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ASARCO (AUSTRALIA) PTY. LTD.

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E.L. 4/73 STERLING VALLEY,

TASMANIA

PROGRESS REPORT TO JUNE 1974

OPEN FILE

R.G. BARKER

AMG REFERENCE POINTS ADDED

SUMMARY

Exploration licence 4/73 covers an area of 33 square km. centred about 6 km. south of the township of Tullah on the west coast of Tasmania. The licence covers the Sterling Valley, and extends to the east across the Murchison River to Victoria Peak. The Sterling Valley has previously been explored by three mining companies who carried out E-M, magnetometer, gravity and soil sampling surveys, and diamond drilling. The southern end of an E-M conductor defined by a survey for Rio Tinto Australian Exploration was intersected by two diamond drill holes put down by Electrolytic Zinc Co. Neither hole intersected ore grade base metal mineralisation, but 1.8 km of the conductor to the north remained untested.

In 1974 McPhar carried out an SS15 E-M survey for Asarco that confirmed the existence of an E-M conductor extending to the north of the E.Z. drill holes, but 6 trenches exposing bedrock across the conductor failed to reveal copper, lead and zinc mineralisation approaching ore grade. However a 3 metre interval in the trench near line 404N gave an assay value of 0.65% Sn, and fine grained cassiterite was seen in thin sections of samples from this zone. Stream sediment sampling of the entire exploration licence defined 5 first priority and 3 second priority stream sediment sample anomalies on the floor and slopes of the Sterling Valley, including a tin anomaly along strike to the south of the trench giving the high tin value mentioned above. The E.Z. drill holes penetrate this area, but the core was not assayed for tin and the cassiterite occurring in the trench near line 404N is very fine grained and is not readily visible. Stream sediment sampling in the area to the east of the Sterling Valley defined two additional second priority anomalies.

Initial follow up of the stream sediment sample anomalies, the tin-rich zone and 5 unexplained anomalies from a soil survey carried out by P.M.I., will involve three or four months work for two geologists.

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1.

E.L. 4/73 STERLING VALLEY, TASMANIA

PROGRESS REPORT TO JUNE 1974

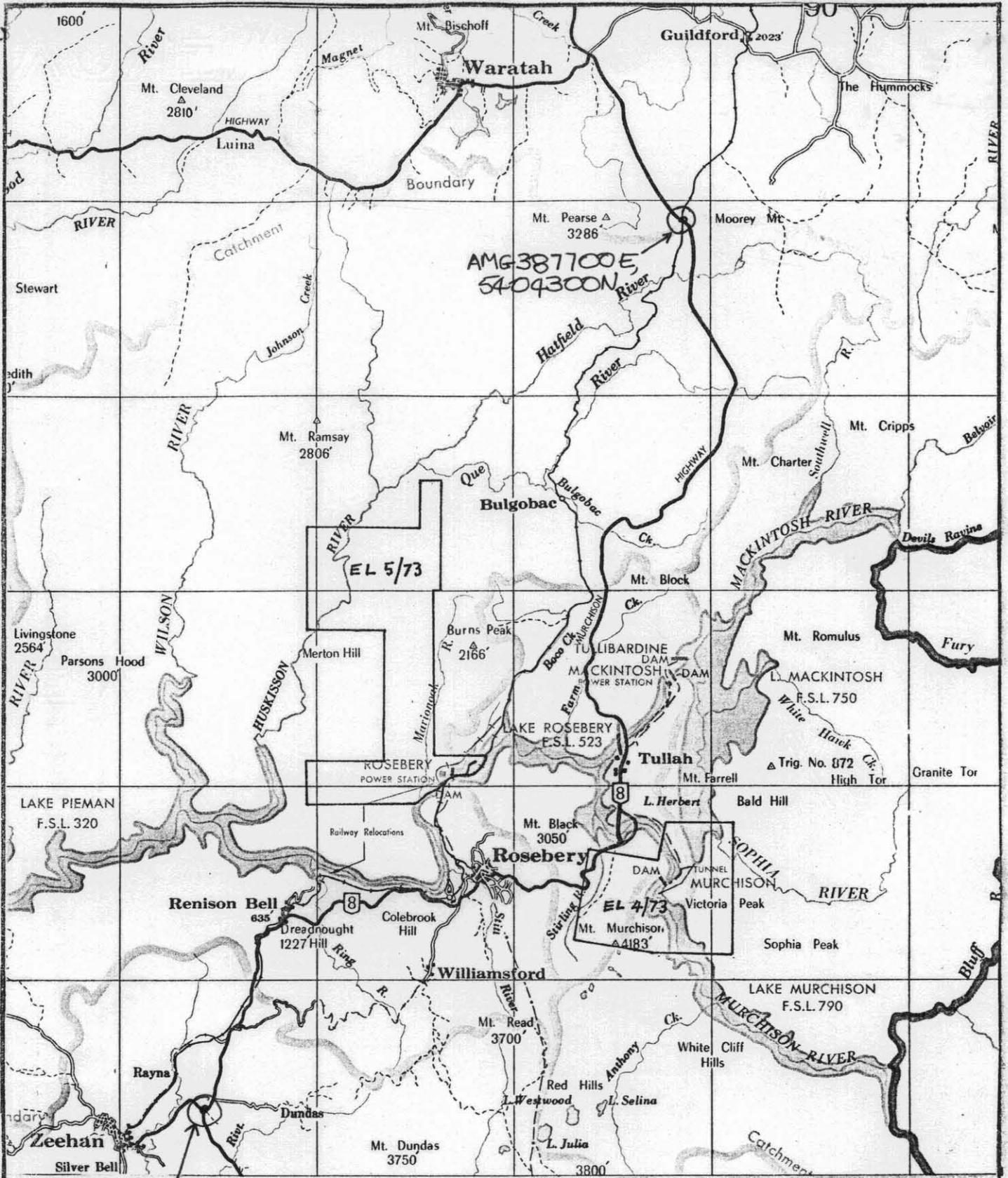
INTRODUCTION1. Location

Exploration Licence 4/73 was granted on March 6, 1973, and is renewed at six-monthly intervals. It covers an area of 33sq. km. on the west coast of Tasmania and is centred 6 km. south south-east of the township of Tullah (lat. $41^{\circ} 44'S$, long $145^{\circ} 37'E$). The licence area covers the Sterling Valley, the northern slopes of Mt. Murchison and extends east across the Murchison River to Victoria Peak. The Murchison Highway crosses the north western corner of the licence and a track to a Hydro - Electric Commission damsite on the Murchison River provides access to the eastern half of the area. The exploration licence is bounded to the north, west and south by other mineral tenements, and two claims (1M/55 and 2M/55) covering the Sterling Valley mine are excluded. These cover an area of 3200 square metres and are held by Electrolytic Zinc Co.

2. Topography

The Sterling River flows along the western side of a steep sided valley with a flat bottom that narrows and steepens to the south towards Mt. Murchison. The valley floor is about 1 km. wide in the north of the licence area near its junction with the Murchison River, and is at an altitude of 200 metres above sea level. To the east, a ridge reaching an altitude of 450 to 540 metres above sea level separates the Sterling Valley from the Murchison Valley. The slopes on either side of the Murchison River are steep and the valley is narrow. Further east again a small valley follows close to the contact between Cambrian and Precambrian rocks which form a prominent ridge rising to an altitude of 950 metres at

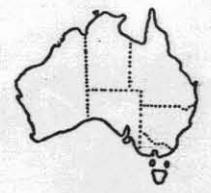
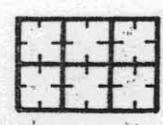
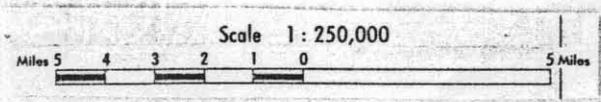
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AMG REFERENCE POINTS ADDED



ASARCO (AUSTRALIA) PTY. LTD.

LOCATION MAP EL 4/73 AND EL 5/73, TASMANIA
WITH PROPOSED H.E.C. PIEMAN POWER SCHEME

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2. Topography cont'd.

Victoria Peak on the eastern boundary of the exploration licence. Dense forest covers the licence area except for the floor of the Sterling Valley, (a swampy button grass flat) and the northern end of its eastern slope which is clear. Outcrop here is exposed over about 30% of the area and is almost continuous along the Murchison River. Elsewhere outcrop is sparse and exposed over less than 5% of the area. The effects of glaciation are visible on the top of Mt. Murchison and on the Cradle Mt. plateau, well to the east of the licence area. A large deposit of fluvioglacial gravel has accumulated at the junction of the Murchison and Mackintosh Rivers and extends up the Sterling Valley, obscuring bedrock over the western half of the valley floor. To the south on the slopes of Mt. Murchison bedrock is obscured by thick sandstone and conglomerate talus (with blocks up to 20 metres across) that is the result of physical weathering during the last glaciation.

The west coast of Tasmania has a wet temperate climate and the average rainfall for the licence area is about 2000mm. (80 inches) per year.

3. Map and Airphoto Coverage

The licence area is covered by the Queenstown 1:250,000 and Sophia 1:100,000 topographic maps. No published maps at a larger scale are available. Published geological maps are not available except for the 1:500,000 geological map of the whole state. However a number of unpublished geological maps cover the area and these are listed in the literature review (Appendix 2).

Lands Department airphotos at a scale of about 1:36,000 were flown in 1971, and in 1973 Australian Aerial Mapping flew this area for Cominco producing airphotos at about the same scale. Three-fold enlargements of the Cominco airphotos were used as a base for mapping and sampling in the eastern part of the licence area.

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4. Sterling Valley Grid

A grid for geophysical surveys, mapping and sampling covers the western third of the licence area. It consists of 52km. of cut lines 120 metres apart, marked at 30 metre intervals. The datum peg has been given the grid co-ordinate 5000m. E, 5000m. N. and is situated at the northern end of the baseline beside the Murchison Highway. The baseline follows a high tension powerline from the datum as far south as line 2480 N. where the power line diverges to the southwest. The baseline continues to the south and terminates at the mining claims held by E.Z. The baseline resumes south of the claims but is displaced to the west because of a surveying error by the line cutters. The grid marking is not affected by this error.

The grid is marked out at 30m. intervals using 10m. co-ordinates, and grid references in the report and on the plans are quoted to the nearest 10 metres. Slope corrections have been made during marking out to avoid distortion of the grid. Slopes exceed 40° along the eastern side of the valley and lines 356N, 404N and 416N have not been marked out continuously because of near-vertical cliffs. The grid is shown on plan 1156.

MINERALISATION

The fine grained acid volcanic and sedimentary rocks of the Sterling Valley (known as the Farrell Slate) are host rocks to the lead mineralisation of the Mt. Farrell mine at Tullah to the north of the Sterling Valley.

The mineralisation consists of pyrite and galena with minor sphalerite and chalcopyrite in quartz and carbonate gangue occurring in fissure veins within black slate. This deposit is at present being worked by the E.Z. Co. The Farrell slate also encloses the copper, lead and zinc mineralisation of the abandoned Sterling Valley mine near the southern boundary of the exploration licence. Here galena, sphalerite, arsenopyrite, chalcopyrite and pyrite occur with quartz and calcite in fracture zones within black

Mineralisation cont'd

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slate close to its contact with tuffaceous acid volcanic rocks. At Rosebery 6 km. to the west of the Sterling Valley a high grade base metal deposit is at present being worked by the E.Z. Co., and has been worked continuously for the last 30 years. The ore is fine grained and consists of about 75% sulfide minerals with 37% pyrite, 31% sphalerite, 7% galena and 2% chalcopyrite with minor amounts of other base metal sulfides and gold in quartz, carbonate, barite and chlorite gangue. The mineralisation occurs in fine grained tuffs (sericite schist) enclosed by coarser grained massive pyroclastic rocks. Narrow lenses of black slate occur above the mineralised horizon.

A smaller deposit (the Hercules mine) occurs 8 km. to the south. The setting and ore type of this mine are similar to that of the Rosebery deposit and both are regarded as stratiform. Current reserves at Rosebery are about 9 million tons of ore with 20% Zn, 6% Pb, 1% Cu, 6 oz/ton Ag and 2 dwt/ton Au. The stratigraphic position of the Rosebery deposit is disputed. (See appendix 2 - literature review). One view is that the Farrell Slate correlates with the shale and tuff associated with the Rosebery deposit.

In May 1974 Cominco Exploration announced a drill intersection of 11.4m. of 2.6% Cu, 5.1% Pb, 7.4% Zn, 2.6 oz. Ag and 1.5 dwt Au in fine grained rhyolitic tuff that they correlate with the Farrell Slate. This prospect is located 25 km. north northwest of E.L. 4/73.

A number of small workings are located on low hills on the floor of the Sterling Valley, and along its eastern slope. Sketch maps and notes on these are included as appendix 2 and they are plotted on plan 1157. In each case the mineralisation is associated with northwest striking shears and quartz veins.

PREVIOUS WORK1. Rio Tinto Australian Exploration Pty. Ltd.

In 1959 Rio Tinto carried out E-M, gravity, magnetic and S.P. surveys on the floor of the Sterling Valley on a grid roughly parallel with the Asarco grid. Grid lines were spaced 400 feet apart along a base line about 25 metres east of the Asarco base line. The grid lines were 340 to 620 m. long and the grid extended from the Murchison River in the north, to within 700 m. of the Sterling Valley mine to the south. The report on this work is included as appendix 6.

E-M Survey

A vertical loop E-M survey showed one major conductor running the entire length of the valley close to the Asarco baseline. Two minor conductors on either side of the baseline were also detected. The high tension power line that forms the Asarco baseline had not been erected at the time of this work.

Gravity Survey

A gravity high was found to coincide with the southern end of the main E-M conductor. However hole STP101 drilled by E.Z. passed beneath this conductor without intersecting significant mineralisation (see below for details of the E.Z. drilling).

Less extensive gravity anomalies were found to coincide with the other two E-M conductors.

The gravity data was interpreted on the basis that bedrock topography is smooth, but trenching by Asarco indicates that the bedrock surface is very irregular with steep slopes, and it is probable that bedrock highs are responsible for most of the gravity effects.

Magnetic Survey

The magnetometer survey indicated a number of local highs affecting one or two lines, but no persistent trends were defined.

There is no record of any follow up work having been carried out by Rio Tinto.

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Previous Work cont'd

S-P Survey

This survey showed a strong but discontinuous anomaly which shows excellent correlation with the major conductor outlined by the E-M survey.

2. Electrolytic Zinc Co.

The earliest recorded work by E.Z. in the Sterling Valley is a diamond drill hole put down near the Sterling Valley mine in 1949. During the 1950's a self potential survey was carried out. Neither the drilling nor the S.P. results are available to Asarco. In the early 1960's McPhar Geophysics carried out an I.P. survey for E.Z. in the Sterling Valley, but the results for this survey are not available either. McPhar include one of the profiles from this survey in their report on the E-M survey they carried out for Asarco in 1974, which is described later in the report. The company still holds two mining claims covering 3200 square metres around the Sterling Valley mine.

Diamond Drilling

Following the Rio Tinto geophysical surveys described above, E.Z. drilled 5 diamond drill holes, three of these near the Sterling Valley mine and two further north, outside the mining claims. The core from all 5 holes has been logged by Asarco. Logs of the two northern holes (STP101 and STP105) are included in appendix 4 and their location is shown on plan 1157. The holes intersected rhyolite, tuff and pyritic black slate with copper, lead and zinc mineralisation associated with quartz veins and shear zones. Cross sections of the holes are shown on plan 1195.

Of the two holes to the north of the claims, the best intersection was obtained in hole STP101 where a 7 foot section of black slate gave 0.25% Cu, 1.0% Pb, 2.8% Zn, 0.4 oz/ton Ag and <0.1 dwt/ton Au. However core recovery over the interval was only 20%. Hole STP105 had a 1 foot 6 inch intersection

Diamond Drilling cont'd

with 0.2% Cu, 0.1% Pb, 1.1% Zn, 0.35 oz/ton Ag and <0.1 dwt/ton Au from a pyritic siderite vein cutting fine grained sericitic tuff. A ten foot section of massive pyroclastics containing disseminated sphalerite with an estimated grade of about 1% zinc was apparently not analysed.

The best intersection obtained in the holes near the Sterling Valley mine was 9 feet with 0.3% Cu, 13% Pb, 8.2% Zn, 7 oz/ton Ag and 0.7 dwt/ton Au. The mineralisation is associated with quartz in fracture zones within black slate. Collars of the holes near the Sterling Valley mine have not been located in the field.

3. Pickands Mather International

In 1968, after the E.Z. diamond drilling, P.M.I. carried out a soil sampling programme, a magnetic survey and compiled a geological map of the Sterling Valley. The text of the report on this work is not available and only the plans are held by the Mines Department in Hobart.

The baseline for the grid used for this work lies to the east of both the Asarco and Rio Tinto baselines. This work covered the same area as the Rio Tinto surveys, but the soil survey extended up the eastern slope of the valley as far as the abandoned Tullah mine. Grid lines were spaced 400 feet apart and samples were taken at 100 foot intervals along the lines. The samples were analysed for copper, lead, zinc, nickel and arsenic. Detailed sampling was carried out over an area 2,400 feet by 700 feet aligned along the baseline south of the centreline, on lines 200 feet apart. Samples were taken at 25 foot intervals along the lines.

Plans 1204 and 1205 show the approximate location of the soil anomalies, transferred to the Asarco grid. Their location is approximate because of lack of adequate topographic control but is accurate to within about 30 m.

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Soil Survey Results

Plans 1204 and 1205 show the two highest contours for copper, lead, zinc, nickel and arsenic transferred from the P.M.I. maps at a scale of 1:4800, to the Asarco grid at a scale of 1:5000. Most of the anomalies are local highs affecting one or two lines and cut across the trend of the geology. However five of the anomalies affect two or more lines and are parallel to the geological trend. The E.M. survey referred to below was carried out for Asarco, and is described later in this report.

1. Lines 452N and 464N: 540E

Coincident copper, lead, zinc and arsenic anomalies occur on lines 452N and 464N at about 540E. This area is just outside the E-M survey, on the eastern slope of the Sterling Valley. The anomaly terminates abruptly to the north at a fault and recurs north of the fault in the same stratigraphic position. However it appears to be unaffected by an inferred fault to the south.

2. Lines 416N and 404N: 518E

A lead anomaly parallel to the strike of the rocks reaches maximum intensity (>1000 ppm) near line 404N: 518E close to a weak E-M conductor. Weaker lead values to the north coincide with a moderate E-M conductor on line 416N while to the south the lead anomaly overlaps weak copper and arsenic anomalies between lines 404N and 392N.

3. Lines 356N, 368N: 509E

A strong (>1000 ppm) lead anomaly occurs on lines 356N and 368N near 509E. The northern end corresponds with a broad weak zinc anomaly while a sub parallel arsenic high coincides with the southern end. This zone lies between two E-M conductors. However, detailed sampling by P.M.I. shows >1000 ppm. Pb soil values confined to an area of only 30 m by 20 m. This anomaly was not trenched by P.M.I.

4. Line 236N: 528E

A 100 ppm copper anomaly on line 236N: 528E coincides with a zinc high of 100 ppm. at the southern end of the P.M.I. grid. No E-M conductor was recorded over this area though it lies near the eastern limit of the E-M traverse on line 236N.

5. Line 500N: 620E

A strong lead anomaly (1000 ppm) with lower copper and zinc values occurs on line 500N at 620E southeast of the abandoned Tullah mine. This may be caused by the shear controlled mineralisation exposed at the Tullah mine (see appendix 3) though the anomaly is well away from any workings.

6. Line 500N, 388N: 587E

A 100 ppm copper anomaly on lines 500N and 488N at about 587E occurs in an area of good outcrop and no mineralisation was observed here during sampling. A stream sediment sample taken from a creek running 100 m. to the east of the anomaly gave only 5 ppm copper.

Detailed Soil Survey

A detailed soil survey was carried out by P.M.I. covering an area of 700 feet by 2,400 feet aligned along the baseline south of its centre point. Samples were taken at 25 foot intervals on lines 200 feet apart, and analysed for copper, lead, zinc and arsenic. The only extensive anomaly of the initial survey also covered by the detailed survey is the lead anomaly described above (no.3).

The area covered by the survey is shown on plans 1204 and 1205. The results of the detailed survey are not impressive. No extensive anomalies were revealed, but scattered samples gave values above 100 ppm. copper, lead, zinc and arsenic. The only values to exceed 1000 ppm. were for four lead samples taken from the same area as anomaly 3 of the initial survey described above.

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Trenching

Three trenches were excavated by P.M.I. on the floor of the Sterling Valley. Two of those were sited within the detailed soil grid, with the third well to the south. The two northern trenches are located over 100 ppm. lead soil anomalies, with coincident 100 ppm, Zn and As anomalies at the location of the northernmost trench. The trench to the south is located in an area of 25 ppm. lead between two small 100 ppm. lead anomalies with other elements at about background levels. The analytical results given for samples from the trenches are low. The highest values obtained were 0.04% Cu and 0.03% Pb from the northern trench, and 0.08% Zn from the southern trench.

Of the trenches now visible only the northern one corresponds well with the location shown on P.M.I. maps. The southern two are about 40 m. west of their mapped location. Bedrock exposed in the trenches is no longer visible as they have filled with water.

The reason for the siting of the trenches is not clear. The two southern trenches are located on ground already tested by the E.Z. diamond drilling and none of them are in areas with particularly high soil base metal values.

EXPLORATION ON EL 4/73 BY ASARCOINTRODUCTION

Exploration licence 4/73 was acquired by Asarco to test the 1800 m. of the Rio Tinto E-M conductor north of the E.Z. drill intersections, and to investigate the acid volcanic rocks of the surrounding areas.

During 1973 W.R. Layer prepared an outcrop map of the open areas within the exploration licence at a scale of 1:12,000 and described five abandoned mine workings. This work is included as appendix 3. Subsequent work was carried out by Asarco from November 1973 until June 1974. This work is described below.

GEOLOGYSTERLING VALLEY GRID1. Introduction

The grid area covering the eastern part of the exploration licence was mapped at a scale of 1:5,000. The geology is shown on 2 maps, an outcrop map (plan 1157) and an interpretation map (plan 1158). Thin section descriptions are included as appendix 1 and the petrographic sample locations are shown on plan 1157.

The stratigraphic table on the following page lists the units mapped in both parts of the licence area with sample numbers for relevant petrographic descriptions.

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STRATIGRAPHIC TABLE

Map Symbol	Maximum thickness (m)	Description	Petrography: Sample number
cg	>1200	Massive conglomerate; conglomerate with interbedded sandstone	
UNCONFORMITY			
br	200	Sheared sericitised lithic crystal tuff	19540
r+pr)	1500	Porphyritic & fine grained rhyolite; with minor lithic crystal tuff; and tuffaceous lithic sandstone	19518,19519,19528,19533
)			19521,19536
)			19522,19534
av))	Altered sheared rhyolite & dacite	19541,19546,19548,19549
))		19550,19552,19553.
rs	180	Sheared Porphyritic rhyolite	19532
fp	90	Porphyritic rhyolite (feldspar phenocrysts)	19533
qt	110	Fine grained porphyritic rhyolite (quartz phenocrysts)	19539
mr)	110	Sericitised rhyolitic tuff	19537
)		Sericite schist; sheared equivalent of mr	19525
sr))		
c,st,dt>500		Fine grained rhyolitic and dacitic) tuff, chlorite schist, sericite) schist, black slate, sandstone)	19520,19523,19524, 19526,19535,19538, 19551.

UNCONFORMITY OR FAULT

pt,bt	>800	Altered trachytic tuff lava and lithic tuff; altered basic crystal lithic tuff; basalt	19514,19516,19517. 19515,19527,19529, 19530
?	?	?	?
sch	>700	metaquartzite, quartz mica schist conglomerate, sandstone	19555
Intrusive Rocks (intruding r + pr unit)			
bi	--	? dolerite	19531
gr	--	granite, granodiorite, adamellite with unsheared rhyolite inclusion	(19543,19544,19545,19547 (19554. 19542

13.

2. Facing Direction

The facing of the Cambrian rocks in this area is disputed. W. Layer has reviewed the data on this subject and his literature review is included (appendix 2). No reliable facings were seen during mapping. One sample of a rhyolite-tuff contact (sample number 19522) and another with suspected graded bedding (number 19551) were submitted for petrographic description, but neither gave conclusive proof of a facing direction. An easterly facing has been used on the maps as there is a report of graded bedding in the Farrell Slates near the Murchison Bridge indicating an easterly facing (see appendix 2) and the Ordovician Owen conglomerate appears to overlie the Cambrian rocks to the east with a minor unconformity.

3. Western intermediate and basic volcanic rocks

The rocks to the west of the Sterling River consist of altered trachytic tuff lava, lithic tuff and lithic crystal tuff. The sequence includes altered basic rocks consisting mainly of chlorite. Thin section number 19515 (altered basic crystal lithic tuff) is of the least altered rock seen on the western slope, and the chloritic rocks are probably derived from similar basic volcanics. Weathering is deep on this slope and outcrop is sparse, making it impossible to determine the relationship between the basic and trachytic rocks.

4. Fine grained sedimentary and volcanic rocks of the Valley floor

The Sterling River runs along the contact between the trachytic rocks forming the western slope, and the fine grained rocks of the valley floor. Outcrop is sparse along the river and the contact is not exposed. It is likely that the contact is faulted, or unconformable because of the abrupt change in rock composition. The contact is part of a major fault that crosses the Murchison 1 mile provisional geological map.

4. Fine grained sedimentary and volcanic rocks of the Valley floor
cont'd

The fine grained volcanic and sedimentary rocks of the valley floor (the Farrell Slates) are host rocks of the Farrell mine at Tullah and the Sterling Valley mine near the southern boundary of the E.L. Their possible relationship to the Rosebery host rocks is discussed in the literature review (appendix 2).

Outcrop on the valley floor consists of sandstone, siltstone, black slate and fine grained rhyolitic and dacitic tuff. Outcrop west of the baseline is entirely obscured by fluvio-glacial gravel. However, sandstone and siltstone is exposed along the Murchison River to the west of the slate and tuff, and these rocks probably underlie the gravels west of the baseline. The sequence of slate and volcanics is complex as the E.Z. drill logs and the trench exposures show. As outcrop is sparse on the floor of the valley it was not possible to correlate the geology between the grid lines, and the rocks are shown as one unit on the interpretation map.

5. Rhyolite of the eastern slope

To the east the sequence becomes more volcanic and the black slate and fine grained volcanics cease at a band of sericite schist (sr) in the north, and medium grained rhyolitic tuff (mr) in the south. The schist contains numerous lensoid inclusions of black slate aligned parallel to the foliation. To the south the unit is less intensely sheared and the schist grades into the medium grained rhyolitic tuff unit (mr). To the east again the tuff is succeeded by a sequence of rhyolites with quartz phenocrysts (qt), felspar phenocrysts (fp) and both quartz and felspar phenocrysts (rs). East of these units the rocks consist entirely of intercalated porphyritic and fine grained rhyolite. These rocks extend to the east over the divide towards the Murchison River.

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5. Rhyolite of the eastern slope cont'd

Outcropping basic rocks were encountered near the eastern end of line 236N. A thin section of the rock (sample no. 19531) was described as tremolite chlorite rock that may have been a basalt or dolerite. The rock may be an altered basic tuff similar to those found on the western side of the valley, or it could be an altered dolerite intrusion.

6. Structure

The main structural feature of the interpretation map (plan 1158) is a series of east-west dextral faults with displacements of up to 175 m. These faults displace the rocks of the valley floor and the rhyolites at the foot of the eastern slope. Near the northern boundary of the licence outcrop is sufficient to locate the faults accurately but towards the south where outcrop is scarce their location is approximate. On the baseline at 330N the black slate strikes east-west, at right angles to the trend of the geology, which suggests that the faults extend across the valley floor.

On air photos prominent lineations run along both sides of the valley. The possibility of a fault along the western side of the valley is discussed in the section above on the rocks of the valley floor. The sericite schist belt along the eastern side of the valley may be due to an old fault that is concealed beneath rhyolite scree further south. If this is the case this fault must be older than the cross faults described above as the belt of sericite schist is displaced by them.

GEOLOGY OF THE EASTERN EXTENSION E.L. 4/73

A reconnaissance geological map (plan 5001) for the licence area east of the grid has been prepared from observations made during stream sediment sampling. Published maps of the area show granite outcrop over a small area near the Murchison River,

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Geology of the eastern extension E.L. 4/73 cont'd

surrounded by Cambrian volcanics that terminate against Precambrian metamorphic rocks to the east. The present mapping indicates a much more extensive belt of granite, granodiorite and adamellite 300 to 1200 m. wide extending from the Murchison Gorge near the northern E.L. boundary to the southern boundary, including most of the area previously mapped as Cambrian volcanics. The granite is flanked by a zone of strongly altered pyritic acid volcanic rocks that grade west into the rhyolite mapped on the eastern side of the grid area.

The gradational boundaries of the granite and the similarity of its composition with the enclosing acid volcanic rocks has led to the suggestion that it may have formed in situ from the rhyolites during metamorphism. Its similarity to the Cambrian Mt. Darwin granite near Queenstown is taken as supporting evidence for a Cambrian age.

A broad belt of near vertically dipping Ordovician Owen conglomerate bifurcates in the north of the area and terminates abruptly with no evidence of major transcurrent faulting in the Cambrian or Precambrian rocks. Outcrop of Ordovician conglomerate recurs 4 km. to the south on Mt. Murchison. An isolated block of conglomerate near the southern boundary of the licence area east of the Murchison River appears to be entirely enclosed by altered Cambrian rhyolite. Explanation of these features would require much more thorough, detailed mapping.

ELECTROMAGNETIC SURVEY

In January 1974 a vertical loop E-M survey was carried out by McPhar Geophysics using their SS15 unit. Details of the survey and an interpretation of the results are included in a report by McPhar. The survey was carried out to locate the conductor defined by the Rio Tinto E-M survey, and to test areas to the east and west of the Rio Tinto grid. The survey covered the flat part of the valley floor as far south as the E.Z. mining claims, and part of three lines south of the claims.

17.

Electromagnetic Survey cont'd

The results of the Asarco and Rio Tinto surveys are very similar. The southern part of the main Rio Tinto conductor coincides with the high tension powerline (erected since the Rio Tinto survey) that forms the Asarco grid base line, and readings could not be obtained within 30 m. of the line because of the interference it caused. However, McPhar show an inferred conductor running along the baseline from line 332N to the point where the power line diverges from the baseline at 248N. South of the power line on lines 236N and 224N continuous readings were possible and confirmed the presence of a conductor. The conductor to the east of the baseline north of line 416N corresponds with the northern part of the Rio Tinto conductor, which is also displaced to the east. Weak conductors were defined on the three lines south of the mining claims. The Asarco interpretation is included as appendix 5, and conductor and trench locations are shown on plan 1179.

TRENCHING

Trenches were excavated near 6 lines over the strong conductors shown in the Asarco interpretation of the E-M results. An end loader with tracks was used which dug a trench about 2 metres wide. Trenches were to have been excavated on all of the lines between 380N and 500N, but the four northern lines were not trenched after failure to reach bedrock near the conductor on line 500N.

Geological logs and analytical results for bedrock exposed in the trenches are shown on plan 1180, and their locations are shown on plan 1157 and 1179. The narrow trench near line 428N was not excavated for Asarco, but was located close to the E-M conductor, in an area where access for the bulldozer was difficult.

Continuous 1 to 2 kg. channel samples were taken over 3 metre intervals of the bedrock exposed in each trench. These samples

Trenching cont'd

were analysed for copper, lead, zinc, silver and tin. Tin was included because cassiterite has been reported in the Turley Show (515E: 370N) on the floor of the Sterling Valley within the slate and tuff sequence.

Traces of chalcopyrite and sphalerite were seen in the trenches but no cassiterite was seen in hand specimen. The geology and analytical results for each trench are summarised below.

Line 500N

A trench close to line 500N exposed 7 m. of fine grained rhyolitic tuff near its eastern end away from the location of the conductor. The highest analytical value for the two samples of this rock was 30 ppm. lead. The bedrock surface sloped away steeply to the east and after excavating through about 4 m. of alluvium the trench was abandoned. A second trench about 30 m. south of Line 500N was excavated on a small tree covered rise. Bedrock has been found outcropping on similar rises elsewhere in the valley and it was hoped this hill was caused by a bedrock high. No outcrop is exposed on this hill, however, and excavation to a depth of about 5 metres failed to reach bedrock. The alluvium in both trenches consists of 1 to 2 metres of silt and sandy silt over sandy gravel. The water table was not reached in either trench.

Line 488N and 476N

Trenches were not excavated on these two lines because conditions appeared to be similar to those at line 500N.

Line 464N

One cut with the machine beside line 464N exposed sticky fine grained alluvium and gravel and this trench was not completed.

Line 452N

The trench alongside line 452N exposed a 3 metre wide barren

Trenching cont'd

quartz vein and a 1 metre wide black slate bed enclosed by fine grained tuff at the conductor location. The sample that included the black slate bed gave the highest assay values for this trench with 50 ppm. Cu, 100 ppm. Pb, 30 ppm. Zn and 60 ppm. Sn.

Line 440N

A trench 25 metres north of line 440N along the top of a ridge exposed 45 metres of continuous outcrop. The Asarco interpretation has the conductor on line 440N linked with that on line 452N but the McPhar interpretation shows a break in the conductor between these two lines. The conductor can be broadly correlated with a 60 cm. wide band of chloritic slate containing 15 to 20% pyrite. Similar pyritic black slate with a trace of chalcopyrite is scattered around an old shaft about 5 m. south of the trench. The pyritic slate occurs near the contact between black slate and fine grained rhyolitic tuff, and assayed 320 ppm. Cu and 2 ppm. Ag. Lead and zinc values reach their highest at the western end of the trench in black slate with 520 ppm. Pb and 50 ppm. Zn. Tin assay results range from 10 to 1700 ppm. and vary independently of the other values. They are highest near the centre of the trench where 6 samples over 18 m. gave an average value of 950 ppm. Sn. This interval includes quartz veined and silicified black slate and schistose tuff. The four samples at either end of the trench where quartz veins are absent gave tin values ranging from <10 to 60 ppm. tin. The schistose tuffs are moderately to strongly weathered but the black slate is unweathered and contains fresh pyrite.

Line 428N

This trench was not excavated for Asarco. However, it was located close to an E-M conductor at the edge of a swamp in an area inaccessible to the excavator. A band of silicified black slate about 50 cm. thick separates fine grained rhyolitic tuff

Trenching cont'd

to the east from unsilicified black slate to the west. To the west of the silicified band the trench is filled with water. A dump of black slate fragments alongside the trench was sampled. The silicified bed gave the highest copper lead and silver values obtained from any of the trenches. Results were 390 ppm. Cu, 1000 ppm. Pb and 18 ppm. Ag. This section contained 650 ppm. tin also. The dump material gave much lower copper lead and silver values but gave 950 ppm. Sn.

Line 416N

Boggy ground prevented access to the conductor on this line.

Line 404N

The trench beside line 404N exposed 50 m. of black slate to the east of the conductor, but the bedrock was obscured by thick alluvium to the west of it. Copper, lead, zinc and silver values for this trench were low, reaching 80, 340, 140 and 4 ppm. respectively. The highest tin value of any of the trenches (6500 ppm. Sn) was obtained over a 3 metre interval from gossanous, silicified, black slate near the western limit of the bedrock exposure. Cassiterite was detected in thin sections of 2 samples (19956 and 19957) from this interval. Values to the east are low and the only sample to the west gave 1700 ppm. Sn. Beyond this point to the west the bedrock is obscured by clay and gravel.

Line 392N

The trench on this line runs down the side of a small hill exposing 54 metres of continuous outcrop centred close to the location of the conductor. Copper, lead, zinc and silver values are low, but one sample over a gossanous quartz vein gave 1400 ppm. Sn. Other quartz veins gave 400 and 320 ppm. Sn, but where quartz veins were absent the tin values ranged from <10 to 120 ppm.

Trenching cont'd

Line 380N

The highest zinc value (1140 ppm.) was obtained from this trench. A small crystal of sphalerite in black slate was seen near the location of this sample during excavation. Elsewhere copper values reach 120 ppm., lead 310 ppm. and silver 4 ppm. in silicified black slate zones. Tin values reach 150 and 460 ppm. over silicified black slate cut by numerous narrow quartz veins. All other tin values are 80 ppm. or less. The possibility of the trench being flooded by a small creek prevented it being extended as far to the west as was intended.

Conclusions

The trenches excavated over the E-M conductors defined by the McPhar survey failed to reveal copper, lead or zinc mineralisation approaching ore grades. The highest values obtained were 390 ppm. Cu, 1000 ppm. Pb and 1140 ppm. Zn. An ore grade tin value of 0.65% was obtained from gossanous silicified slate on line 404N. All samples were taken over 3 m. intervals. Tin values show a strong correlation with quartz veins and zones of silicification, but not with rock type. The trenches near lines 440N and 380N show this correlation most strongly. However, some quartz veins and silicified zones gave low tin values. No tin minerals were seen in any of the trenches, but cassiterite was detected in thin sections of 2 samples (19956 and 19957) from the tin rich zone on line 404N. The conductors may be accounted for by concentrations of pyrite forming 10 to 20% of the rock on lines 440N and 428N, and pyrite beneath gossanous zones after pyrite on lines 404N, 392N and 380N. The black slate bed enclosed by fine grained tuff on line 452N may be the conductor recorded on that line.

STREAM SEDIMENT SAMPLINGIntroduction

A stream sediment sampling survey was carried out over the entire exploration licence. Results for the grid area are shown on plan 1178 and for the eastern extension on plan 5002. The 12 square km. covered by the grid was most closely sampled, with 115 samples being taken where creeks crossed the grid lines. This gives a sample density of 10 samples per square km. (25 per square mile). The eastern extension was sampled less densely with 51 samples taken over about 16 square km. giving a sample density of 3 per square km. (8 samples per square mile). Only one sample was taken from the remaining 6 square km. of the exploration licence along the eastern boundary beyond the limit of rhyolite and granite outcrop. All samples were analysed for copper, lead, zinc, silver, tin and cold extractable copper and zinc. Samples from the eastern area where granite occurs were analysed for molybdenum also, but none of the values exceeded the limit of detection of 5 parts per million Mo.

The eastern area gives consistently lower values than the grid area for all elements, so background and threshold values were determined separately for each area. The results produce irregular log probability plots because of the small number of samples, but were useful in determining threshold and background values. These are listed below for both areas.

Sterling Valley grid

	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
background	5	40	40	<2	<1	4	15
threshold	25	150	120	2	4	40	60

Eastern Area

	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>	<u>Mo</u>
background	6	30	40	<2	<1	3	<15	<5
threshold	15	80	70	<2	2	12	40	<5

Introduction cont'd

The threshold value for each of the elements is lower for the eastern area than for the grid area. The background copper and zinc values are similar for both areas, but the range of values of both elements is smaller for the eastern area, resulting in lower threshold values.

ANOMALIES

The anomalies described below have been divided into 3 groups: first priority, second priority, and anomalies that do not warrant following up. Anomalous values in the tables are marked with an asterisk.

Sterling Valley Grid

(a) First Priority Anomalies

1. Tin anomalies near the baseline

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30484	494E/356N	25*	60	40	<2	1	7	60*
30485	498E/344N	<5	60	40	<2	<1	5	150*
30500	491E/260N	5	30	30	<2	<1	3	200*
30511	498E/248N	<5	40	30	<2	<1	6	60*

Two strong tin anomalies were obtained from creeks sampled immediately west of the baseline. The southern sample (30500) on line 260N gave the highest tin value of the survey (200 ppm.) and the creek drains an area where Rio Tinto obtained a coincident E-M conductor and gravity anomaly. Core of the E.Z. diamond drill hole that passed beneath these anomalies was not assayed for tin. The creek giving this anomaly is large and the sediment is likely to be diluted by low tin bearing material from further upstream. Two more tin anomalies were obtained on lines 344N and 356N less than 100 metres west of the baseline. These two samples and sample 30489 downstream show that tin dispersion is very weak. Tin values for the three samples decrease from 150 to 60 ppm. over

029

Anomalies cont'd

a 130 metre interval, and then to 20 ppm. over a further 140 metres. The tin values decrease from ten times background to near background over a distance of 270 metres. Two other creeks cross the baseline between sample 30500 and 30485, and samples from these creeks would indicate whether a continuous tin-anomalous zone follows the baseline in this area. A weak copper anomaly (sample 30484) is unsupported by anomalous values in nearby samples.

Sterling Valley Grid2. Mt. Murchison lead and zinc anomaly

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30542	593E/135N	15	210*	1510*	<2	2	720*	20
30529	564E/166N	10	100	470*	<2	3	230*	20
30528	555E/166N	5	60	240*	<2	1	90*	20

Sample 30542 gave a very strong zinc anomaly with decreasing lead and zinc values downstream. The sample is located close to the southern boundary of the exploration licence on the slopes of Mt. Murchison in an area where Cambrian rock outcrop is obscured by conglomerate and sandstone talus. The anomaly is not supported by nearby samples, but warrants following up because of its intensity.

3. Eastern end of line 452N, copper, lead and zinc anomaly

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30472	452N/736E	60*	200*	250*	2*	8*	59*	20
30473	452N/722E	30*	140	220*	2*	5*	33	30

Two creeks near the eastern end of line 452N gave copper, lead, zinc and silver anomalies. Rhyolite outcrop occurs here and no mine workings are known upstream on these creeks.

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Anomalies cont'd

4. West side of valley; copper, zinc and tin anomalies

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30483	447E/356N	60*	120	210*	<2	3	23	60*
30486	475E/344N	25*	50	300*	2*	1	56*	70*
30490	467E/368N	10	50	80	<2	1	5	180*
30491	460E/368N	50*	120	210*	<2	3	32	60*
30512	433E/236N	50*	80	220*	2*	3	37	10
30560	451E/205N	10	70	120*	<2	1	26	20
30561	446E/217N	40*	110	260*	<2	3	46*	20

Copper and zinc anomalies were obtained in two areas to the west of the baseline, within the trachyte and basic volcanic rocks. The northern group of samples on lines 344N, 356N and 368N were anomalous in tin also. No significant creeks drain the area between the two groups of samples. The range of copper and zinc values in both groups is small, and the results do not increase rapidly upstream as they do for the other anomalies described above. It is possible that the anomalies are the result of high local copper and zinc background values in the intermediate and basic rocks of the western side of the valley. Further stream sediment, and rock chip and soil sampling here would confirm whether or not this is the case.

5. Eastern end of line 236N; lead, zinc and copper anomaly

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30516	665E/236N	25*	580*	320*	<2	5*	84*	10

A strong lead anomaly with moderate zinc and weak copper anomalous values was obtained at the eastern end of line 236N. Altered basic rocks (?dolerite) crop out on the western side of the creek, but the dominant rock type here is porphyritic rhyolite.

031

Anomalies cont'd

(b) Second Priority Anomalies1. Lead anomalies; 416N to 452N, 593E to 621E

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30467	600E/440N	30*	210*	220*	<2	2	7	20
30468	592E/452N	10	150*	70	<2	2	8	20
30475	612E/428N	<5	180*	50	<2	<1	13	10
30476	621E/416N	<5	180*	40	<2	<1	9	20

Four samples anomalous in lead (and one also anomalous in copper and zinc) were collected along a creek in the northeast of the grid area. The creek may follow a weakly mineralised fault which would account for the uniformity of the values and their distribution along the creek.

2. Copper and lead anomaly; 531E/200N

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30520	531E/200N	50*	220*	110	<2	14*	17	<10

This copper and lead anomaly occurs in a densely sampled area east of the E.Z. mining claims. None of the surrounding samples is anomalous, but the copper value is twice threshold and the cold extractable copper value exceeds three times threshold, so this anomaly has been included for follow up.

Anomalies cont'd

3. Eastern slope of Sterling Valley; scattered tin anomalies

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30478	584E/404N	<5	20	20	<2	<1	1	80*
30481	623E/356N	<5	40	30	<2	<1	3	70*
30488	525E/368N	<5	20	10	<2	<1	4	100*
30495	671E/308N	<5	20	10	<2	<1	5	60*

These 4 isolated tin anomalies on the eastern side of the valley cannot be ignored because of the very weak tin dispersion observed for the baseline tin anomaly. Sampling upstream from these anomalies would indicate whether or not they warrant detailed follow up.

(c) Anomalies not warranting follow up1. Anomalies caused by known mineralisationLead anomaly; 451E/500N

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30543	541E/500N	5	520*	110	<2	1	31	20

This strong lead anomaly was obtained about 50 metres downstream from abandoned mine workings. Galena and sphalerite mineralisation occurs along a narrow quartz veined shear zone in rhyolite.

Sterling Valley Mine

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30599	467E/205N	25*	570*	90	<2	6*	17	30

This sample was taken on a creek that runs past the Sterling Valley mine, about 300 m. downstream from the mine.

Anomalies cont'd

2. Isolated single element anomaliesZinc anomalies east of the mining claims

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30509	551E/248N	5	100	150*	<2	<1	21	20
30527	549E/166N	5	20	160*	<2	<1	3	20
30538	540E/135N	15	130	120*	<2	2	7	30

Three isolated zinc anomalies occur to the east of the mining claims in a densely sampled area. In each case none of the surrounding samples is anomalous.

Silver anomaly; 378E/500N

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30466	378E/500N	10	40	60	2*	<1	7	20

This sample in the northwestern corner of the exploration licence gave a 2 ppm. silver value unsupported by anomalous values for other elements.

Lead and copper anomalies northeast of mining claims

<u>Sample</u>	<u>Grid</u>							
<u>No.</u>	<u>Reference</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30497	522E/284N	10	190*	50	<2	1	10	<10
30499	523E/296N	15	200*	50	<2	4	23	40

Two weak lead anomalies and a threshold cold extractable copper anomaly were obtained from 2 samples taken 150 metres apart on the same creek. None of the surrounding samples is anomalous.

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EASTERN EXTENSION

All of the anomalies listed below are plotted on plan 5002. None of the anomalies in the eastern area warrant first priority follow up.

(a) Second Priority Anomalies1. Northern zinc, lead and copper anomaly

<u>Sample No.</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>	<u>Mo</u>
30590	5	50	80*	<2	<1	7	10	<5
30591	15*	120*	160*	<2	1	25*	20	<5
30627	15*	120*	150*	<2	1	21*	40*	<5
30628	15*	80*	160*	<2	1	5	20	<5
30632	20	1100	3600	2	5	700	30	<5

Four samples collected east of the Murchison River in the north of the exploration licence area were anomalous in zinc. Three of these were also anomalous in lead and copper. This area is mapped as granite, and no rhyolite outcrop was seen here during mapping.

A horizontal H.E.C. diamond drill hole passes to the south of the anomalous sample location. When I visited the area, water was flowing from the hole at a rate of about 2,000 gallons per hour and a large quantity of yellow-brown clay has been deposited by the water alongside the hole. A sample of this clay gave very high lead and zinc values (see the results for sample 30632 above).

The core from this hole is stored at Wayatinah and parts of it were examined in August 1974.

The hole was drilled through the ridge separating the Murchison and Sophia Valleys, from both ends. The hole giving the lead and zinc-rich sludge (no. 6627) penetrated 290 feet of siliceous conglomerate and sandstone (Owen conglomerate), then a further 707 feet of granite. The hole from the western end (No. 6630)

035

1. Northern zinc, lead and copper anomaly cont'd

intersected 604 feet of granite, giving a total length of 1600 feet (490 metres).

The H.E.C. logs for the holes record a number of occurrences of chalcopyrite, galena and sphalerite, and 7 mineralised sections of core were examined from both holes. Mineralisation consisted of narrow ($\frac{1}{2}$ inch) quartz veins containing pyrite, sphalerite and galena. The granite is cut by numerous quartz veins, but mineralisation is confined to isolated veins over intervals of less than 6 feet. At a depth of 12 feet in hole 6630, blebs of galena, pyrite and sphalerite occur over an interval of about 4 inches. No chalcopyrite was seen in core from either of the holes. The lead, zinc mineralisation seen accounts for the lead and zinc values obtained in the sludge from hole 6627 and the lack of chalcopyrite is consistent with the low (20 ppm.) copper value. The lead and zinc anomalies in stream sediment samples from creeks draining an area to the north of the hole are probably caused by similar mineralisation at the surface.

The significance of the anomaly is downgraded by the proposed H.E.C. tunnel that will cross the ridge close to the location of the drill hole, and by the sporadic low grade mineralisation seen in the core. However, the source of the stream sediment anomaly appears to be located about 500 m. northwest of the drill hole and is anomalous in copper as well as lead and zinc, and the anomaly is included for second priority follow up.

2. Eastern tin anomalies

<u>Sample No.</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>	<u>Mo</u>
30610	5	10	30	<2	<1	1	50*	<5
30611	<5	30	30	<2	<1	1	50*	<5
30612	5	30	40	<2	<1	2	90*	<5
30615	15*	40	40	<2	<1	2	50*	<5

31.

2. Eastern tin anomalies cont'd

Three tin anomalies were obtained from creeks draining the eastern limit of Cambrian outcrop in the east of the licence area. A fourth tin anomaly (30615), well to the east of the other samples, from a creek draining Precambrian rocks gave threshold tin and copper values. The only tin value to exceed twice threshold was for sample 30612 with 90 ppm. Sn.

Further sampling upstream from 30612 and 30615 is required before these anomalies can be eliminated. Anomalous samples 30608 (12 ppm. cold extractable copper) and 30609 (110 ppm. lead) could be resampled at the same time.

(b) Anomalies not warranting follow up1. Zinc anomaly east of the Tullah mine

<u>Sample No.</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>	<u>Mo</u>
30583	5	30	160*	<2	<1	5	10	<5

A weak zinc anomaly was obtained upstream from the Tullah mine near the northern boundary of the exploration licence. This anomaly is close to the location of a P.M.I. soil anomaly (number 5) described in a previous section. The grid area background and threshold values are relevant here as the creek sampled drains the unaltered rhyolite of the grid area, but is located outside the grid about 100 m. north of line 500N.

2. Lead anomaly east of line 500N

<u>Sample No.</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>	<u>Mo</u>
30600	5	90*	30	<2	<1	1	<10	<5

A weak lead anomaly was obtained about 150 m. east of the end of line 500N. This anomaly may be related to the copper, lead and zinc anomalies obtained near the end of line 452N within the grid areas.

(b) Anomalies not warranting follow up cont'd

3. Lead and cold extractable copper and zinc anomalies east of the grid area

<u>Sample No.</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>
30622	5	80*	60	<2	1	8	20
30623	<5	10	20	<2	3*	2	20
30624	5	120*	50	<2	1	17*	<10
30625	5	90*	60	<2	1	8	30

These four anomalous samples were collected from creeks draining the unaltered rhyolite of the grid area as well as altered rhyolite and granite. Sample 30622 is located about 1.2 km. downstream from sample 30516 on line 236N that was strongly anomalous in lead (580 ppm). Sample 30623 is from a small creek and gave a threshold cold extractable copper value unsupported by anomalies for other elements. Sample 30624 and 30625 are from creeks draining the southern part of the licence area between the eastern limit of the grid and the Murchison River. Both creeks drain rhyolite similar to the rhyolite of the eastern part of the grid area and none of the values exceed the threshold values determined for the grid area.

4. Isolated anomalies

<u>Sample No.</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Ag</u>	<u>cxCu</u>	<u>cxZn</u>	<u>Sn</u>	<u>Mo</u>
30587	5	80*	70*	2	1	15*	15*	5
30604	5	20	30	2	1	3	70	5

Sample 30587 gave weak lead and zinc anomalous values, and sample 30604 gave a tin anomaly. Both samples occur in a densely sampled area east of the Murchison River and neither anomaly is supported by results for nearby samples.

CONCLUSIONS AND RECOMMENDATIONS1. Grid Area(a) Sterling Valley Floor

Trenching indicates that the main E-M conductor in the north of the licence area along the floor of the valley is caused by pyritic black slate horizons within the Farrell Slate sequence. Copper, lead, zinc and silver values from the 7 trenches that expose bedrock do not approach ore grade. However, one trench gave 0.65% Sn over 3 metres, and two strong tin stream sediment anomalies occur to the south of this trench near the baseline on lines 260N and 344N (first priority anomaly 1). Further closely spread stream sediment sampling is required along the baseline to determine whether a continuous tin bearing zone exists between these 2 groups of tin anomalies. Soil geochemical methods are unlikely to be successful as some of the soils here are residual, but most are developed over alluvium. Excavation of about 5 trenches at 250 m. intervals along the baseline from lines 248N to 344N should expose sufficient bedrock to evaluate the tin potential of this zone.

(b) Stream sediment anomalies, eastern slope

Stream sediment anomaly 2 (Mt. Murchison), 3 (eastern end of line 452N) and 5 (eastern end of line 236N) can be followed up initially with further stream sediment sampling, and prospecting. Additions to the grid in these areas may be required if the initial work does not explain the source of the anomalies.

(c) Stream sediment anomaly, western slope

Anomaly 4 on the western side of the valley may be due to high local background, as the copper and zinc values are consistent and do not increase rapidly upstream. Rock

(c) Stream sediment anomaly, western slope cont'd

chip sampling and soil sampling over both the porphyritic trachyte and the basic rocks of this area are required to determine whether or not these rocks are unusually rich in copper and zinc, and more detailed follow up is required. The tin anomaly at the northern end of this zone can be followed up at the same time with further stream sediment sampling upstream from sample 30490 (grid reference 447E/568N).

(d) Comparison of anomalies with values obtained below known mineralisation.

The first priority stream sediment anomalies compare favourably with stream sediment values obtained from a creek that flows past the Sterling Valley mine and was sampled about 300 m. downstream from the mine. The creek flows through the workings close to a black slate dump containing galena, sphalerite and chalcopyrite. The sample (no. 30599) gives a strong lead anomaly (570 ppm) but only a weak copper anomaly (25 ppm) and the zinc value of 90 ppm. is below threshold. Anomalies 2, 3, 4 and 5 all give zinc values higher than this and anomalies 3 and 4 give copper values about twice as high as sample 30599. Only one anomaly (no. 5 with 580 ppm. Pb) gives a lead value above the 570 ppm. Pb obtained from sample 30599.

Sample 30543 downstream from a galena and sphalerite show, also gives a high lead value (520 ppm) and a below threshold zinc value (110 ppm). The apparent low mobility of zinc may be due to precipitation with limonite and organic matter in the stream sediment close to the source.

(e) Second priority stream sediment anomalies

Three second priority stream sediment anomalies are listed for the eastern slope of the valley. In each case they are likely to be eliminated by further sampling and prospecting. Four scattered tin anomalies were included for follow up

(e) Second priority stream sediment anomalies cont'd

because of the very poor tin dispersion observed in 3 samples near the baseline. Sampling upstream from these would indicate whether they warrant more detailed follow up work.

(f) P.M.I. soil anomalies

A total of 6 soil anomalies affecting 2 or more lines were defined by the soil survey carried out by P.M.I. None of these can be attributed to known mineralisation. The P.M.I. soil data has been transposed to the ASARCO grid and the anomalous areas could be examined along with the stream sediment follow up work. All of these soil anomalies occur to the east of the base line on the floor and slopes of the Sterling Valley.

2. Eastern Extension Area

The best anomaly obtained for the stream sediment survey over the eastern extension of EL 4/73 is the northern copper, lead and zinc anomaly (anomaly 1). However its significance is diminished by the occurrence of minor lead-zinc mineralisation in H.E.C. diamond drill holes 6627 and 6630 which pass about 500 metres to the south-east of the apparent source of the anomaly, and by the proposed Sophia Tunnel that will pass through the area close to the drill hole. This anomaly and 4 tin anomalous samples to the south (anomaly 2) have been included for second priority follow up.

3. Time estimate for initial follow up

Initial follow up of the tin anomalous zone along the baseline with sampling and trenching and of the first priority anomalies of the grid area will take 2 to 3 months for 2 geologists.

041

3. Time estimate for initial follow up cont'd

Follow up of the second priority anomalies of both areas, and the P.M.I. soil anomalies should take a further month making a total of 3 to 4 month's work for the initial follow up.

R.G. Barker

R.G. BARKER

20th August, 1974.

042

APPENDIX 1

Petrographic Descriptions

043
CENTRAL MINERALOGICAL SERVICESDate 5th February, 1973.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/1/28 Date Received: 26/1/73Reference Letter - 23/1/73Sample No. 28032Nature of Sample: Hand specimen

DESCRIPTION

SECTION No. 10791

a. Hand Specimen:

Grey fine grained basalt, K stain negative, magnetic.

b. Microscopic:

An altered leucocratic basalt which is completely devoid of olivine and pyroxene. The rock consists of labradorite phenocrysts in a faintly fluidal groundmass of plagioclase laths with intersertal calcite chlorite and magnetite. Dispersed throughout are intersertal patches of devitrified glass with microscopic feldspar microlites and flakes of chlorite.

Calcite is replacive of feldspar to some extent but there is no textural evidence suggestive of calcite/chlorite replacement of mafic silicates. The intersertal nature of chlorite suggests it is of primary origin (? deuteritic) whereas calcite occurs with minor quartz in crude veinlets and as vesicle fillings the latter at least being secondary.

This specimen would not be correlated with 26350 on petrological grounds.

D. Cowan.

IDENTIFICATION
28032
Leucobasalt.

CENTRAL MINERALOGICAL SERVICES

Date 5th February, 1973.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/1/28 Date Received: 26/1/73.
 Reference Letter - 23/1/73
 Sample No. 28033
 Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 10792

a. Hand Specimen:

Fine grained pink quartz feldspar porphyry, K stain negative.

b. Microscopic:

This is a sodic quartz feldspar porphyry. The phenocrysts are of albite with lesser quartz and the groundmass consists of quartz, plagioclase and white mica. Staining reveals the rock to be devoid of K feldspar the pink colour (hand specimen) being related to incipient kaolinisation and Fe staining of the feldspar.

The groundmass has a very fine grained subgraphic texture with scattered quartz spherulites. Phenocrysts show some evidence of resorption (especially quartz), the inferred unstable cooling being typical of this type of rock.

Accessories include euhedral opaques (?magnetite), apatite and red brown rutile. Occasional feldspar phenocrysts are slightly altered to sericite white mica (possibly paragonite), the alteration being of deuteric rather than hydrothermal character.

D. Cowan.

045

573046

CENTRAL MINERALOGICAL SERVICES

Date 5th February, 1973.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/1/28 Date Received: 26/1/73

Reference Letter - 23/1/73.

Sample No. 28034

Nature of Sample: Hand specimen.

IDENTIFICATION
28034
Saussuritised rhyolite. (? tuff lava).

DESCRIPTION **SECTION No.** 10793

a. Hand Specimen:

Grey porphyritic ? rhyolite, K stain positive (groundmass).

b. Microscopic:

This is a porphyritic rhyolite which has undergone saussuritic alteration. The phenocrysts consist of oligoclase and quartz and are quite coarse (mean about 0.5mm) possibly implying a high level intrusive origin for the rock. The groundmass consists of felted K feldspar microlites with irregular patches of felsite (devitrified glass) and of mosaic textured quartz (secondary). There is some evidence of autobrecciation textures which are largely masked by the alteration but no indications of a pyroclastic origin.

Alteration comprises abundant epidote and chlorite replacive of phenocrysts and the groundmass. Associated are veinlets and replacive aggregates of calcite together with disseminated pyrite euhedra and aggregates (max 0.5mm). The sulphides are epigenetic.

D. Cowan.

CENTRAL MINERALOGICAL SERVICES

Date 5th February, 1973,

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/1/28 Date Received: 26/1/73.Reference Letter -- 23/1/73Sample No. 28035Nature of Sample: Hand specimen.

DESCRIPTION SECTION No. 10794

a. Hand Specimen:

Grey rhyolitic ? fragmental, K stain positive (major).

b. Microscopic:

Although rhyolitic this rock differs quite markedly from 28034. It consists of variably shattered and bent phenocrysts of orthoclase and oligoclase with lesser strained quartz in a matrix of sutured mosaic quartz and fine grained sericite (? hydro-muscovite).

There are dispersed sericitic aggregates possibly derived from vitric fragments and thus some identity of a pyroclastic origin apart from the shattering of phenocrysts which is in part a result of stress.

Quartz-sericite alteration is accompanied by traces of subhedral pyrite (max 100 μ) which may represent recrystallised diagenetic sulphides. The rock is poorly foliated and sericitic aggregates are incipiently replaced by unorientated flakes of brown biotite suggesting a later phase of low grade contact metamorphism.

D. Cowan.

047
CENTRAL MINERALOGICAL SERVICESDate 5th February, 1973.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/1/28 Date Received: 26/1/73Reference Letter - 23/1/73Sample No. 28037Nature of Sample: Hand specimenDESCRIPTION SECTION No. 10795

a. Hand Specimen:

Green fine grained epidote rock, K stain weak.

b. Microscopic:

This is an extensively altered (saussuritised) medium grained igneous rock thought to be an intrusive. The original rock was of mafic-intermediate composition (dolerite or microdiorite).

The section consists mainly of finely granular epidote, fibrous chlorite and secondary quartz. Altered relicts of plagioclase are abundant and typically enclosed in chlorite forming a relict "ophitic" texture. Primary titaniferous opaques are altered to leucoxene.

Quartz-epidote veins are accompanied by ovoid to subspherical aggregates of quartz which are semi-optically continuous. On the basis of shape these features, possibly represent recrystallised chalcedony spherulites or alternatively (and less likely) vesicle fillings.

Adjacent to one veinlet a fine grained replacive aggregate of quartz and epidote includes a few goethite pseudomorphs of pyrite euhedra. Traces of chalcopyrite may have been present.

D. Cowan.

048

CENTRAL MINERALOGICAL SERVICESDate 10-4-73**SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)**Job No. CMS 73/3/32 Date Received: 30-3-73Reference Note - W. LayerSample No. 64801Nature of Sample: Hand specimen**DESCRIPTION** SECTION No. 11371**a. Hand Specimen:**

Quartzose rock with sulphide veins.

b. Microscopic:

Though rather altered, this rock is regarded as a sheared rhyolite, which has been mineralised.

The rock consists of phenocrysts of quartz showing characteristic corroded and embayed features, and sericite-carbonate pseudomorphs after feldspar phenocrysts. These are set in a microcrystalline groundmass of quartz and interstitial sericite. Flow-banding and other extrusive textures are absent, and the rock is more likely to be a minor intrusive than a flow. A few muscovite flakes are also present.

The rock has been sheared, stressed and fractured. Evidently the fractures were filled with sulphides, manganese oxides and quartz, as well as dark, sideritic carbonate.

The sulphides are galena (up to 0.7 mm across), sphalerite (a very pale variety) with small chalcopyrite inclusions, and euhedral pyrite crystals. The galena and sphalerite are associated with each other and with carbonate, and occur in veins; thus the mineralisation is epigenetic, probably epithermal.

H. W. Fander, M.Sc.

IDENTIFICATION
64801
Mineralised, Sheared, Porphyritic Rhyolite.

049

573050

CENTRAL MINERALOGICAL SERVICES

Date 10-4-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
64802
Porphyritic Rhyolite.

Job No CMS 73/3/32 Date Received: 30-3-73

Reference Note - W. Layer

Sample No. 64802

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 11372

a. Hand Specimen:

Fine-grained, porphyritic felsic rock. K-feldspar stain positive.

b. Microscopic:

This is a porphyritic rhyolite, much finer-grained than 64801 and different in petrological characteristics.

The quartz phenocrysts are corroded and embayed, with sharp, hook-like projections and corners. There are no feldspar phenocrysts, but occasional biotite "books", partly or wholly chloritised. Chlorite pseudomorphs after ? hornblende are also present, and magnetite crystals not uncommon.

The groundmass is extremely fine-grained (average grainsize = 20-30 μ) and is composed of quartz and K-feldspar, with small, aligned flakes of chlorite and euhedral magnetite crystals. Some flow-banding is evident in the section.

The rock is cut by irregular quartz-chlorite veins carrying goethite pseudomorphs after chalcopyrite, as isolated patches.

H. W. Fander, M.Sc.

Q50

573051

CENTRAL MINERALOGICAL SERVICES

Date 10-4-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
64803
Chlorite - Metaquartzite.

Job No. CMS 73/3/32 Date Received: 30-3-73

Reference Note - W. Layer

Sample No. 64803

Nature of Sample: Hand specimen

DESCRIPTION **SECTION No. 11373**

a. Hand Specimen:

Medium-grained, grey, clastic rock with scattered pyrite.

b. Microscopic:

Actually a low-grade metasediment, which is best termed a chlorite-quartz schist or chlorite-metaquartzite. The latter term is probably preferable, since schistosity is not very well developed.

The main constituent is quartz, as angular grains which have developed as small lenses by preferential growth and by tectonic elongation. The original grainsize distribution is still reflected in the present grainsizes.

The interstitial areas between the quartz grains are occupied by fine green chlorite flakes with extremely low birefringence (almost isotropic) showing sub-parallel orientation. Occasional detrital heavy-mineral grains occur, indicating a sedimentary origin for the rock.

Pyrite occurs as isolated euhedral crystals scattered through the rock, sometimes with host-rock inclusions and thus of metamorphic origin.

H. W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 19th February 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. GMS 74/2/16 Date Received: 15/2/74
 Reference Note - RG Barker
 Sample No. 19514
 Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13654

a. Hand Specimen:

Felsic, fine grained porphyritic rock. K stain reaction positive (but weak) in ? groundmass.

b. Microscopic:

This is a trachytic flow brecciated lava, or trachytic tuff-lava; some late stage alteration has occurred which may be responsible for some compositional variations.

The rock consists of numerous well formed albite phenocrysts of various sizes (0.1mm-3.0mm) in a devitrified groundmass. The groundmass shows marked flow-banding on a fine scale, because of inclusions of fibrous crystallites (? pale amphibole). The nature of the devitrified material cannot be determined with accuracy; it may be more quartzose than has been assumed, and thus the rock could be a sodic rhyolite rather than a trachyte.

The rock was evidently brecciated, probably during flow, into patches which must have been still plastic at the time. The interstitial areas are altered, with plagioclase crystals and fragments, fine chlorite, K feldspar and granular zoisite-epidote. Dark, cloudy leucoxene occurs.

A vein of quartz cuts the rock; it contains tremolite fibres and some K-feldspar.

H. W. Fander, M.Sc.

IDENTIFICATION

19514

Trachytic Tuff-Lava

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th February 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/2/16 Date Received: 15/2/74Reference Note - RG BarkerSample No. 19515Nature of Sample: Hand specimenDESCRIPTION SECTION No. 13655

a. Hand Specimen:

Fine grained, pale homogeneous rock. K stain reaction feeble or negative.

b. Microscopic:

This rock appears to be a metasomatised or propylitised basic crystal-lithic tuff. Its uniformity or homogeneity is mainly due to the introduction or development of secondary minerals in a fine tuff of fairly uniform initial composition.

The fragments (average size 0.1-0.3mm) consist mainly of fresh, pale (diopsidic) augite, with andesine plagioclase, leucoxenised opaques, and quartz in minor amounts. Lithic fragments consist of andesine intergrown with augite, ie. andesine microgabbros.

Shapes and outlines of fragments are poorly delineated, because of the development of fine secondary minerals interstitially. However, very vague indications of bedding are recognisable.

Traces of sulphide occur, and were probably introduced with secondary minerals (zoisite-epidote mainly).

This rock is similar to some Crimson Creek Formation tuffs, though perhaps more basic. The remarkable feature is the absence of alteration, especially of the pyroxene. If this rock can be correlated with the Crimson Creek lithology, then it is probably earlier than the main Mt. Read Volcanic episode, though pyroclastics are very widespread in the Crimson Creek.

H. W. Fander, M.Sc.

IDENTIFICATION

19515

Altered, Basic Crystal/
Lithic Tuff

053

573054

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th February 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/2/16 Date Received: 16/2/74Reference Note - RG BarkerSample No. 19516Nature of Sample: Hand specimenDESCRIPTION SECTION No. 13656

IDENTIFICATION
19516
Propylitised Lithic Tuff.

a. Hand Specimen:

Pale, fairly coarse pyroclastic rock. K stain reaction positive on some fragments.

b. Microscopic:

This is a propylitised lithic tuff, dominantly of trachytic composition.

Many of the fragments are highly vesicular or even scoriaceous, with jagged outlines. Many were probably still plastic when deposited and were deformed. The fine grained, vesicular rocks were originally wholly or partly glassy, but are now cloudy and devitrified. The vesicles are commonly chlorite-filled. Other fragments include fine trachytes composed mainly of felted K feldspar laths, and sodic-potassic porphyritic trachytes with well defined albite phenocrysts. Large euhedral albite crystals are conspicuous and have obviously originated from the same source; they are fresh except for patches of replacive zoisite-epidote.

Most lithic fragments range from 1 to 5mm in size and are fairly closely packed. Some welding quite possibly occurred. The secondary zoisite-epidote has penetrated the rock, mainly interstitially, and is cloudy and semi-opaque.

The rock was most probably subaerially deposited from an intermediate-alkaline source.

H. W. Fander, M.Sc.

054

573055

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74

Reference Letter - R. G. Barker

Sample No. 19517

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13920

a. Hand Specimen:

Green grey altered ? fragmental rock, K stain positive.

b. Microscopic:

An altered lithic-crystal tuff consisting essentially of closely packed lava fragments with subordinate feldspar crystals (mainly orthoclase) and a sparse chloritically altered matrix.

Lithic fragments are fairly variable ranging from pumiceous-scoriaceous types to cloudy altered vitric types with subtrachytic alkali feldspar microlites and rare feldspar phenocrysts. Overall composition tends to trachytic (sodi-potassic) or loosely keratophyric. Several fragments have well defined chilled margins and welding is evident in places.

Alteration is marked and of low grade (regional) metamorphic character. Chlorite is pervasive throughout and accompanied by very fine cloudy epidote. Feldspar crystals show variable development of sericitic white mica, minor acicular to semi-fibrous tremolite occurs in some altered fragments. Occasional thin veins of quartz epidote and chlorite are present.

No sulphides detected.

IDENTIFICATION
19517
Altered Lithic-Crystal Tuff ("Ignimbrite")

D. Cowan, B.Sc.

055

573056

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74
 Reference O.N. - Letter - R.G. Barker
 Sample No. 19518
 Nature of Sample: Hand specimen

IDENTIFICATION
19518
Devitrified Rhyolite

DESCRIPTION **SECTION No.** 13921

a. Hand Specimen:

Grey brown fine grained siliceous ? rhyolite, K stain positive (strong).

b. Microscopic:

A devitrified rhyolite with an unusual fragmental fabric evidently resulting from flow- or auto-brecciation.

The rock contains occasional fairly coarse (to 1.5mm) oligoclase phenocrysts but consists mainly of closely packed poorly defined felsite-textured fragments with quartz microphenocrysts (100-200 μ) set in anhedral, quartz and potash feldspar with scattered fine lath-like grains of orthoclase and oligoclase. Quartz (phenocrysts) is the inverted beta variety. Accessory amounts of magnetite and apatite are present. Fragments are sized to about 2mm but are generally less than 500 μ diameter. There is no matrix component, a fabric typical of auto-brecciated lavas rather than tuff lavas.

The rock is weakly but pervasively altered. The secondary phases are sericite, chlorite and green phlogopitic biotite occurring partly as an alteration of feldspar and as numerous thin discontinuous veinlets particularly along the margins of fragments. These features intersect earlier formed (? deuteritic) healed quartz veinlets. They carry disseminations of fine leucoxene-anatase but are devoid of sulphides.

D. Cowan, B.Sc.

058

573057

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
19519
Sheared Altered Porphyritic Rhyolite

Job No. CMS 74/3/6 Date Received: 6/3/74

Reference Letter dated - from R.G. Barker

Sample No. 19519

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13922

a. Hand Specimen:

Grey altered porphyritic ? rhyolite, K stain positive.

b. Microscopic:

A sheared and altered porphyritic rhyolite. Phenocrysts are stressed and locally recrystallised resorbed quartz; stressed sericitised feldspar (mainly orthoclase, subordinate oligoclase) and buckled brown biotite. The groundmass consists of felsitic to microgranular quartz and feldspar with accessory fine grained sub- to euhedral apatite and zircon. The phenocrysts are strongly flow orientated.

Fine grained semi-orientated chlorite and green biotite are pervasive in the groundmass, in pressure shadows on the phenocrysts and as a marginal alteration of the primary biotite. Numerous intersecting sheared veinlets of chlorite and green biotite with granular epidote are present with recrystallisation zones where these phases of shearing can be inferred.

No sulphides detected.

D. Cowan, B.Sc.

057

573058

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74

Reference Letter - R.G. Barker

Sample No. 19520

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13923

IDENTIFICATION
19520
Sheared Sericitised Vitric Crystal Tuff

a. Hand Specimen:

Grey fine grained sericitic rock, K stain weakly positive (? micas).

b. Microscopic:

A weakly sericitised and sheared vitric-crystal tuff of dacitic affinities.

The rock consists essentially of abundant randomly orientated fine (to 50µ) shards and subordinate silt to fine sand sized crystal fragments (quartz and oligoclase) set in a very fine altered matrix of microgranular quartz and "sericite" flakes (illite-hydromuscovite) with rare ?graphite flakes. The shards have crystallised to felsitic anhedral quartz and plagioclase but are essentially unaltered. Occasional non-pyroclastic rock fragments (chert metaquartzite) are present.

Shards and crystal fragments show incipient development of sericitic pressure shadow "tails". Overall the slaty cleavage is not well developed, however there is a tendency for sericite to be orientated in two directions intersecting at about 40-45° in the plane of the section. Thus as in 19519 two phases of shearing can be inferred.

The rock is intersected by occasional irregular sericitic shear planes with orientated graphite flakes and a little fine cloudy leucoxene-anatase. Rare goethite pseudomorphs and cavities after subhedral pyrite (to 100µ) are present.

D. Cowan, B.Sc.

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74Reference Letter - R.G. BarkerSample No. 19521Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13924

IDENTIFICATION
19521
Sheared Chloritised Lithic Crystal Tuff

a. Hand Specimen:

Grey green altered ? fragmental rock, K stain positive (strong).

b. Microscopic:

This is a highly potassic lithic-crystal tuff consisting of feldspar crystals and feldspar porphyritic felsitic lithic fragments in a somewhat sheared felsitic to microgranular quartzo-feldspathic (K) matrix.

Feldspar crystals are mainly orthoclase with subordinate ~~anidine~~-anorthoclase and minor sodic plagioclase. Rare apatite crystals are present but quartz crystals are absent. Overall quartz is markedly subordinate to the alkali feldspars, the rock being of trachytic rather than rhyolitic affinities.

Nonetheless some K metasomatism has occurred this being reflecting in occasional adularia veinlets probably pre-consolidation features as they show evidence of healing where they intersect feldspar crystals.

Pyroclasts show incipient development of chloritic pressure shadows in the weakly sheared/recrystallised matrix. Chlorite flakes, crude veinlets and aggregates with subordinate fine green biotite are pervasive throughout the section.

There are a few oxidised pyrite grains present and patches of goethite possibly derived from sparse fine grained chalcopyrite.

D. Cowan, B.Sc.

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74Reference Letter R.G. BarkerSample No. 19522Nature of Sample: Hand specimenDESCRIPTION SECTION No. 13925

a. Hand Specimen:

Grey porphyritic rhyolite in contact with sericitic schist, K stain positive.

b. Microscopic:

The section is cut through a contact between a porphyritic rhyolite and a sericitic schist (tuffaceous siltstone).

The lava consists of weakly orientated stressed quartz phenocrysts, variably saussuritised oligoclase and completely chloritised biotite phenocrysts in a finely granular quartz-K feldspar groundmass with vague perlitic devitrification textures. The rock has been weakly sheared with pervasive development of fine chlorite and ultrafine sericite in the groundmass. Fine grained secondary magnetite occurs associated with chlorite, granular epidote replacing feldspar and biotite.

The siltstone consists of silt to fine sand sized splintery to subrounded quartz and subordinate felsitic lava fragments in a matrix of well orientated sericitic white mica carrying detrital zircon and apatite grains. Poorly defined relict bedding is sub-parallel to the slaty cleavage.

The contact is convex towards the siltstone, locally sheared and generally vague on a micro-scale due to development of sericite in both rocks. There is no evidence of chilling and although the complete shape of the lava fragment is not known it is evidently a clast or pebble. Relict bedding in the siltstone is weakly deformed but it is not clear which rock was deposited first, the siltstone being ungraded and the incipient compaction of bedding a non-diagnostic facing criteria.

Occasional thin pre-shearing adularia veinlets cut both rocks and the contact.

IDENTIFICATION
19522
Altered Porphyritic Rhyolite/Sericitised Tuffaceous Siltstone

060

573061

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/4/74

Reference Letter R.G. Barker

Sample No. 19523

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13926

IDENTIFICATION
19523
Sheared Chloritic Carbonaceous Sandstone

a. Hand Specimen:

Grey ?carbonaceous sandstone, K stain negative.

b. Microscopic:

This is a sheared carbonaceous (graphitic) sandstone.

The framework (about 60%) is mainly silt to fine sand sized angular to subrounded quartz with subordinate white mica flakes and occasional lithic fragments mainly micaceous quartzite. The sheared/recrystallised matrix consists of platy microgranular quartz with subordinate orientated chlorite and pale green illite-hydromuscovite. Detrital heavy mineral grains (mainly zircon, traces of rutile, leucoxene, sphene and blue tourmaline) occur sporadically and graphite flakes are common in chlorite-illitic areas of the rock.

Thin Fe-stained chlorite veins subparallel to the rock cleavage are present. These are free of sulphides but traces of (oxidised) euhedral pyrite and anhedral dark red sphalerite occur sparsely disseminated throughout the section. Sulphides are of pre-shearing origin.

Much of the detrital quartz in this rock is of volcanic character.

D. Cowan, B.Sc.

061

573062

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74

Reference Letter R.G. Barker

Sample No. 19524

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13927

IDENTIFICATION
19524
Sheared Chloritic Carbonaceous Sandstone

a. Hand Specimen:

Grey graphitic sandstone, K stain negative.

b. Microscopic:

A sheared graphitic sandstone, similar and closely related to 19523.

The detrital framework is fairly well sorted silt to fine sand sized quartz with subordinate white mica, chlorite (? after biotite) and rare, feldspar, quartzite, quartz-mica and quartz-chlorite schist fragments. The matrix consists mainly of weakly orientated flakes of graphite and relatively minor microgranular quartz. Very fine detrital grains of sphene, leucoxene, zircon and rare tourmaline are present.

Crude chlorite veins occur sporadically and these are intersected by displaced quartz veinlets intersected by thin graphitic "shears". Where developed the slaty cleavage is frequently crenulated and at least two semi-distinct phases of shearing have occurred.

Minor fine grained pyrite, a small trace of sphalerite and rare goethite boxworks after chalcopyrite are present.

D. Cowan, B.Sc.

062
CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74

Reference Letter R. G. Barker

Sample No. 19525

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13928

a. Hand Specimen:

Grey sericitic schist, K stain negative.

b. Microscopic:

A sericitic schist derived from a porphyritic dacite.

The rock consists largely of well orientated and weakly crenulated sericitic white mica with subordinate chlorite and minor fine grained quartz enclosing relict stressed and locally recrystallised embayed quartz and variably sericitised oligoclase phenocrysts. K-feldspar is absent and the rock is completely devoid of pyroclastic features.

The grey colour (hand specimen) is due to ultrafine flecks and microscopic films of carbonaceous material (? graphite) presumably of diagenetic origin. Additionally the rock is stained throughout with very fine leucoxenic TiO_2 and secondary limonite.

No sulphides or sulphide-derived textures were detected.

D. Cowan, B.Sc.

IDENTIFICATION

19525

Sheared Sericitised
Porphyritic Dacite

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74

Reference Ketter R.G. Barker

Sample No. 19526

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 13929

a. Hand Specimen:

Grey sericitic schist, K stain negative.

b. Microscopic:

Rather similar to 19525 but in this case possibly a lithic crystal tuff.

The section consists mainly of Fe-stained ultrafine orientated sericite enclosing stressed resorbed relict quartz grains ("phenocrysts") and Fe-stained chlorite pseudomorphs of plagioclase crystals which persist locally as relicts. Occasional poorly defined sericitised fragments of felsite are present and it is on this basis that the rock could be considered as an altered tuff.

The chlorite (?vermiculite) in this rock probably represents degraded/weathered biotite. Traces of graphite occur intergrown with sericite-Fe-staining results at least in part from oxidation of disseminated sub-to euhedral pyrite which occurred as discrete grains (to 100 μ) and small aggregates (to 400 μ) occasionally with sericitic pressure shadows. Traces of chalcopyrite may have been present.

IDENTIFICATION
19526
Sheared Sericitised Dacite (?Lithic Crystal Tuff)

D. Cowan, B.Sc.

064

573065

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 20th March 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/3/6 Date Received: 6/3/74
 Reference Letter R.G. Barker
 Sample No. 19527
 Nature of Sample: Hand specimen

IDENTIFICATION
19527
Chloritised ? Basalt

DESCRIPTION **SECTION No.** 13920

a. Hand Specimen:

Grey green chloritic rock with irregular quartz veins, K stain negative.

b. Microscopic:

A thoroughly altered igneous rock thought to have been a basalt or microgabbro on the basis of sketchy relict textural features.

The rock consists almost entirely of fine grained weakly orientated and crenulated magnesian chlorite stained throughout with ultrafine leucoxene anatase. The chlorite is vaguely pseudomorphous of lath-like plagioclase grains which persist to a very minor extent as relicts in some portions of the section. Elsewhere feldspar is represented by crude sericite semi-pseudomorphs partly of prismatic phenocrysts. There are no recognisable microtextures after mafics (eg. olivine) although the original fabric seems to have been "ophitic".

Granular aggregates and crude veins of quartz are common. These features are weakly stressed and include sparse goethite pseudomorphs of an- to subhedral pyrite and small cavities after ?arsenopyrite. Minor fine grained chalcopyrite was present.

D. Cowan, B.Sc.

065
CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 10th April 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/4/6 Date Received: 2/4/74

Reference Letter - R.G. Barker - 26/3/74

Sample No. 19535

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 14049

a. Hand Specimen:

Grey brown sheared ? rhyolite, K stain positive.

b. Microscopic:

A weakly sheared and sericitised porphyritic rhyolite.

The relict phenocrysts are resorbed quartz, recognisable as the inverted beta (bipyramidal) variety although these grains are now stressed, somewhat rotated and have incipient micaceous pressure shadow tails. These are set in a very fine moderately sericitised groundmass consisting of microgranular quartz-K feldspathic material with orientated white mica flakes distributed around the grain boundaries. There are scattered coarser patches of sericite (illite-hydromuscovite) containing small relict patches of indeterminate plagioclase present. These evidently represent altered feldspar phenocrysts.

Traces of greenish biotite accompany sericite particularly in pressure shadow areas. Biotite also occurs on slightly discordant intersecting microfractures and two semi-distinct phases of shearing seem likely.

Incipient but variable Fe-staining is present. This can be related to oxidised pyrite subhedra with sericitic pressure shadows.

D. Cowan, B.Sc.

IDENTIFICATION
19535
Sheared Sericitised Porphyritic Rhyolite.

066

573067

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 10th April 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/4/6 Date Received: 2/4/74

Reference Letter - R.G. Barker - 26/3/74

Sample No. 19536

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 14050

a. Hand Specimen:

Grey brown sheared fragmental rock, K stain positive.

b. Microscopic:

This is a sheared sericitised lithic crystal tuff.

The rock consists mainly of stressed "volcanic" quartz and orientated sericitised lithic fragments in a poorly defined matrix of orientated/stressed fine quartz and sericite. Much of the quartz present has relict embayments and/or pseudo-inclusions. Lithic fragments are mainly indeterminate but several show relict felsitemicrotextures, a few include quartz crystals. Additionally occasional fragments of orthoclase crystals are present. That the rock was a tuff and not a tuffaceous lithic sandstone is inferred from a distinct lack of detrital features for example definitely sedimentary lithic fragments and detrital heavy mineral grains.

Incipient silicification is evident in development of patches of granular quartz and elsewhere as overgrowths on quartz crystals. These features are now stressed. Probably related are (oxidised) subhedral/poikilitic pyrite crystals common throughout the section. These frequently have sericitic pressure shadow tails.

IDENTIFICATION
19536
Sheared Sericitised Rhyolitic Lithic Crystal Tuff.

D. Cowan, B. Sc.

067
573068

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 10th April 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/4/6 Date Received: 2/4/74

Reference Letter - R.G. Barker - 26/3/74

Sample No. 19537

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 14051

IDENTIFICATION
19537
Sheared Sericitised Rhyolite (? Vitric Crystal Tuff)

a. Hand Specimen:

Light grey brown sheared porphyritic ? rhyolite, K stain positive.

b. Microscopic:

This is a sheared sericitised rhyolite and possibly a vitric-crystal tuff rather than a lava. Unfortunately the pervasive effects of low grade regional metamorphism have largely obliterated the finer textural detail.

The crystals are mainly stressed resorbed quartz accompanied by occasional weakly sericitised (illite-hydromuscovite) orthoclase grains and fairly numerous clots of sericite representing altered plagioclase. These are set in a fine grained sheared "matrix" consisting essentially of semi-poikilitic sheets and fine flakes of sericite replacing anhedral/felsitic quartzo-feldspathic material.

A faint relict flow structure persists in the matrix. Additionally vague shard-like shapes occur in some portions of the section. Thus the rock could be interpreted as a devitrified and subsequently sericitised flow banded lava, alternately an (? ignimbritic) vitric tuff. At this stage there is little to choose between these two.

No sulphides or sulphide-derived textures were detected.

D. Cowan, B.Sc.

038

573069

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 10th April 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/4/6 Date Received: 2/4/74
 Reference Letter - R.G. Barker - 26/3/74
 Sample No. 19538
 Nature of Sample: Hand specimen

IDENTIFICATION
19538
Graphitic Quartz Mica "Schist" with disseminated Pyrite.

DESCRIPTION **SECTION No.** 14052

a. Hand Specimen:

Dark grey laminated ? carbonaceous shale, K stain negative.

b. Microscopic:

This is a graphitic quartz-mica phyllite with disseminated poikilitic pyrite grains.

The rock was originally a finely laminated sediment (shale/siltstone) and much of the mica (muscovite) present represents weakly recrystallised/regrown detrital material. Relict detrital flakes of chlorite (possibly originally biotite) are present as are scattered detrital well rounded heavy mineral grains (tourmaline zircon, rutile).

Layering is now reflected in an alteration of siliceous (microgranular interlocking quartz with intergranular carbonate [? dolomite] rhombs) and relatively micaceous layers. This is intersected by a slaty cleavage at approximately 15° in the sectionplane. Flakes and thin orientated films of graphite are common particularly in micaceous layers.

Pyrite occurs as an- to euhedral grains (to 200µ) frequently with orientated mica inclusions. In its present form the pyrite is ~~post~~-tectonic but could present recrystallised "syngenetic" material. Occasional crude quartz-chlorite-carbonate veinlets are present, these are post-tectonic features.

D. Cowan, B.Sc.

069

573070

CENTRAL MINERALOGICAL SERVICES PTY. LTD.

Date 10th April 1974

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 74/4/6 Date Received: 2/4/74

Reference Letter - R.G. Barker - 26/3/74

Sample No. 19539

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 14053

a. Hand Specimen:

Grey sericitic ? rhyolitic fragmental, K stain positive.

b. Microscopic:

A sheared sericitised porphyritic rhyolite similar and evidently closely related to 19535.

Relict resorbed quartz phenocrysts with inverted beta bipyramidal habit are fairly common and these are accompanied by sericitic aggregates representing feldspar (probably plagioclase) phenocrysts. These features are enclosed in a fairly homogenous sericitised groundmass of anhedral/interlocking (felditic) K feldspar with scattered quartz microphenocrysts.

The rock is devoid of pyroclastic features but is interlocking by numerous sericitic veinlets which are commonly Fe-stained and impart a mesoscopic "fragmental" appearance.

Fe staining appears to originate from disseminated fine grained anhedral sulphide (? pyrite).

IDENTIFICATION
19539
Sheared Sericitised Porphyritic Rhyolite.

D. Cowan, B.Sc.

070

573071

CENTRAL MINERALOGICAL SERVICES

Date 30-4-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/4/24 Date Received: 19-4-73

Reference Note - W. Layer

Sample No. 30291

Nature of Sample: D.D. Core

IDENTIFICATION
30291
Sheared Altered ? Rhyolite/ Acid Tuff.

DESCRIPTION SECTION No. 11528

a. Hand Specimen:

Fine grained grey-green schistose rock,

b. Microscopic:

Because of the strong shearing, and the extensive alteration, the precise nature of the original rock is very difficult to determine. However, it is believed to be in the nature of a sodic rhyolite - microgranite.

The rock consists of lenses and elongate patches of quartz and plagioclase in a fine grained matrix. The quartz patches appear to be corroded relict phenocrysts; the plagioclase sometimes shows twinning and represents fragmented larger crystals, but many patches are untwinned, perhaps recrystallised and altered material.

The matrix consists of fine, foliated sericite, chlorite and carbonate, and is schistose. The matrix could well be sheared igneous groundmass material.

The composition of the rock is "acid" but it could be a sheared tuff or tuff-lava, rather than a minor intrusive or even extrusive type. Primary textures have virtually been obliterated.

RECEIVED
- 3 APR 1973
D. P. CADWELL

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CENTRAL MINERALOGICAL SERVICES

Date 30-4-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/4/24 Date Received: 19-4-73

Reference Note - W. Layer

Sample No. 30292

Nature of Sample: D.D. Core

IDENTIFICATION

30292

Feldspathised Porphyritic
Rhyolite (with Pyrite)

DESCRIPTION SECTION No. 11529

a. Hand Specimen:

Flow-banded or sheared fine-grained pale rock. Patchy K-feldspar staining occurs. Fine pyrite.

b. Microscopic:

The fabric of this rock is mainly due to flow, though minor shearing has also occurred.

It is a porphyritic sodic rhyolite, and has been K-feldspathised in patches; evidently the introduction of potassic material was accompanied by pyrite, which is confined to the K-feldspar patches.

The rock consists of occasional phenocrysts, of quartz (inverted beta quartz crystals) and albite, in a finely crystalline groundmass of quartz, albite and minor K feldspar. The groundmass also contains secondary carbonate and foliated sericite. The irregular patches of feldspathised rock contain virtually no sericite, but fine, poorly-developed K feldspar and small euhedral pyrite crystals; they are otherwise very similar to the surrounding rock.

H. W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date 30-4-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/4/24 Date Received: 19-4-73

Reference Note - W. Layer

Sample No. 30293

Nature of Sample: D.D. Core

DESCRIPTION SECTION No. 11520

a. Hand Specimen:

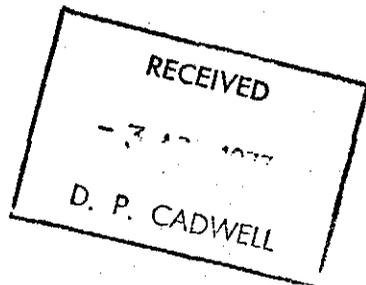
Dark, carbonaceous, pyritic slate or schist.

b. Microscopic:

This is a very finely laminated carbonaceous slate.

It consists of very thin ($<20\mu$) alternating laminae of black carbonaceous material and of "sericite" (probably illite-hydromuscovite) and small streaks and lenses of quartz. Small euhedral pyrite crystals are scattered through the rock and are epigenetic; they cut across the laminae and do not displace or distort them. Occasional thicker layers of quartz are present and may be recrystallized chert.

The rock is cut by veins of varying composition. These veins have moved into fractures of tectonic origin, and also along the laminations; they are composed of massive carbonate with embedded tourmaline crystals, and of chlorite. The veins are thought to post date the formation of pyrite (which is probably redistributed syngenetic pyrite) but some veins contain goethite which may have been sulphide.



H. W. Fander, M.Sc.

073

573074

CENTRAL MINERALOGICAL SERVICES

Date 30-4-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
30299
Quartzose Micaceous Schist with Magnetite.

Job No. CMS 73/4/24 Date Received: 19-4-73

Reference Note - W. Layer

Sample No. 30299

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 11531

a. Hand Specimen:

Greenish sheared rock, slightly magnetic.

b. Microscopic:

Little is known about the rock, because only a polished section was requested.

However, the rock appears to be a micaceous, quartzose schist.

The only opaque mineral detected in the polished section was magnetite. This mineral occurs as small, euhedral crystals with sieve-texture (ie. with inclusions) and is of post-metamorphic formation. A careful examination failed to reveal sulphides of any type. The magnetite itself is devoid of noteworthy features.

RECEIVED
 - 3 APR 1973
 D. P. CADWELL

H. W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date 18-5-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/5/6 Date Received: 9-5-73Reference Note - W. LayerSample No. 30285Nature of Sample: Had specimen

IDENTIFICATION

30285

Porphyritic Potassic
Rhyolite.

DESCRIPTION SECTION No. 11607

a. Hand Specimen:

Pinkish, porphyritic fine-grained igneous rock. K-feldspar stain test strongly positive.

b. Microscopic:

This is a slightly stressed potassic, porphyritic rhyolite, probably extrusive because of evidence of devitrification and flow-banding.

The phenocrysts consist mainly of quartz, showing embayments and magmatic corrosion, and with strain-extinction. There are also occasional phenocrysts of sanidine, usually incomplete; they were probably fractured during extrusion.

The groundmass is very fine grained (<0.05 mm) and is highly potassic, consisting dominantly of K-feldspar. Much of the groundmass was originally glassy and now shows characteristic devitrification textures and small, poorly-developed spherulites.

The rock is traversed by thin fractures containing chlorite and goethite. Occasional, slightly larger patches of goethite are also present and are pseudomorphous after a sulphide, probably pyrite.

H. W. Fander, M.Sc.

075

CENTRAL MINERALOGICAL SERVICESDate 18-5-73**SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)**Job No. CMS 73/5/6 Date Received: 9-5-73Reference Note - W. LayerSample No. 30286Nature of Sample: Hand specimen**IDENTIFICATION**

30286

Porphyritic Sodi-potassic
Rhyolite (Brecciated).**DESCRIPTION SECTION No. 11608****a. Hand Specimen:**

Fine-grained buff coloured, slightly porphyritic igneous rock. K-feldspar stain test positive.

b. Microscopic:

This brecciated porphyritic, sodi-potassic rhyolite verges on a trachyte in composition; it contains no quartz phenocrysts (in contrast to 30285). This rock differs from 30285 in a number of details and is quite possibly unrelated to it despite its classification.

The phenocrysts are albite, euhedral and fresh except for incipient argillisation; they occasionally occur in clusters. Quartz phenocrysts are absent. The groundmass consists of fine K-feldspar and quartz pseudomorphs after tridymite, with very small (euhedral magnetite crystals (as well as occasional larger clusters) of primary origin.

The rock is extensively fractured, and veined by chlorite, albite-laumontite (a zeolite) and quartz. There are also larger quartz patches or fracture fillings, with patches of well-defined chlorite rosettes and isolated albite crystals.

The rock is compositionally and texturally different to 30285.

H. W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date 18-5-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/5/6 Date Received: 9-5-73
 Reference Note - W. Layer
 Sample No. 30287
 Nature of Sample: Hand specimen

IDENTIFICATION
30287
Quartz Sericite Schist or Schistose Volcanic.

DESCRIPTION SECTION No. 11609

a. Hand Specimen:

Grey, fine-grained schistose rock. K-feldspar stain test negative.

b. Microscopic:

Although this rock may be termed a quartz-sericite schist, it may well be a sheared volcanic, possibly a metamorphosed tuff.

It is composed of angular and splintery grains of quartz of variable size, of mosaic quartz (perhaps derived from quartz veins), fragments of plagioclase, and small sericite lenses (representing altered feldspar). The matrix consists mainly of foliated sericite flakes, fine quartz, and thin streaks of leucoxene. Occasional small, euohedral zircon crystals are seen and are regarded as supporting evidence for an igneous/volcanic origin.

The angular to splintery nature of the quartz grains suggests a volcanic derivation; however, this is not very substantial evidence in itself, or even in conjunction with other observations (euohedral zircon, presence of plagioclase). The interpretation is naturally influenced by the field observations.

H. W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date 18-5-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/5/6 Date Received: 9-5-73

Reference Note - W. Layer

Sample No. 30288

Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 11610

a. Hand Specimen:

Fine-grained, grey schist with traces of pyrite. K-feldspar stain test negative.

b. Microscopic:

This is a quartz-chlorite schist, and is a low-grade metasediment belonging to the greenschist facies of regional metamorphism.

It consists of small, stressed grains of quartz, some of which has been drawn-out into small lenses; average grainsize is 0.15-0.2mm, probably near the grainsize of the original detrital grains (ie. fine sand size). The matrix between the grains consists of very fine, recrystallized quartz and parallel flakes of very pale chlorite. The chlorite is an almost isotropic, magnesian variety possibly formed from montmorillonite.

Occasional detrital heavy mineral grains are present, including zircon and tourmaline, and there are streaks of leucoxene. The pyrite crystals may be pre-metamorphic, and there is a possibility that traces of dark sphalerite occur; a check for Zn is recommended to confirm this.

H. W. Fander, M.Sc.

078

573079

CENTRAL MINERALOGICAL SERVICES

Date 18-5-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/5/6 Date Received: 9-5-73

Reference Note - W. Layer

Sample No. 30289

Nature of Sample: Hand specimen

IDENTIFICATION
30289
Quartz-Sericite-Muscovite Schist

DESCRIPTION SECTION No. 11611

a. Hand Specimen:

Grey, fine grained schist. K feldspar stain test negative.

b. Microscopic:

This quartz-sericite-muscovite schist is similar to 30288, except that sericite is a major mineral and chlorite is subordinate.

It consists of angular and splintery grains of stressed quartz ranging in size from 0.05 mm to 0.5 mm and averaging 0.15 mm. Detrital flakes of muscovite occur sporadically, and there are small grains of chert and mosaic quartz. Many of the grains are drawn-out and lens-shaped.

The matrix consists mainly of small, foliated flakes of sericite and pale chlorite, and micro-crystalline quartz. Detrital heavy mineral grains are present. A few euhedral pyrite crystals occur, partly oxidised.

The rock was probably an argillaceous sandy siltstone and has undergone very low grade regional metamorphism (greenschist facies). There is no evidence of pyroclastic components.

H. W. Fander, M.Sc.

079

CENTRAL MINERALOGICAL SERVICES

Date 18-5-73

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 73/5/6 Date Received: 9-5-73

Reference Note - W. Layer

Sample No. 30290

Nature of Sample: Hand specimen

IDENTIFICATION
30290
Sheared porphyritic Potassic Rhyolite.

DESCRIPTION SECTION No. 11612

a. Hand Specimen:

Fine grained, sheared micaceous volcanic rock. K feldspar stain test strongly positive.

b. Microscopic:

This is a strongly sheared porphyritic, potassic rhyolite.

The rock has been sheared into a series of small contiguous lenses, separated by fine chlorite-filled shears. These lenses have a uniform composition, and consist of phenocrysts of quartz and ? sanidine or inverted sanidine, set in a fine grained groundmass.

The groundmass is probably devitrified and now consists dominantly of poorly-refined K feldspar (perhaps a devitrified potash-silicate glass), with fine quartz and secondary chlorite. Very occasional small, euhedral zircon crystals are present.

Parts of the rock are heavily iron-stained with a zonal arrangement unrelated to the shearing direction; this seems to be a superficial phenomenon. There are also quartz-hematite veins.

H. W. Fander, M.Sc.

080

APPENDIX 2

Literature Review; W.R. Layer

FILE MEMO

E.L. No. 4/73

1:100,000 Sophia Sheet 8014

13th March, 1973.

LITERATURE REVIEWROSEBERY - MT. FARREL AREA1. INTRODUCTION.

The data compiled is based mainly on the examination of thesis made available at the University of Tasmania and on a brief investigation of the Stirling Valley Exploration Licence. (see locality map attached). An appendix describing a brief inspection of five sulphide occurrences in the Stirling Valley is attached.

2. GENERAL GEOLOGY.

Geological maps covering the area between Rosebery and Tullah are available at the following scales:

- (1) Brooks (1962), Scale: 1" = 500'
- (2) McKibben (1968), Scale: 1" = 1,000'
- (3) W. Anderson (1972), Scale: $\frac{7"}{10}$ = 1 mile

The central feature in the E.L. is a horizon of slates, tuffs and shales known collectively as the Farrel Slates. With an apparent thickness of 2,000 feet and a north, north east strike, this unit encompasses 15 of the 17 silver-lead sulphide occurrences in the area. Included is the still active North Mt. Farrel mine. While dipping steeply to the west the Farrel slates are thought to face east. That is, they are overturned. McKibben (1968) reports that this evidence is based on graded bedding and ripple marks recorded near the Murchison bridge.

The Farrel slates are bounded on both sides by Mt. Read Volcanics which in turn abutt against uncoformably overlying Ordovician conglomerates and breccias. The latter are situated in the north eastern corner of the E.L. The presence of the above mentioned lithologies was confirmed by the author and J. Martins.

Stratigraphic and structural interpretation of the area between Rosebery and the Stirling Valley is a highly contentious issue. The controversy focuses on the basic question of whether or not the Primrose pyroclastics (enclosing the Rosebery Pb - Zn deposit) are stratigraphically equivalent to the Farrel slates.

As there are no major faults recorded in the volcanic sequence between the Primrose pyroclastics and the Farrel slates, two structural models appear feasible:

- (1) There is a continuous east facing and westerly dipping succession from the Stirling Valley to Rosebery (Brook 1962). If this theory were correct, then the Farrel slates would represent a younger horizon than the Primrose pyroclastics.
- (2) W. Anderson (1972) proposes the presence of several small inclined anticlinal and synclinal structures occurring to the east of Rosebery. The eastern limb of the more western anticline is overturned and is represented by the Farrel slate. Stratigraphic equivalence between the Primrose pyroclastics and the Farrel slates is a possibility within this structural model (see fig. 20 attached).

Braithwaite (1969) favours the first hypothesis on the grounds that lithologies similar to those in the Primrose pyroclastics (ie. lithic or vitric rhyolic tuffs) are absent in the Farrel slates.

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The second hypothesis is supported by W. Anderson (1972) and Solomons (person comm.) whose reasons for advocating a stratigraphic correlation between the Farrel slates and the Primrose pyroclastics are as follows:

- (a) The Farrel slates are associated with Primrose like pyroclastics which is possibly indicative of the extension of predominantly subaerially erupted activity.
- (b) Both Rosebery and the Farrel ore deposits are characterized by abundant lead and low copper values. If both these ore bodies are of a volcanic - exhalative origin (see the Economic Geology section to follow) then abundant lead is probably indicative of their association with rhyolitic volcanism (?).

Furthermore M. Solomon (person comm.) undermines Braithwaite's case (op cit) by stating that to reject stratigraphic equivalence on purely petrological grounds is erroneous as a facies change between the Stirling Valley area and Rosebery is not unlikely.

3. ECONOMIC GEOLOGY.

The major ore deposits in the area are at Rosebery and Tullah. The former has been described by G. Hall et al (1965) M. Solomon, (1964) and Braithwaite (1969). The deposits at Tullah are described by Brook (1962), McKibben (1968) and M. Solomon (1965).

Contemporary ideas on ore genesis favour a strataform origin for the Rosebery ore deposit. (Braithwaite 1969). Two schools of thought still prevail with regard to the one genesis of the Mt. Farrel ore deposits. Braithwaite (1969) states that with respect to the evidence of sulphur isotope studies the Mt. Farrel deposits are possibly remobilized Volcanic - Cambrian sulphides transported

during the Tabberaberran orogeny. M. Solomon (person comm.) ascribes to this view on the basis of sulphur isotope evidence and believes further work at the New North Farrel Mine will substantiate this view. McKibben (1968) and many others consider the Mt. Farrel lodes to be hydrothermal fissure filling deposits formed during the middle Devonian.

The Stirling Valley E.L. contains several small abandoned mines. Brook (1962) makes the following comments on these mines:

(i) The Stirling Valley Mine:

"Structure revealed by these workings is a zone of mineralization striking 27° and dipping 70°E. in sheared and crumpled slate near its contact with fine grained tuff. While the mineralization occurs over a width of 20 feet, high grade ore lies only near the footwall with mineralization working out irregularly into the walls. Ore minerals consist of galena, sphalerite, arsenopyrite, chalcopyrite, pyrite plus quartz and calcite as gangue minerals".

(ii) Green and King Mine:

"Trenching has exposed a lode containing brecciated slate cemented with siderite, quartz and a little galena. The lode could be a continuation of the Farrel lode since it is in close proximity to the western contact of the Mt. Read Volcanics. The lode strikes 355° and dips 70°W."

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(iii) The Thomas Workings:

"A series of fissures striking at 355° and dipping at 65°W. contain lenticular veins of galena, sphalerite and siderite with gangue quartz. The galena assays 65% Pb and 27 - 50 oz. Ag".

(iv) The Tullah Silver-Lead Mine:

The description is similar to the Thomas workings.

4. GEOPHYSICS.

Brook (1972) reports that an S.P. Survey was carried out in the Tullah area by E.Z. (Richardson 1951; report unpublished). The extent of this survey is not known. Several S.P. anomalies were drilled and found to arise from pyritic and graphitic slate.

An E.M. survey by Rio Tinto Australia Limited (McCarthy 1959) reveals the presence of an anomaly within and parallel to the Stirling Valley. Whether this anomaly arises from sulphides or other physical effects is debateable. Brook (1962) reports that an E.M. survey (unknown extent) carried out by the B.M.R. north and south of the New Farrel Mine revealed that at least one of the anomalies (anomaly A) was "not due to economic mineralization". Other E.M. anomalies were not investigated.

5. GEOCHEMISTRY.

No geochemical surveys were recorded in the thesis referred to.

6. GENERAL REMARKS.

Information received from an employee of the New North Mt. Farrel Mine reveals that only 20 mines work on the site. The mining has reached a depth of 1,000 feet.

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7. CONCLUSIONS.

The Stirling Valley E.L. covers 4.5 miles strike length of the Farrel slates which are the host rock to the Mt. Farrel ore deposits.

The genesis of the Mt. Farrel deposits and the stratigraphic relationships of the Farrel slate to the Primrose pyroclastics at Rosebery are controversial issues.

From a practical point of view these controversies allow for the finite probability that the Farrel slates are a potential stratiform base metal bearing horizon . As such the testing of the Farrel slate in the Stirling Valley is a worthwhile exploration venture.

W. Layer

087

REFERENCES

1. W. Anderson (1972) "The Mt. Read Volcanics in the Rosebery Tullah Area". Honours thesis.
2. Braithwaite (1969) "The Geology of Rosebery". Phd. thesis.
3. Brook (1962) "The Geology of the Tullah Area". Honours thesis.
4. G. Hallett (1965) "Lead Ore Deposits of Read - Rosebery" Geology of Australian Ore Deposits Vol. 1.
5. E. McCarthy (1959) "Stirling Valley Geophysical Survey". Report available to Asarco.
6. McKibben (1968) "Geology of the Mt. Farrel Ore Deposits". Honours thesis.
7. M. Solomon (1964) "Spilites, Keratophyres and the Mt. Lyell, Rosebery Ore Deposits. Ph.D. thesis.

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LIST OF ATTACHMENTS

1. W. Anderson (1972) The Geology of the Rosebery - Tullah Area (Map).
2. Brooks (1962) The Geology of the Tullah Area (Map).
3. McKibben (1968) The Geology of the Mt. Farrel Area (Map).
4. W. Anderson (1972) Sketch Section along 8560 (ref. to "1")
5. Appendix: Inspection tour of 5 Sulphide Shows E.L. 4/73.

069

APPENDIX 3

Description of 5 base metal shows

W. R. Layer

APPENDIXINSPECTION TOUR OF 5 SULPHIDE SHOWS - E.L. 4/73

Five hours were spent looking at sulphide deposits in the Stirling Valley. This was done in the company of Mr. J. Smythe of Tullah. He is a well known local prospector who has worked in the Stirling Valley.

The showings visited are known by the following names:

- (a) Thomas Workings.
- (b) Tullah Mine.
- (c) The Mase Mine (not shown on university maps).
- (d) The Midson Mine (not shown on university maps).
- (e) The Turley Mine.

All the deposits contain visible massive sulphides and occur either in quartz or brecciated country rock.

Mines (a) and (e) are enclosed in the Farrel Slates while the other occurrences are situated in the near by volcanics.

All mines with the exception of (d) trend north, north west. The lode at the Midson Mine trends approximatley east - west.

Sulphide mineralization at mines (a), (b) and (c) consist mainly of galena and sphalerite. Mine (d) contains massive chalcopyrite with some bornite. At mine (e) an aggregate of galena, arsenopyrite chalcopyrite and pyrite occurs. In addition minor tin is said to

be present. Mr. Jekyle Smythe (person comm.) says he has seen cassiterite derived from the Turley workings.

CONCLUSIONS.

The occurrences examined appear to be small high grade hydrothermal lead - zinc deposits. The near by Murchison granite presents a likely parent.

Exploration in the area will be complicated by the numerous small lead - zinc occurrences. All sulphide detecting geophysical methods will not discern the small high grade hydrothermal deposits from the larger stratiform type. Stream sediment sampling is rendered unefficient as a result of contamination of creeks by existing mine shafts.

032

573093

EXPLORATION NOTE FILE — RECONNAISSANCE

NO. 309.

Location: Universal Grid: 55 G.CP. 853753.

Property Thomas Block E.L.473
Area Rosebery - Tullah Area
Map Sheet Sophia 1:100,000
State TASMANIA.

Field Check by: W.R. LAYER. Date 5th April, 1973.

Recommended Company Interest Classification: <input type="checkbox"/> First Order <input type="checkbox"/> Second Order <input type="checkbox"/> Inactive <input checked="" type="checkbox"/> None <input type="checkbox"/> Technical	Conclusion: <p style="text-align: center;">The lode represents a typical small high grade hydrothermal deposit. No further work is warranted.</p>
--	--

Notes on Reconnaissance:

A geological map of underground workings covering 200 meters of adit development was compiled. The job spanned a 3 day period and involved the author plus an offsider.

The adit cross cut begins in black slate interbedded with a rhyolite-porphry. Within 11 meters of the adit entrance the westerly dipping interbedded slate horizons give way to massive rhyolite porphyry.

Sulphide mineralization in four places within the workings as follows:

- (a) Minor sphalerite associated with calcite veinlets occurs along cleavage planes within black slate horizons.
- (b) Disseminated galena and sphalerite occurs in rhyolite-porphry over a 2 meter 30 meters from the adit cross cut entrance.
- (c) Massive galena and sphalerite occurs in the back of the adit-drive which is situated 64 meters from the entrance of the adit crosscut. The mineralization is located in fissure with a 330° trend and 60-70 degree dip to the west. This sulphide zone consists of a number of small pods with dimensions determined in one case as being around 40 cubic meters. These pods are connected by attenuated veinlets. Stope development along the 160 meter drive reveals the presence of only 3 pods. The author estimates that between 200 and 500 tons were taken out of the mine.

Sphalerite, galena and quartz form zones within the lode such that quartz and sphalerite lie along the margins and galena in the centre of the pod. This crustification is typical of hydrothermal deposits. Gangue mineralogy consists of quartz, carbonate and fluorospar.

- (d) A vein of galena and sphalerite 25cm. wide occurs along a foliation plane 7 meters east of the drive in the southern cross cut.

Map Attached

Date 5th April, 1973. By W.R. LAYER

098

573094

- 2 -

EXPLORATION NOTE FILE — RECONNAISSANCE

NO. 309.

Location: Universal Grid: 55 G.C.P. 853753.

Property Thomas Block E.L.4/73
Area Rosebery-Tullah Area.
Map Sheet Sophia 1:100,000
State TASMANIA.

Field Check by:

W.R. LAYER.

Date 5th April, 1973.

Recommended Company
Interest Classification:

- First Order
 Second Order
 Inactive
 None
 Technical

Conclusion:

The lode represents a typical small high grade hydrothermal deposit. No further work is warranted.

Notes on Reconnaissance:

A composite sample from the dump above the rise had the following assay:

	Cu	Pb	Zn	Ag	Au
30247:	3900	33,000	112,000	126	0.4

 Map Attached

Date 5th April, 1973. By

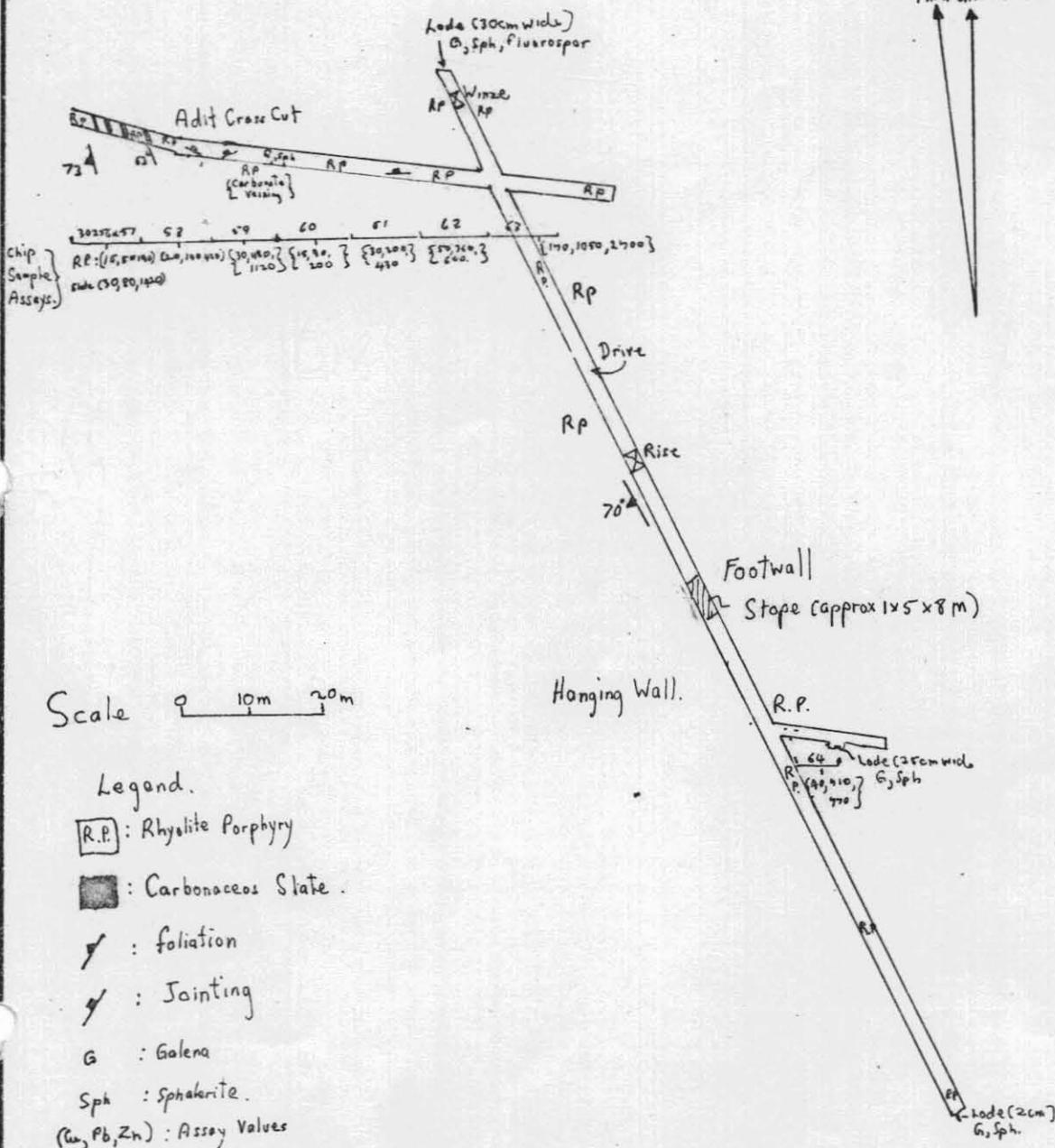
W.R. LAYER

094

Thomas Block.

573095

M.N. G.N. CASARCO B.L. (Stirling Valley)



Scale 0 10m 20m

Legend.

- [R.P.] : Rhyolite Porphyry
- [■] : Carbonaceous Slate
- ↗ : foliation
- ↘ : Jointing
- G : Galena
- Sph : Sphalerite
- (Cu, Pb, Zn) : Assay Values

5 cm

SCALE 1:1000



ASARCO (AUSTRALIA) PTY. LTD.		
Thomas Block.		
Geology of Underground Working		
COMPILED: W.R.L	DATE: 14/4/73.	PLAN NO:
DRAFTED: W.R.L	FILE NO:	

095

573096

EXPLORATION NOTE FILE — RECONNAISSANCE

NO. 310.

Location: Universal Grid 55 G.CP. 852740

Property Midson Show E.L. 4/73
Area Rosebery-Tullah Area.
Map Sheet Sophia 1:100,000
State TASMANIA. (8014)

Field Check by: W.R. LAYER Date 5.4.73.

Recommended Company Interest Classification: <input type="checkbox"/> First Order <input type="checkbox"/> Second Order <input type="checkbox"/> Inactive <input type="checkbox"/> None <input checked="" type="checkbox"/> Technical	Conclusion: The copper mineralization is confined to a shear zone where chalcopryrite gives way to pyrite to the east and southeast. While the Midson Show is too small to represent a target exploration in the surrounding area may justify further interest in the show.
---	---

Notes on Reconnaissance:

The author and offsider spent 3 days chain and compass mapping and area of 140 X 80 meters square. Chip samples were taken along the walls of a cutting and in a nearby adit. In addition grab samples of gossan and country rock were taken for assay.

Sulphide mineralization consists of pyrite, pyrrhotite, chalcopryrite and minor galena associated with sphalerite. These minerals are confined to foliation and joint planes within rhyolite porphyry. Visible chalcopryrite mineralization is limited to an area of 14 X 7 meters square. It is exposed in a cut where veinlets, blebs and localized massive chalcopryrite lies in foliation planes within a shear zone having a 345° trend and steep westerly dip.

Oxidized outcrop adjacent to the cut is characterized by a maroon coloured hematitic encrustation. Pockets of chalcocite and pyrite occur within the hematite.

East and southeast of the cut are pyrite magnetite veins lying within foliation planes which constitute part of the same shear zone exposed in the cut described above. An easterly trending adit located 50 meters south of the cut intersects a pyrite bearing vein.

Alluvium covers the area north-northwest of the copper bearing cut.

Approximately 245 meters west-northwest of the copper shows is a trench exposing massive pyroclastic containing minor veinlets of sphalerite and galena located in joints and foliations.

An interesting feature of the area is the presence of red soils in proximity to sulphide occurrences. This may indicate that soil geochemistry could delineate the extent of copper mineralization in soil covered areas.

Chip sample assays of the mineralized zone yielded the following results:

No.	Cu	Pb	Zn	Ag
30251A:	0.3%	0.04%	0.01%	6ppm.
30251:	0.1%	0.01%	0.02%	4ppm.

Map Attached

Date 5th April, 1973. By

W.R. LAYER

096

573097

EXPLORATION NOTE FILE — RECONNAISSANCE

NO. 310.

Location: Universal Grid 55 G.C.P. 852740

Property Midson Show E.L. 4/73
Area Rosebery-Tullah Area.
Map Sheet Sophia 1:100,000
State TASMANIA. (8014)

Field Check by: W.R. LAYER.

Date 5.4.73.

Recommended Company Interest Classification:

- First Order
- Second Order
- Inactive
- None
- Technical

Conclusion:

The copper mineralization is confined to a shear zone where chalcopyrite gives way to pyrite to the east and southeast. While the Midson Show is too small to represent a target exploration in the surrounding area may justify further interest in the show.

Notes on Reconnaissance:

A grab sample from the dump had the following assay:

No.	Cu	Pb	Zn	Ag
30227:	25%	1.1%	3.6%	380ppm.

Map Attached

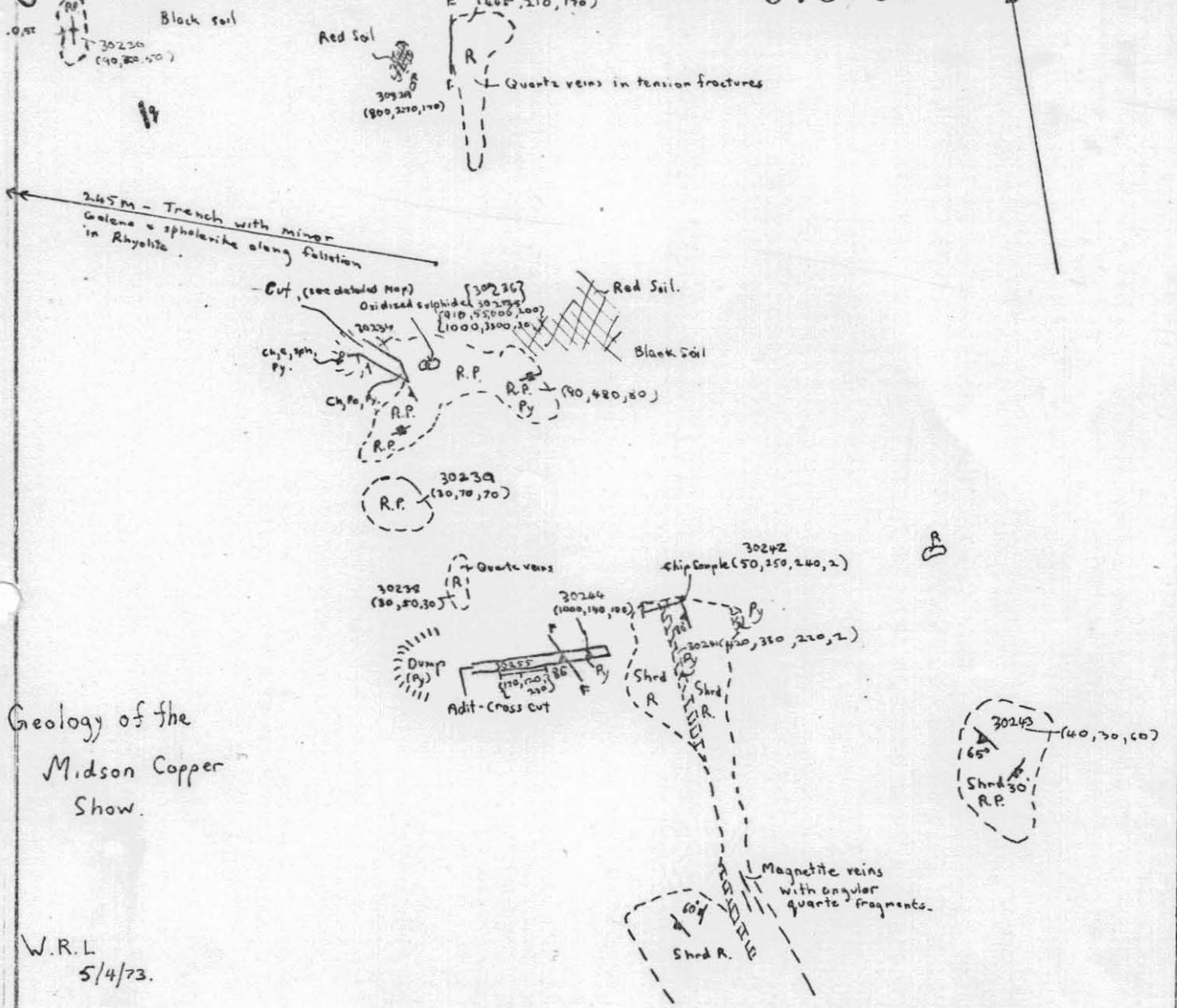
Date 5th April, 1973. By

W.R. LAYER

573098

M.N.

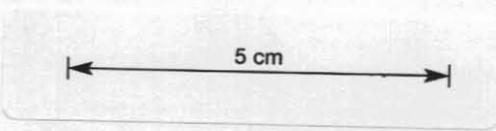
097



Geology of the Midson Copper Show.

W.R.L.
5/4/73.

Scale 1:1000
0 10m.



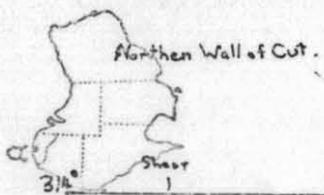
- Legend**
- Pyrite-magnetite-chalcopyrite vein
 - Rhyolite tuff; fine-grained pinkish coloured rock.
 - Rhyolite porphyry: Quartz phenocrysts set in a fine-grained felsic groundmass.
 - Area of red soil after sulphide
 - foliation
 - Joint
 - Sheared rock
 - Ch: Chalcopyrite
 - Sph: Sphalerite
 - G: Galena
 - Py: Pyrite.
- (Cu, Pb, Zn, Ag) : Assay Results.



SCALE 1:1000

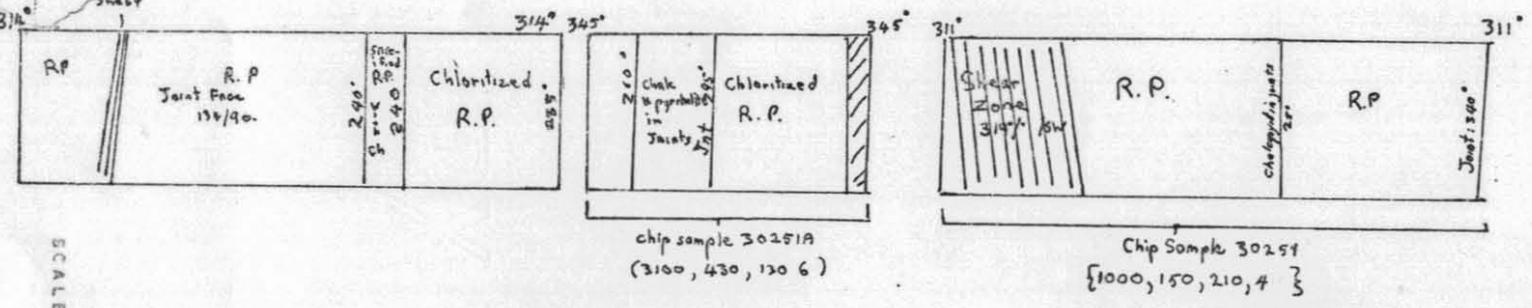
ASARCO (AUSTRALIA) PTY. LTD.		
Geology of the Midson Copper Show.		
Stirling Valley (E.L. 4/73)		
COMPILED: W.R.L.	DATE: 5/4/73.	PLAN NO.
DRAFTED: W.R.L.	FILE NO.	

000



Face of Cut

Southern Wall of Cut



Grab sample taken from dump: Massive chalcopyrite with minor galena and spiculerite
 : (255,000, 11,300, 36,000, 380)

SCALE

Scale: 1:100

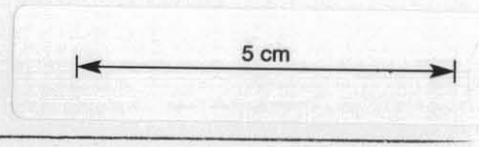
Legend

Quartz vein with chalcopyrite

Rhyolite porphyry

(Cu, Pb, Zn, Ag): Assay Result

W.R.L. 5/4/73



ASARCO (AUSTRALIA) PTY. LTD.		
Midson Copper Show, Stirling Valley (264/73)		
Geology Map of Cut		
COMPILED: W.R.L.	DATE: 5/4/73	PLAN NO
DRAFTED: W.R.L.	FILE NO	

573099

000

EXPLORATION NOTE FILE — RECONNAISSANCE

573100
NO. 308.

Location: Universal Grid Co-ordinate:
55G CP 860742

Property Mase Show
Area Rosebery - Tullah Area
Map Sheet Sophia 1:100,000
State TASMANIA.

Field Check by: W.R. LAYER Date 5th April, 1973.

<p>Recommended Company Interest Classification:</p> <p><input type="checkbox"/> First Order</p> <p><input type="checkbox"/> Second Order</p> <p><input type="checkbox"/> Inactive</p> <p><input checked="" type="checkbox"/> None</p> <p><input type="checkbox"/> Technical</p>	<p>Conclusion:</p> <p>The Mase show is a small, structurally controlled hydrothermal deposit. No further work is recommended.</p>
---	---

Notes on Reconnaissance:

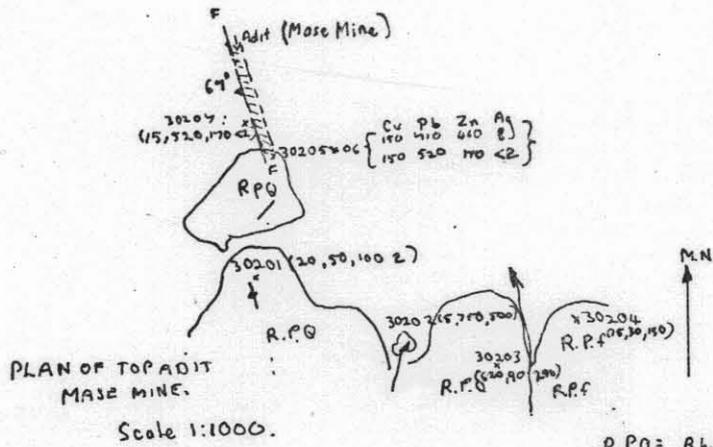
The Mase Ag - Pb show is a small high grade lode situated at the intersection of a westerly dipping shear plane striking at 330° and a vertical joint with a 045° trend. As a result the mineralization plunges south. The host rock is a rhyolite porphyry which is chloritized in the vicinity of the lode.

Two adits exist at the mine site. Only the one adit which is 17 meters long was investigated.

Map Attached

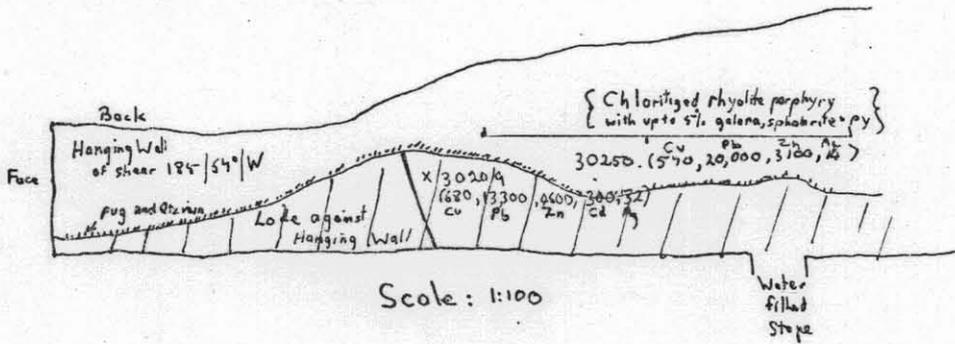
Date 5th April, 1973. By

W.R. LAYER



R.P.Q. = Rhyolite porphyry with quartz phenocrysts
 R.P.F. = Rhyolite porphyry with quartz and feldspar phenocrysts.
 Assay: (Cu, Pb, Zn, Ag)

Plan of Hanging Wall - Mase Mine



SCALE

ASARCO (AUSTRALIA) PTY. LTD.		
Geology of Mase Mine Stirling Valley Mine EL4/73 Tasmania		
COMPILED: W.R.L.	DATE: 5-4-71	PLAN NO.
DRAFTED: W.R.L.	FILE NO.	

101

APPENDIX 4

ASARCO log of E.Z. diamond drill

holes STP101 and STP105

HOLE NO: STP 101

LOCATION: STIRLING VALLEY

DEPTH: 870' CORE SIZE: 0-644' BX DIP INCLINATION: 47° BEARING: 301° 644' - 870' AX

COLLAR CO-ORDINATES: N: 325 (Rio Tinto Grid) LOGGED BY: P.N.W.

E: (See P.M.I. map)

OBJECT OF HOLE: To test the Rio Geophysical Anomalies at their maximum development on the Stirling Valley grid on line 325 at approx. 500' below surface.

<u>INTERVAL</u>	<u>LITHOLOGY</u>	<u>ASSAYS</u>						
		<u>FOOTAGE</u>	<u>RECOVERED FOOTAGE</u>	Cu	Pb	Zn	Ag (ozs.)	Au (dwts)
0 - 301'	<u>Coarse grained rhyolitic tuff. Oxidised to 250'.</u>							
301' - 321'	<u>Tuffaceous slates.</u> Chloritic.							
321' - 375'	<u>Black slates with inter-bedded tuffs.</u>	344'-351'	1' 3"	0.25	1.0	2.8	0.4	< 0.1
		351'-371'	5' 4"	0.10	0.3	0.6	0.25	< 0.1
	341'. Minor red-brown coarse grained sphalerite.							

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<u>INTERVAL</u>	<u>LITHOLOGY</u>	<u>ASSAYS</u>						
		<u>FOOTAGE</u>	<u>RECOVERED FOOTAGE</u>	Cu	Pb	Zn	Ag (ozs)	Au (dwt)
375' - 421'	<u>Coarse grained tuffs</u> with thin black slate interbeds. Sheared.							
421' - 437'	<u>Fine grained rhyolitic tuffs.</u>							
437' - 445'	<u>Black slate</u>	437'-444'	2' 1"	0.67	0.2	0.4	0.15	0.1
445' - 447'	<u>Massive pyrite</u> with trace galena.	444'-447'	1' 3"	0.22	0.1	0.2	2.5	0.4
447' - 560'	<u>Fine - medium grained tuffs</u>	447'-456'	3' 1"	0.02	0.1	0.1	0.25	0.1
	531' - 540'. Quartz vein.	456'-463'	3' 6"	0.01	0.1	0.1	0.25	0.1
560' - 580'	<u>Black slate.</u> Minor fine grained stratiform pyrite.							

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573104

INTERVAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu

Pb

Zn

Ag (ozs)

Au (dwts)

580' - 638' Medium grained tuffs.

638' - 705' Black slate.

038'-644' 2' 6"

0.10 0.15 0.1 0.05

Nil.

638'-640' silicified

644'-654' 2' 9"

0.17 0.1 0.1 0.40

Nil.

with erratic patches

654'-664' 4' 7"

0.10 0.1 0.1 0.20

Nil.

of pyrite and arsenopyrite.

664'-674' 4' 4"

0.20 0.1 0.2 0.15

Nil.

644'-670' 10% pyrite

674'-684' 2' 6"

0.07 0.1 0.1 0.15

Nil.

as coarse grained veins

684'-694' 2' 0"

0.20 0.1 0.1 0.20

Nil.

and fracture fills.

694'-705' 0' 9"

0.55 0.15 0.1 0.40

Nil.

Trace chalcopyrite.

705' - 870' Fine - medium grained

tuffs with thin slate

interbeds.

END

OF

HOLE

COMMENTS:

Recovery in black slate sections is extremely low (40%) and for the entire hole is less than 60%. Deviation is extreme with this hole lifting from a declination of 47° at surface to 6° at 700' ie. a deviation rate of 6°/100 ft.

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573105

HOLE NO: STP 105
LOCATION: STIRLING VALLEY

105

DEPTH: 1062' CORE SIZE: BX DECLINATION: 53° BEARING: 300°

COLLAR CO-ORDINATES: N: 205 (Rio Tinto grid) LOGGED BY: P.N.W.
E: (see P.M.I. map)

OBJECT OF HOLE: To test the I.P., E.M., S.P. and gravity anomalies in the area.

<u>INTERNAL</u>	<u>LITHOLOGY</u>	<u>ASSAYS</u>						
		<u>FOOTAGE</u>	<u>RECOVERED FOOTAGE</u>	Cu	Pb	Zn	Ag (ozs.)	Au (dwts.)
0 - 308'	<u>Massive pyroclastics</u> (agglomeritic?). Base of oxidation at 30' 66' - 127'. Rare sphalerite - pyrite veinlets upto 1/2" thick. 231' to 241' pyrite - sphalerite - siderite veins. Section would run approx. 1% Zn. 256' - 260'. Minor weathering.							

573106

INTERVAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu

Pb

Zn

Ag (ozs.)

Au (ozs.)

308'-327'

Fine to coarse
grained tuffs.
Chloritic.

327'-358'

Fine grained tuffs.
Moderately chloritic
and sericitic.
Approx. 2% pyrite in
blebs and trace
sphalerite.

327'-337'

95%

0.05

0.2

0.2

0.02

Nil.

337'-342'

95%

0.05

0.1

0.2

0.10

Nil.

342'-350'

93%

0.03

0.1

0.2

0.06

Nil.

350'-358'

93%

0.05

0.1

0.2

0.26

Nil.

358'-388'

Fine - medium grained
sericitic tuffs. Pyrite
and trace sphalerite in
blebs.

372'. 6" dacitic dyke.

388'-418'

Medium grained tuff.
Chloritic with minor
pyrite on foliation planes.

573107

107

INTERVAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu

Pb

Zn

Ag (ozs.)

Au (dwts.)

418'-459'

Fine grained tuffs with
minor black slate horizons.

Prominent carbonate
lamellae in the tuffs.

428'-446'. Highly
fractured with quartz veins.
Fault zone.

459'-520'

Medium grained tuff with
minor slate interbeds. 478'
1/4" pyrite-sphalerite veinlet.

520'-592'

Black slate. Highly
fractured with pyrite in
fractures and foliation planes
with sideritic carbonate. Trace
sphalerite.

568'-588'

18'5"

0.10 < 0.1

< 0.1

0.4

< 0.1

Section approx. 3% pyrite.

592'-594'

Quartz vein.

573108

INTERVAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu

Pb

Zn

Ag (ozs.)

Au (dwts.)

594'-608'

Fine grained tuff and
black slate interbedded.

608'-628'

Medium to coarse grained
tuff.

628'-666'

Coarse grained tuff and
agglomerate.

666'-742'

Agglomerate

700'-715' pyrite - sphalerite-
carbonate veins up to ½" thick.

Section runs approx 1% Zn.

742'-875'

Medium grained sericitic
tuff with minor pyrite-
sphalerite - carbonate
veining.

763'-763'6" 5"

0.10 <0.1 <0.1 0.3 <0.1

789'-794'6" 4'10"

0.10 <0.1 <0.1 0.3 1.4

812'6" - 1'6"
814'

0.07 0.2 0.1 0.2 Nil.

573109

INTERVAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu Pb Zn Ag (ozs.) Au (dwts.)

763'. 3" pyrite - arsenopyrite - siderite vein.

855'-862'

3'

0.02 0.1 <0.1 0.2 Nil.

862'-863'6" 1'5"

0.2 0.1 1.1 1.35 <0.1

806' minor galena in

863'6"-867' 3'

0.02 0.1 0.2 0.1 Nil

1/2" quartz vein

867'-870' 3'

0.07 0.1 0.1 0.2 Nil

830'. 1" quartz -

870'-875'6" 5'6"

0.05 0.1 <0.1 0.05 Nil

carbonate - sphalerite - galena vein.

862'-863'. Galena-siderite-pyrite vein with minor sphalerite and trace galena.

875'-887'

Black slate with minor tuff horizons.

887'-898'

Fine grained tuff with minor black slate.

898'-903'

Black slate

Trace galena in quartz vein.

573110

INTERVAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu

Pb

Zn

Ag (ozs.)

Au (dwts.)

903'-913'

Fine grained tuffs.

913'-978'

Black slates. Minor
sphalerite in fractures.

927'. 1' quartz vein
with minor pyrite and
trace galena.

948'. 1" pyrite-sphalerite
vein.

977' 6" massive pyrite -
arsenopyrite.

This section would show assays
of approx. 1%Zn over local
5ft. sections.

978'-981'

Fine - medium grained
tuff.

981'-988'

Black slate.
trace sphalerite.

111

INTERNAL

LITHOLOGY

ASSAYS

FOOTAGE

RECOVERED
FOOTAGE

Cu

Pb

Zn

Ag (ozs.)

Au (dwts)

988'-1040'

Fine-medium grained tuffs
slightly silicified.
Minor pyrite - carbonate-
sphalerite veining.

1040'-1054'

Black slate
3% pyrite or foliation.

1054'-1062'

Interbedded black slate
and fine - medium grained
tuffs.
Trace sphalerite in
carbonate veinlets.

END OF HOLE

COMMENTS:

Most of the core from 918' onwards has been split but there is no record of assays. Minor sphalerite occurs in much of this hole in unassayed sections where it appears to have been misidentified as siderite and many of these sections would run + 1% over 5' - 20'.

573112

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APPENDIX 5

ASARCO interpretation of E-M Survey

C.K. Moss, Salt Lake City

573114

APR 30 1974

EXPLORATION SERVICES DIVISION

3422 SOUTH 700 WEST
SALT LAKE CITY, UTAH 84119

D. M. FLETCHER

April 24, 1974

R. G. B.

Mr. D. M. Fletcher
Perth OfficeMcPHAR E. M. REPORT
STIRLING VALLEY, TASMANIA

Dear Dave:

I have studied McPhar's report which you sent me earlier this month.

Recommendations for any follow-on geophysical work at Stirling Valley surely need to consider your present level of hope for the area. The geologic mapping, geochemistry, and other factors which have entered the picture since I visited the property could be of over-riding importance in planning future activity. Unfortunately, the E. M. results cannot command a great deal of enthusiasm without other supporting evidence of mineral potential.

The McPhar report is pitched at a reasonable key. Basically, McPhar's conductor zones agree with the ones which I had marked. One primary exception is Zone B, where I would prefer my correlation of continuity. In regard to dip of the conductor, if the dip is steeper than 60°, the dip-angle method usually does not give a reliable indication of dip direction -- let alone magnitude. McPhar's recognition of a tendency to east dips is valid. For Zone A-2 the dip is probably quite shallow.

McPhar's comments regarding relative depths to conductors are also appropriate. If costeans are practical (boggy conditions?), then relative depths are especially important, as is an accurate pick of conductor locations. For the latter consideration McPhar's recommendation for additional detail E. M. has some validity.

The recommendation for using I. P. to "pin-point" drilling targets is not persuasive to me. However, if the prospect is a "hot" one, then I. P. should be conducted for the purpose of obtaining additional information to classify zones for testing.

(If we presume that exploration in this environment will continue, then I. P. should be used sooner or later (preferably now) to determine the role which I. P. might play in future projects of this sort.)

Would be pleased to hear of your present sentiments regarding this prospect.

Yours very truly,

Cal Moss

CKM:am

C. K. MOSS

cc: R. J. Lacy
T. C. Osborne

*Copy to P.H.W.
R.C.B. ✓*

APPENDIX 6

Geophysical Surveys in the Sterling Valley; J.B. Boniwell

(for Rio Tinto Australian Exploration Pty. Ltd.)

116

by

J. B. Boniwell

CONTENTS

	<u>Page</u>
GEOPHYSICAL COVERAGE	1
DISCUSSION OF RESULTS	1
(a) Electromagnetic	
(b) Gravimetric	
(c) Magnetic	
PREVIOUS WORK	3
RECOMMENDATIONS	3

Addendum I by J.B. Boniwell

Addendum II by E. McCarthy

PLANS

No. T.515	Electromagnetic Profile, Sterling Valley	1" to 400'
" T.516	Bouguer Gravity Profile, " "	1" to 400'
" T.518	Regional Gravity Gradients " "	1" to 400'
" T.513	Residual Gravity Contours " "	1" to 400'
" T.517	Topographic Contours " "	1" to 400'
" T.514	Vertical Intensity Contours " "	1" to 400'
" T.525	Gravity Traverse on Sterling Mine	1" to 400'
" T.527	Spontaneous Potential Contours Sterling Valley	1" to 400'

N.B.

UNFORTUNATELY THE 1959-GRID, CANNOT
BE PRECISELY LOCATED

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573118

A band of Cambrian sediments enclosed by members of the Dundas volcanic assemblage forms the floor of the Sterling Valley. Interest in this belt is brought into focus by the Tullah lead-zinc mineralization in the North, and the heavy pyritisation at the old Sterling Mine in the South. Schistocities in the Sterling Valley slates apparently link up the two occurrences to the one shear structure.

GEOPHYSICAL COVERAGE

An extensive coverage of the valley South from the Murchison River to the S.P.L. boundary was provided for by a grid of lines out at 400' intervals, pegged at 100' stations, and controlled from a base-line bearing 17 degrees azimuth. Primary electromagnetic surveying was undertaken with a vertical loop excited at 1000 cps. by a motor-generator unit. Auxiliary gravimetric and magnetic coverage provided detail on the anomalous indications of the primary phase.

DISCUSSION OF RESULTS

(a) Electromagnetic (Plan T.515)

One major electrical horizon dominates the grid area, crossing from North to South with but one apparent discontinuity. Between lines 16S and 48S, strengths of the secondary field reach their maximum level, and show uniform field patterns consistent with a steeply dipping, viz. about 75 degrees West, conducting sheet of appreciable dip extent under a shallow cover, circa 10'-20'. To the North of line 16S, although resolved with decreasing amplitudes, this horizon has been traced with certainty to line 20N, and there is evidence that it may continue beneath the alluvial cover right to the Murchison River. However, in this sector, a parallel conducting horizon has been defined in the East, weakening from the Murchison South to line 16N. As the strikes implicit to these geophysical horizons are significantly dissociated from bedding strikes, it is virtually certain that they represent trends in schistocities. Thus, in this event, the weakening North of one and the strengthening North of the other rather suggests that, despite the influence of cover, exaggerated an echelon shearing occurs across the grid area.

In addition, two comparatively minor conductors of finite length have been established in the central part of the grid. Neither are particularly well resolved nor of marked quality, but both are distinguished by differing geologic settings. The more westerly, whilst part under alluvium, can be presumed to be arising from bedded members of the sedimentary series (tuffs?); the easterly from a significantly conducting segment of the slate-volcanics contact.

(b) Gravimetric

Observed gravity data have been reduced to the Bouguer values on the assumption of a near-surface density of 2.67 gms/cc. Profiles of Bouguer gravity are shown in Plan T.516. Regional gravity effects have been removed empirically in a series of curve-fits (depicted in Plan T.519) to provide the residual data. The latter have been contoured (see Plan T.513) only to the extent of emphasising major departures from a zero datum as it is felt that the accuracy of the actual field observations may have suffered in the swampy ground conditions of the valley floor.

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Several patently interesting gravity situations emerge from this breakdown:-

(a) A lenticular region of high gravity in correlation with the conductor-cure-shear in the extreme South. The likelihood that the increased densities so implied here are due to mineralization is heightened by the fact that the Sterling Mine appears on immediate strike, and that the electrical disturbance identified with the shear intensifies just in this region. Just how important this zone could be would be best gauged by a gravimeter check of the Sterling Mine mineralization. However, drilling by the E.Z. Co. of the latter, and the relatively narrow widths intersected there, of the order of 20', rather suggest a gravity expression smaller in magnitude and extent than those obtained in the gravity region under discussion. Thus, it would seem that more massive and/or more widespread mineralization exists here.

(b) A broader region of high gravity peaking on the CL West of the BL. Pertinent conductive effects exist, but are vague and show no consistent correlation with the gravity anomaly. However, the peak magnitude of the residual closure is of an order and character to allow the presence of 10% sulphides in a bedded horizon.

(c) A high gravity closure peaking near the CL East of the BL. Correlating electromagnetic effects are definitely indicated here, although amplitudes are not large. (It should be noted, however, that amplitudes have been suppressed, in comparison with the primary survey, by the use of traverses spaced 400' from the transmitter position). This anomaly assumes importance largely by virtue of its geologic setting (see above), and of a prospect trench at 4E on line 4B in which massive pyrite occurs. It is seen that the local gravity expression at the latter point is minor only, and that the parent gravity system centres at least 400' North where it is of added stature by reason of a coincident magnetic high of over 500 gammas. Thus, it can be presumed that greater amounts of more varied mineralization occur on the CL.

(d) An axis of gravity low immediately North of (c) and striking into the grid area from the SE. There is regional evidence to suppose that this is the axis of a cross-structure, presumably a fault, whose immediate import lies in its possible implications to (c) and to (e).

(e) A distorted region of gravity high North again of (d). Apparent electromagnetic correlations exist on lines 16N and 20N, but not on line 24N. As the gravity closure occurs, apparently, entirely in volcanics through which the conductor axis passes virtually unchanged into other rock-types North, no ready association of gravity with mineralization can be made in this case.

(f) An axis of gravity low striking NE into the grid area across lines 24N to 36N inclusive. It is thought, again, that this feature represents a structural axis whose presence may be of import to subsequent findings.

(g) Two small areas of positive gravity centred on 16S/4E and 40N/BL. Both these are marked by magnetic correlations of a character to presume, at least, the incidence of minor mineralization. Neither, however, possess electrical correlations.

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573120

It should be noted that, apart from the above individual considerations, any evaluation of a zone of residual gravity high must take into account the possible influence of bed-rock topography on anomaly resolution. As surface land forms so often reflect bed-rock behaviour, topographic contours have been compiled in Plate T.517 to allow comparison. It is seen at once that anomaly (e) above is remarkably accounted for by such a surface relief bedrock combination, but elsewhere, on anomalies (a), (b) and (c), the effect, whilst present, is either not clear or inconsistent. It is considered, therefore, that these latter anomalies must largely stand as genuine expressions of excess masses in situ.

(c) Magnetic

Coverage by the vertical intensity variometer has disclosed a number of highly localised magnetic centres, but has revealed virtually no trends in the regional sense (see Plate T.514). Features in the coverage are:-

- (a) the magnetic centre at CI/4E (see above).
- (b) 200 gamma correlation with positive gravity centres at 16S/4E, and at 4ON/BL (see above).
- (c) indications of magnetic mineralization in the gravity-inferred structure between lines 8N and 16N. These appear spasmodic and of an order to suggest only the minor dissemination of magnetic pyrrhotite.
- (d) two large centres on line 16N. Unsupported by other geophysical evidence, these anomalies are of minor interest only, and probably indicate nothing further than the localisation of small amounts of free magnetite, i.e. less than 1%.

PREVIOUS WORK

Self potential surveys of the southern portion of the valley down to the Sterling Mine were carried out in 1957. Unfortunately, the surveys grid cannot be located on the ground, and there is no way of accurately tying this previous work to the present coverage from the existing plans.

Nonetheless, it would appear that negative centres of self-potential were obtained in discrete zones along the shear North of the Sterling Mine up to about line 24S. Although SP. coverage apparently extended further North up to about line 4S, it was virtually all West of the present DL and quite a substantial proportion West of the Sterling River. Thus, another line of SP. anomalies evidently occurs West of the present grid area circa lines 23S - 8S.

RECOMMENDATIONS

Although the history of the Sterling Valley mineralization bespeaks semi-massive pyritisation with little or no grade values, it is felt that the series of geophysical anomalies now outlined should not go untested. Therefore, it is recommended that drilling or trenching should be undertaken with the following initial targets in view:-

- (1) The "contact" anomaly at CI/4E. Drill site: 180' chained West along line of traverse from station 4E on CI, depression -45 degrees, bearing East along line of sight of traverse, estimated length 100'.

Gravity inferred tonnages, however, are not large, being of the order of 450,000 tons of 30% sulphides conservative estimate, and therefore, must even be considered smaller if more massive concentrations are expected. Therefore, widths would be of the same order as the Sterling Mine, that is, circa 20'.

- (2) The "shear" anomaly at the South of the grid. Drill site: 200' chained West along line of traverse from station 2W on line 32S, depression -45 degrees, bearing East along line of sight of traverse, estimated length 550'.

Tonnages indicated on line 32S are 600,000 tons and for the zone, 2.2 million tons of 30% sulphides.

- (3) The "bedded" anomaly at 6W/CL. Drill site: 240 chained West along line of traverse from station 6W on line CL, depression -45 degrees, bearing East along line of sight of traverse, estimated length 500'.

Drilling of these holes should be conditional on subsequent findings, e.g. the gravimetric check of the Sterling Mine mineralization itself, geological and geochemical conclusions, and in the case of DDH. No. 3, on the results of the first two holes. Experience at Gooseneck has shown that the density of a slate rock-type at depth is substantially higher than at surface, and given the inclusion of even minor amounts of sulphide mineralization, densities climb to a detectable level above the volcanic country rock. Broad gravity anomalies result, and it appears probable that the gravity target of DDH. No. 3 may fall in this category. It is because of this effect that trenching is allowed as a possible preferred alternative to drilling, at least on this zone.

1st March, 1959
Zeehan, Tasmania.

J.R. Boniwell,
Geophysicist.

STERLING VALLEY GEOPHYSICAL SURVEYSAPPENDUM I

(S)

A short gravimetric check of the Sterling Mine mineralization was made on the 4th March, 1959. The base point of the single line traverse was placed 100' N. of the old mine shaft. The profile is shown on plan No. T.525.

(T)

The reduced profile is remarkable for its smoothness, in fact, the only departure is a small 0.15 mgal. positive anomaly at station 2W. The underground workings are all East, approximately 60', of the shaft; and whilst the exact collar positions of the seven holes drilled by the E.Z. Co. in 1949 are not known, they all fall within an area 700' along strike by 300' across strike, and, by reason of the short hole lengths, 150' or less, are all obviously grouped to explore the mine lode channel at a shallow depth. Thus, two things are clear: one, the lode itself is situated at about 1E on the gravimeter traverse and has given rise to no gravimetric expression; two, the one-station anomaly at 2W, whatever its pertinence, has not been drilled.

DDH. No. St.P.75 appears to provide the closest correlation with the gravity traverse. This hole intersected variably pyritised slates and tuffs throughout, and a 25' width of semi-massive pyrite (30%) at 120'-145' down-hole. As it is fairly certain that the gravimeter traversed into the porphyries to the West, the lack of a marked contact expression precludes that the density contrast between these mineralised slates and the volcanics is of an appreciable order.

Therefore, in the light of the evidence from this one traverse, the anomalous gravity systems to the North are enhanced insofar as they do not appear to represent a mere slate-porphyry contrast, or mineralization of the order as that at the Sterling Mine. Sulphide bodies of much greater widths and tonnages are indicated. However, the effects of topography, that is, bedrock relief, still remain largely unresolved, as it is seen that the terrain on this traverse, at least in profile, is remarkably regular. This in itself confirms that bedrock effects exist to the North, but provides no clue as to degree and character.

In consequence of the above, drilling recommendations in the Sterling Valley sited on geophysical evidence still warrant implementation.

15th March, 1959.
Zeehan, Tasmania.

J.R. Boniwell,
Geophysicist.

STERLING VALLEY GEOPHYSICAL SURVEYSA D D E N D U M I I

A report on geophysical work in the Sterling Valley area was written by J. Boniwoll. Since that report was written the following work has been undertaken: (1) testing of Afmag equipment (2) the relocation of old S.P. grid in relation to present grid. This will be described briefly.

Electrolytic Zinc kindly consented to having tests made of Afmag equipment on R.T.A.E. ground. On March 7th the Afmag equipment and operator P. Hallof were available for tests at Sterling Valley and in the Chester area. Short tests were made on two grid lines, namely lines 40S and 24N in the Sterling Valley area. On line 40S the Afmag confirmed the presence of a conductor near the base line where the Sharpe vertical loop equipment showed a strong conductor and indicated the presence of a conductor approximately 300 feet east of the base line. On line 24 north the activating field was not sufficiently strong to give any conclusive readings over an area where the Sharpe equipment indicated a conductor of weaker quality than was recorded on line 40S. Operator P. Hallof pointed out that the Afmag activating field is much weaker around noon at the time the tests were made on line 24N.

Spontaneous Potential work was conducted in the Sterling Valley in March 1957. The position of the old S.P. grid can now be located with respect to the present grid. A plan T.527 attached shows the S.P. contours in relation to the new base line. It will be seen that a number of S.P. anomalies form a line along the new base line which corresponds to the position of the conductor indicated by the Sharpe method from grid line 48S to line 12S. The S.P. anomaly is not continuous along the conductor line. The reason for this could be that conditions favourable for active electrochemical action responsible for the S.P. indications do not exist for the entire length of the conductor. The breaks in line of S.P. anomalies correspond with the lower lying ground where the water table is close to the surface of the ground, allowing for no zone of active oxidation.

There are two other zones of S.P. indications; one centered at 4800N, 1100W (old grid) and a second centered at 6800N, 1000W. The first of these strikes in a N-S direction and it is interesting to note that if the line were continued 300 feet southward it would cross line 40S (new grid) at the position of the second conductor indicated by the Afmag equipment on this line.

The S.P. anomaly at 6800N, 1000W corresponds approximately with a magnetic high and a small gravity high on line 16S, also there is some evidence on the electromagnetic profiles to suggest the presence of a conductor zone. All these indications are near the eastern limit of the area surveyed and no conclusions can be made about this zone until the surveys are extended

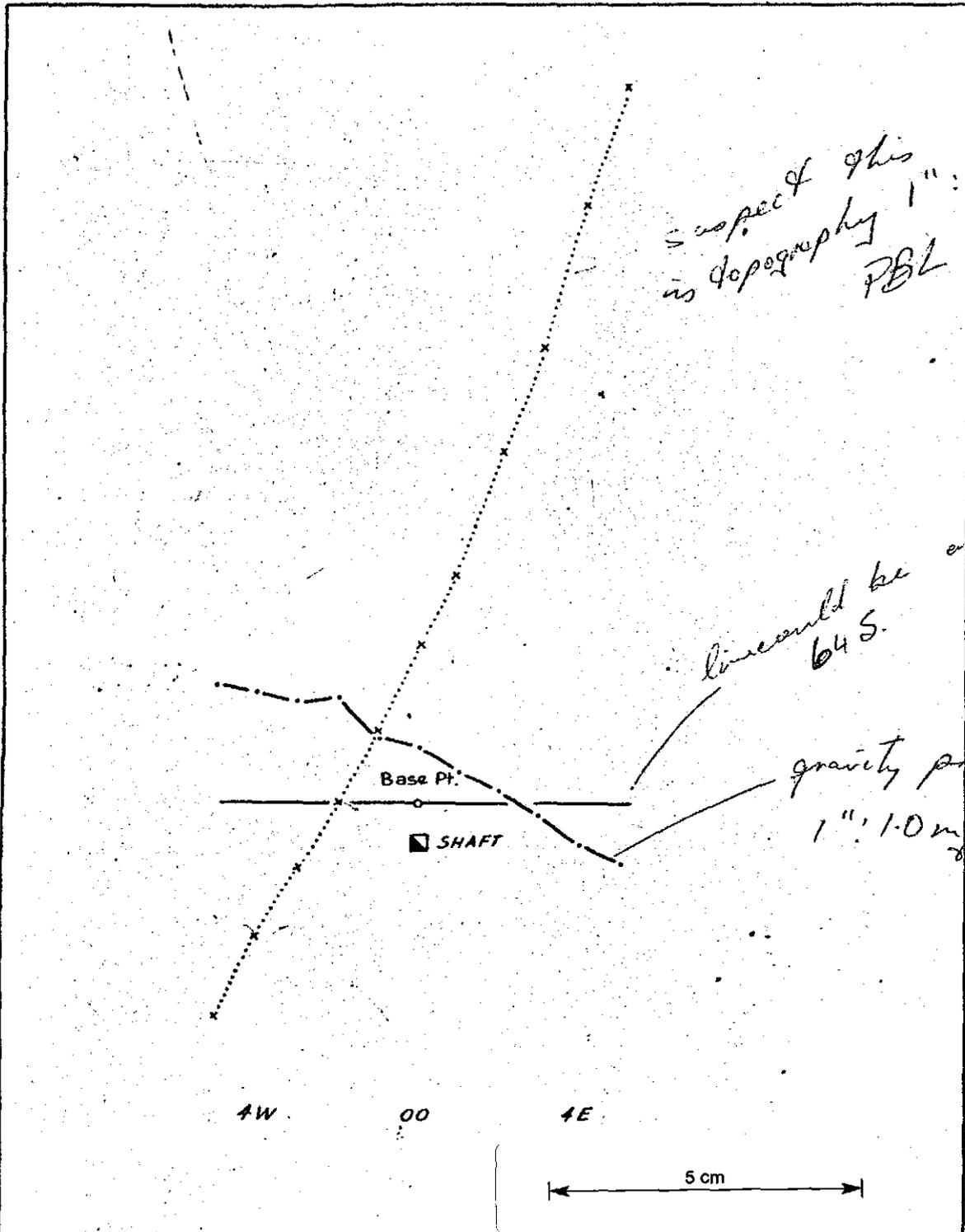
- 2 -

The above does not materially affect the recommendations made in report by J. Boniwell for the drilling of geophysical indications, although it is now evident that there are two conducting zones on line 32S. The hole recommended by Boniwell on line 32S would check the stronger western zone. Further drilling in the area would be dependent upon the results obtained from this hole.

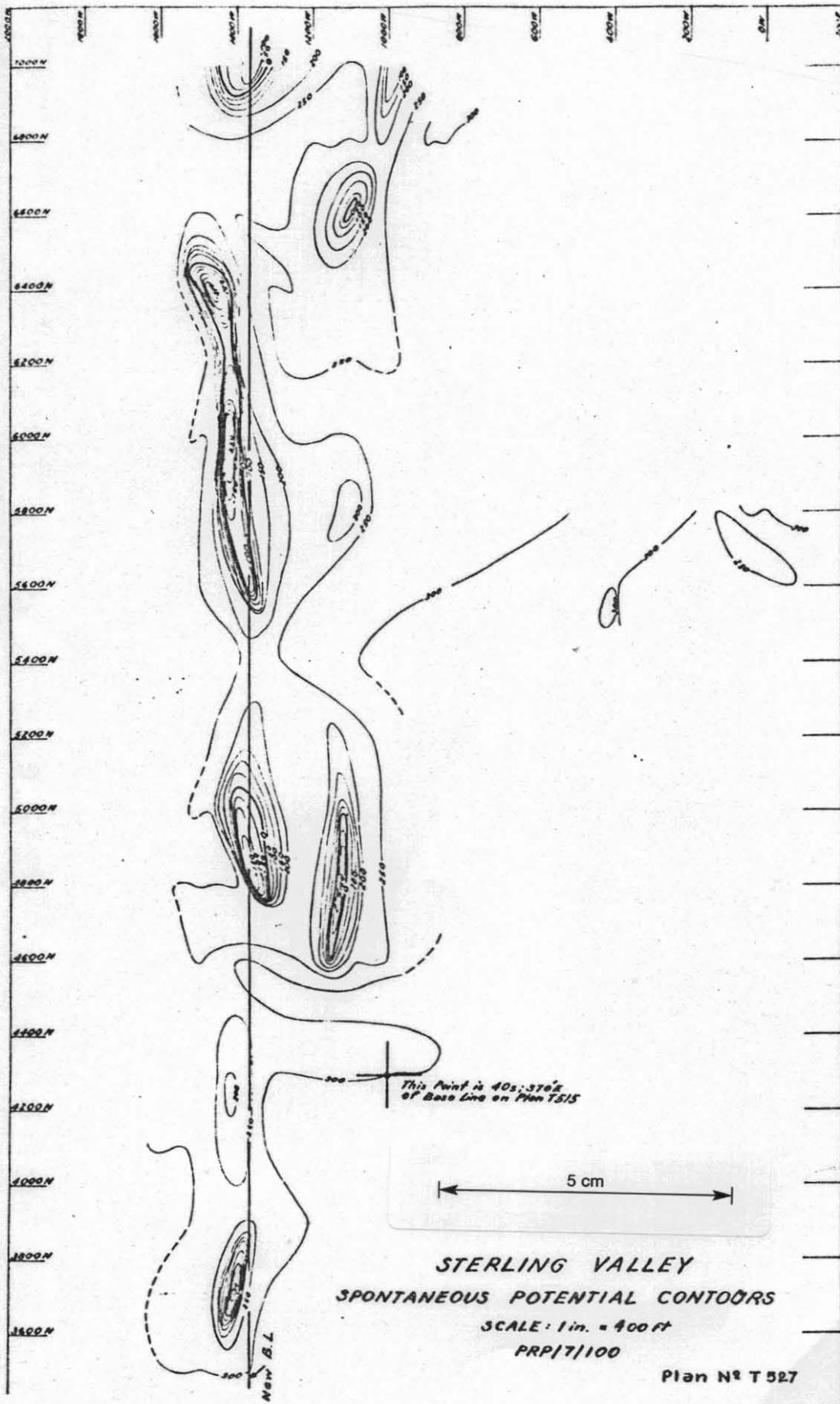
6th April, 1959.

E. McCarthy,
Senior Geophysicist.

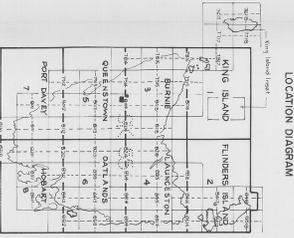
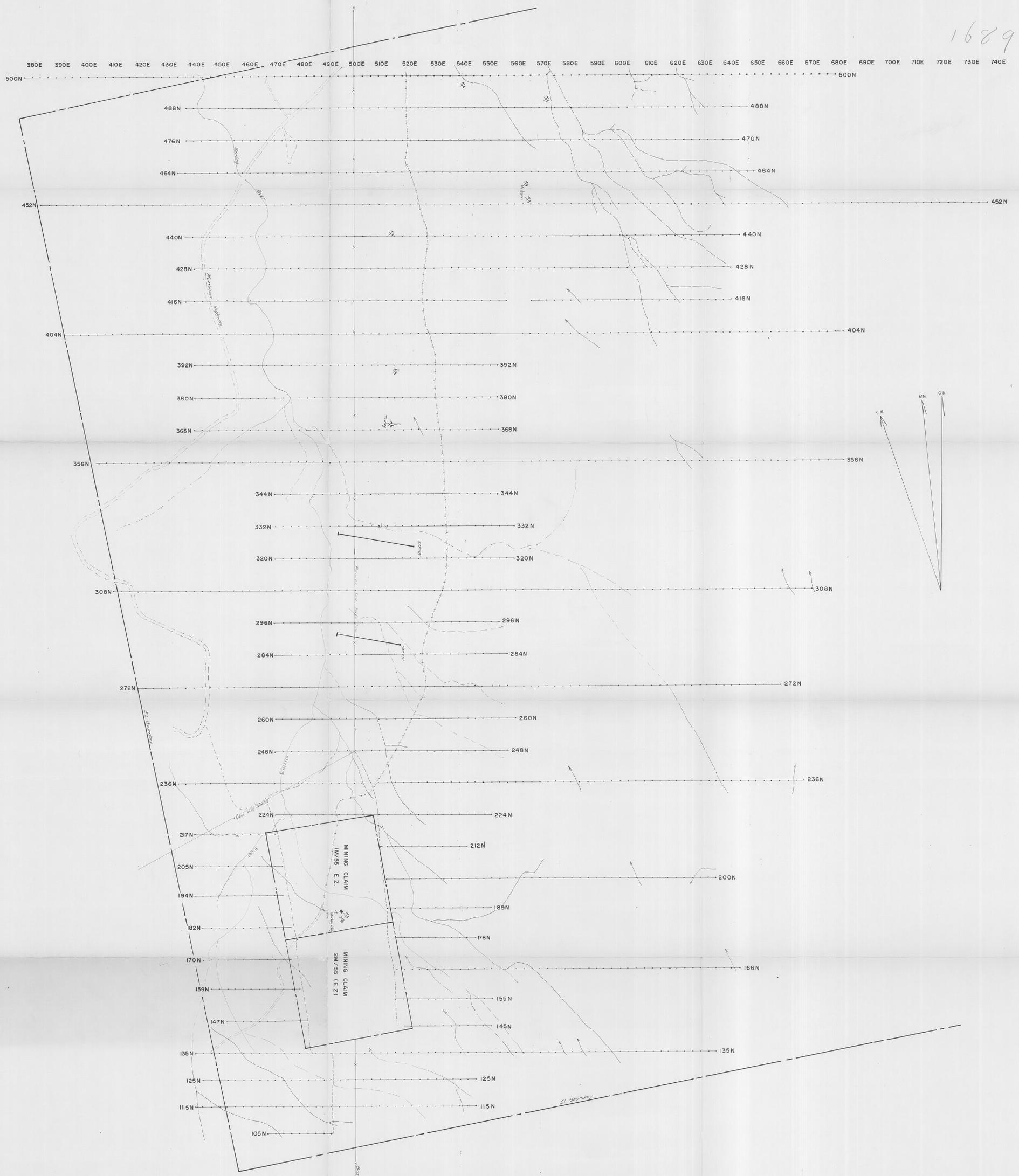
124



RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED			
GRAVITY TRAVERSE ON STIRLING MINE STIRLING VALLEY TASMANIA			
18 th March 1959	SCALES: 0g./in. = 1.0 mgal in. Plan: 1 in. = 400 ft topogr. 1 in. = 20 ft	PRP/7/100	Plan N° T525

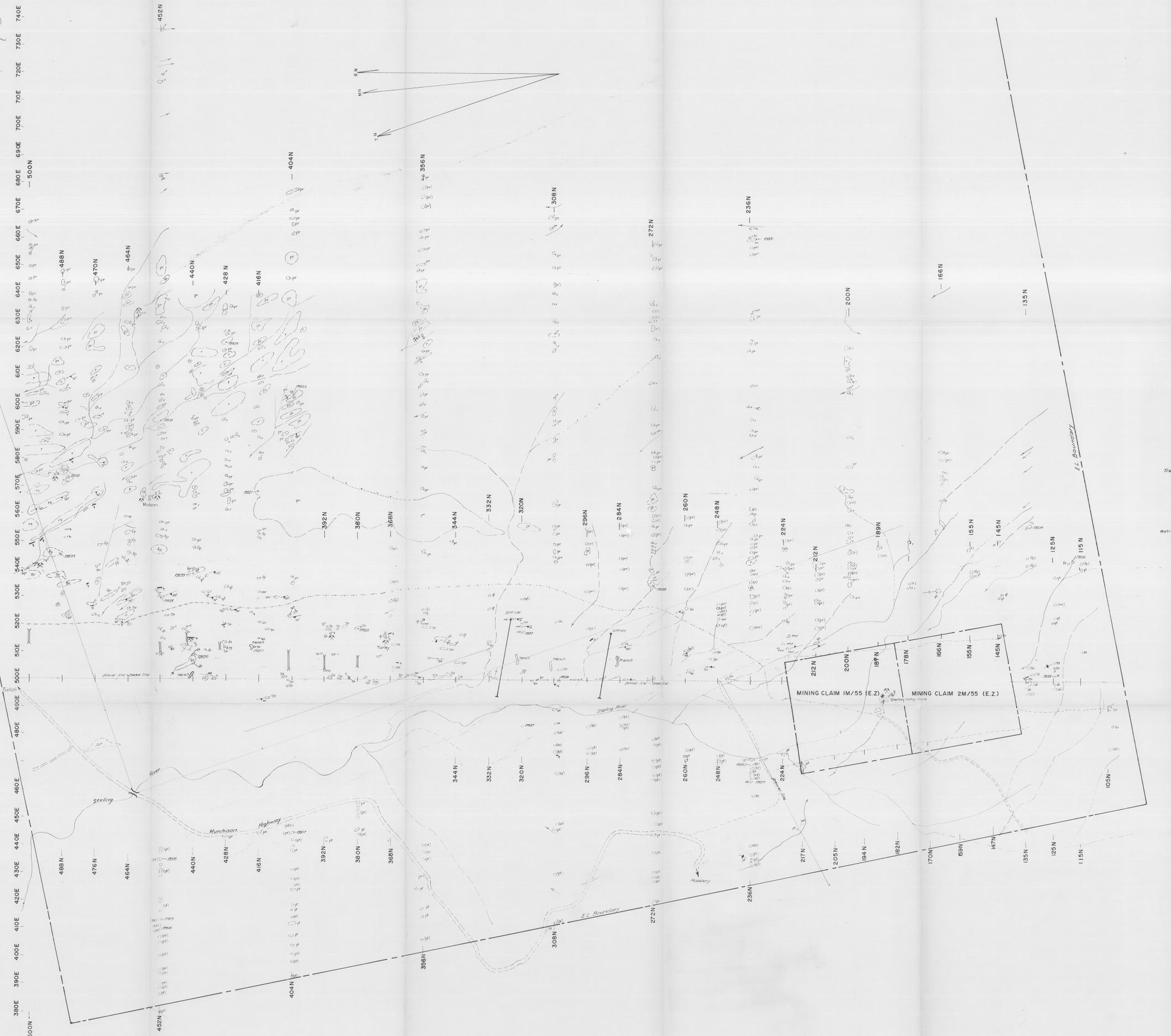


1689



573127 FIG. 1 74-1037
 ASARCO (AUSTRALIA) PTY. LTD.
 EL. 4/7/3, STIRLING VALLEY TASMANIA
 MAPPING GRID
 SCALE 1:5000

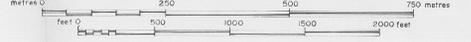
1690



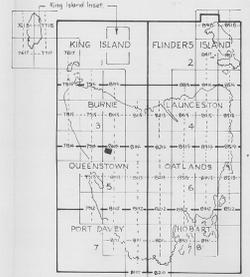
LEGEND

- bi Altered basic ? intrusion
- r Fine grained devitrified rhyolite
- pr Porphyritic rhyolite (*Quartz Phenocrysts*)
Tuffaceous lithic sandstone (ts) and rhyolitic crystal lithic tuff (lt)
- rs Sheared porphyritic rhyolite (? tuff)
- fp Porphyritic rhyolite (*Plagioclase Phenocrysts*)
- qt Fine grained porphyritic rhyolite (*Quartz Phenocrysts*)
- mr Sericitised rhyolitic ? tuff
- sr Sericite schist *Shear's sericitised porphyritic rhyolite and dacite*
basalt siltstone inclusions common
- st Fine grained rhyolitic tuff, chlorite schist, sericite schist and sandstone
sericitised fine grained rhyolite and dacite
- c Black slate
- pt Altered trachytic tuff-lava and lithic tuff
Altered basic crystal lithic tuff - basalt
- Bedding
- Foliation
- Cleavage
- Diamond drill hole, surface projection
- Abandoned mine
- Outcrop boundary
- Float or suboutcrop
- Petrographic sample location
- Walking track
- Vehicle track
- Road
- Creek permanent
- Creek intermittent
- Abandoned railway
- Trench excavated for ASARCO
- Trench previously excavated

SCALE 1:5,000



LOCATION DIAGRAM



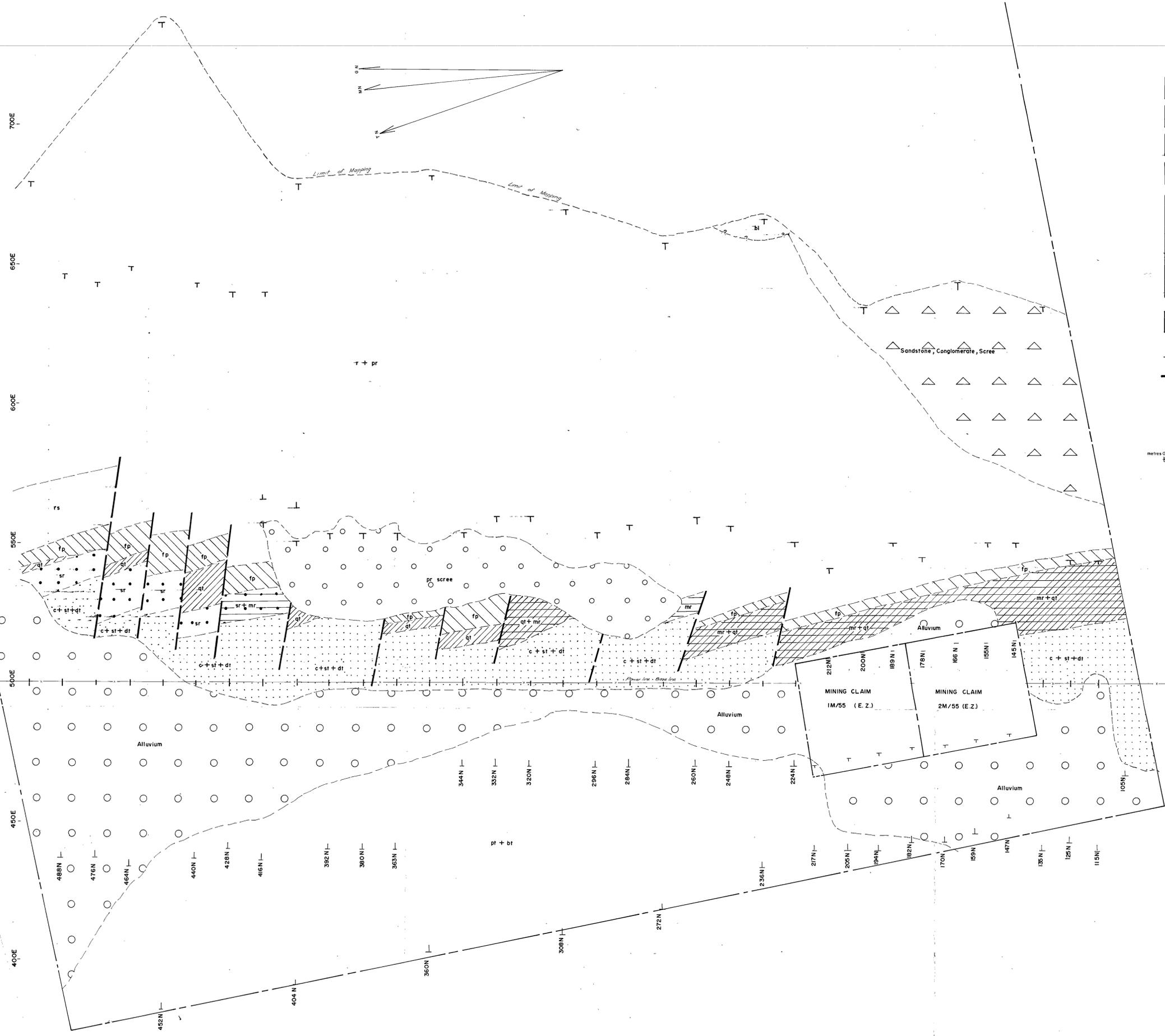
573128

FIG 2 74-1037

ASARCO (AUSTRALIA) PTY. LTD.
 EL 4/73, STIRLING VALLEY TASMANIA
 GEOLOGY - OUTCROP MAP
 SCALE 1:5000

COMPILED R.G.B.	FILE	PLAN NO.
DRAFTED M.J.S.		1157
CHECKED	DATE MAY 74	

1691



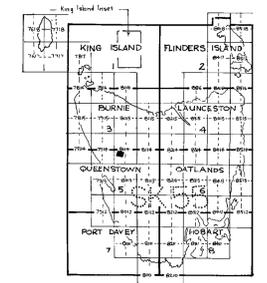
LEGEND

- Quartzite and conglomerate scree below Mt Murchison
- Alluvial and glacial gravel
- Porphyritic rhyolite scree
- Altered basic? intrusion
- Porphyritic and finegrained rhyolite
- Sheared porphyritic rhyolite (? tuff)
- Porphyritic rhyolite (feldspar phenocrysts)
- Fine grained porphyritic rhyolite (quartz phenocrysts)
- Sericitised rhyolitic? tuff
- Sericite schist (Sheared sericitic porphyritic rhyolite and dacite) with black slate inclusions
- Fine grained rhyolitic tuff, chlorite schist, sericite schist, black slate and sandstone sericitic fine grained rhyolite and dacite
- Altered trachytic tuff lava and lithic tuff, altered basic crystal lithic tuff, basalt
- GEOLOGICAL BOUNDARY approximate position
- INFERRED FAULT

SCALE 1:5,000



LOCATION DIAGRAM



573129 FIG3 74-1057
 ASARCO AUSTRALIA PTY. LTD.

EL. 4/73, STIRLING VALLEY TASMANIA
 GEOLOGY - INTERPRETATION
 SCALE 1:5000

COMPILED R.G.B.	FILE	PLAN NO.
DRAWN M.J.U.		1158
CHECKED	DATE May, 72	

1693

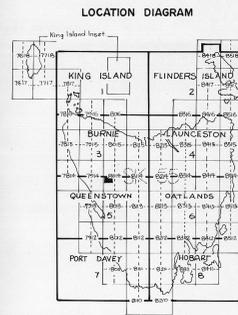


LEGEND

$\begin{matrix} Cu & Pb & Zn \\ Ag & Mn & \end{matrix}$ STREAM SEDIMENT SAMPLE RESULTS

— CREEK

--- BOUNDARY OF EXPLORATION LICENCE



573130

5cm

FIG.5 74-1037

ASARCO (AUSTRALIA) PTY. LTD.

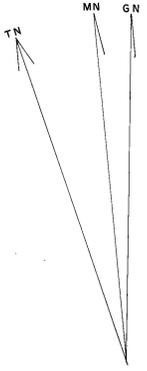
EL 4/73, STIRLING VALLEY TASMANIA

STREAM SEDIMENT SAMPLE RESULTS

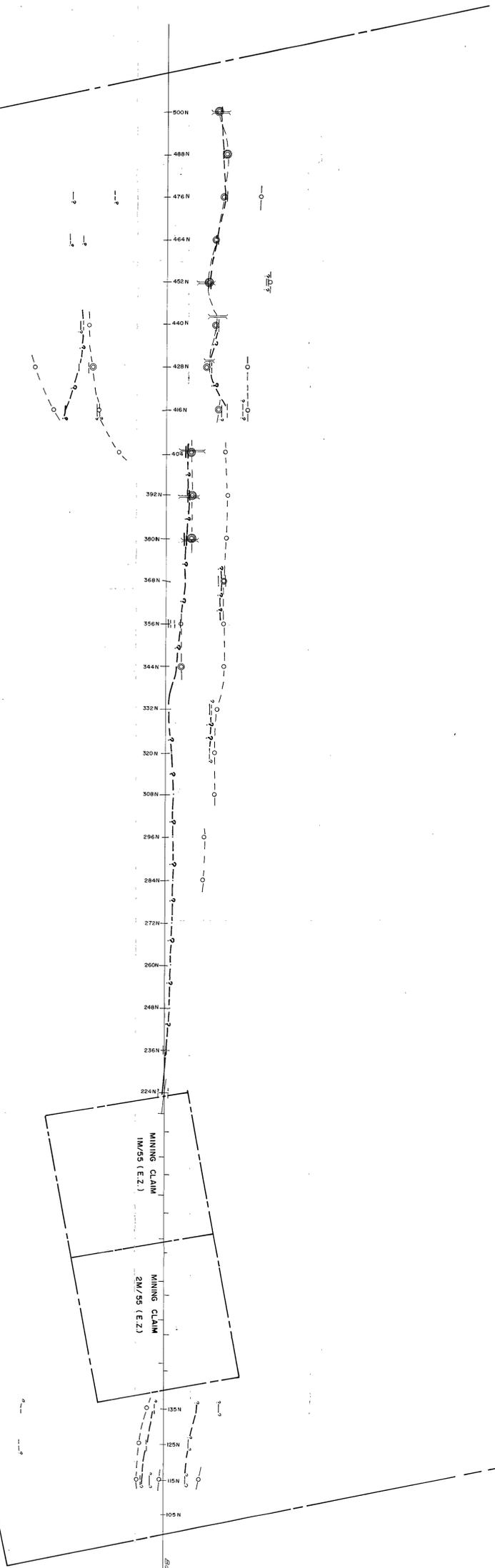
SCALE 1:5000

COMPILED: R.S.B.	FILE	PLANN
DRAWN: H.O.U.	1178	
CHECKED:	DATE: JUNE '74	

1692

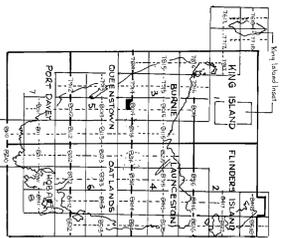


LEGEND
M. PILLAR
5000Hr Conductor
5000 Hr Conductor
Conductor Trench
ASARCO
Intermediate conductor
Weak conductor
Conductor Trench
Trench

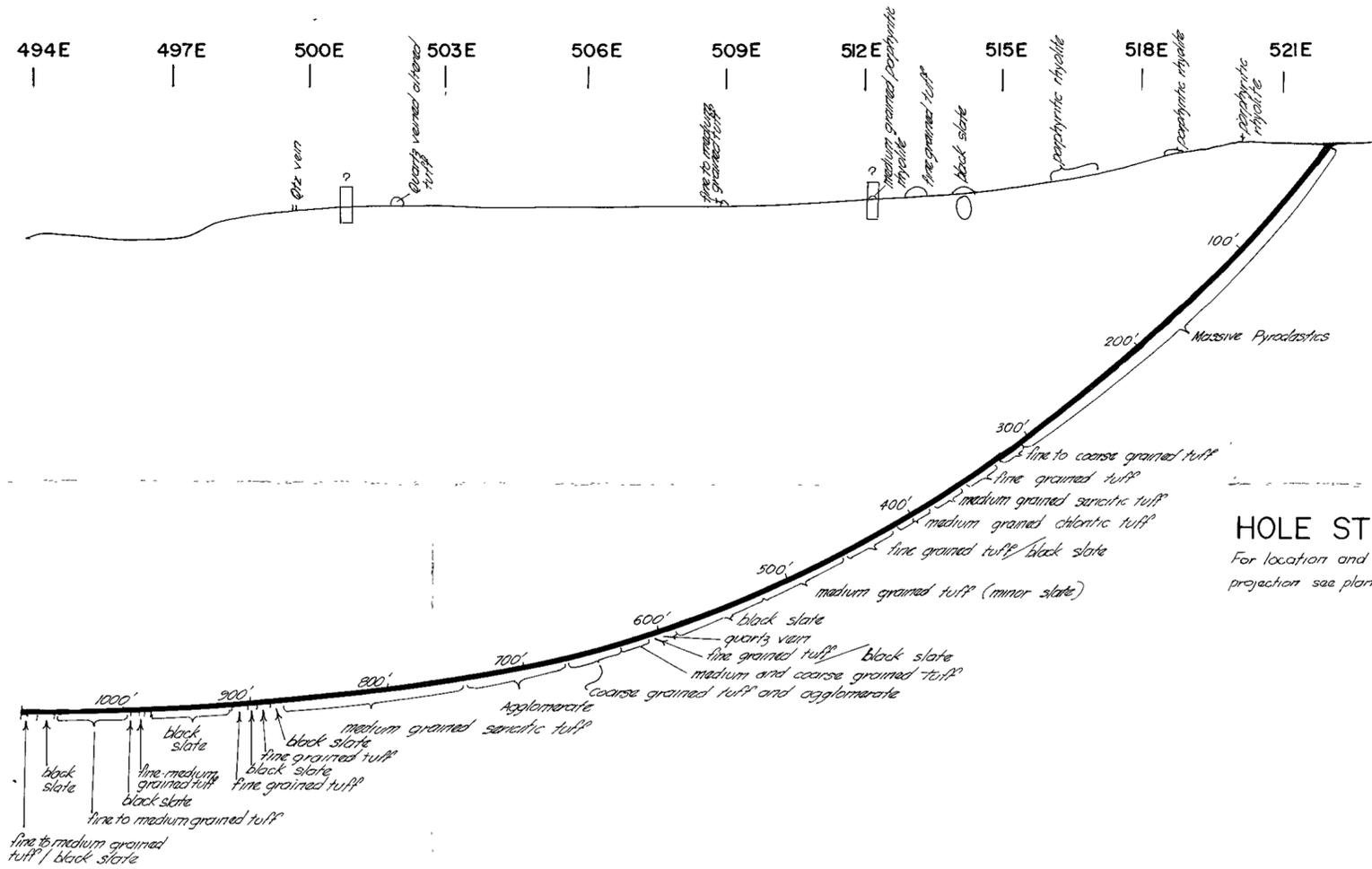


EL Boundary

LOCATION DIAGRAM

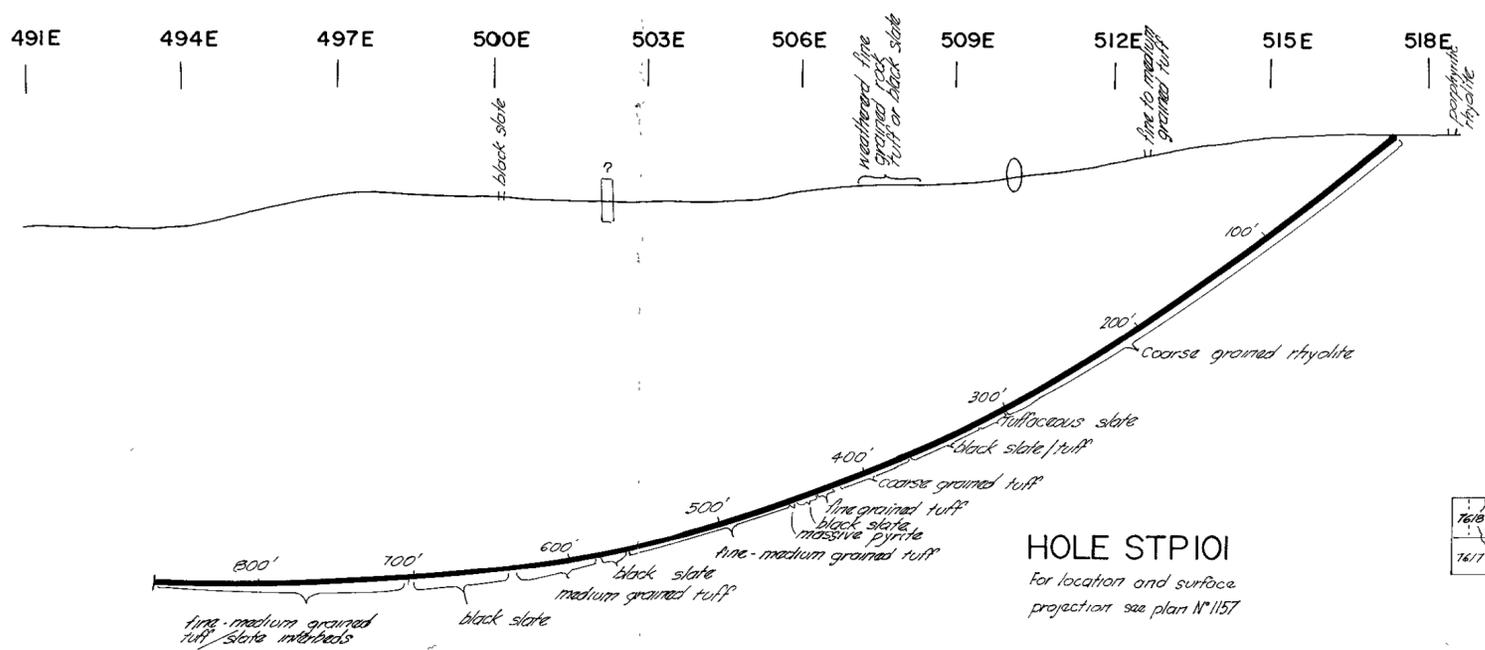
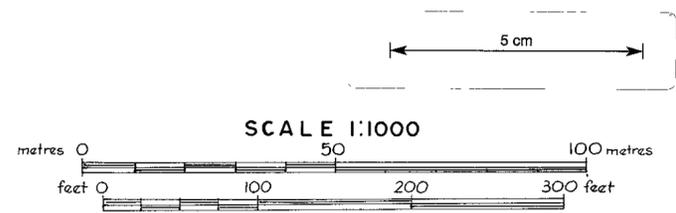


573131 FIG4 74-1087
ASARCO (AUSTRALIA) PTY. LTD.
EL 4/73, STIRLING VALLEY TASMANIA
MERRIMAN VERTICAL LOOP E-M SURVEY
INTERPRETED CONDUCTOR AND TRENCH
LOCATIONS
DRAWN BY: J.S.B. 1179
CHECKED BY: J.S.B. 1179
DATE: 08/07/74

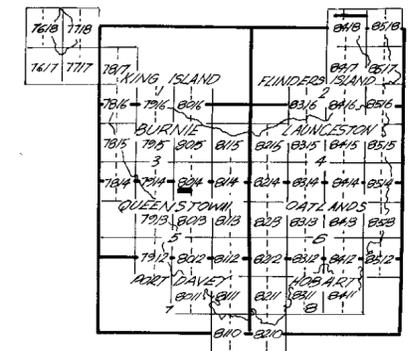


HOLE STPI05
For location and surface projection see plan N° 1157

- E M CONDUCTORS**
 Mc PHAR INTERPRETATION
 ? INFERRED CONDUCTOR
ASARCO INTERPRETATION
 ○ WEAK CONDUCTOR



HOLE STPI01
For location and surface projection see plan N° 1157



573132A. 74-1037

ASARCO (AUSTRALIA) PTY. LTD.

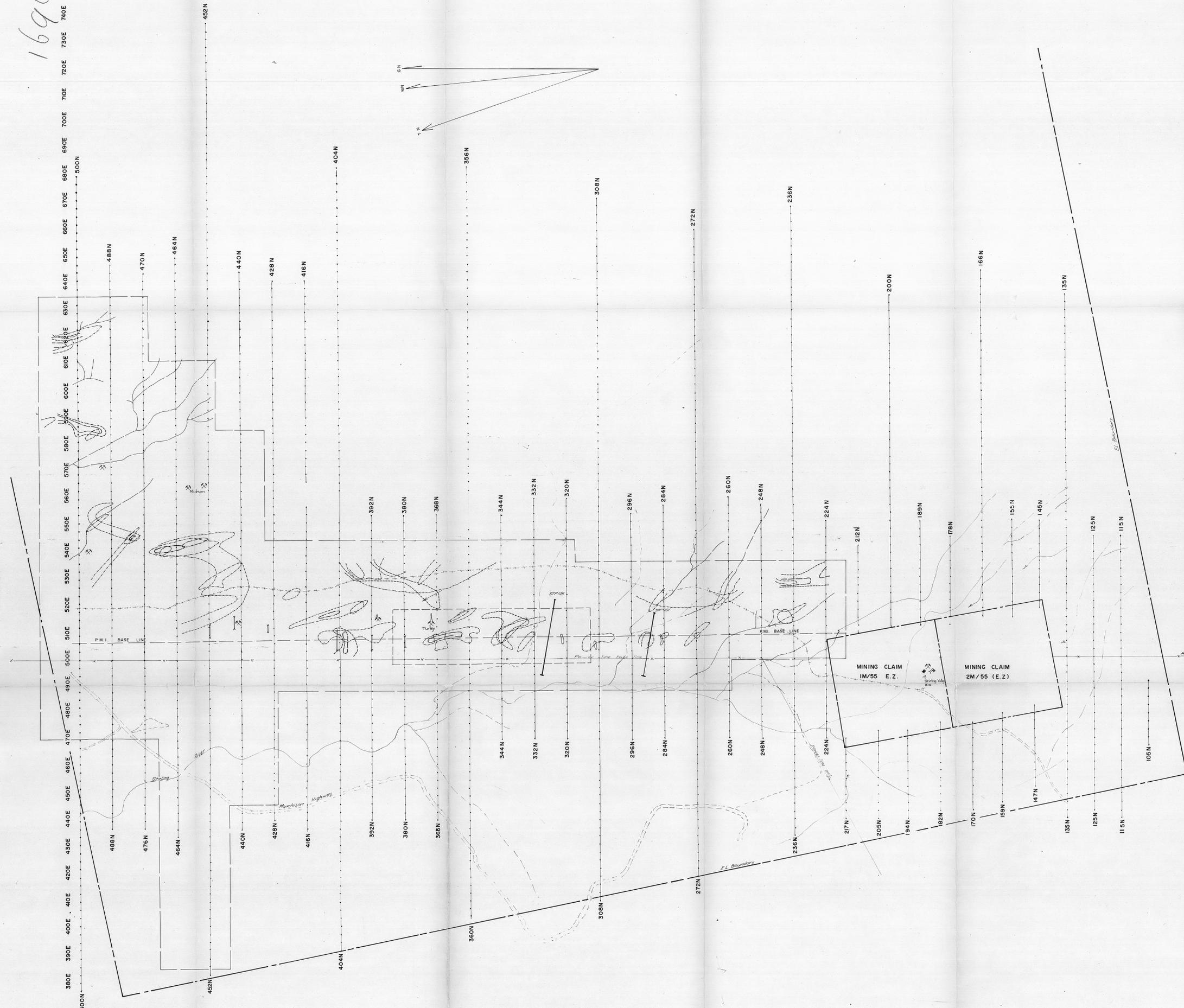
EL 4/73, STIRLING VALLEY TASMANIA

E.Z. DIAMOND DRILL HOLES STPI01, STPI05

CROSS SECTIONS LOOKING NORTH

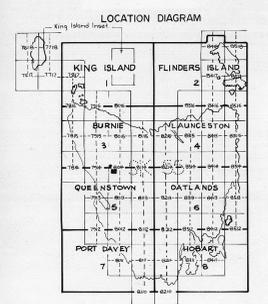
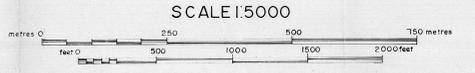
COMPILED: RGB	FILE	PLAN N°
DRAFTED: MJU		1195
CHECKED	DATE: JULY 1974	

1696



LEGEND

Contours	
Cu	
—	100 ppm
- - -	50 ppm
Pb	
—	1000 ppm
- - -	100 ppm
Zn	
—	500 ppm
- - -	100 ppm
- - - - -	Approximate limit, P.M.I.
- - - - -	Approximate limit, detailed soil sampling grid.
I	ASARCO trench.
O	P.M.I. trench.



573133 74-1037

ASARCO (AUSTRALIA) PTY. LTD.

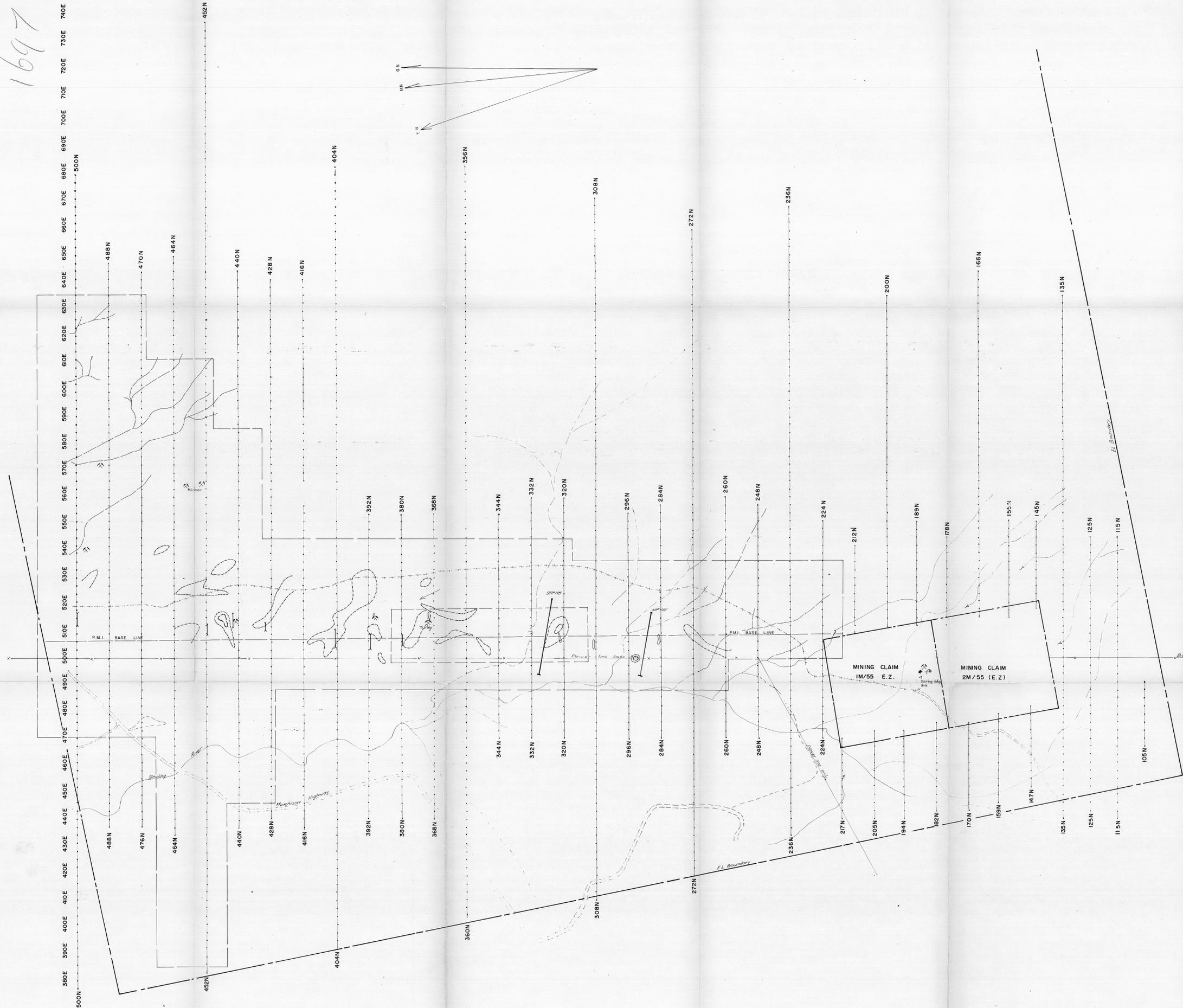
EL 4/73, STIRLING VALLEY TASMANIA

P.M.I. SOIL SAMPLE ANOMALIES

Cu, Pb, Zn

COMPILED G.B.	FILE	PLAN #
DRAWN M.J.V.	DATE MAY '74	1204
CHECKED		

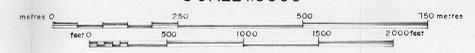
1697



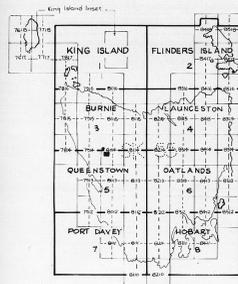
LEGEND

- Contours
- 100 ppm
 - - - 50 ppm
- As
- 1000 ppm
 - - - 100 ppm
- - - Approximate limit, P.M.I. grid.
 - - - Approximate limit, detailed soil sampling grid.
- Y ASARCO trench.
 - O P.M.I. trench.

SCALE 1:5000



LOCATION DIAGRAM



573134 74-1037

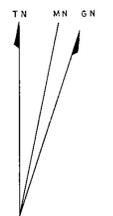
ASARCO (AUSTRALIA) PTY. LTD. ←

EL 4/73, STIRLING VALLEY TASMANIA
P.M.I. SOIL SAMPLE ANOMALIES
Ni, As

COMPILED BY	FILE	PLAN #
DRAWN BY	DATE	1205
CHECKED BY	DATE	MAY '74

FOR DETAIL OF THIS
AREA SEE PLAN 5003

ASARCO GRID AREA
(SEE PLANS 1157 and 1158)



- Alluvium
- Conglomerate, massive, interbedded sandstone
- Lithic crystal tuff, sheared, sericitized
- Rhyolite, porphyritic and fine grained
- Rhyolite, dacite tuff, lava and tuff, sheared, altered
- Granite, granodiorite, adamellite
- Metaquartzite, quartz-mica schist, conglomerate, sandstone

- Geological boundary, position approximate
- Geological boundary, inferred
- Strike and dip of bedding
- Vertical bedding
- Strike and dip of foliation
- Vertical foliation
- Fault, position approximate
- Fault, inferred
- Boundary of Exploration Licence
- Petrographic sample location and number
- Vehicle track
- Foot track, position approximate

SCALE 1:12 000 (approx.)
0 100 200 300 400 500 1000 METRES



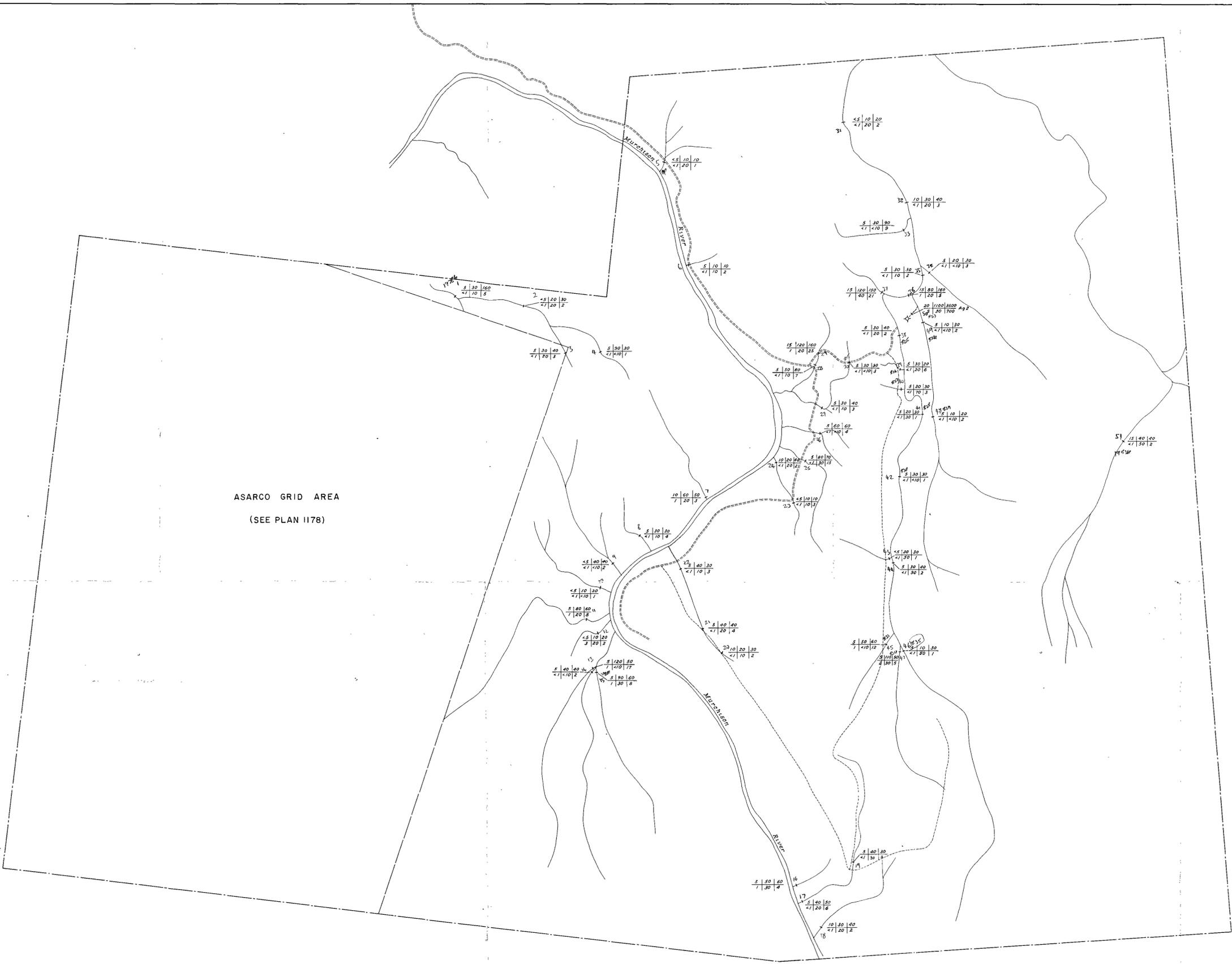
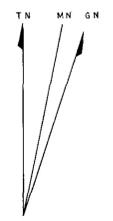
573135 74-1037

ASARCO (AUSTRALIA) PTY LTD

RECONNAISSANCE GEOLOGY MAP
EASTERN EXTENSION
E. L. 4/73
STERLING VALLEY, TASMANIA

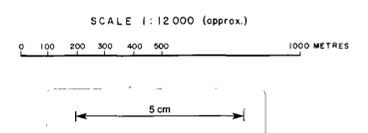
COMPILED RGB	FILE:	PLAN No
DRAFTED Robert G Winchester		5001
CHECKED RGB	DATE: July, 1974	





ASARCO GRID AREA
(SEE PLAN 1178)

- Stream sediment sample location
- $\frac{Cu}{2} \frac{Pb}{12} \frac{Zn}{2}$ Sample results in ppm: all samples
+2 ppm Ag and +5 ppm Mo
- \diamond H.E.C. diamond drill hole
- ===== Vehicle track
- Foot track



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ASARCO (AUSTRALIA) PTY LTD

STREAM SEDIMENT SAMPLE RESULTS
EASTERN EXTENSION
E L. 4/73
STERLING VALLEY, TASMANIA

COMPILED RGB	FILE	PLAN No
DRAFTED Robert G Winchester		5002
CHECKED RGB	DATE July, 1974	

