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TASMINEX N.L.

EXPLORATION LICENCE 17/78

REPORT COVERING THE PERIOD FROM 1st MAY TO 30th OCTOBER 1981

Date of Report: November 1981

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TASMINEX N.L.

EXPLORATION LICENCE 17/78

REPORT COVERING THE PERIOD FROM 1st MAY TO 30th OCTOBER 1981

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CONTENTS (continued)

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CONTENTS (continued)

LIST OF PLANS ACCOMPANYING REPORT

Note: All the above plans are contained in a separate folder accompanying this Report.

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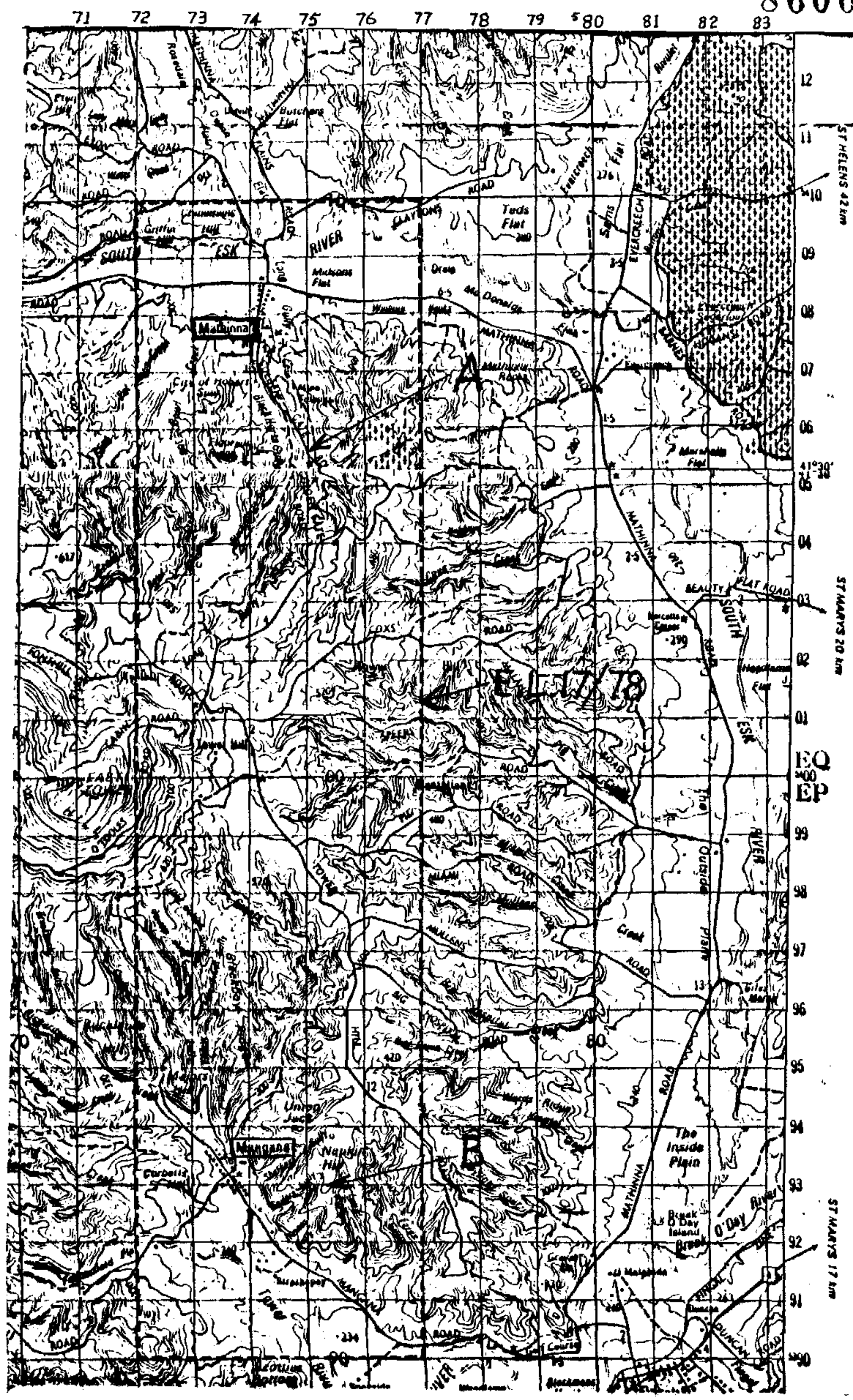

Parts of Sheets 8415 and 8414 Scale 1 : 100,000

Location of Mines at Mathinna marked "A"
Location of Argyle Mine, Mangana marked "B"

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EXPLORATION LICENCE 17/78

SUMMARY OF COMPLETED WORK PROGRAMME

PERIOD 1st MAY 1981 - 31st OCTOBER 1981

INTRODUCTION

Exploration Licence 17/78 covers an area of 100 sq. km in north-eastern Tasmania, and includes the Mathinna, Tower Hill and Mangana goldfields.

During 1979 Tasminex N.L. carried out a general reconnaissance of the area, stream sediment sampling in the Mangana district, and preliminary testing of the Golden Gate Mine tailings dumps at Mathinna.

During 1980 extensive testing of alluvial deposits at Mathinna and Mangana was carried out, and investigations made into methods of extracting gold from the tailings dumps at Mathinna. Upon completion of the alluvial test work, attention became concentrated on a study of all the old gold mines within the licence area, with the ultimate objective of defining sub-surface lodes which might provide suitable targets for diamond drilling.

In the six month period covered by this report a detailed analysis has been made of recorded information on the New Golden Gate and Tasmanian Consols Mines at Mathinna, together with an assessment of the nature of faulting in the vicinity of these mines. A programme for diamond drilling at this location has been finalised, although a decision to implement this programme has not yet been made.

An assessment of geophysical methods and their application to gold exploration in the Mathinna beds is included in a report by Dr. J. Bishop of Mitre Geophysics, (Appendix A)

Proposals for diamond drilling have also been finalised in respect of the Jubilee and City of Hobart Mines at Mathinna, and a detailed investigation and sampling of the Argyle Mine at Mangana has been carried out.

The tailings dumps at the New Golden Gate site at Mathinna have been surveyed, and new calculations made of their volume, tonnage and gold content.

SECTION (A)

E.L. 17/78

EXPLORATION FOR LODE GOLD

The New Golden Gate Mine, Mathinna

Within E.L. 17/78 the New Golden Gate Mine was by far the main producer of gold. During its life it produced some 253,865 oz compared with 10,997 oz for the Tasmanian Consols Mine, and 6,033 oz for the total remaining mines in the Mathinna district.

A thorough examination has been made of all available records of the New Golden Gate and Tas. Consols Mines, and it is clear that the "East Reef" was not explored north of the New Golden Gate main shaft, and therefore offers the most obvious target for diamond drilling.

Four diamond drill holes have been planned to test for northern extensions of this reef and possible extensions of the "West Reef" at greater depth, as well as the ground beneath the nearby Caledonian Mine workings. These proposed drill holes are shown on "Map A" and "Map B", and accessibility and water supply were considered in selecting the drill sites.

The possibility of extending the Tasmanian Mines Department Borehole No. 3 might also be considered for exploration of the West and East Reefs; this hole stopped at 54m west of the trend of the West Reef.

In all level drives south in the New Golden Gate Mine, the "Loanes" and "Main" reefs are observed to junction and terminate. With depth, the "East" and "West" reefs are observed to terminate at a fault zone contact. Information on the mine workings (Zig-Zag reef en echelon displacement, drag indications on vein stringers beyond the fault contact) indicate an apparent dextral strike-slip displacement. The dip-slip component is not recorded. However, the fault zone occurs in an area of topographical high (a ridge) which might suggest a reverse fault block, uplifted. The degree of displacement is unknown, but the assumed western limit of the fault zone might be observed in the Golden Hinges adit (Map reference 742067). In the vicinity of this shear contact, transposed quartz veining might suggest a component of dip slip, with a greater (4x) component of strike slip.

An attempt to map the area across the fault zone is being made, to detect change in metamorphic grade. No major differences in lithotype are evident from field observations, although Mesoscopic changes can be detected. It is considered that petrographic or microprobe analysis of structural states of graphite, chlorite, and crystalisation index of phengite across the fault zone may indicate a change in metamorphic grade from which the dip slip component might be determined.

Other Mines

In general, quartz reefing within the Mathinna, Tower Hill and Mangana goldfields is small-scale. Reefs in the New Golden Gate Mine were only economically significant because of their high gold content. A number of smaller mines also recorded high gold contents but these were mostly shallow mining operations which failed to penetrate the limit of the zone of weathering, and their high values were probably due to secondary enrichment. Mines which did penetrate this limit of weathering and still maintained a high gold content include the Jubilee and City of Hobart Mines.

In the Mangana district quartz reefing is well defined and usually persists for some distance (e.g. up to 5 km). In the Mathinna district there is very little continuity or correlation between reefs of individual mines.

The Argyle Mine at Mangana represents the south-eastern extent of the Golden Entrance Reef, and a 0.45m vein in the Argyle No.1 Adit South averages over 1 oz per tonne. However, this adit did not penetrate the zone of secondary enrichment/weathering.

(a) The Jubilee Mine, Mathinna (Map 1)

A single drill hole is suggested to explore for southern and deeper extensions of the reef formation, associated with a probable system of transposed synformal folding (saddle reef). Geophoto (1973) geochemical soil and geophysical (I.P./EM-VLF) anomolies reflect areas of known mineworking mineralisation.

(b) City of Hobart Mine, Mathinna (Map 2a and 2b)

A single diamond drill hole is planned to test the reef south-west of, and below the point of fault displacement (177m below shaft collar), and at right angles to the trend of coincident geochemical soil anomolies (Geophoto, 1973).

(c) The Argyle Mine, Mangana (Map 3)

A single drill hole is planned to test the reef south-east of the adit workings, at a depth of about 60m below the surface.

Adit No.2 South is presently inaccessible, but does penetrate below the probable extent of water table fluctuation/secondary enrichment. Before diamond drilling is considered this adit will be sampled to give some indication of possible Au values in the section of the reef between Nos.1 and 2 Adits.

Proposed Exploratory Drilling

Northern Extensions - New Golden Gate Mine Reefing

Four diamond drill holes are proposed, as shown on Maps A and B.

E.H. No.1 would intersect the East Reef, the West Reef and ground to the west of the West Reef.

E.H. No.2 would intersect the Caledonian Reef, the East Reef and the West Reef.

E.H. No.3 would intersect the East Reef and the Caledonian Reef.

E.H. No. 4 would intersect the East Reef.

The New Golden Gate East Reef has not been explored north of the main shaft, except for insignificant occurrences of a reef in level No.9 and level No.11 of the Tasmanian Consols Mine.

The above exploratory drill holes would intersect the East Reef along a line of bisection of known stoping in the New Golden Gate Mine, which is also a trend line for high gold content.

Exploratory drill holes Nos. 1 and 2 would intersect the West Reef at different depths. E.H. No.2 intersects the West Reef along the line of bisection of known stoping, close to a trend line of very high gold content.

Exploratory drill holes Nos. 2 and 3 are planned to intersect reefing at different depths beneath the Caledonian "saddle reef" workings. E.H. No.3 would be continued for a further 155m (inclined).

Proposed Drilling Sequence

E.H. No.1 would be drilled first, to test the East Reef primarily, then the West Reef, with further exploration west of the West Reef into the zone of faulting, to intersect any possible new lines of reef formation. If encouraging results were obtained in intersection of the East Reef, then E.H. No.4 would be the second hole drilled, to test the East Reef near the Tasmanian Consols main shaft.

If no significant intersection of the East Reef was made in E.H. No.1, then E.H. No.2 would be the second hole drilled, and if no encouraging results were obtained from this hole further drilling might be abandoned.

In the event of obtaining encouraging intersections of the East Reef in E.H. Nos. 1 and 4, then E.H. No.3 would be the third hole drilled.

If encouraging results were obtained in any of the above exploratory holes, one or two additional holes might be required to adequately test the New Golden Gate line of reefing south-west of the fault zone, after ascertaining the probable nature of any displacement on the fault zone.

Contour Mapping - New Golden Gate Mine (Map E)

Reef width and reef gold content contour maps have been produced for the East and West Reefs of the New Golden Gate and Tasmanian Consols Mines.

A comprehensive record of reef widths and gold contents is not available, so any conclusions drawn from these maps are somewhat subjective. However, contour lineations are observed to reflect structural changes (strike and dip) within the reefing, suggesting that such maps may be of some significance.

This data, along with the known trend of stoping, is the only information available as a guide to possible diamond drilling targets. It has been ascertained that no currently available geophysical survey technique would be applicable.

The West Reef - Contour Map (Map D)

In the vicinity of the Tasmanian Consols Mine it is observed that with a change in reef strike from North to N.N.E. the dip of the reef changes from vertical (90°) to slightly north of W, 86°, and the gold content falls. South towards, and in the vivinity of the New Golden Gate Mine, the reef strike is consistently N.N.E. and a high gold content persists. With depth, however, the reef dip changes from 90° to 86°, slightly north of W, and the gold content falls.

Reef width ranges from 0.5 to 6.5m, and high gold content (>18ppm) appears to occur when the reef is from 1.0m to 4.5m wide.

In the No.15 level, south drive of the New Golden Gate Mine, a fault plane (apparent normal dip-slip and dextral strike-slip components) is intersected, and the reef does not persist beyond this point. The swing of the reef from a north to a NNE strike is probably related to a dextral drag component along the fault plane.

The East Reef - Contour Map (Map C)

Reef width and gold content appear to be related to structural changes. The strike of the reef remains in a constant N.N.E. direction with depth and distance until it intersects the plane of faulting.

When the dip of the reef changes from $80^{\circ}/90^{\circ}$ to 65° (south of east) the gold content falls. High gold content appears to favour the reef when it is 2m - 4m wide. With depth, and distance towards the fault plane the dip of the reef decreases to 65° (south of east). In levels 12, 13 and 14 of the New Golden Gate Mine the reef beyond the fault plane is represented by dextrally dragged stringers of quartz. In the Nos. 13 and 14 levels these stringers assayed 14.3ppm Au and <5ppm Au respectively.

Data for Proposed Exploratory Drill Holes

New Golden Gate Mine, Mathinna

E.H. No.1

(i) Location: East side of tailings dumps, Long Gully, Mathinna. 18.58m below the collar of the New Golden Gate Mine shaft.

(ii) Access: Very good, via the New Golden Gate Mine road.

(iii) Water Supply: Long Gully Creek nearby.

(iv) Bore Orientation: N 81.5° W.

(v) Bore Plunge: 52° W.

(vi) Bore Penetration (relative to drill site)

	East Reef	West Reef	Total
Horizontal Dist.	~ 91m	~136m	+200m
Inclined Dist.	~147m	~228m	+354m
Vertical Depth	~116m	~183m	+292m

Note: intersection of the West Reef is incidental, as the bore would continue to penetrate the fault zone.

Data for Proposed Drill Holes (continued)

New Golden Gate Mine, Mathinna

E.H. No.2

(i) Location: On vehicle track, east side of Long Gully, Mathinna. 0.57m above collar of the New Golden Gate Mine shaft.

(ii) Access: good.

(iii) Water Supply: required to be pumped (about 20m head) from Long Gully Creek.

(iv) Bore Orientation: N 68° W.

(v) Bore Plunge: 55.8° W.

(vi) Bore Penetration: (relative to the drill site)

	Caledonian	East Reef	West Reef	Total
Horizontal Dist.	~ 75m	~ 201.5m	~ 256m	~283m
Inclined Dist.	~133.5m	~358.5m	~ 456m	~503m
Vertical Depth	~110.5m	~296.5m	~372m	~416m

Data for Proposed Drill Holes (continued)

New Golden Gate Mine, Mathinna

E.H. No.3

(i) Location: West side of tailings dumps, Long Gully, Mathinna. 18.67m below the collar of the New Golden Gate Mine main shaft.

(ii) Access: very good, via the New Golden Gate Mine road.

(iii) Water Supply: small reservoirs at N.W. corner of tailings dumps.

(iv) Bore Orientation: N 81° E.

(v) Bore Plunge: 45.3° E.

(vi) Bore Penetration: (relative to the drill site)

	East Reef	Caledonian	Total
Horizontal Dist.	~ 98.5m	-	~275m
Inclined Dist.	~140m	-	~390m
Vertical Depth	~ 99.5m	-	~277m

Note: the angle of bore plunge might be flattened below ~ 110m depth to explore beneath the Caledonian Mine workings.

Data for Proposed Drill Holes (continued)

New Golden Gate Mine, Mathinna

E.H. No.4

(i) Location: East side of tailings dumps, on south-east side of Long Gully Creek, Mathinna. (South of E.H. No.1)

(ii) Access: good, via the New Golden Gate Mine road.

(iii) Water Supply: Long Gully Creek.

(iv) Bore Orientation: N 85.5° W.

(v) Bore Plunge: 51.6° W.

(vi) Bore Penetration: (relative to the drill site)

	East Reef	Total
Horizontal Dist.	~ 140m	~151.5m
Inclined Dist.	~ 225.5m	~244m
Vertical Depth	~ 177m	~191m

Note: The bore would not be continued to intersect the West Reef because at the probable point of intersection the West Reef was not found in mine workings.

All proposed drill sites have been located and indicated on the "Topographical Survey Sheet of the Mathinna tailings Dump. The sites have been pegged.

RESEARCHING THE NATURE OF FAULT MOVEMENT AND LODE FORMATION IN THE VICINITY OF THE NEW GOLDEN GATE MINE, MATHINNA

(a) INTRODUCTION

In the New Golden Gate Mine, Mathinna, it is observed and documented that quartz-gold reefing is truncated by a shear zone, when driven on to the south on a number of levels. On some levels, this shear zone is reported as being penetrated to its western boundary.

This shear zone is documented as being a composite of many gouge-filled mylonite shears. In the "New Golden Gate Shear Zone" it is recorded as ~48m wide in the No.6 level drive, and ~82.3m wide in the No.13 level drive. Drilling by the Tasmanian Mines Department in 1962 confirms a shear zone of comparable width.

Twelvetrees (1906) believes that the shear zone/fault is a pre-lode formation, as the lodes do not appear to be displaced by faulting. He documents an increase in reef width and gold content towards the shear zone eastern contact, and a dwindling/disappearance of reefing beyond this contact, within the shear zone. He visualises reefing developed on opposite limbs of an antiformal fold.

Finucane (1935) suggests that most reef occurrences in the Mathinna district are related to a "belt of close folding" which constitutes the main structural line of weakness.

020

Threader (~~1962~~ 1966) believes that this belt of close folding constitutes the main shear zone. He also states that several new lodes were discovered by driving along the footwall of the shear zone eastern contact, which implies that the fault zone and lodes are integral parts of the same structure.

It is the opinion of this Company's geologist, A.B. Daly, that the "New Golden Gate Shear Zone" is only one such zone within a very wide belt of close folding. There is very little documentary evidence on the nature of the faulting and displacement, and indeed the magnitude of faulting. The following is a study to assess the usefulness of further research to establish such information, which might lend itself to a possible projection of fault-displaced, New Golden Gate-type reefing.

(b) <u>Reefing, Fault Displacement, New Golden Gate Mine</u>

The Loanes, Main and Central Reefs of the New Golden Gate Mine are documented as having junctioned, and disappearing in level drives south. At deeper levels the East and West Reefs are documented as having been truncated by a fault plane. At this fault plane contact it is documented that the reef either disappears completely or persists as quartz vein stringers which trail off in a right lateral direction from the actual trend of the reef (e.g. levels 10 to 14). In level No. 4, and especially level No.6, the "Zig-Zag Reef" is observed as being a sequence of en echelon fault-displaced (right lateral) segments of

Strike slip faulting on the New Golden Gate "Main Slide" was proposed in my thesis (1966) but a ~~strike~~ sinistral sense was suggested.
[illegible]

the one reef. This evidence suggests that a dextral (right lateral) component of strike slip on the fault plane has occurred.

(c) The Golden Hinges Adit, Black Horse Gully, Mathinna (Map 4)

The Golden Hinges Adit is accessible, and is of geological importance because it provides the only existing cross-section through what is probably the "New Golden Gate Shear Zone". It had little significance as a gold producing mine.

In the adit to the crosscut, relatively competent phyllite, quartzwacke is intersected. Within 10m from the entrance, however, a short section of intensely folded phyllite/quartz is intersected, with mesoscopic faulting. Beyond this small shear zone, folding of $S_0=S_1$ units shows a dextral sense of vergence. An S_2 schistosity is developed at an oblique angle to this folding.

The adit crosscut marks the onset of a major shear zone - the New Golden Gate Shear Zone. Beyond this point the rock is incompetent, black powdery graphitic phyllite, with intensely transposed fragments of quartz veining. Folding is intense, with marked variations in fold axis orientation. Mesoscopic faulting within this highly "mylonitised" zone is not uncommon. A sinistral sense of fold vergence could be generalised.

Mesoscopic faulting, and sense of fold vergence, suggests that a component of dip slip is present. Observation of boudinaged quartz veining in the crosscut, and measurements of quartz blocks, lends itself to a possible argument that the strike slip component is more that five times the dip slip component. The intensity of mylonitisation/folding suggests that the shear zone is a major one, and that the extent of strike slip is great.

(d) Metamorphic Grade - A Petrographic Study

The geology of a 2 sq.km area centred on the New Golden Gate Mine Shear Zone has been mapped, and a selected number of rock samples petrographically studied. A number of lithotypes were observed in outcrop, including slate, phyllite, quartzwacke and schists. Throughout the mapped area there is a lack of outcrop, and owing to the erratic nature of the lithotypes no attempt was made by Mr. A.B. Daly to subdivide discrete mappable units.

There is no obvious change in lithotype across the New Golden Gate Shear Zone, with the exception of the mylonite zone observed in the Golden Hinges adit. Threader (1962) designates two lithotypes within the Mathinna Beds. These are: Lutite with subordinate arenite content, and arenite with subordinate lutite content. Banks (1962) believes that the above associations of lutite/arenite are facies equivalents, or separate formations, but structural evidence suggests the latter.

Sixteen samples were petrographically studied. Texturally, the rocks are variable, with no graded relationship. Rocks from either side of the fault zone may show an S_1 slatey cleavage, whereas unaltered sandstone is not uncommon. Mineralogy is equally monotonous with ubiquitous quartz, albite ($\leq$90% of the rock). Phengite, graphite and other opaques are usually present. Clinozoisite and digenetic chlorite is not uncommon. Overall, no metamorphic change in grade is evident across the shear zone. The mineralogy might suggest low greenschist facies, at the maximum.

(e) Summary/Conclusions

The intensity of mylonitisation and folding in the Golden Hinges Adit suggests a major shear zone, with a magnitude of strike slip far greater than that of dip slip, as suggested by mesoscopic faulting and transposition of quartz veins within the shear zone. Petrography suggests that the component of dip slip is not of sufficient significance to warrant further study, such as an electron microprobe geothermal gradient study of phengite, chlorite or graphite across the shear zone.

It may be concluded that a major shear zone is evident, having a large dextral strike-slip component and a small dip-slip component. This shear zone lies within a wide belt of close folding which constitutes several shear zones. Threader (196~~2~~6) believes that the Mathinna goldfield lies within an upfaulted block. He suggests a major belt of shear trending north from the Fingal Valley to perhaps the north coast of Tasmania, and offset at intervals by ~~post-~~ pre-Permian wrench faulting.

If any fault-displaced segment of the New Golden Gate Mine reefing exists, it could be located anywhere within 5 - 20 km north of the New Golden Gate, if indeed the New Golden Gate reefing is not an integral part of the shear zone.

The Jubilee Mine - Exploratory Drilling (Map 1)

The Flat Reef, Derby and Lyons Reefs could be considered as equivalents of the same reef, transposed in a system of macroscopic synformal folding, which has a general S.S.E. plunge. Throughout the mine workings there is very little evidence of faulting. The fault on Lyons Reef is considered to be of pre/syn reef origin.

In the final stages of mine development gold was being recovered from Lyons Reef. About 18.8 tonnes of ore were crushed to yield 23.9 oz. of gold (i.e. 39.5ppm). Grab samples assayed 75 and 401 ppm respectively. This ore came from Lyons winze and the 79m No.2 level, i.e. outside the limit of secondary enrichment. Mine operations terminated because of financial difficulties.

In 1973 Geophoto conducted soil geochemical and I.P./V.L.F. geophysical surveys in the area of the mine. Two recorded I.P. anomolies were tested by costeaning. In the southernmost costean a quartz reef/shear zone was observed, which is on strike with the line of known mineralisation on the Derby Reef. The quartz is non-gold-bearing. Geochemical anomolies (Cu,As, MnO_2,Hg, and (As/Cu)100) coincide with the line of known mineralisation on the Derby/Flat/Lyons Reef. Less than 100m east of the mine workings is a zone of coincident geochemical anomolies.

Suggested Exploratory Drill Holes - Jubilee Mine

The geophysical and geochemical anomolies observed by Geophoto (1973) have not been thoroughly tested by costeaning and/or drilling. The testing of several specimens, both quartz vein and host rock, for various physical properties has suggested that no geophysical method can be usefully applied to the detection of gold reefs at Mathinna. It is also considered that further costeaning would only delay the inevitable necessity to diamond drill.

Two exploratory drill holes tentatively planned for the Jubilee Mine are:-

E.H. No.6 - To explore extensions of known reefing.

Location: on vehicle track S.E. of main shaft.

Access: good; a backhoe will be required to level the access and drill site.

Water Supply: by pump from Long Gully Creek, a distance of about 100m.

E.H. No.7 - To investigate ground of geochemical (As) anomolies some 200m east of the mine workings.

Access: difficult; would involve bulldozing a track for 100m up narrow creek gully.

Water Supply: drill site would be adjacent to creek.

Jubilee Mine - Drilling Data

E.H. No.6

	Line of Reef @79m below shaft collar	Total
Horizontal distance	~ 42 m	~125 m
Inclined Distance	~ 84 m	~250 m
Vertical Depth	~ 73 m	~216 m

Bore orientation - S 2°E
Bore plunge - 60° S

This drill hole would explore for southern and deeper extension of the reef formation associated with the assumed transposed system (envelope-like) of synformal folding (saddle reef).

E.H. No.7

	Total penetration
Horizontal distance	~100 m
Inclined distance	~140 m
Vertical depth	~100 m

Bore orientation - S 83° E
Bore plunge - 45° E

City of Hobart Mine - A Proposal for Drilling

"At 580 feet deep a slide was met with which threw the reef over 8 feet to the west, and also carried the shoot of gold away to the north at an angle of 45 degrees, and I may say that shoot of gold is still there."

Mr. P. Irvine, Mine Manager, Special Edition Australian Mining Standard, July 1st 1898 (page 63).

Nature of the Reef

(a) To 61m depth in the shaft the reef has a vertical to slightly easterly dip (strike N 15^{o} E). Below 61m depth the reef dips westerly (about 76^{o}).

(b) To 91m depth in the shaft the reef had an average gold content exceeding 1 oz. per tonne. The extent of the payable reef in the adit drive from the shaft was about 37m. The reef in the adit drive was white, loose, with an average thickness of 0.9m.

(c) Below 91m depth in the shaft the length of payable reef decreased to 15m, with an average thickness of 0.4m, in a hard blue slate host rock, the lode being laminated and rich in arseopyrites.

City of Hobart Mine - Exploration Drilling

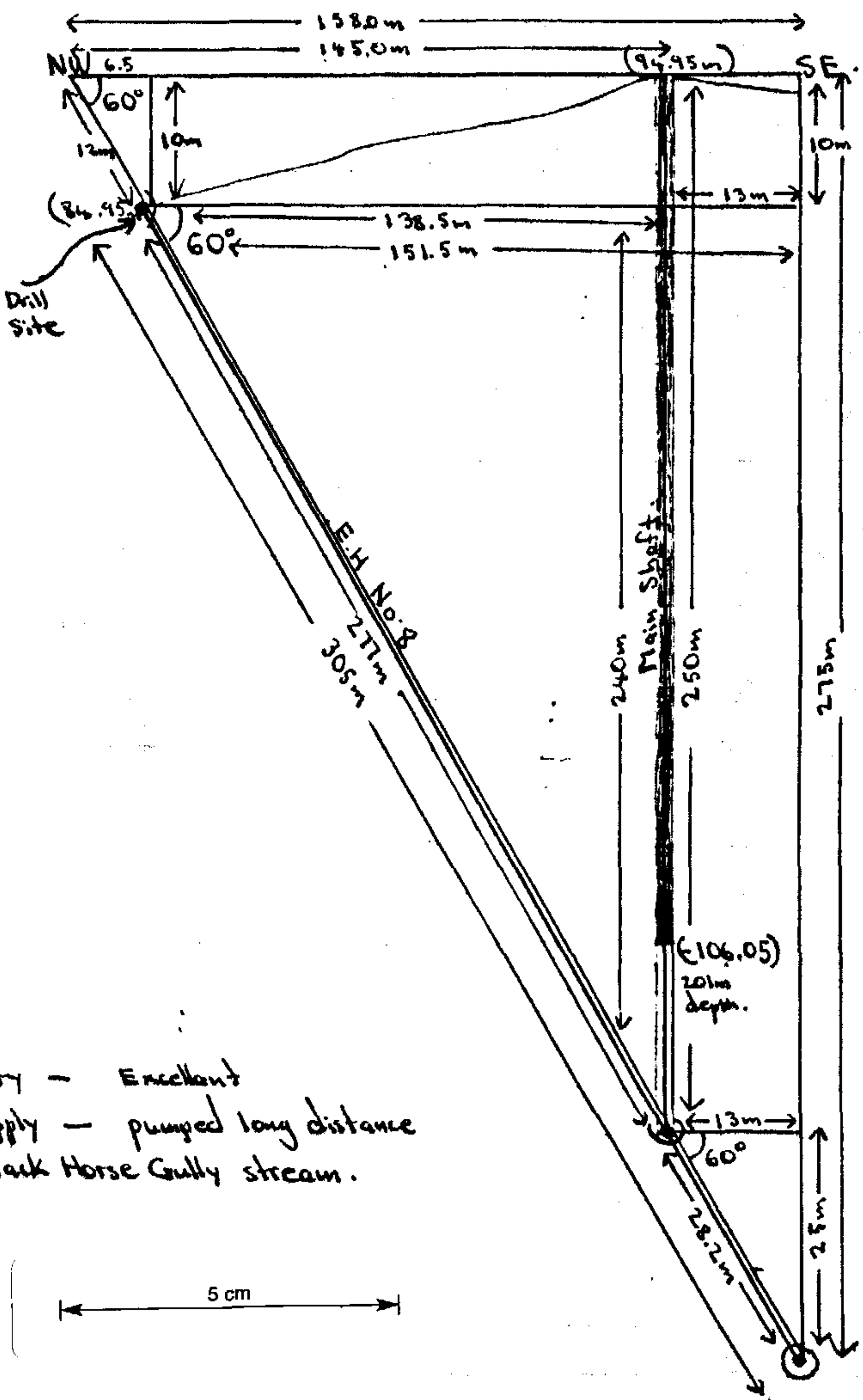
(Map 2a and 2b)

A proposed exploratory drill hole (E.H. No.8) is shown on the following page. This hole is planned to test the reef south-west of, and below the point of fault displacement. It is planned also to intersect at right angles with the trend of geochemical anomolies (Soil sampling survey, Geophoto, 1973). Anomolies for copper, manganese, arsenic and As:Cu ratio are coincident.

	Expected Point of Reef Intersection	Total
Horizontal Distance	139 m	152 m
Inclined Distance	277 m	305 m
Vertical Depth (below shaft collar)	250 m	275 m

Bore plunge - 60° S.E.

City of Hobart Mine, Mathinna.



a. Accessibility – Excellent
b. Water Supply – pumped long distance from Black Horse Gully stream.

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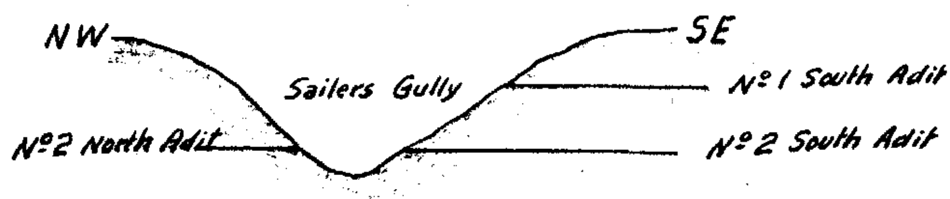
SECTION (B) - Re-sampling of Old Gold Mines

The Argyle Mine Workings, Mangana (Map 3)

The mine workings consist of three adits (No.1 South, No.2 South and No.2 North), and trenches on the southern continuation of the Golden Entrance reef. To the west is a short adit and shaft on a 0.6m wide reef of low grade.

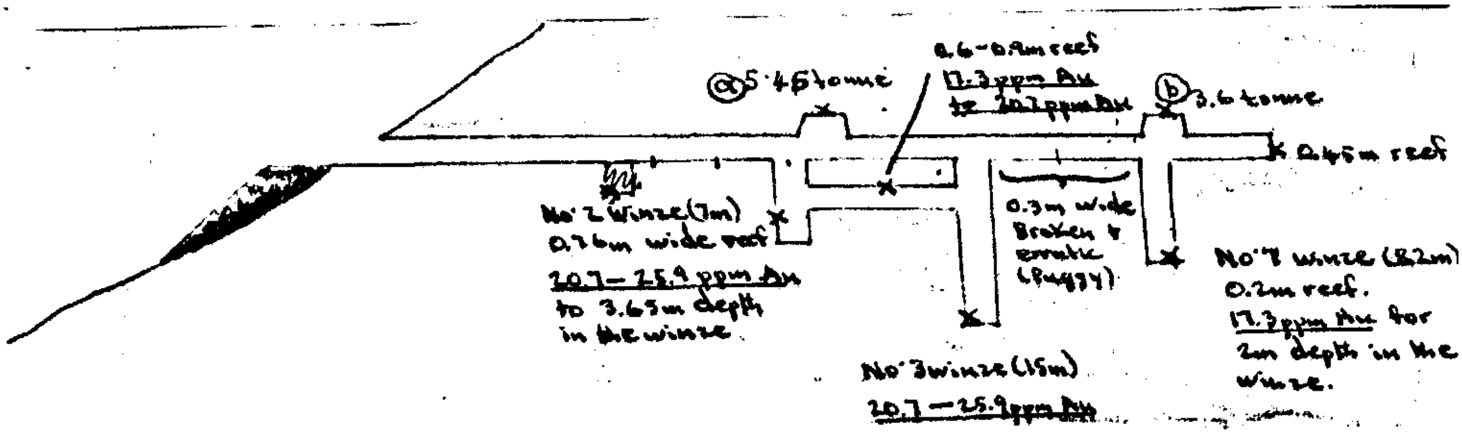
Overall the Golden Entrance reef varies from a puggy trace to 1.5m wide, with an average width of 0.6m to 0.9m. It trends N 40-55^{o}W/55-70^{o}NE.



(a) No.2 North Adit: the Golden Entrance reef is 0.9 - 1.5m wide, well mineralised with py and Aspy, but with minor gold content.

(b) No.2 South Adit: The Golden Entrance reef is 0.9m to 1.5m wide, well mineralised with py and Aspy, for the initial 20m into the adit. Beyond 20m to the end of the adit at 126m the reef width varies from 0.3m to 1.2m with an overall minor gold content.

(c) <u>No.1 South Adit</u> - on Golden Entrance Reef



<u>Bulk Sampling</u>

9 tonnes of reef material from the points marked (a) and (b) in the above sectional view of No.1 South Adit are recorded as giving a return of nearly 8 oz. gold, equivalent to about 26.4 ppm Au.

Grab samples taken at (a) and (b) assayed 26.2 ppm Au and 24.8 ppm Au respectively.

Quartz dumps near the adit entrance showed a gold content varying from 1.76 ppm to 14.5 ppm, with an overall low grade of about 4.1 ppm Au.

The Argyle Mine - History and Gold Recovery

1900 to 1902 : 203.7 tonnes ore yielded 1427.1 oz. Au.
1903 to 1905 : 400.9 " " " 988.15 oz.
1907 to 1909 : no results recorded.
1910 to 1924 : little gold recovered.

From 1900 to 1905 the ore produced averaged 3.99 oz. of gold per tonne, i.e. 124 ppm Au.

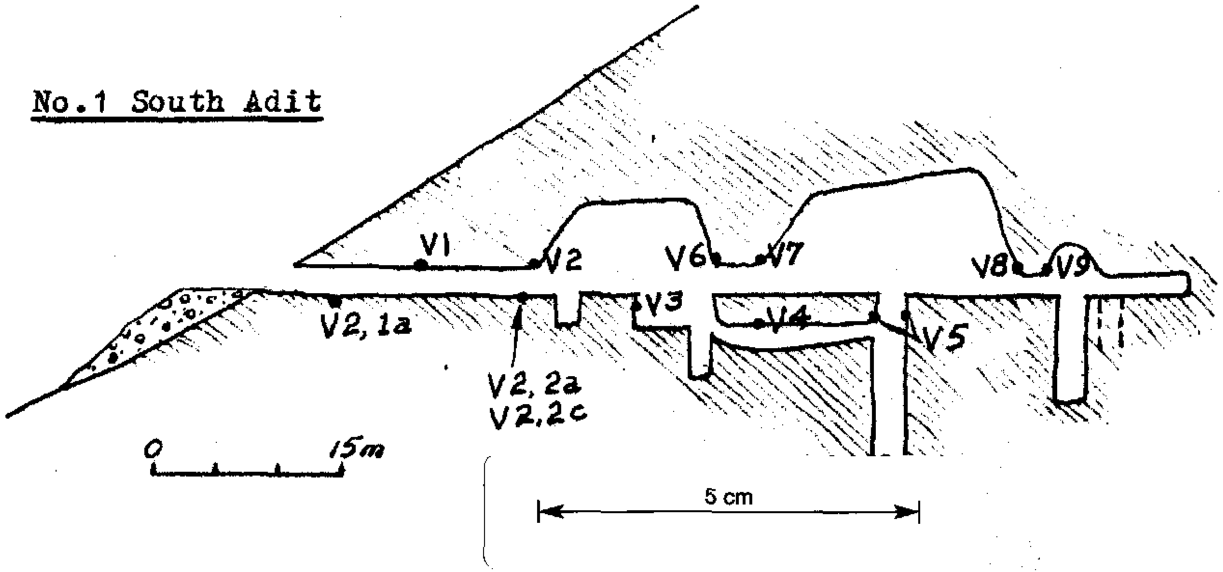
In 1929 the Argyle Gold Development Company was formed, and tested the workings described above, finding the in situ ore to vary in grade from 17 ppm to 26.4 ppm.

Accessibility

The Nos. 1 South and 2 North Adits are accessible. No.2 South Adit is partly flooded and has collapsed sections. The only adit having significant gold content is No.1 South, which is located via a footpath rising at a 30° gradient for some 250 metres from the end of a vehicle track.

Argyle Mine, Mangana - Resampling

No.1 South Adit



Because of encouraging assays obtained from samples taken in the Argyle No.1 South Adit during the previous licence period, further samples were taken during the period covered by this report. The location of these samples is shown on the above section, and assay results are as follows:

Fire Assay Analysis (< 5 kg samples)

A-V1	=	133 ppm	A-V6	=	12 ppm
A-V2	=	11	A-V7	=	76
A-V3	=	14	A-V8	=	13
A-V4	=	7.6	A-V9	=	20
A-V5	=	75	A-V10 (composite)	=	18 ppm

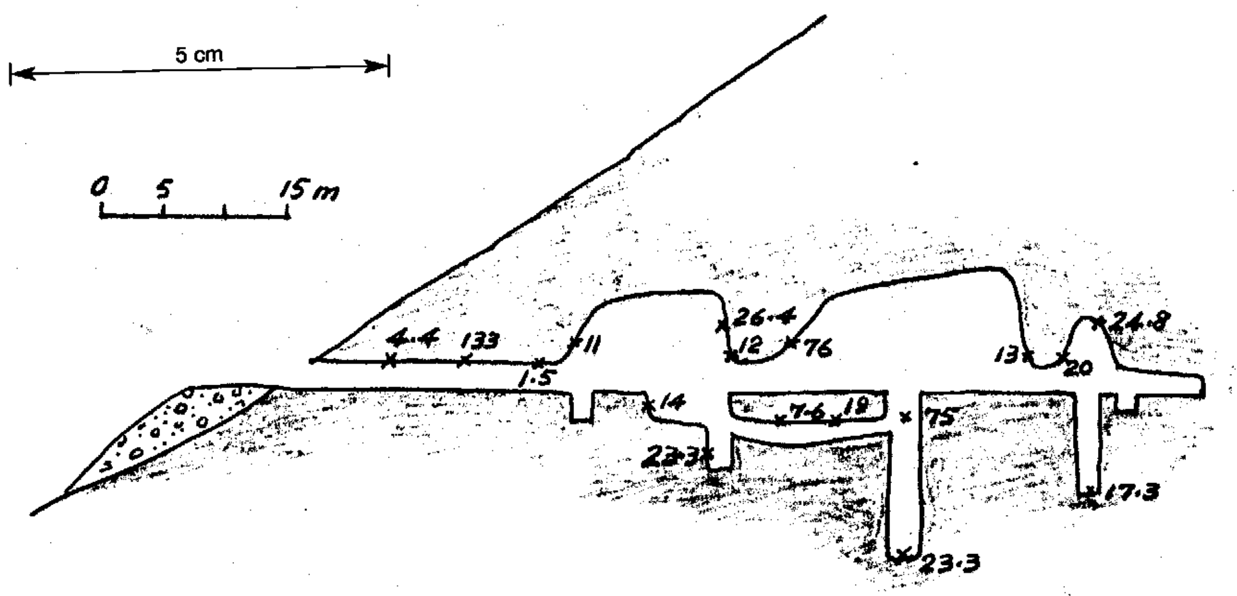
Average vein width = 0.45 m
Average grade = 40.2 ppm (1.3 oz/tonne)

Fire Assay Analysis (< 300gm chip samples)

A-V2,1a	=	4.4 ppm	A-V2,2a	=	< 0.3 ppm
A-V2,2c	=	1.5 ppm			

Argyle Mine - Mangana

Section of Argyle No.1 South Adit, showing all Tasminex sample points and assays in ppm.



Vein Width at sample points varies from 0.1m to 0.9m, and averages 0.44m.

Average Grade of all samples is 31.2 ppm, or approximately 1 oz. per tonne.

It is estimated that some 920 tonnes of reef material have been extracted in this adit, which at the above average grade would yield 920 oz. gold. The actual recorded gold production was 2,415 oz. from 605 tonnes, an average grade of about 4 oz. per tonne.

Argyle Mine - Mangana

Proposed Further Investigation

While the relatively high Au values obtained in the Argyle No.1 Adit are offset by the narrowness of the reef, this mine is considered to be worth further attention, and arrangements have been made to drain and repair the No.2 South Adit for sampling.

The mine area has been geologically mapped.

Sampling of Quartz Reefs in Other Mines

A further 35 chip prospect samples of quartz reef from a number of mines within E.L. 17/78 were sent to the Tasmanian Mines Department, Launceston, for fire assay. of these 35 samples only 15 were above the detection limit of the analytical method.

The Miners Dream Mine at Mathinna was close-spaced resampled (5 kg samples), but the assay results were discouraging.

SECTION (C)

Golden Gate Mine Tailings Dumps, Mathinna

Survey and Calculation of Volume, Tonnage and Au Content
(Maps 5a and 5b)

Introduction

During August 1981 a tacheometric survey of the Golden Gate tailings dumps was carried out. Tasminex N.L. have a scheme for heap-leach cyanidation of these tailings, and it was considered desirable to make a new estimate of their quantity as the previous estimate by Hughes was made in 1948.

In the new calculation of volume, certain assumptions had to be made owing to the difficulty in correlating Hughes' survey with adjacent stable topographical landforms.

Hughes' topography and the present topography were correlated using the "residues" at the southern part of the dumps, which might be considered a relatively stable lithotype. Water erosion of the "residue" appears to result in the formation of well-defined rills and channels, with little change to the overall topography. In other areas, correlation was based on the "slimes" as a relatively stable lithotype, and on the adjacent Long Gully Creek, which may represent a stable base level. Stream terracing was also used as a base for correlation, although the 1948 survey excludes such features.

Summary of Survey Results

(a) Volume (Cubic metres)

	Sand	Residue	Total
Total Volume 1948	164,944	49,200	214,145
Total Volume 1981	132,124	43,139	175,263
Net Loss (1948-81)	32,820	6,091	38,911

Note: The "Residue" is material which has previously been cyanided, whereas "Sand" and "Slimes" are in fact different size fractions of the same uncyanided material, and are therefore grouped in the above table as "Sand".

(b) Density (Tonnes per cubic metre)

(i) Sand: Number of samples weighed = 23
Volume of each sample = 3023.12 cm^3
Range of sample weights = 4.3 - 4.4 kg.
Average sample weight = 4.35 kg.
= 1441 kg per m^3
Weight of dry sand = 1.44 tonnes per m^3

(ii) Residue: Number of samples weighed = 6
Range of sample weights
= 1.439 - 2.013 tonnes per m^3
Mean density of (wet) residue = 1.73 tonnes/m^3.

(c) Tonneage

	Sand (d=1.44)	Residue (d=1.73)	Total
1948	237,519	85,116	322,635
1981	190,258	74,630	264,888
Net loss (1948-81)	47,261	10,486	57,747
Net loss per annum	1,432	317	1,750

(d) Gold Content (compiled from data of Hughes (1948) for all of twelve measured sections (1981)

	Sand	Residue	Total
Number of samples	69	22	91
Average sample value	1.578 ppm	1.177 ppm	1.482 ppm
Tonneage (1981)	190,258	74,630	264,888
gms Gold (Au)	300,227	87,839	392,564
Ounces (Troy) Au	9,652.5	2,824.4	12,622.6
* Value ($450/troy oz)	$4,343,625	$1,270,980	$5,680,186

* Assuming 100% recovery.

Calculation of Volume from Cross-Sections (Map 5b)

Volumes in cubic metres:

Section	Sand			Residue			
	Vol.	loss	gain	Vol.	loss	gain	Net ±
Fence to Line AA	280.4	-	-	-	-	-	-
AA-BB	5036	1884	-	-	-	-	-1884
BB-CC	7090	9090	-	-	-	-	-9090
CC-DD	12003	9726	-	-	-	-	-9726
DD-EE	17085	4698	-	-	-	-	-4698
EE-FF	17516	2178	-	-	-	-	-2178
FF-GG	14396	-	-	717	-	-	-
GG-HH	20895	242	-	2456	-	-	-242
HH-II	24409	1983	-	7037	269	-	-2252
II-JJ	10775	2500	-	13025	1425	-	-3925
JJ-KK	2635	520	-	12837	2304	-	-2824
KK-LL	-	-	-	6508	1802	-	-1802
LL to Fence	-	-	-	559	261	-	-261

Topographic Changes (1948 - 1981)

Line AA : No record of original topography or depths of sand.

Line BB : Loss of sand, wind erosion, subordinate water erosion.

Line CC : Substantial degredation of sand by wind erosion.

Line DD : Net degredation of sand - wind erosion. Re-deposition of sand with slimes revealed at east end of section.

Line EE : Degredation of sand - wind erosion, with subordinate water erosion.

Line FF : Little change in topography.

Line GG : Aggradation of sand - gully trap accumulation.

Line HH : Little change in topography, minor sand degredation.

Line II : Degredation of sand by wind erosion, and minor degredation of residue by water erosion (rill erosion).

Line JJ : Degredation of residue, redistribution by water erosion.

Line KK : " " " " " " "

Line LL : " " " " " " "

Density of Tailings

There is an appreciable difference in measurements of the density of the tailings materials when compared with densities given by Hughes (1948).

Density - tonne/m^3	Sand	Residue
Hughes 1948	2.16	1.86
Daly 1981	1.44	1.73

Density measurements were made by Daly as follows:-

(a) Sand: the density of both dry and wet sand was measured. Dry density readings were consistent, whereas wet density measurements were variable, and less than dry density measurements. A sample container of known volume and weight was used.

Number of samples $n = 23$

Dry weight $\hat{x} = \tilde{x} = \bar{x} = 4.35$ kg

Wet weight Range = 3.6 to 4.25 kg

$\bar{x} \neq \hat{x}$ mode = 3.8 kg

Dry density 1.44 tonne/m^3

Wet density 1.26 tonne/m^3

(b) <u>Residue</u>: residue sediment is typically moist/damp with considerable variation in sample weight. Due to the consolidated nature of this material each sample was obtained as a carved geometric shape, from which the volume was calculated and the weight measured.

Number of samples $n = 6$

Range of densities = 1.439 to 2.013 tonne/m^3

Mean density $\bar{x}$ = 1.73 tonne/m^3

Summary of Survey Data (Hughes, 1948)

	Sand/slime	Residue	Total
No. of boreholes	285	65	350
Total footage	3285	560	3845
Average depth (feet)	11.5	8.6	11.0
Volume (cu.yards)	197,630	80,000	277,630
Tons (long)	321,600	112,000	433,600
Value (dwt/ton)	1.11	0.84	1.04
Total ounces Au	17,850	4,700	22,550
Density (ton/yd^3)	1.63	1.40	1.56
Converted to Metric			
Volume (cu. metres)	151,100	61,164	212,264
Metric tonnes	326,763	113,792	440,537
Density (tonnes/m^3)	2.16	1.86	2.01

Comparison of 1981 Survey with 1948 Survey

	Sand/slime	Residue	Total
Recalculation 1948			
Volume (m^3)	164,944	49,200	214,145
Metric tonnes	237,519	85,116	322,635
Calculation for 1981			
Volume (m^3)	132,124	43,139	175,263
Metric tonnes	190,258	74,630	264,888
Net loss tonnage (1948 to 1981)	47,261	10,486	57,747

1.44 1.73

Conclusions

The recent (August 1981) survey of the Golden Gate tailings dump at Mathinna indicates a reduction of some 40,000 m^3 from the volume measured by Hughes in 1948. This is believed to be due to wind and water erosion over the intervening years.

The considerable reduction in calculated tonnage from the 1948 survey is due in part to the decreased volume but mainly to the different values of the density of the tailings. It is not clear why this discrepancy should be so large.

Other Tailings Dumps Within E.L. 17/78

Because of this Comany's interest in establishing a plant for cyanidation of tailings at the Golden Gate site, a search was made for other tailings dumps in the area, from which material might be transported to the treatment plant.

Several small tailings dumps, all associated with old gold mine battery sites, have been located, measured for volume estimates, and sampled for fire assay analysis.

These small tailings deposits are located as follows:

(a) Volunteer Mine, Mathinna Map Ref.726082
(b) City of Melbourne, Mathinna " 730111
(c) City of Hobart, Mathinna " 738070
(d) Twilight Mine, Tower Hill " 740020
(e) Mangana Reefs, Mangana " 744923
(f) Fingal Mine, Mangana " 742946

With the exception of the deposit at the Fingal Mine, which is of low volume and negligible gold content, all these tailings dumps contain significant amounts of gold. The twilight Mine deposit is of exceptionally high gold content; there is evidence of a cyanide treatment system at this mine, but no records of gold recoveries during the life of the mine.

Estimates of the volumes and tonnages, and mean gold content are:-

	Volume (m^3)	Tonnes at density 1.44	$\bar{x}$ Assay ppm Au
Volunteer	10,000	14,500	0.67
City of Melbourne	520	750	2.07
City of Hobart	10,500	15,120	0.43
Twilight	3,500	5,000	15.0
Mangana Reefs	13,900	20,000	0.83
Fingal	-	-	0.3

Assay results are included in the Appendix.

Reference List

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Finucane K.J.	1933	The Mathinna Goldfield. Geol. Survey Bulletin 43, Tas. Mines Dept.
Geophoto	1973	Geophoto Resources Consultants, Progress Reports, Final Report, Induced Polarisation Survey (Webb).
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Threader V.	1962	Mangana-Waterhouse Goldfields. Unpublished MSc, Thesis (Tas. Mines Dept.)
Threader V.	1966	The Occurrence of Gold. Unpublished MSc. Thesis (Tas. Mines Dept.)
Threader V.	1966	Drilling - New Golden Gate Mine - Mathinna. Unpublished (Tas. Mines Dept.)
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SECTION (D)

EXPLORATION LICENCE 17/78

Total Expenditure by Tasminex N.L. for the Six Months Period 1st May 1981 to 30th October 1981

Services, Rentals	$4,880.94
Wages, Salaries, Fees	$12,233.21
Accommodation	$1,419.90
Transportation	$4,852.94
Assays	$463.00
Total Expenditure	$23,849.99

PERSONNEL EMPLOYED ON E.L. 17/78

Throughout the period covered by this report, geologist Mr. A.B. Daly was fully employed in exploration and research in respect of E.L. 17/78. He was assisted by an average of two field assistants.

The programme of exploration continued to be guided by geological consultant Dr. M. Solomon of the University of Tasmania, and directed by Mr. E.N. Charlton of Tasminex N.L.

SECTION (E)

TASMINEX N.L.

EXPLORATION LICENCE 17/78

PROPOSED PROGRAMME OF EXPLORATION WORK

During the new licence period commencing 1st November 1981 it is proposed to explore for sub-surface gold reefs by diamond drilling.

The drilling programme will be as outlined in this report, with priority given to the area of the New Golden Gate Mine at Mathinna.

Investigation and sampling will continue at the Argyle Mine, Mangana, with a more general study of the Golden Entrance Reef, which is considered interesting, and a possible diamond drilling target.

A geologist will be maintained full time in the licence area, with field assistants as required, involving an expenditure of about $4,000 per month. The cost of diamond drilling will be in addition to this amount.

E.N. Charlton
Director,
Tasminex N.L.

APPENDIX 1

051

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MITRE GEOPHYSICS PTY LTD
MINERAL EXPLORATION AND ENGINEERING CONSULTANTS
BUGGS LANE ELLIOTT TASMANIA 7325 PHONE 004-363143

GEOPHYSICAL METHODS
FOR
GOLD REEF EXPLORATION

MATHINNA GOLDFIELD, N.E. TASMANIA

for

TASMINEX N.L.

by

Dr. J.R. BISHOP

TX/MG81/09
June, 1981

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CONTENTS

List of Tables and Figures

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SUMMARY

A visit was made to Tasminex's E.L. 17/78 to advise on geophysical methods which might assist in the exploration for gold at the Mathinna Goldfield.

The reef gold at Mathinna occurs in quartz veins; these vary in size but are typically one metre wide and tens of metres long. The target depth specified by Tasminex was up to 30m. Samples of vein quartz and country rock (mostly 'black' shales) were collected and sent for measurement of density, magnetic susceptibility, resistivity and IP effect. Although the small number of samples (9) may not be representative of the field as a whole, the results showed that measurable density and magnetic contrasts were unlikely. They also showed that IP effects were possible from the target (the vein quartz has minor amounts of sulphides) and from the country rock (black shales).

An IP (and VLF) survey had previously been conducted over part of the area (in the vicinity of the Jubilee mine), however the interpretation of this survey had not considered the subtle anomalies expected from 1% to 1½% of sulphides in quartz veins; further the anomalies that were defined were not properly followed up (two costeans were dug to test coincident IP and Geochem anomalies; no mineralisation was found).

The possibilities of a VLF survey are considered since the method should respond to veins that are extremely weathered, however responses may also be expected from faults, joints, contacts etc. (The results of the VLF survey mentioned above were not sighted.) Also discussed is the SP method, on a rather tenuous link with the Rossarden/Storey's Creek tin field where SP has apparently been successfully used to detect sulphide-bearing quartz veins.

It is recommended that IP test surveys be conducted over old workings where the geology is well known. These tests should include an area of fresh quartz veins (e.g. the Tower Freehold, a sample of which gave an

effect), and from weathered (altered?) veins (e.g. the West Vein, New Golden Gate), where IP effects might be obtained from clay minerals.

Also recommended is a magnetometer survey, which, given the lack of contrast in the test samples, is suggested on the grounds of cost, speed and ease of operation. VLF and SP surveys could be carried out as complementary surveys to IP or as subsequent surveys if IP failed.

AIM AND INTRODUCTION

The Mathinna goldfield surrounds the town of that name in north east Tasmania. Following the discovery of alluvial gold at Mangana, south of Mathinna, in 1852, reef gold was mined in the area up until 1932. The principal mines were the New Golden Gate which produced 253,000 ounces of gold from 298,000 tons of ore, and the Tasmanian Consuls mine which recovered about 11,000 ounces of gold from 23,500 tons of ore. The total production from all other mines in the district was about 6,000 ounces from 11,000 tons of ore (Noldart and Threader, 1965).

The lode gold occurs in quartz reefs which vary in width from a few centimetres up to 10m., and in length from about 5m. up to 300m. An average size is perhaps 1m. wide and about 30m. long. In addition to the gold, the quartz "contains small amounts of arsenopyrite, pyrite, chalcopyrite, sphalerite and galena. The arsenopyrite and pyrite are the most abundant and constitute about 1.5% of the ore, and the pyritic concentrates average about 1oz. gold per ton of concentrate". (Hughes, 1953). The host rocks are the Lower Palaeozoic Mathinna beds, a series of steeply dipping mudstones, siltstones, quartzwackes, with a marked foliation striking NNW. The rocks are folded, and according to Hughes (1953), the reefs occur along and on either side of "the zone of close folding" which "corresponds to a zone of maximum development of slate, but there is no relationship between the rock structures and the reefs, and no preferred direction of strike". (However Noldart and Threader, 1965, state that the "quartz reefs occupy planes of foliation, bedding and jointing".)

I visited the area in April, accompanied by Tasminex geologist Adrian Daly. The purpose of the visit was to determine what geophysical methods might be used to assist in the detection of the gold-bearing quartz reefs. The veins were observed as both fresh, relatively competent veins (e.g. the Tower Freehold workings) and as weathered (altered?) clayey veins (e.g. West Vein, west of the New Golden Gate). The depth to (undiscovered) veins was expected to be as much as 30m. From the mine dumps it was noted that much of the host rock was dark to black shales. All the mine shafts had collapsed and were inaccessible, however some adits were still open.

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PHYSICAL PROPERTY MEASUREMENTS

Several samples of vein quartz with visible sulphides, and of host rock (black shales) were collected from various mine dumps. Nine specimens were sent to the University of Sydney for petrophysical testing. The properties measured were density, porosity, magnetic susceptibility, resistivity and induced polarisation (IP) effect. The results are shown in Table 1. It is emphasised that these are a few, small sample, measurements which may not represent the field values. This is expected to be particularly true for the resistivity values, since the resistivities of in-situ rocks may be largely dependent on joints, fractures etc. The differences between CT1 and CT2 (2 specimens from the one sample) illustrate the point: there is over one order of magnitude difference between the resistivities.

The little variation in the wet bulk density values suggest that the gravity method would not be useful for detecting quartz veins. Similarly the very low magnetic susceptibilities imply that there would be insufficient contrast for a magnetometer survey.

There is a very large range in the measured resistivities, over two orders of magnitude; these may be classified as moderately resistive (TF1), resistive (SGG1, CT1, CT3, J2 and MR1) and very resistive (CT2, J1, TF2). Whilst the three very resistive samples are all vein quartz, the presence of joints, fractures, weathering etc. in the veins means it is most unlikely that a resistivity contrast would be observed in the field. The results of the IP tests are unusual, only two specimens showed an effect: one, a specimen of vein quartz (TF2) gave a good IP effect of 20%; another, a specimen of black shale (SGG1), gave a low effect of 8%. The inconsistency of these results suggests that the IP method would also not be a useful method, however its possible application is further discussed under Geophysical Methods.

PREVIOUS SURVEYS

Induced Polarisation survey:

A dipole-dipole frequency domain IP survey was carried out by Austral Exploration P/L for Geophoto Resources Consultants in 1973. The survey covered nine lines, 75m. apart, and used a 30m. dipole spacing. The survey was centred on the Jubilee mine; a location plan, showing anomalies, is given in drawing A184 (Turner, 1974) at a scale of 1:750. J. Webb (Austral Exploration's manager and chief geophysicist) stated that "a strong anomaly in all three parameters exists on all lines either at the extreme eastern end or beyond the limits of the lines" (Webb, 1973). One other anomaly "of significance" persisted for three lines. Other anomalies were interpreted on all other lines but they were weak and no work was recommended on these "numerous small anomalies marked and discussed" (Webb, 1973). I consider a different interpretation may be placed on these anomalies and this is discussed in the next section, Geophysical Methods.

The comment in the Geophoto Progress Report no. 73/11 (Turner, 1973) that "The lower limit of detection of sulphides for IP is believed to be about 5%" is not true. Nearly fifteen years ago the method was considered capable of detecting as little as 1% by volume of metallic conducting sulphides (Seigel, 1967) and there have been considerable advances in instrumentation since then.

VLF - electromagnetic survey:

Turner (1973) also mentions a VLF survey and states that the method is "not applicable to this area although several well defined anomalies were found." Turner (1974) states that the VLF survey used a Ronka EM16 instrument and that the work was carried out in conjunction with the IP. He also states that "several anomalous zones of questionable significance were indicated" and concludes that "the method is probably of little use in this particular area for a number of reasons" (unspecified, although Turner, 1973a, notes that the anomalies were unlikely to be caused by the sulphide mineralisation). I have not seen the results of this survey, but my comments on the possible application of the VLF method are given in the next section.

Geophoto Minerals carried out some geochemical sampling and Turner (1973) states that some of the geophysical results can be correlated with geochemical anomalies. Two costeans were dug; (1) centred at 135E on line 225N, which is a little over 1 km. grid south east of the Jubilee main shaft and (2) centred at 15E on line 75N, which is just 2 kms. grid south of the Jubilee main shaft (grid north is about 25° west of true north). The costeans were to "further investigate the better IP and geochemical anomalies" (Johnston, 1973). They revealed pale grey slates with a lesser amount of grey to dark grey slates. The results of the geochemical sampling of the costeans were not available for Johnston's report, but the costeans "failed to encounter any macroscopic mineralisation." Johnston (1973) noted that the IP anomaly was deep and that therefore the costean did not test the IP results. He also states that throughout costean no. 2 there were "sporadic graphitic partings and narrow graphitic bands" and he correctly observes that "their presence cannot be precluded from contributing to the IP response." The testing of the black shale from the South Golden gate workings confirms that such may be the case. This point is further discussed in the next section.

Radiometric survey:

Finally, Turner (1974) comments on an airborne spectrometer (gamma ray) survey. K^{40} and Bi^{214} anomalies were supposedly located in the vicinity of the New Golden Gate mine with others nearby. However, according to Turner, other authors dispute the existence of anomalies in the area. I have not seen the data, but do not consider it likely to be significant. The use of radiometric surveys is briefly discussed below.

GEOPHYSICAL METHODS

In this section a brief description of commonly used geophysical methods is given with an opinion on its possible application to the Mathinna Goldfield. The first method discussed is not commonly used (or even available) but is included since it probably offers the greatest potential.

The Piezoelectric technique:

This method is not available for routine surveys, but it is probably the most applicable (Bishop, 1980). It is also possible that the technique will be available in the future (date unspecified).

The piezoelectric technique stresses a quartz vein, usually with a seismic explosion, and the resulting charges give rise to an electric field which is measured via electrodes placed in the ground. From the time lapse, the distance from the shot to the vein may be calculated. The method is not able to discriminate between mineralised and unmineralised quartz veins.

Magnetometer surveys:

Whilst no magnetic effect was expected from the quartz veins, and although a target with higher magnetic susceptibility is preferred, it was thought that the host rocks may have had sufficient magnetic minerals to provide a measurable contrast with the quartz veins. The tests made, show that neither the veins nor the host rocks are magnetic and that there is no contrast. However the number of samples tested was limited, and a test survey over old workings could be recommended on the grounds that it would cost very little to try it.

Gravity survey:

Like the magnetic susceptibility values, the range of target densities overlaps those of the host and the range of values is small. A test gravity survey would not be cheap and is not recommended.

Resistivity survey:

Resistivity measurements may be made (and usually are) during IP surveys, however surveys which measure only resistivity are very much cheaper. The tests show a considerable contrast in resistivities, with the quartz vein samples consistently high. However as was previously mentioned, the in-situ environment, with water filled joints, fractures, cavities, weathering etc., will ensure that the resistive sections of the veins are largely 'bypassed' by the transmitted electric currents so that the quartz veins would not stand out as resistive anomalies - particularly at depths of up to 30m. Therefore a resistivity survey is not recommended.

IP survey:

The induced polarisation (IP) phenomenon is analogous to the behaviour of a capacitor in an electric circuit: it may be charged up and will then, upon removal of the charging current, slowly release its electrical energy (decay). An alternative description is the way in which a capacitor changes its impedance with change in frequency: a capacitor has a low impedance at high frequencies and a high impedance at low frequencies. The 'capacitors' in the earth are metallic conductors (usually sulphides, although magnetite and graphitic shales also cause an effect). Thus time domain IP systems measure the decay of pulses transmitted into the ground and frequency domain systems measure the change in the earth's impedance with change in frequency. (Mathematically the two systems are equivalent.) The technique is used to detect concentrations of sulphides too disseminated to show a contrast in conductivity, i.e. electromagnetic or resistivity anomalies.

The IP tests have shown that measurable effects are possible from the target (although there would be considerable dilution of this effect in the field), but they have also shown that the host rocks may give an effect.

The sulphides in the vein quartz were observed to be confined to planes; the large effect from TF2 may therefore be due to an exposed plane or a small specimen containing a larger than average percentage of sulphides. Conversely, the fact that no responses were observed from the other quartz specimens may have been because of an unrepresentative lack of sulphides.

I had expected the black shales to be much more conductive and have higher IP effects than the tests have shown. Table 1 shows that the host rocks are largely resistive and from three different areas only one sample gave a measurable effect. This suggests that, in at least some areas, the background levels should be minimal.

Webb (1973) appears to have interpreted the survey as though for a metalliferous deposit, i.e. the bigger the IP effect and the lower the resistivity, the better the anomaly (lack of briefing ?). However since it is believed that the target consists of only small percentages of sulphides, then subtle anomalies should be looked for, with, if anything, corresponding resistivity highs reflecting the resistive quartz host. Large anomalies may well be caused by graphitic black shales. It is emphasised that small amounts of sulphides will only be detectable in areas of very low geologic 'noise'. To illustrate the variability of IP surveys: at Pine Point in N.W. Canada, ore-bodies were defined by IP effects over about 1% frequency effect: the west coast of Tasmania typically has background levels of nearly 3%.

I obtained a copy of the results of the IP survey and these have been forwarded to geologist Daly. Examples of the subtle anomalies referred to above are (from south to north): line 0N, 105E (? no resistivity high): line 22N, 75W and 45E; line 450N, 135W; line 525N, 105W; line 600N, 195E (?). However it is recommended that IP test surveys be conducted over known areas before either following up these anomalies or commissioning surveys over areas of interest to Tasminex. The tests should include areas of both fresh quartz veins and weathered, clayey veins: the former since IP may respond to the sulphides, the latter since a response may be obtained from the clays. Surveys should also be carried out over areas from where samples were taken, in particular Tower Freehold and South Golden Gate.

Electromagnetic (EM) surveys:

There are various types of EM techniques, usually serving different, but overlapping purposes: all rely on the generation of 'secondary' currents in subsurface conductors by the application of 'primary' currents from transmitted EM fields (either natural or man-made).

If any method is appropriate, it is the VLF method and a brief description follows. VLF stands for 'very low frequency' and it refers to the frequency of radio waves (usually) used for communication with submerged submarines and long range navigation. Geophysically speaking, the frequency (about 20kHz) is very high, and this means that the penetration is often poor and that the geologic noise is high, since responses are obtained from usually unwanted features such as faults, contacts, swamps etc. Its possible application at Mathinna is in detecting the very weathered, clayey veins (e.g. the West Vein, previously mentioned), which may give rise to VLF anomalies. However it is likely that the many faults etc. in the area would also cause anomalies, and therefore the technique would only be complementary to some other method(s). The cost and execution of a VLF survey would be comparable to a magnetometer survey, i.e. one person to operate, with several kilometres coverage per day.

Self Potential (SP) survey:

A naturally occurring voltage (self potential) often occurs in the vicinity of metallic conductors (massive sulphide bodies). The precise cause of the voltage is poorly understood, however it is known not to be oxidation at the surface, since SP anomalies are normally negative over the body.

The method is mentioned here since it was used at Rossarden and Storey's Creek to find the mineralised quartz veins. The type and amount of mineralisation at these mines is quite different from Mathinna, however the sulphides there do not appear to be sufficiently connected to cause an SP anomaly.

The equipment needed is simple and cheap; a good voltmeter, a long length of wire (preferably as long as one profile line) and the same electrodes as are used in IP surveys ('porous-pots'). Rate of progress would be slower than a magnetometer survey and two men would be needed.

The method cannot be recommended on theoretical grounds, and like IP and EM methods, it too is an excellent finder of black slates, however presuming the petrophysical tests are right and the slates are not conductive (confirmed by VLF?), the SP could be tested over known veins (anomalies of the order of 50mV were apparently recorded at Rossarden).

Radiometric surveys:

Radiometric surveys use spectrometers or scintillometers to monitor the amount of gamma-ray activity. The former measures rays with certain energy levels (which can help to discriminate the cause of the radio-activity); the latter receives all energies. Gamma rays will penetrate hundreds of metres of air, but only tens of cms. of soil, and even less through rock.

Apart from detecting uranium, radiometric surveys can be used as an aid to mapping; for example granites with their high potassium content often show anomolous highs. It is very unlikely that there is any measurable difference in gamma-ray activity between the quartz veins and the host rocks at Mathinna and even if there was, this would not be detectable over a vein buried more than say a metre under the surface. To be consistent with previous recommendations, a survey could be recommended on the grounds of cost (similar to a magnetometer survey), however the physical reasons (i.e. attenuation of γ rays) are more stringent here.

CONCLUSIONS AND RECOMMENDATIONS

The testing of several specimens, both quartz vein and host rock, for various physical properties has suggested that no geophysical method (measuring the properties tested) will detect gold reefs at Mathinna. The IP method appears to be the most promising, however the possibility of IP effects from black shales in the host rocks significantly reduces its promise. It is recommended that several test surveys be conducted over old workings where the geology is well known (?). The tests should include the South Golden Gate mine to test for a black shale response in-situ. Usually a black shale that gives an IP effect is sufficiently conductive to show up as a resistivity low (this would be a possible criterion for distinguishing black shale responses from target responses) however Table 1 shows the SGG sample to be quite resistive.

The cost of an IP survey would be about \$350 - \$400 per day for a 3 man crew and all equipment, but it does not include board or vehicles (at cost plus 12-15%). Alternatively one operator plus equipment can be hired at about \$250 per day, again plus all costs. For test surveys, equipment only could be hired.

Magnetometer, SP and VLF instruments all cost about \$20 per day. The SP method requires 2 men to operate it, but magnetometer and VLF surveys may be carried out by one person. These three methods are not considered as promising as the IP method and are suggested as complementary surveys.

J R Bishop

J.R. Bishop
July 6, 1981

REFERENCES

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NOLDART, A.J. and THREADER, V.M., 1965. Gold Deposits of Tasmania, in Geology of Australia Ore Deposits, ed. J. McAndrew. (8th C'wealth Min. Met. Cong.).

SEIGEL, H.O., 1967. The Induced Polarisation Method, in Mining and Groundwater Geophysics, ed: L.W. Morley. (Geol. Survey Canada, econ. geol. rep. no. 26).

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TABLE 1: PETROPHYSICAL VALUES

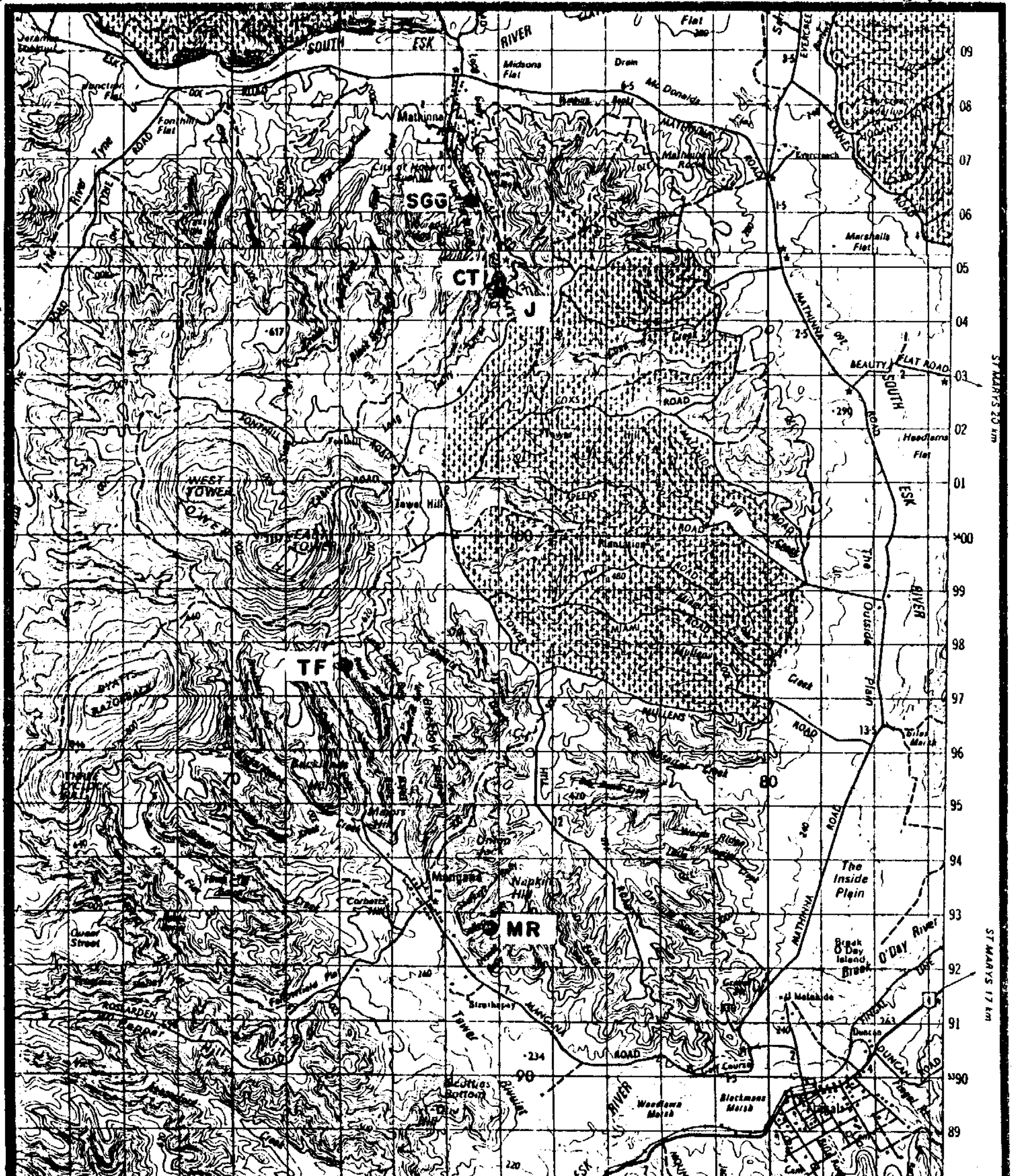
South Golden Gate:	Location (AMG)	- 574,500mE, 5,406,200mN
City P.A. Tunnel:		- 575,000mE, 5,404,800mN
Jubilee:		- 575,100mE, 5,404,500mN
Tower Freehold:		- 572,100mE, 5,397,600mN
Mangana Reef:		- 574,700mE, 5,392,800mN

Sample	Description	Dry Bulk Density (gm/c.c.)	Effective Porosity (%)	Wet Bulk Density (gm/c.c.)	Magnetic Susceptibility (cgs unit x 10^{-6})	Resistivity at 120 Hz RW = .5Ωm at 16°C (ohm-m)	IP Frequency effect
SGG1	Black shale	2.73	0.9	2.74	50	3,120	8
CT1	Quartz vein with sulphides (originally one sample)	2.64	0.6	2.65	20	5,684	-
CT2		2.62	0.1	2.62	20	83,033	-
CT3	Quartz-rich host rock	2.61	1.4	2.62	30	1,356	-
J1	Quartz vein with sulphides	2.58	1.35	2.59	20	38,951	-
J2	Black shale	2.78	1.0	2.79	50	1,248	-
TF1	Metasediment host rock	2.44	5.0	2.49	10	521	-
TF2	Quartz vein with sulphides	2.63	0.4	2.67	20	61,025	20
MR1	Black shale	2.77	0.4	2.77	30	2,920	-

\- INDICATES NO MEASURABLE EFFECT

066

860067



MITRE GEOPHYSICS PTY. LTD.

TASMINEX N.L. E.L. 17/78
MATHINNA GOLDFIELD

PETROPHYSICAL SAMPLE LOCATIONS

5 cm

067

APPENDIX 2

0685 MJ588 | Appendix |

DEPARTMENT OF MINES—TASMANIA

860069

TELEPHONES:
Metallurgical Research Laboratory, Mines Inspection, Explosives & Inflammable Liquids .. 44 2431-2 (2 lines)

LAUNCESTON OFFICES
287 WELLINGTON STREET
SOUTH LAUNCESTON 7250

26th Jun'81

Tasminex N.L.,
P.O. Box 123,
St. Marys,
TASMANIA

Attent. Adrian Daly.

Reg. No 812921-962

Dear Sir,

Please find below results of samples submitted to this laboratory on the 15th Jun'81 and stated to be from E.L. 17/18 Mathinna.

Reg. No		Description			Au g/tonne
812921	A.	V2	1a	Argyle Mine, Mangana.	4.4
922			2a		<0.3
923			2c		1.5
924	Ge.	V2	2a	Golden Entrance, Mangana.	0.8
925			2b		0.6
812926		V2	4c		<0.3
927		V1	2a		0.9
928			1a		0.9
929	MR	VA	2b	Mangana Reefs mine	<0.3
930			3f		0.8
812931	UJ	V	1c	Union Jack mine, Mangana.	<0.3
932	TF	VA	2b	Tower Freehold Mine, Mangana.	<0.3
933			4a		<0.3
934		VB	5d		<0.3
935		VE	1		<0.3
812936		VE	2d		<0.3
937	C	V	1a	Caledonian adit, Mathinna.	0.5
938		V	2		<0.3
939	J	V	2a	Jubilee Mine, Mathinna.	<0.3
940		V	3b		0.7
812941		V	3d		<0.3
942	Y	V	4a		<0.3
943	MD	V	1a	Miners Dream, Mathinna.	13
944		V	1b		33
945	SMD	V	1a	South Miners Dream, "	0.4
812946	H	V	2a	Horseshoe mine , "	0.9
947	E	V	4a	New Eldorado mine , "	<0.3
948	E		4d		<0.3
949	E		5a		4.7
950	E		5e		<0.3

069

860070

TA 4588

DEPARTMENT OF MINES—TASMANIA

LAUNCESTON OFFICES
287 WELLINGTON STREET
SOUTH LAUNCESTON 7250

TELEPHONES:
Metallurgical Research .. .. } 44 2431-2
Laboratory .. .. .. } (2 lines)
Mines Inspection .. .. ..
Explosives & Inflammable Liquids

1st July 1981

Tasminex N.L.,
P.O. Box 123,
St. Marys,
Tasmania

Attent. Adrian Daly.

Reg. No 813004-18

Dear Sir,

Please find below results of samples submitted to this laboratory on the 16th Jun'81.

Reg. No	Description		Au g/tonne
813004	A - V 1	Rock Samples	133
005	A - V 2		11
006	A - V 3		14
007	A - V 4		7.6
008	A - V 5	Argyle Mine, Mangana	75
813009	A - V 6	~5kg resampling	12
010	A - V 7	samples.	76
011	A - V 8		13
012	A - V 9		20
013	A - V 10		18
813014	TW - B	Tailing Sand.	6.4
015	TW - Ca		41
016	TW - Cb	Twilight mine, Tower Hill	1.4
017	TW - D	(~5kg samples)	19
018	TW - E		8.0

Yours faithfully,

(H. K. Wellington)
Chief Chemist & Metallurgist.

Analyses by J. R. Lettborg

Fee $75.00

Reg. No				Description		Au g/tonne
812951	GH	V	1	Uncrushed Vein	Golden Hinges adit, Mathinna.	<0.3
952	GH		3	" "		<0.3
953	GH		5	" "		<0.3
954	GH	V	2	Large Vein		<0.3
955	GH		4	" "		0.3
812956	CH		1	Tailing Sand sample (<5 kg)		0.5
957	CH		2	" " "	City of Hobart, Mathinna. (~5kg samples)	<0.3
958	CH		3	" " "		0.4
959	CH		4	" " "		<0.3
960	CH		5	" " "		<0.3
812961	CH		6	" " "		<0.3
962	CH		7	" " "		<0.3

Yours faithfully,

(H. K. Wellington)
Chief Chemist & Metallurgist.

Analyses by J. L. Tellborg

Fee $210.00

071 — M 1588

860072

DEPARTMENT OF MINES—TASMANIA

TELEPHONES:
Metallurgical Research, Laboratory, Mines Inspection, Explosives & Inflammable Liquids: 44 2431-2 (2 lines)

LAUNCESTON OFFICES
287 WELLINGTON STREET
SOUTH LAUNCESTON 7250

26th Aug'81

Tasminex N.L.,
P.O. Box 123,
St. Marys
TASMANIA

Attent. Mr. Daly

Reg. Nos 813959-967

Dear Sir,

Please find below results of samples submitted to this laboratory on the 17th Aug'81.

Reg. Nos		Descriptions		g/t Au
813959	1	M.D. - V1	Vein samples — Miners Dream mine, Mathinna. ~5kg resampling samples.	2.0
960	2	M.D. - V2		2.8
961	3	M.D. - V3		8.8
962	4	M.D. - V4		<0.3
963	5	C.H. - 1a	Tailings sand — City of Hobart, Resampling. (~5kg samples)	0.65
964	6	C.H. - 1b		0.63
965	7	C.H. - 2a		1.2
966	8	C.H. - 2b		0.85
967	9	C.H. - 3a		0.88

Yours faithfully,

(H. K. Wellington)
Chief Chemist & Metallurgist.

Analyses by. J.R. [signature]

Fee $45.00

072

860073

DEPARTMENT OF MINES, TASMANIA

Laboratory, 287 Wellington Street
Launceston, Tas. 7250

2nd June 1981

CERTIFICATE OF ANALYSIS

To Tasminex
P.O. Box 815 Burnie

The sample of Specimens Tailings Sand *received from* you *on the* 10th Apr'81 *and stated to be from* Volunteer & City of Melbourne *has/have been examined, with the following results:—*

Registered Number	Description		Au g/tonne
811894	Volunteer	V - A	1.2
811895	"	V - B	0.5
811896	"	V - C	0.5
811897	"	V - D	0.5
811898	City of Melbourne	CM - TA	4.5
811899	"	CM - TB	0.8
811900	"	CM - TC	0.9

Analyses by. J. L. Kettering

Fee $35.00

Chief Chemist and Metallurgist

073

Received 16.2.81

860074

DEPARTMENT OF MINES, TASMANIA

Laboratory, 287 Wellington Street
Launceston, Tas. 7250

12th February 1981

CERTIFICATE OF ANALYSIS

To Tasminex N.L.
P.O. Box 815. Burnie 7320

The sample of Tailings received from you on the 6th Feb'81 and stated to be from Mathinna ~~has~~ have been examined, with the following results:—

	Registered Number	Description	g/tonne Au
?.2.81	810719	TM - A	1.4
	810720	TM - B Mangana Reefs, Mine Tailings sand (~ 5kg samples)	0.5
	810721	TM - C	0.8
	810722	TM - D	0.6

Analyses by. G.R. ...

Fee $20.00

21302

Chief Chemist and Metallurgist

Copy to: A.Daly

CONTENTS (continued)

LIST OF PLANS ACCOMPANYING REPORT

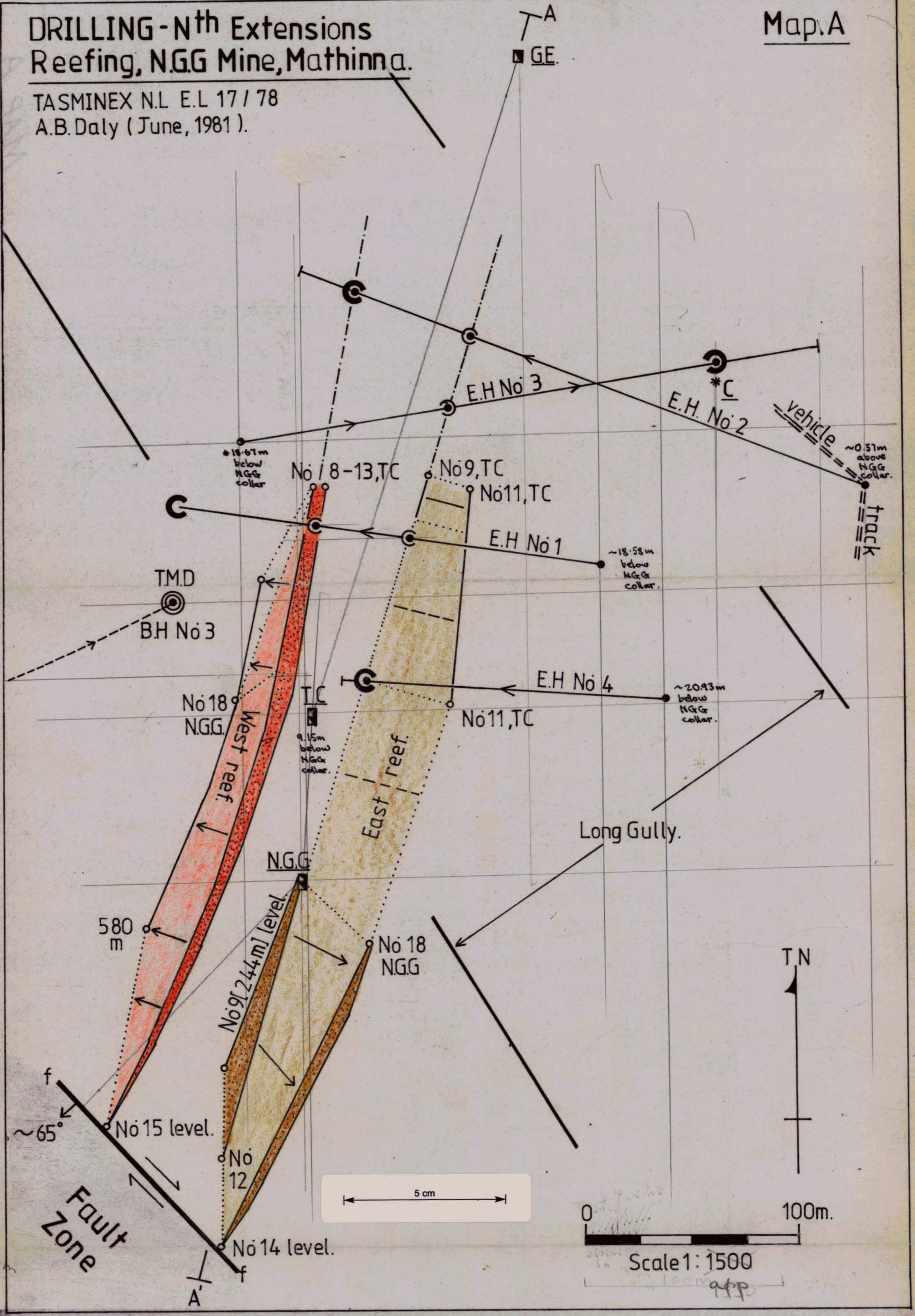
Note: All the above plans are contained in a separate folder accompanying this Report.

860076 81-1622 3016

DRILLING - Nth Extensions Reefing, N.G.G Mine, Mathinna.

TASMINEX N.L E.L 17/78
A.B. Daly (June, 1981).

Map. A



KEY

GE Gate Extended main shaft.
T.C Tasmanian Consols main shaft.
N.G.G New Golden Gate main shaft.
C. Caledonian adit.

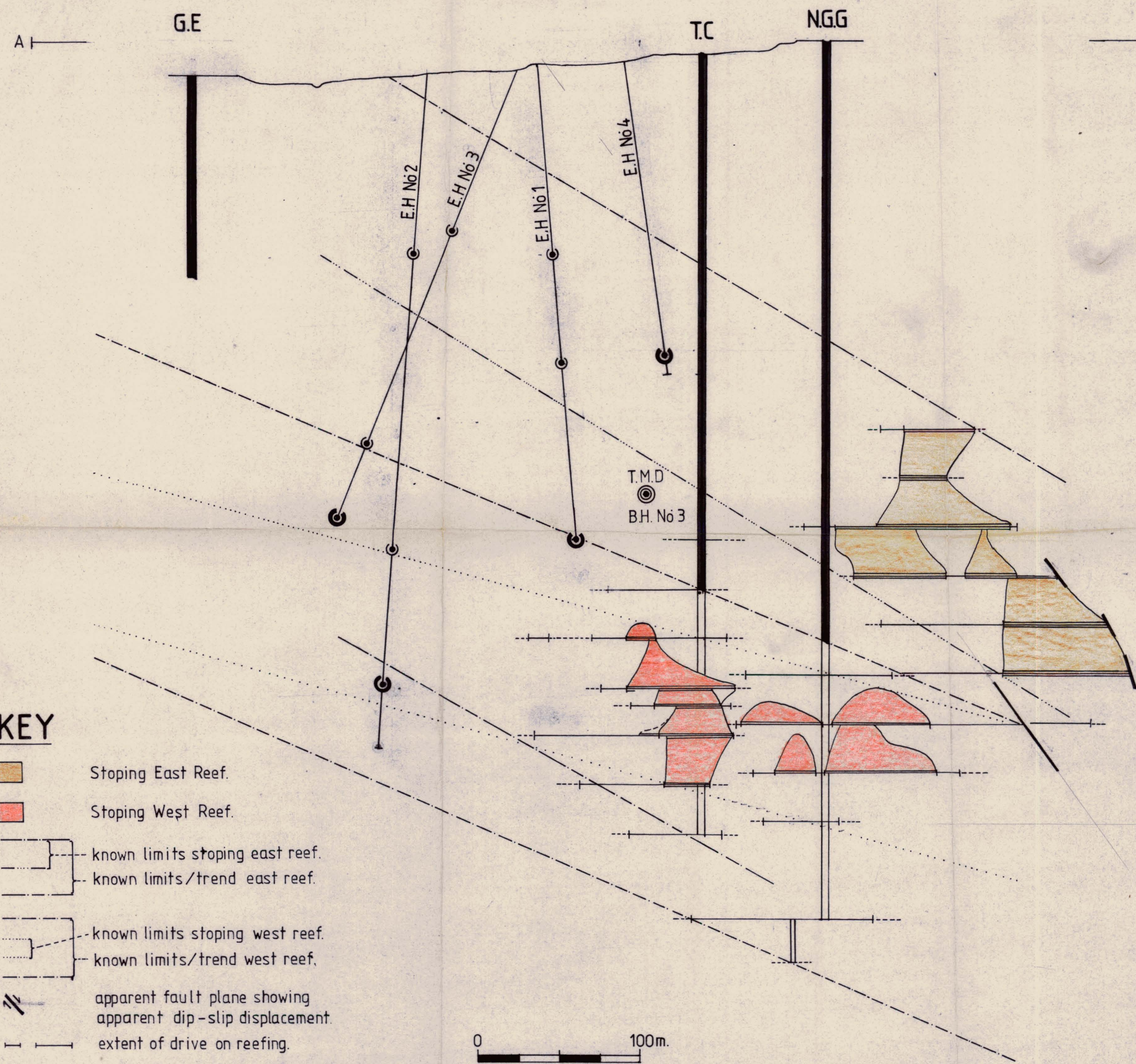
Reef. Dip~90°.
Reef. Inclined Dip. Direction of dip is indicated.
Projected trend of reefing.
f Fault plane (Level 15 NGG)
A—A' Line of cross-section.

EXPLORATION HOLES.

	Direction	Plunge	Depth Penetration.
E.H No 1	N81½W	52°W	+292m.
E.H No 2	N68W	56°W	+416m.
E.H No 3	N81E	45°E	+277m.
E.H No 4	N85½W	52°W	+191m.

Drill site.
Expected point of intersection.
Final point of expected intersection.
T. Mines Dept., B.H. No 3 (1966). Final depth penetrated is located 53.8m West of the West Reef at 283m depth (b NGG collar).

Map. B Cross-section - Drill holes - Reefs/stoping N.G.G Mine, Mathinna.



KEY

- Stoping East Reef.
- Stoping West Reef.
- known limits stoping east reef.
- known limits/trend east reef.
- known limits stoping west reef.
- known limits/trend west reef.
- apparent fault plane showing apparent dip-slip displacement.
- extent of drive on reefing.
- A——A' line of cross-section. N16°E (true).

0 100m.

Scale 1:1500

5 cm

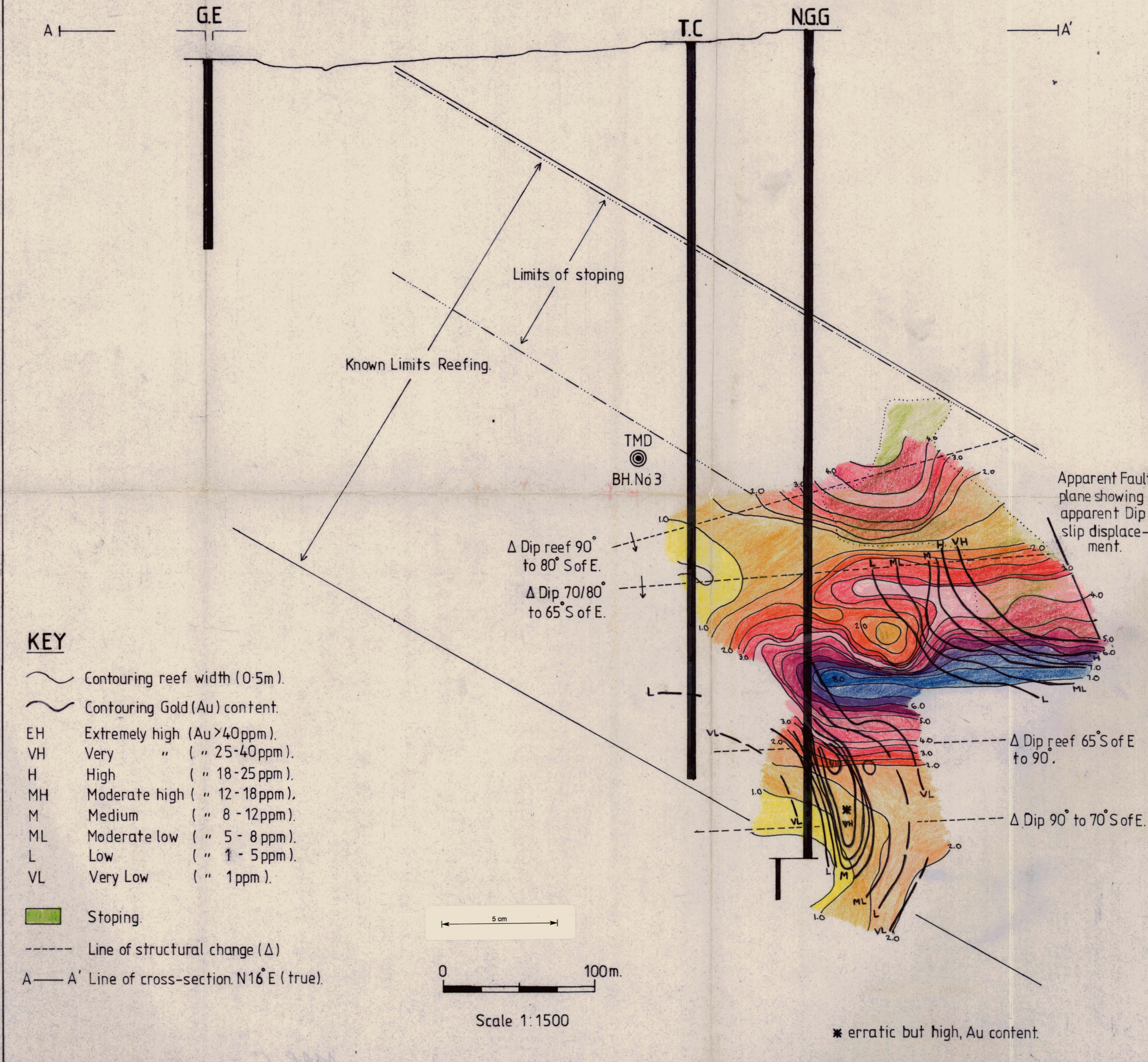
Tasminex N.L E.L 17/78

A.B.Daly (June, 1981).

81-1642

860078 3018

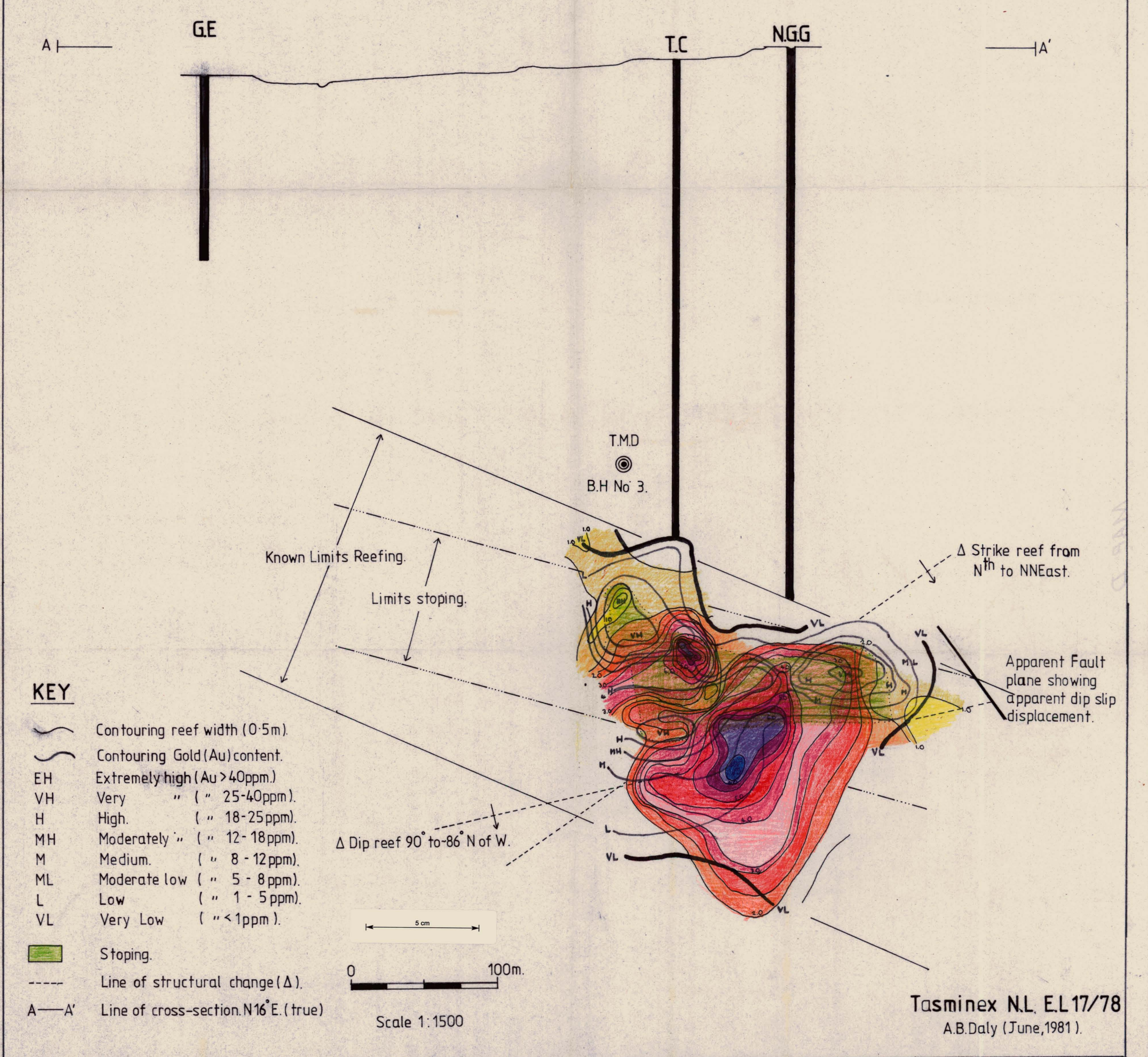
Map C. Cross-section - Contouring width, Au content East Reef, NGG Mine, Mathinna.



81- 1642

860079 3019

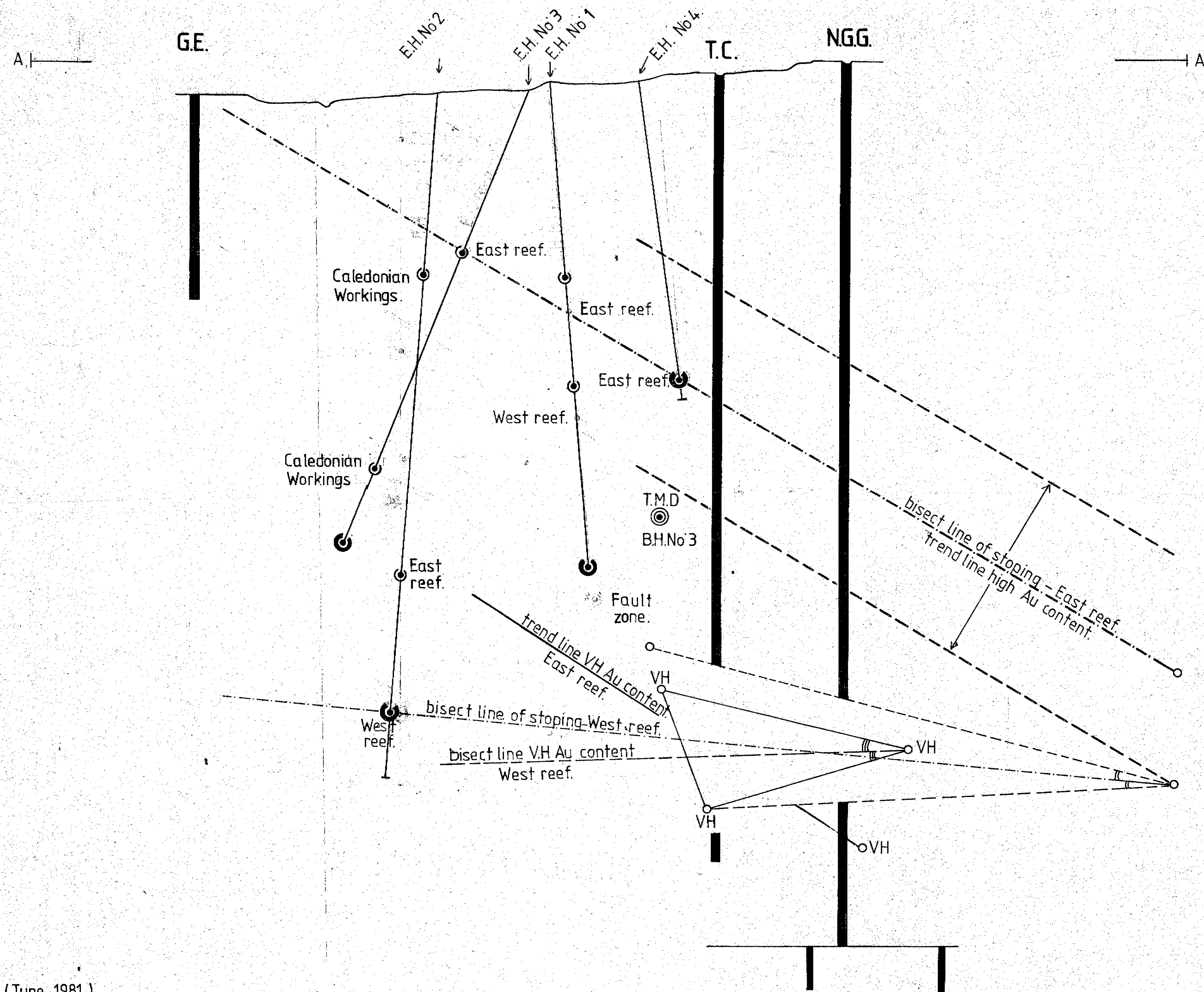
Map. D Cross-section-Contouring Reef width, Au content West Reef. NGG Mine, Mathinna.



81-1642

81-1642 860050 3020

Map E Cross-section: Drill Holes - Lineations stoping / gold content - N.G.G Mine, Mathinna. Tasminex NL EL 17/78



KEY

N.G.G	New Golden Gate main shaft collar.
T.C	Tasmanian consols " " "
G.E	Gate Extended " " "
V.H.	Very High Au content. [25 - 40ppm].
A—A'	Line of cross-section. N 16° E. [true].

DRILL HOLES.

E.H No 1	Direction	N81½°W.	Plunge	52°W.
E.H. No 2	"	N 68° W.	"	56°W.
E.H. No 3	"	N81° E.	"	45°E.
E.H. No 4	"	N85½°W.	"	52°W.

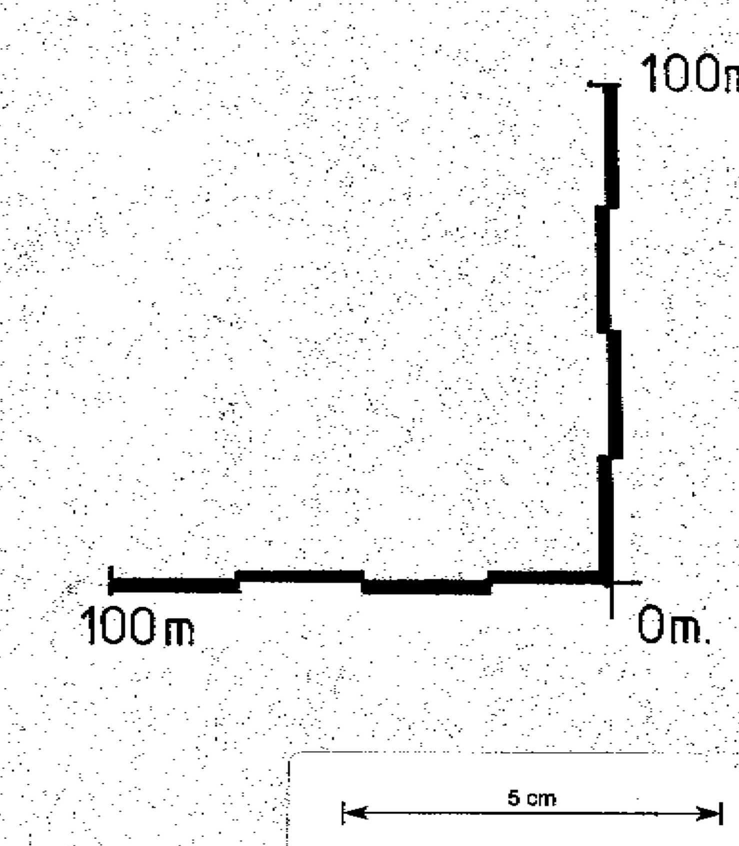
Exploration hole.

Expected point of intersection.

Final point of expected intersection.

Final depth of penetration.

T.Mines Dept., B.H. No 3. (1966). final depth penetrated, located 53·8m west of West Reef.



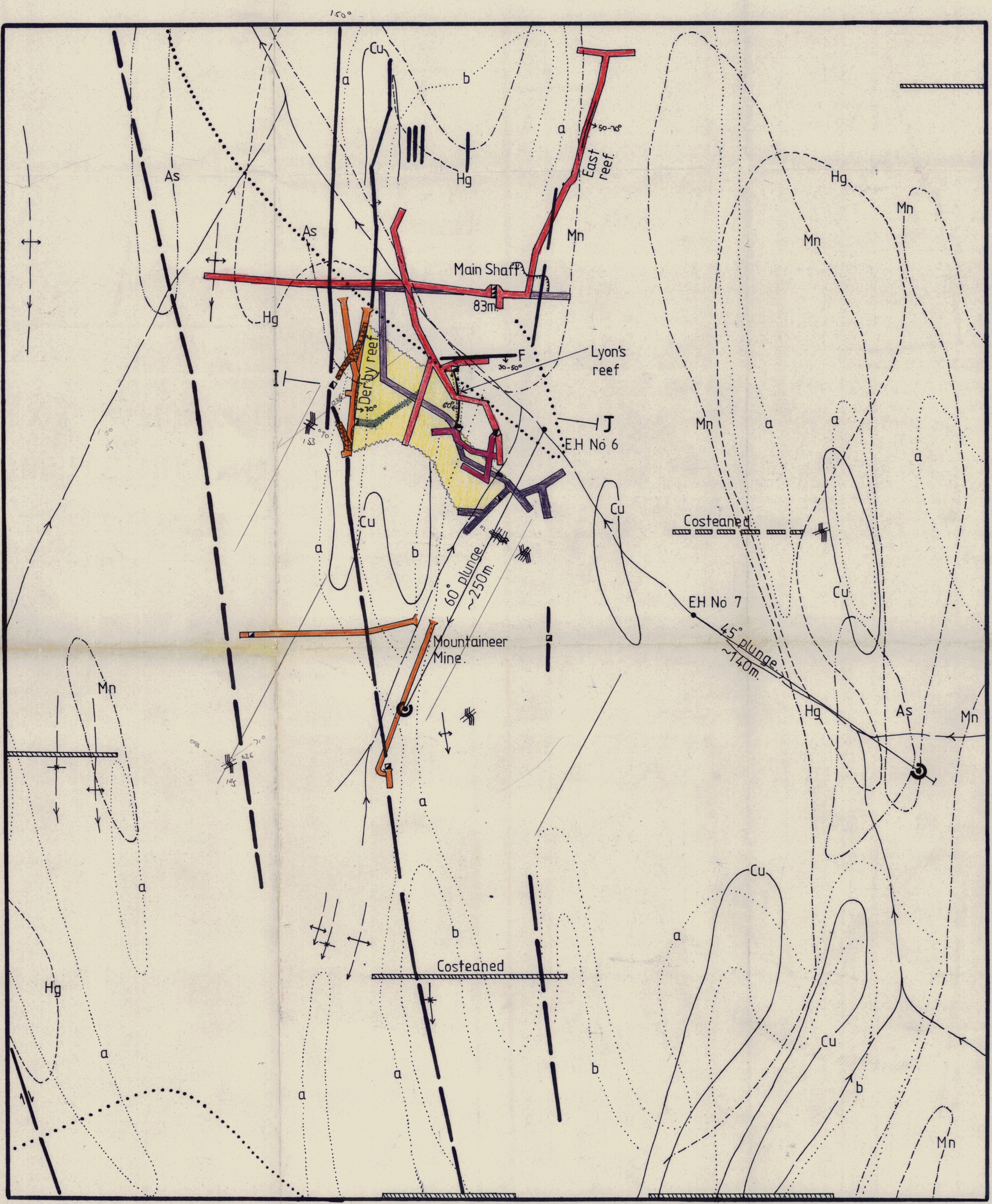
Scale : 1 : 1500

A.B.Daly (June, 1981).

Map. 1

JUBILEE MINE, MATHINNA. TASMINEX N.L WITHIN E.L 17/78

EXPLORATION DRILLING.



LEGEND

General

- Vehicle track.
- Stream.
- Open cut.

Geology

- Fault trace.
- Trace quartz reef.
- Kink/chevron fold.
- Anticlinal fold axis.
- Synclinal fold axis.

Mine Workings

- Shaft; winze.
- Adit level/surface stoped.
- Winze.
- No 1 Level [48m].
- Intermediate Level.
- No 2 Level [79m]

Geophoto, 1973.

- Induced Polarisation survey anomaly.

Cu	Copper contoured at	43·9	ppm.
As	Arsenic	" 48	ppm.
Mn	Manganese	" 285	ppm.
Hg	Mercury	" 45	ppb.
a	(As/Cu)100	" 75	
b	(As/Cu)100	" 50	

Geochemical Deep soil survey anomalies.

✱ Main Shaft is located M.R 750°4046.

Exploration Drilling

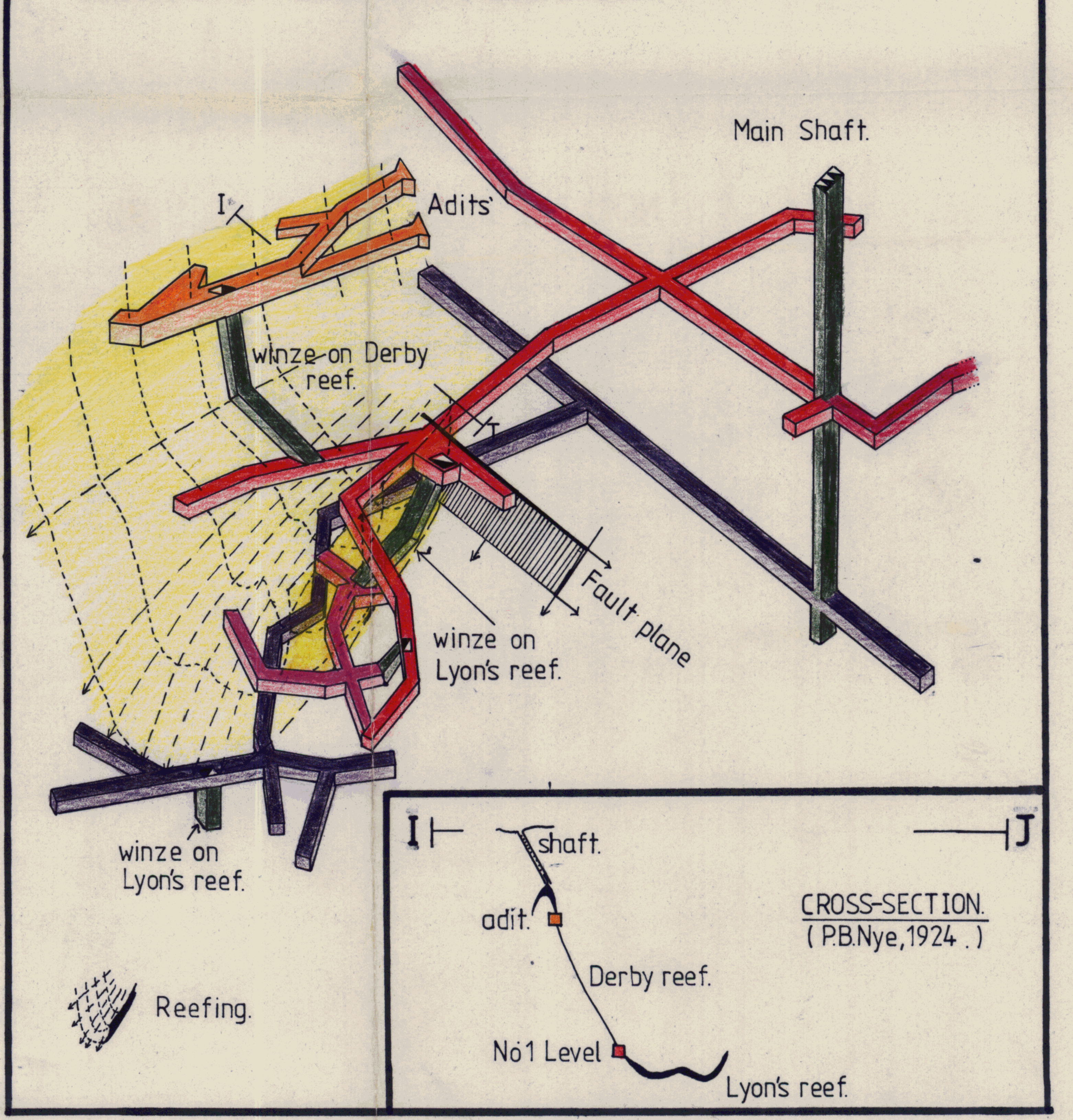
- E.H Drill site.
- Point of drill hole penetration.

0 — 60m

Scale 1:750

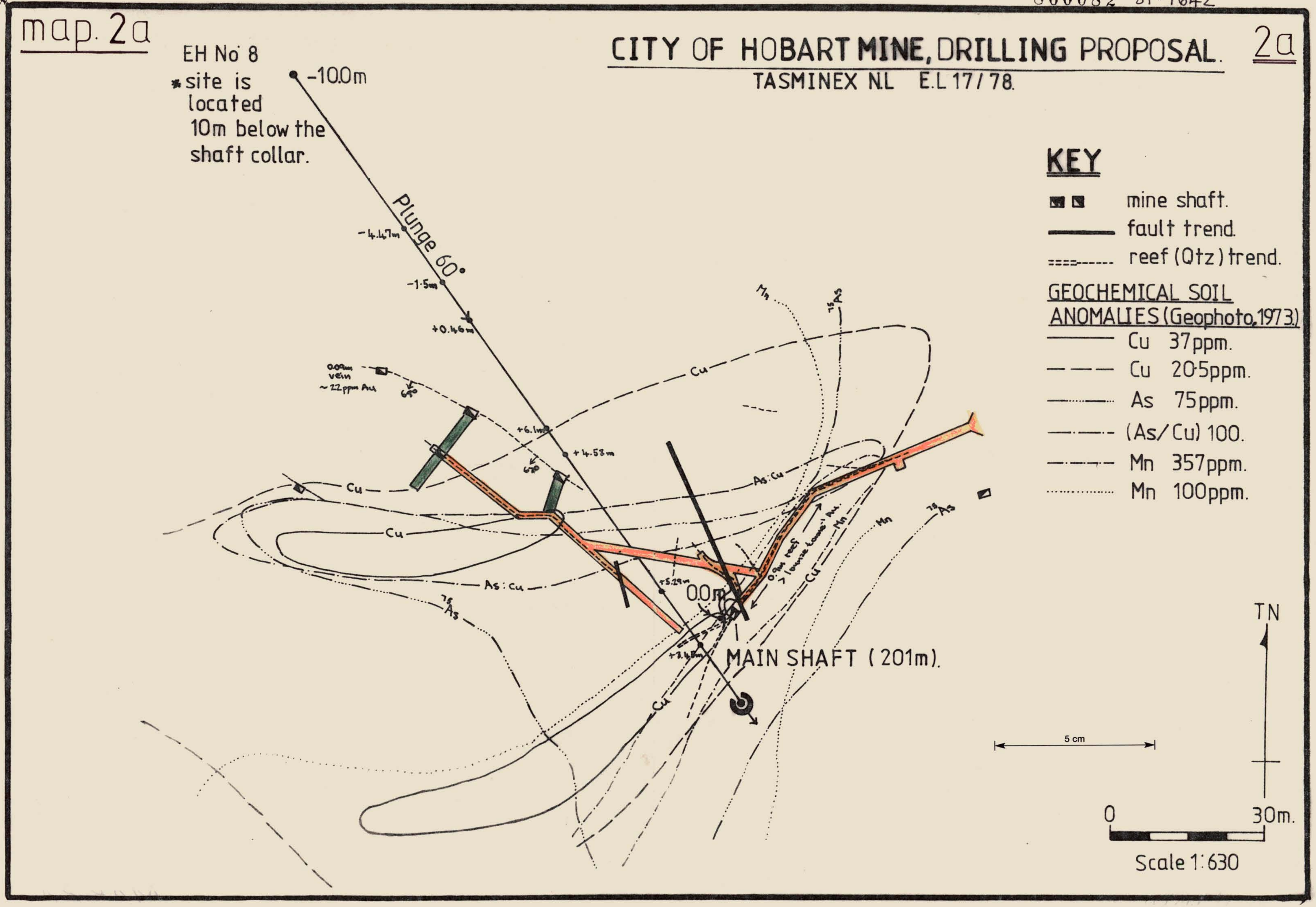
TN

ISOMETRIC SKETCH PROJECTION.

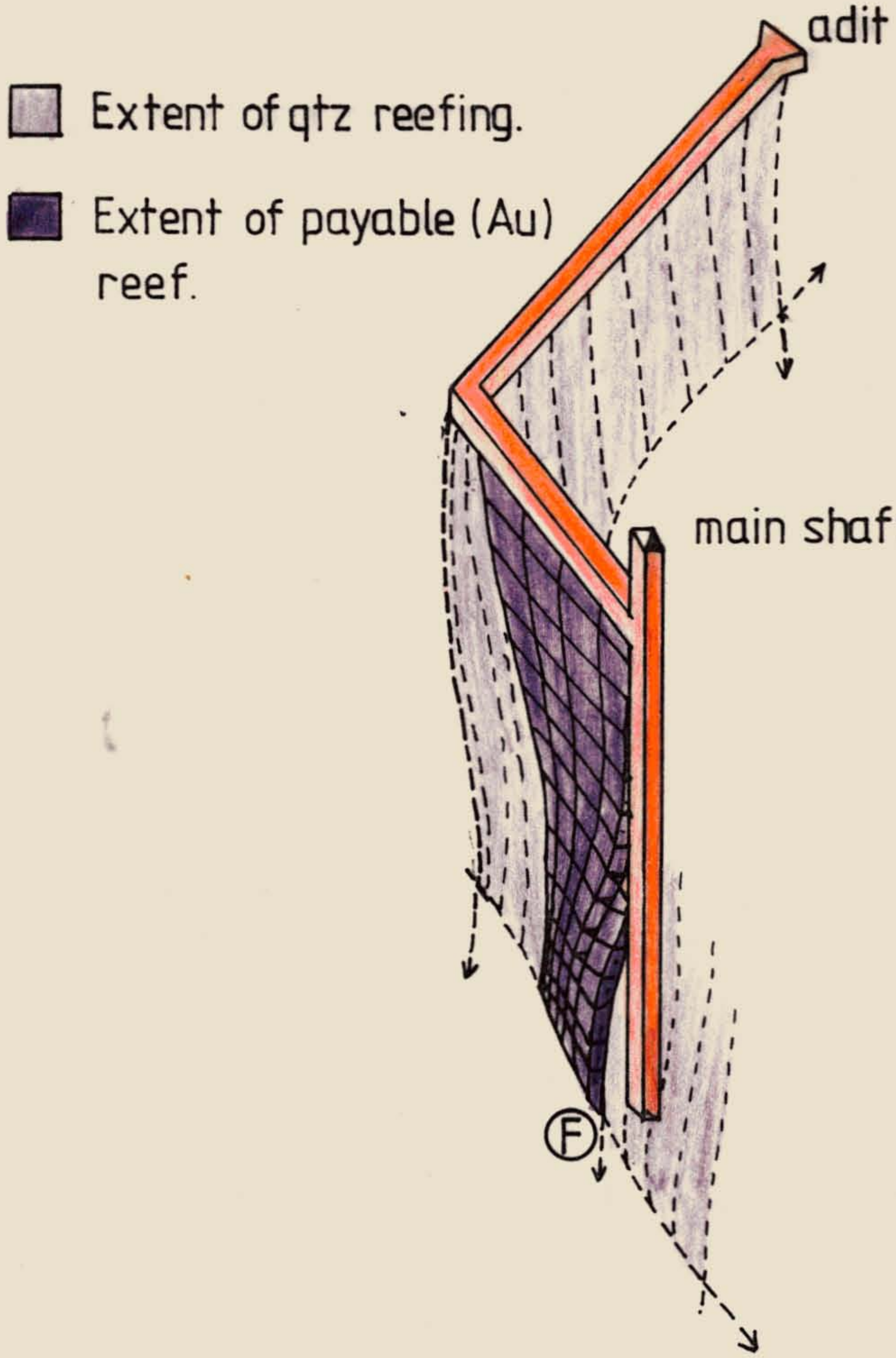


A.B.Daly August, 1981.

860082 81-1642



HYPOTHETICAL MODEL, CITY HOBART MINE. 2b



Ⓕ Fault "........which threw the reef over 8 feet to the west, and .also carried the shoot of gold away to the north at an angle of 45 degrees." [P.Irvine, mine manager, 1898.]

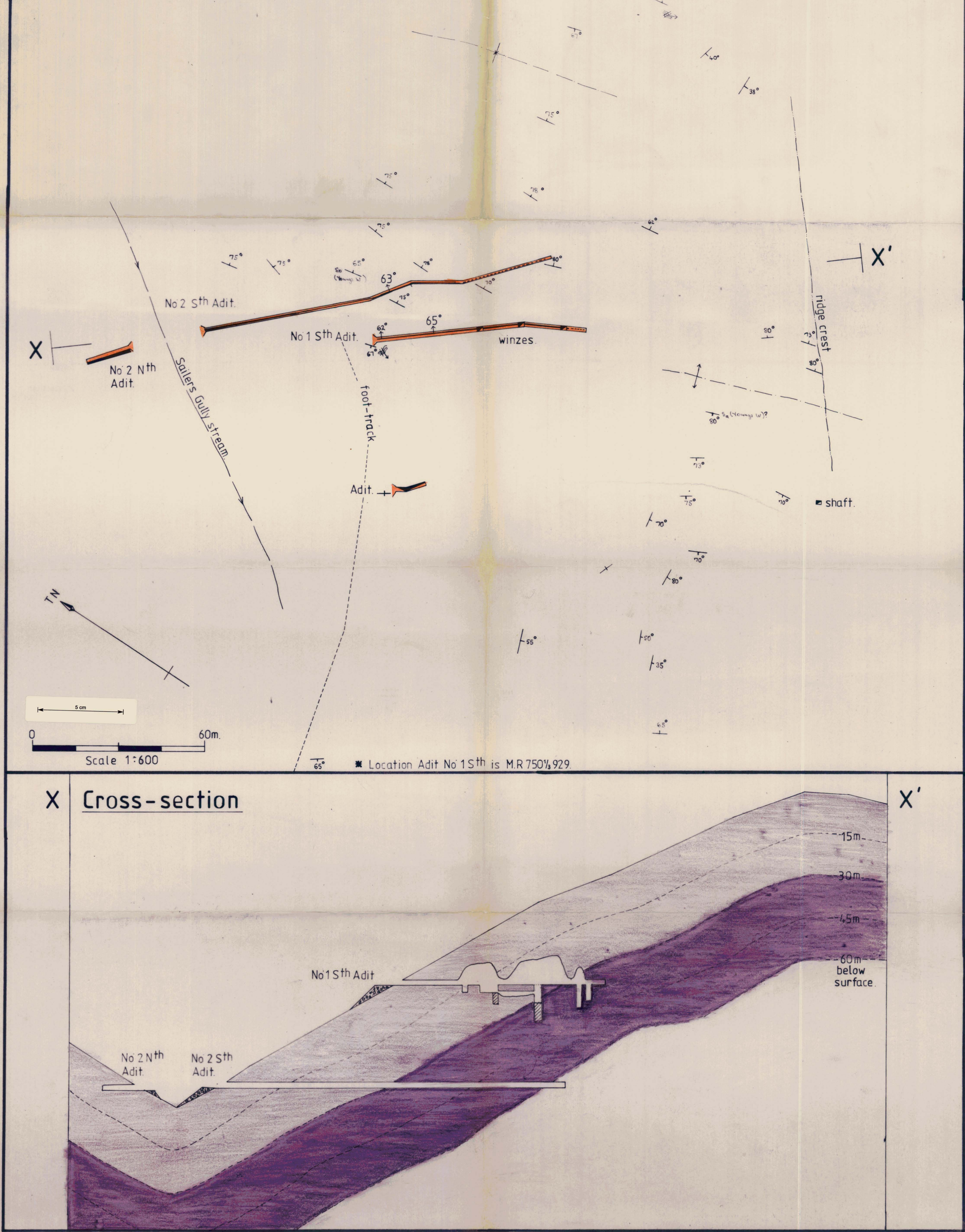
81-1642

860084 3022

ARGYLE MINE WORKINGS, MANGANA.

TASMINEX N.L E.L 17/78

Map. 3

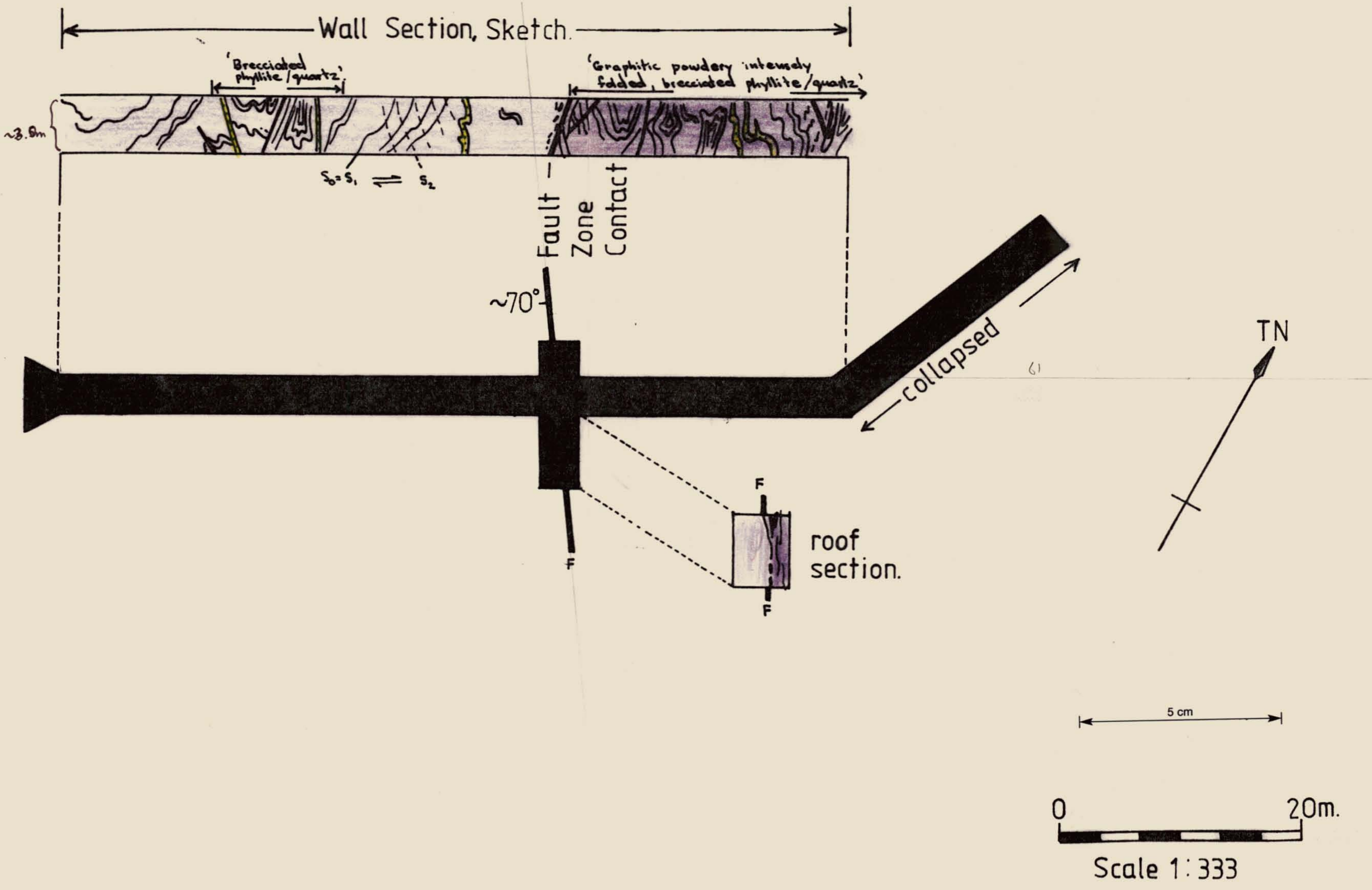


A.B.Daly, August 1981. (compiled from Blake, 1939.)

Map. 4

GOLDEN HINGES MINE ADIT, MATHINNA. 4

TASMINEX N.L E.L 17/78.



TOPOGRAPHIC SURVEY MAP, TAILINGS DUMP, LONG GULLY, MATHINNA. & EXPLORATION DRILL SITES

TASMINEX N.L WITHIN E.L 17/78.
M.L

MAP. 5a


3025
CROSS-SECTIONS, TAILINGS DUMP, LONG GULLY, MATHINNA. TASMINEX N.L
M.L within E.L 17/78.
MAP.5b
LEGEND
Sand (includes slime).
Residue (cyanided sand).
Gold content, gms' long tonne⁻¹ [Hughes, 48].
Topography [Hughes, 1948]
Topography [1981].
NOTE: Origional surface topography is based on bore hole data. [Hughes, 1948.]
A A'
4 m
B B'
1·15 1·68 1·07 1·23 1·15 1·07 2·68
5 m
C C'
1·23 1·53 1·45 1·68 1·53 1·37
5·2 3·37 slime
6 m
D D'
2·68 2·07 3·30 1·37 1·23 1·37 1·92 1·30 0·92 2·22 0·92 1·15 1·23 1·00
1·76 2·61 3·29 2·68 3·75 slime
slime
7 m
E E'
1·99 2·30 1·23 2·45 1·61 1·15 1·69 1·30 1·15 1·45 N.S
0·38 2·53 slime
17 m
F F'
1·61 2·22 1·53 2·76 1·53 1·53
20 m
G G'
0·92 1·00 2·00 1·92 0·92 1·07 1·23 1·23
27 m
H H'
1·23 2·30 1·38 1·76 1·38 1·53 1·68 1·61 1·84
1·61 slime
27 m
I I'
0·92 1·23 1·15 1·15 1·53 1·76 1·92 1·92 1·61 2·30 1·45 1·61 1·53
28 m
J J'
1·15 1·15 1·15 1·30 1·61 1·23 2·14 1·30 1·23
2·00 slime
27 m
K K'
1·23 1·45 1·23 1·53 1·38 0·76
27 m
L L'
1·15 0·92 0·76
27 m
5 cm
0 90m.
Scale 1:600
A.B.Daly, 1981.
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