite

plagioclase

chlorite

quartz

plagioclase

plagioclase

chlorite

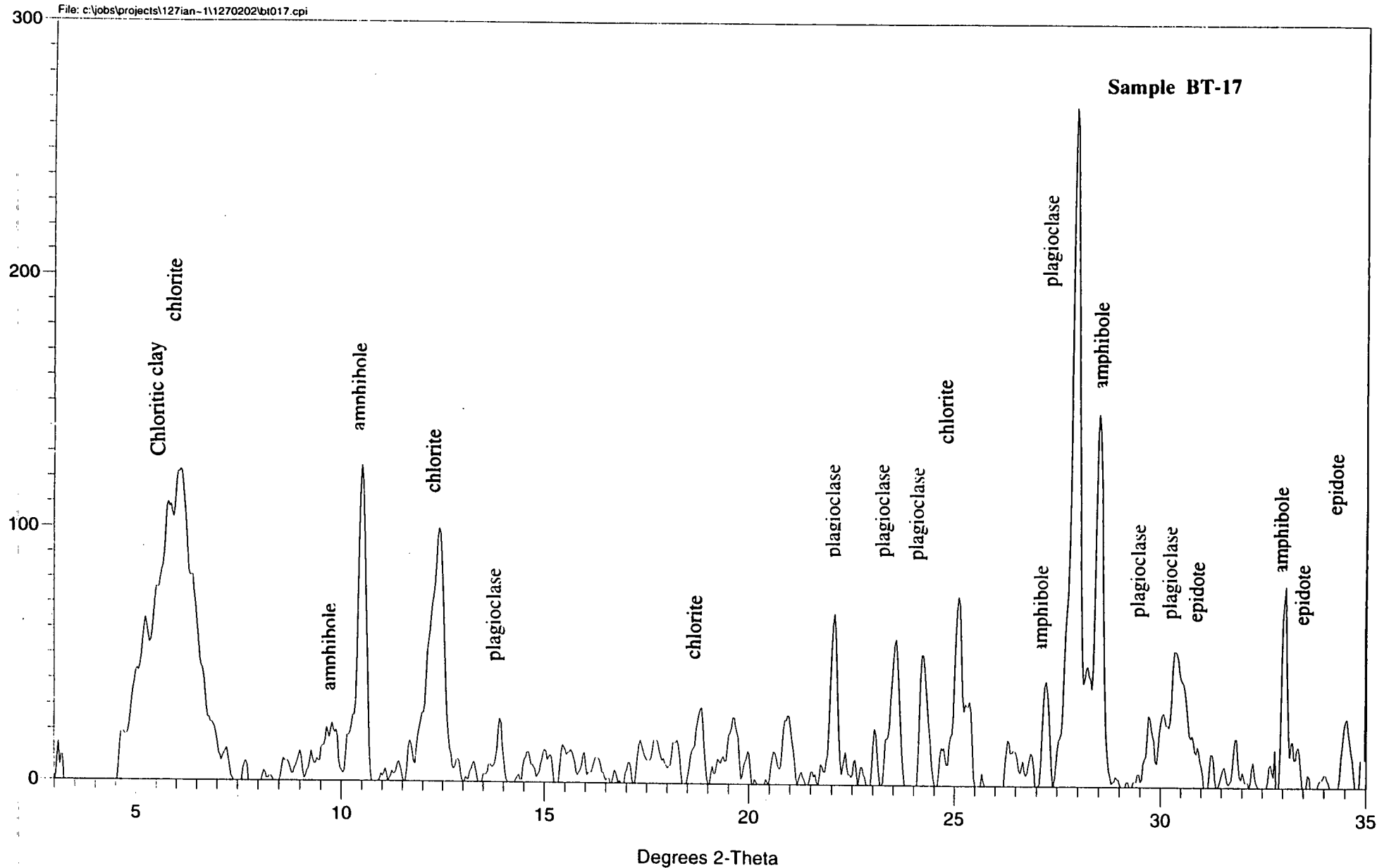
biotite

quartz

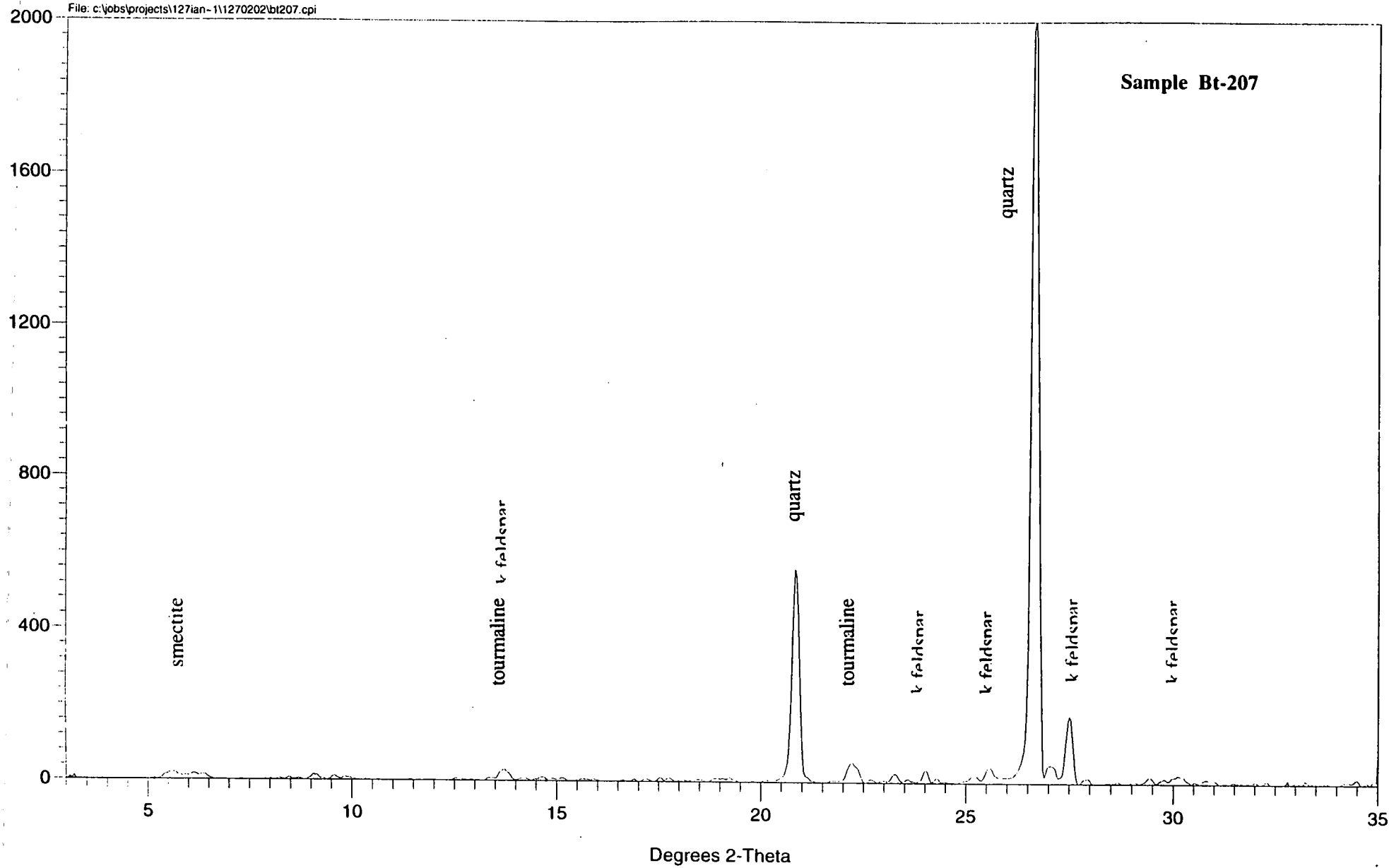
plagioclase

plagioclase

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Counts



APPENDIX IV: CLIENT DATA

FROM : Bob Burke Ugentiane

PHONE NO. : +356 21 414850

May. 29 2000 12:05PM P01

FACSIMILE MESSAGE

To: Terry Leach
Fax: 64 9 422 9977
From: Bob Burke
Subject: Mt Grainger Petrology
Date: 29/5/00

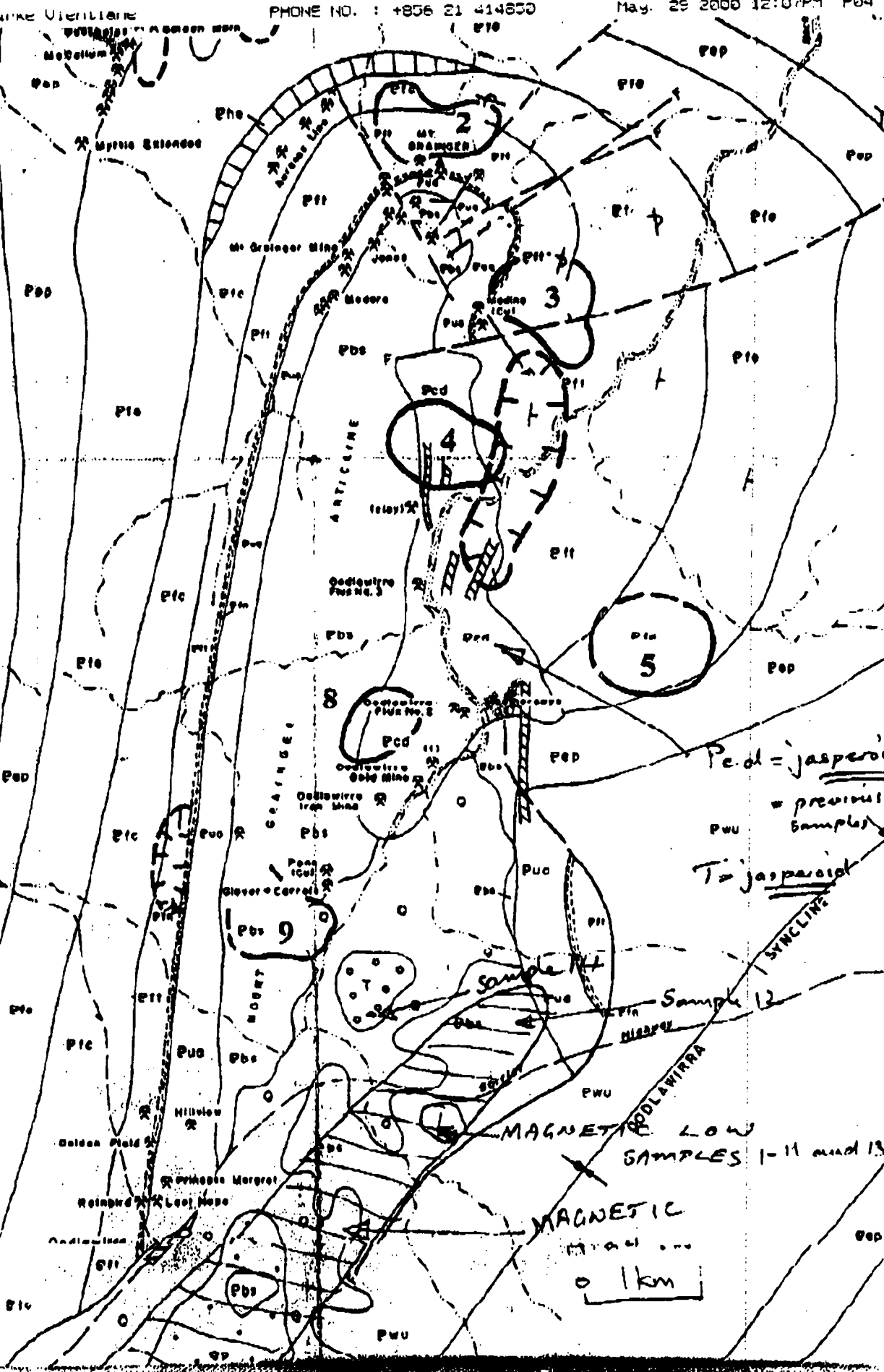
Dear Terry,

Over the last year or so you have received a number of upper Proterozoic (Adelaidian) rock samples from the vicinity of Mt Grainger that feature jasperoidal replacement textures developed in black calc shale and dolomite. You also received some calc silicate samples related to intrusive lamprophyres or biotized dolerite which occur as apophyses above a very large, regionally extensive magnetic high interpreted to represent a parental intrusion at mid crustal levels. Most of your jasperoid and k-silicate/clay altered samples came from the axial zone of the Mt Grainger anticline which has an anomalous N-S orientation in contrast to the syncline-anticline pairs surrounding it which have a NE orientation. The amount of clay alteration and jasperoid development in the Mt Grainger area is truly remarkable and surpasses anything I have seen in Nevada or SE Asia. Recent work has shown that the jasperoid is barren except where it is cut by late, brecciated structures. These late breccia zones are weakly mineralized. Muscovite/sericite=specularite±minor sulphide±silica alteration appears to be consistently associated with anomalous Au±Cu±Co±As everywhere in the Mt Grainger gold and copper mining district.

I have just returned from Mt Grainger where we followed up a major discordant magnetic anomaly in the hinge zone where the Mt Grainger anticline appears to be "twisted" away from the regional fold trend. A traverse along the discordant magnetic high resulted in the discovery of a previously unmapped, highly altered dacite intrusion about 300m X 100m and an andesite dyke (to the NE) above the discordant magnetic high which is itself an apophysis of the larger, regional magnetic high. The dacite appears to be highly altered. It could be reasonably

PHONE NO. : +856 21 414650

May. 29 2000 12:07PM P04



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FROM : Bob Burke Uientiane

PHONE NO. : +856 21 414850

May. 29 2000 12:27PM P03

BOB 9/10 - Spotted green sericite rich foliated dacite "schist". (from peripheral pits)

BOB 11 - Silicified green "schist". (from peripheral pits)

BOB 12 - Fine grained intermediate dyke rock from 2 km NE of the dacite intrusion containing abundant martitized magnetite. (from dryblower hill creek pit)

BOB 13 - White, highly altered dacite with crystals and streaks of a pink mineral, possibly alunite or adularia. (from near tank) (TONY)

BOB 14 - Black jasperoid from 1 km north of the dacite intrusion (south end of silica ridge) which is thought to contain abundant finely crystalline brown/black tourmaline in vughs. (IAN FILSELL)

Please note that the grey coloured samples are central to the dacite intrusion. Paler, cream or white coloured samples are generally found away from this central area. Pink coloured dacite "schist" is peripheral to the pale coloured dacite. Green coloured dacitic "schist" is found furthest from the core of the intrusion. The intrusion is surrounded by subcropping FeO rich rocks of indeterminate composition. Beyond these is massive jasperoid.

Please complete a petrographical report on these rocks and try to integrate them into the overall scheme of things in terms of district wide alteration zonation. Use sufficient XRD analyses to check alteration types.

Cheers,

Bob Burke
rburke@loxinfo.co.th
Ph/Fax 856 21 414850

rburke@loxinfo.co.th