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GEOPHOTO MINERALS REPORT 1970/96

KOSMINSKY - SOUTH COMET GEOLOGICAL REPORT

by

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INTRODUCTION

As little further drilling or surface exploration has been carried out on this prospect since the completion of Geophoto Minerals Report 1970/38-38A, the following report has been written to supplement rather than succeed the former.

No attempt has been made to reassess the total possible ore tonnages availabe. Rather, the probable tonnages indicated within the present drill pattern have been calculated. These calculations have been based on true widths which it is believed are reasonably accurate. Both strike and dip cosine factors have been introduced to modify lengths of intersections. A chart showing this data is appended. Calculation of true widths has not been attempted where lode geometry is uncertain. True strike patterns of lodes have been assessed by projecting all intersections to a median (-200') level.

A section entitled "Specific Geological Aspects" has been included in this report. Here an attempt has been made to list ideas and observations of the author and others relating to the ore deposits. A summary of geophysical methods suggests those which are most desirable for location of extensions and further mineralised zones in this area.

Finally, some proposals have been made concerning further exploration. These follow closely those outlined in Geophoto Minerals

Report 38 and 38A although it is felt that more use could be made of existing workings to supplement drill hole data. A plan showing some proposed drill holes is enclosed and it is considered that these are necessary to test discontinuities and better determine lode geometry.

THE PROSPECT

The prospect has been divided into six sections. These divisions have been made

(i) at discontinuities between projected correlations of lode horizons,

(ii) at limits of ground which has been subjected to detailed exploration with some diamond drilling.

The six sections are :

I. Northern strike extensions, Comet Creek - D.D.H. K.H. 2

II. The Kosminsky Hill section, D.D.H. K.H. 2 - D.D.H. K.H. 4

III. The Intermediate Section, D.D.H. K.H. 4 - South Comet Creek.

IV. South Comet Creek - Top of South Comet Hill.

V. South Comet Hill - Adelaide Mine Creek.

VI. Adelaide Mine Creek - Mariposa Creek.

Maximum vertical relief over these sections is about 1100 ft. and elevations range from 900 ft. to 2,000 ft. above sea level.

Vegetation ranges from extremely thick secondary regrowth to more open primary growth as in Adelaide Mine Creek where some of the larger trees would be of considerable value for timber. Some almost impenetrable horizontal growth exists on the most southern section and on the higher slopes of Mt. Dundas which are not considered here.

Each of the six sections is considered below in relation to the order of investigation to which they have been subjected.

Section II

Eight diamond drill holes have been drilled in this section and two major and three minor lode horizons are indicated.

The two major ones have been described as the Lunar Landing and Apollo lodes while one of the minor ones has been described as the

Tranquility. The remaining two minor lode horizons appear to be fissures branching off the Lunar Landing lode. However, geometry of these minor zones is virtually unknown at this stage.

The Lunar Landing lode appears to be contained in a 322° (true) striking shear zone which dips between 65° and 70° to the south west. This lode has been intersected in seven of the holes drilled. D.D.H. K.H. 2A a vertical hole, did not proceed far enough to intersect but could possibly be reoccupied.

True widths of intersections in this lode range from 1.7 ft. to 25.3 ft. with total metal ranging from 3.0% to 14.5% and with value averaging approx. $18 a ton. (Total metal refers to Pb and Zn only).

Considering the best section between holes K.H.3 and K.H.6 over the present drilled vertical extent which is approximately 600 ft., the tonnage indicated is 810,000 tons with a total metal value of approximately $18.00 a ton. The strike length considered is 900 ft. and the average true width is 15.7 ft. 10 cu. ft. of ore in place has been considered as being equivalent to one ton.

Providing there is considerable depth extent, then the tonnage which could be expected from this lode is substantial.

The Apollo lode has doubtful geometry but on present indications it appears to strike a little more west of north than the Lunar Landing lode and dips between 45° and 50° west. If this interpretation is correct then the Apollo lode should outcrop some 1,200 ft. east of the Lunar Landing gossan. The former has been intersected in three of the holes drilled. Correlation has been based on mineralogy and the linear relation between intersections. Again, the lode appears to be in a shear zone. Hole lengths of intersections have ranged from 8 ft. to 35 ft. with total metal ranging from 2.14% to 6.54%. The proportion of zinc in this horizon is much less than that in the Lunar Landing, that is, 1:2 in the latter compared with 1:6 in the former.

It should be realised that the basis for the correlation of the three intersections is not strong and other possibilities exist. Dimensions of this lode have thus been considered too doubtful for true widths and hence tonnages to be calculated.

Nevertheless, this Apollo lode horizon appears to have considerable potential since although total metal is not high, the Ag content is quite strong. The moderate widths indicated are also attractive. Some carefully selected drill holes are necessary to better define the geometry of the lode channel.

The Tranquility lode appears to have been intersected in two of the holes drilled but if correlation is correct, its width makes it unattractive at this interval along strike. Since the other lodes have been so erratic in width, however, there are still possibilities at other intervals along strike. This lode is in a broad shear zone which at this point separates the Precambrian from what are at present known as the Transition beds.

Section III

Two diamond drill holes K.H. 7 and 8 have been drilled in this section and two major and three minor lode horizons are indicated.

The two major ones have been described as Snoopy and Charley Brown, while one of the minor ones has been described as Peanuts. The remaining two minor lodes were intersected in K.H. 7 and appear to be continuations of the lodes worked in the Kosminsky Mine (the Mine adits are driven N.N.W. from just north of South Comet Creek).

The Snoopy and Charley Brown lodes are approximately 50 ft. apart and parallel. They appear to dip west at a lower angle than the Lunar Landing but have the same strike to within one or two degrees. These lodes are contained in grey and black micaceous sandy shales (calcareous?) and black graphitic slates of the Precambrian Oonah Quartzite and Slate, and are characterised by a high proportion of massive and disseminated pyrite. They are of marginal grade, 1.8% - 6.6% total metal, and true widths range from 5.2 ft. to 10.1 ft.

These lodes do not correlate precisely with the lodes of Zone II, that is; there may be a cross fault separating them, or; a change in attitude of the controlling structure may have occurred across the boundary separating the Cambrian and Precambrian rocks causing errors in the submitted projection. A carefully planned drill hole is necessary to solve this structural discontinuity.

The Peanuts Lode is similar to the two above but is too narrow and low grade to be of economic significance. It is similar as far as mineralogy and enclosing lithology. It has been intersected in only one hole (K.H. 8) so that geometry is unknown.

The Kosminsky Mine lodes are also too narrow to be significant although they may make at intervals down dip or along strike. They warrant a closer investigation. Enclosing rocks are graphitic slate and light grey - dark grey fine siltstone with numerous partings of pale grey fine sandstone (Hodge slate type).

Section IV

This zone, together with Zone V, and part of Zone VI, is at present under option from J.A. Smyth.

Four diamond drill holes S.C.1, 2, 2A and 3 have been drilled beneath the South Comet Mine workings in this section, and intersections are spaced at 400 ft. intervals along strike. S.C. 2A was drilled from the same site as S.C. 2, to intersect the Main South Comet lode at approximately 1,000 feet below the top of South Comet Hill.

Three major and one minor lode horizons are indicated.

The first of the major lodes has been described as the Main South Comet lode and correlates with the lode worked in the low level adit of the South Comet Mine. The second has been described as the Lucky lode as, although a minor mineralised zone was known to exist from holes S.C.1 and S.C. 2, the major intersection in S.C. 2A came completely by surprise. The third of the major lodes is unnamed and was intersected in S.C.1 only.

The minor lode horizon appears to be a fissure branching from the Main South Comet lode. It has been intersected in only one hole (S.C.2) and its geometry is unknown.

The Main South Comet lode has been intersected in all four holes drilled. It apparently consists of multiple lenses. It is contained in a well defined shear zone which has a mean strike of 332° true and dips between 65° and 70° to the south west.

True widths of the main lens range from 2.9 ft. to 8.75 ft. Total metal ranges from 3.1% to 12.3% with value averaging approximately $25 per ton.

Considering the present drilled vertical extent which is approximately 600 ft. below the level of No. 1 adit, and the drilled strike length of 900 ft., the tonnage indicated for the main lens is 468,250 tons. Average true width is 6.27 ft. Assayed zones have not been weighted for strike and dip separations at this stage.

In addition to this main lens there appears to be at least two others which occur on the hanging wall and which were intersected in S.C.2. These might be better described as making up, in part, a broad disseminated hanging wall zone which seems to be at least 50 ft. wide. In addition to finely disseminated ore it is typified by narrow (½") massive galena sphalerite veins spaced at 6ins. to 3 ft. intervals. Whether this zone makes ore will depend on the density of these veins. For example, consider S.C.2. There are two separate zones each with a true width of 6.8 ft., separated by approximately 2 ft. of weakly mineralised rock with a further 4½ ft. of weakly mineralised rock on the hanging wall. Total metal for each zone is between 4.2% and 4.5%. Together they make up a zone with a true width of 19.2 ft. with a metal content of 3.3%.

Footwall lenses are described in Geophoto Minerals Report 1970/27 from the upper workings of the South Comet Mine and an aggregate mineralised width of 35 ft. is indicated.

Obviously the Main South Comet lode has a very much greater potential tonnage than indicated by the main lens. It is thought that the extent to which the footwall and hanging wall zones have developed is governed by the competency, composition and texture of the rocks through which the shear is passing. Large widths and higher grades are definitely associated with a massive cream - yellow sandy calcarentie.

<u>The Lucky Lode</u> has been intersected in three of the holes drilled. It appears to have a similar strike and dip to the Main South Comet Lode and is also in a shear zone. True widths range from 2.7 ft. to 17.4 ft. with total metal between 1.0% and 9.27%. Since the geometry of the ore occurrence is incompletely known, no tonnage calculations have been attempted.

This lode appears to have become enlarged where it crosses an horizon of massive cream - yellow sandy calcarenite.

The Snoopy? or Charley Brown? lode has been intersected in S.C.1 only. It is mineralogically similar (i.e. pyritic), and is contained in the same type of host rocks as the above lodes with which it is temporarily correlated. It may be a faulted extension of these. However, the mineralogical resemblance may be an expression of the type of host.

The intersection was made over a hole length of 20 ft. which can be broken into two 5 ft. lengths containing between 3.6% and 7.9% total metal.

Hence, mineralisation is significant and some carefully selected drill holes are necessary to solve the geometry of this lode and also to enable interpretation of the structural discontinuity in South Comet Creek. These holes should be planned so that they are an integral part of a carefully designed proving program.

Section V

This zone has been subjected to geological mapping only.

Weakly disseminated material occurs occasionally on the southern slopes of South Comet Hill (southern extension of the South Comet shear), but most outcrop is obscured by scree. The host rocks at the surface appear to have been unfavourable to mineralisation.

In Adelaide Mine Creek, massive lode material is again apparent and two adits have been driven north into the hill. Good massive Pb - Zn ore occurs on the dumps (Adelaide Mine Creek workings.).

Further west down Adelaide Mine Creek massive veins of galena and sphalerite are visible and an adit has been driven south into the hill. This may be a faulted extension.

Drilling at 400 ft. centres of the southern part of the South Comet shear is to be attempted as soon as access can be made.

Since mineralisation is not weathered to any great depth it is considered that a V.L.F. survey will reveal further extensions or lines of mineralisation and also structural data.

Geological mapping will be aided considerably by the construction of access which will be located to give maximum useful exposure.

Section VI

As yet, this zone has not been investigated. Once access has been constructed over South Comet Hill, gridding, mapping and geophysics will proceed into this area which is the most rugged.

Section I.

This zone has been investigated by geological mapping and geophysics. A number of mineralised veins have been located where access has crossed to the north of the Lunar Landing lode outcrop. These do not appear to be on strike with the Lunar Landing lode which is obscured by downwash, but correlate more with a narrow vein intersected near the top of K.H.2.

The V.L.F. survey suggests that, the Lunar Landing shear at least, continues along strike with perhaps some westerly displacement or dip flattening to the north of K.H.2. Self Potential minima appear to support this V.L.F. extension. A graphitic slate footwall for the Lunar Landing lode here seems likely and this may have influenced these anomalies.

A gossan zone occurs to the north-west of K.H.3 and is distant some 1,000 feet. It seems to be approximately 500 ft. long but is poorly defined. It is anomalous for Pb and Zn and may represent a northern extension.

A drill hole seems necessary to test the geophysical anomalies and a poorly exposed more western mineralised zone, i.e. a number of mineralised veins, approximately 400 ft. along strike from K.H.2 and K.H.3. A detailed geological field examination of the geophysical anomalies should precede the drilling in an attempt to locate any previously overlooked gossan zones or other obvious causes for the anomalies.

B I Geology

Stratigraphy

Introduction :

In an attempt to reconstruct a stratigraphic sequence for the Cambrian and Precambrian rocks at Dundas the work of J. Elliston (Geology of the Dundas District, Tasmania) and A.H. Blissett (Geological Survey Explanatory Report - Zeehan Quadrangle) has been followed closely. Many of the rock types described in these reports have been observed in surface work and diamond drilling. Some types appear not to have been described previously and some difficulty has been experienced in placing them in the sequence. These types most of which were observed in South Comet 2A obviously belong to the Dundas Group and are various carbonated, poorly bedded and possibly sheared greywackes and tuffs. Difficulty has also been experienced in placing numerous recurrent lengths of graphitic shale.

Correlation has been made more difficult by the complex deformation, ultrabasic intrusions and lack of exposure. Coupled with this Cambrian sedimentation appears to have taken place in a tectonically unstable trough. Wide variations in lithology laterally and vertically are apparent. Solomon (1960) visualised sedimentation in impermanent basins and considered that contemporaneous deposition of any particular rock type was unlikely.

Graded bedding, poor sorting, current bedding, slumping, flame and cast structures and various types of preconsolidation deformation apparently related to either scouring by turbidity currents or tectonic movement have been observed at various points in the cambrian succession. Poor sorting and current bedding are confined to the Dundas Group.. Facing of strata is easily determined within the Dundas Group.

A number of possible sequences are suggested below. They are listed as rock types and their equivalent stratigraphic names are suggested alongside. Obviously a great deal more work is necessary, and unless prove up drilling at 50' centres is undertaken then resolution of many of the problems is unlikely.

A.

Brewery Junction Form	Very similar to Crimson Creek Beds
Conglomerate	Razorback Conglomerate
Hodge Slate	Hodge Slate - Severn Slate
Cream Calcarenite	Continuous into Hodge Slate may be hydrothermally altered Hodge Slate
Sheared Fuchsitic Conglomerate)) (interbedded Dolomite)	Red Lead Conglomerate ?
Sheared Green Greywacke,)) Grit or Tuff)	South Comet Grit - Judith Formation ?

Graphitic Shale	No equivalent
Greywacke Grit	Red Lead Conglomerate ?
Tuff or Sandstone	Judith Formation ?

~~~~ may be local only Serpentinite Intruded here ?

Crimson Creek Beds) Transition Beds)	Crimson Creek Formation
Oonah Quartzite & Slate)	Oonah Quartzite & Slate - Carbine Group

~~~~ unconformity or metamorphic boundary

Concert Schist

B.

Brewery Junction Formation

Conglomerate	Razorback Conglomerate
Interbedded grey shale and buff greywacke	
	Hodge Slate - Severn Slate
Cream Calcarenite	Part of Hodge Slate
Conglomerate	Red Lead Conglomerate
Tuff or Sandstone	Judith Formation
Chert Conglomerate	no equivalent

~~~~ may be local only Serpentinite intruded here
~~~~

Crimson Creek Beds)	Crimson Creek Formation
Transition Beds))	
Oonah Quartzite & Slate)	Oonah Quartzite & Slate - Carbine Group

unconformity or metamorphic boundary

Concert Schist

Problems are posed by impersistent bands of conglomerate and possible faulted repetitions of sections of the sequence.

No attempt has been made to subdivide the Crimson Creek Formation or the Oonah Quartzite and Slate apart from introducing a transition series which is apparent in drilling on Kosminsky Hill. Both these groups of rocks are much more complex structurally than the Dundas Group. Surface correlation of drill data has not been possible with the Crimson Creek formation on Kosminsky Hill due to the deep weathering of surface outcrop. However, above the Crimson Creek Beds there appears to be a separate sequence of rocks which could be described as Cream, Grey and Khaki Dolomitic Series.

The following are more detailed descriptions of the various rock types encountered in :

The Oonah Quartzite & Slate :

Rock types consist of -

1. quartzites, white to grey; massive; micaceous in part; crosscut by milky quartz veins up to ½" wide; competent.

2. Shales, pale grey to black; massive to thinly bedded; micaceous; graphitic in part; secondary veins of quartz with minor CO_3.

3. Slates, black to grey ; graphitic; well laminated; occasionally micaceous; puckered and contorted into fantastic shapes.

4. dolomite to marble; white to grey; coarsely crystalline.

5. Dolomitic breccia or conglomerate.

Transition Beds :

1. Interbedded cream to grey to dark grey shales, siltstones and minor greywacke; graphitic in darker sections; calcareous in creamy coloured bands; generally less deformed than the Oonah Quartzite and Slate.

Crimson Creek Beds :

Purple, green, cream, blue grey, and grey with minor black shales, siltstones, cherty mudstones, tuffs; show effects of slumping and general preconsolidation deformation; dolomitic rocks are common and tend to be drawn out into string of beads type structures on shearing.
Near top of formation grey to crimson weathered iron rich sandstones or tuffs are significant.

Cream, Grey and Khaki Dolomitic Series :

Deeply weathered, cream to grey dolomitic sandy shales and siltstones. Some mica developed. (sericite).

Structure :

Folding :

Comprehensive accounts of folding at Dundas have been given by both Blissett and Elliston. There is little further to be added to this at present.

The structure at Dundas is domal. The main fold axis of the Dundas anticlinal high trends N.E. to S.W. and pitches from Central Dundas in these directions. A reversal in pitch to the north brings up the Oonah Quartzite again at Renison Bell.

The Oonah Quartzite is tightly folded in comparison with the other rock groups. Drag folding and brecciation in the apex of folds of competent quartzite have been observed in drill core and in surface outcrop.

The concentration of mineralisation at Dundas may have been assisted by the location of a structural high or dome at this point. The Renison Bell Mine appears to occupy a similar structural high.

Faulting :

The Dundas area has been complexly segmented by faults and by some suspected thrusting which was probably contemporaneous with folding and the Tabberaberan Orogeny. The main fault directions are N.N.E. - N.N.W. with less abundant E.W. and N.E. The former directions have been probably influenced by the trend of earlier folds and, together with the numerous mineralised fissures or shears in the region which have a similar alignment may have been formed in part, by relief of compression.

Faulting younger than the Tabberaberan Orogeny does not appear to have been as apparent at Dundas as in the Zeehan Mineral Field. Mineralised lines still appear to be continuous over considerable strike lengths. The existence of numerous parallel lines of mineralisation may be creating this impression.

The Montezuma Thrust which is described as being a wide heavily mineralised crush zone by Elliston requires a more detailed mineralogic investigation. It is apparently Devonian in age and is particularly continuous again illustrating an apparent lack of later dislocation. It is possible that some of the older faluts have been reactivated in younger times.

B II. Specific Geological Aspects

(a) (i) Thin section descriptions of various core samples can be studied in Geophoto Minerals Report 19. Further thin sections are at present being prepared and coupled with geochemical analysis and it is hoped some further ideas on rock unit correlation will be obtained.

(ii) Gossans typical of lode formations :

In the Kosminsky South Comet area the lodes are oxidised to less than 50' below the surface.

The gossans formed are dark reddish brown and occasionally black in colour, poor in quartz (except where they cross quartz rich host rocks, e.g. chert conglomerate) and contain numerous vughs and holes or pits attributable to leached CO_3 and sulphides.

A typical gossan overlying the Lunar Landing lode contains values of up to 2% Pb and 1½% Zn but generally averages about 1% of each metal, e.g., 1.06% Pb - 0.4% Zn would be considered significant in a gossan.

Where the lodes cross the Crimson Creek formation and the Dundas Group they tend to contain a much higher proportion of carbonate gangue, i.e., ankerite-siderite-manganosiderite than where they cross the black slates, micaceous shales and quartzites of the Oonah beds. The lack of carbonate gangue is supplemented here by a much larger proportion of pyrite.

Prominent gossans tend to cap the orebodies where they cross the Cambrian carbonate rocks and the ore is rich in CO_3 or CO_3 + SiO_2,but very little surface expression is apparent where the orebodies cross the Oonah black slates and quartzites etc. and the ore is poor in CO_3 and rich in pyrite. The only indication of the latter orebodies is surface yellow staining which often occurs in the pyritic rocks of the Oonah series and hence is not indicative of sulphide ore. The pyritic orebodies are not as deeply weathered as those rich in carbonate, i.e. 10 - 20' $\bar{c}$ 50'.

The gossans typical of the carbonate rich lodes are characterised by a gossan scree halo surrounding a hard gossan core which corresponds with the underlying lode material. The hard gossan core is never larger in width than the lode material below it and on occasions seems to be much narrower.

The pyritic lodes are insignificant at the surface and are almost impossible to locate except where they have been trenched or cut by access. They appear to give favourable responses in the S.P. method and also in the electromagnetic and induced polarisation methods. Where the lodes come to surface detailed geochemistry is capable of distinguishing anomalies due to graphite and pyrite from the true pyritic Pb-Zn orebody. Values above 4,000 ppm in Pb and Zn can be significant.

Thus gossans typical of the carbonate rich lodes in the Kosminsky South Comet Sector vary significantly from the gossans overlying the carbonate rich Comet and West Comet lodes.

For instance : The latter gossans mushroom significantly at the surface although generally a hard brownish black gossan core exists which probably is of similar width to the underlying unoxidised lode. This core is surrounded by a reddish brown friable limonitic clay which can be up to 100' wide.

They are oxidised to 300-400 ft. below the ground surface.

They tend to show higher total metal than could be expected in the unoxidised zone, i.e. some secondary enrichment appears to have occurred.

They are high in Pb and Ag but contain very little zinc. Cu is more abundant than at Kosminsky Hill.

(b) <u>Ore control and features of lode horizons</u> :

(i) <u>Favourable units</u> :

The most favourable units in which ore deposition has occurred appear to be :

a cream - yellow calcarenite - (Crimson Creek Formation) presumably due to its chemistry, i.e. easy replacement by ore bearing solutions and its being more easily carried away in solution leaving larger cavities for ore deposition.

Composition

a creamy grey - yellow sandy calcarenite (Dundas Group) for the same reasons as the above. Usually is host to a greater width of disseminated ore possibly because it is more porous.

Composition

bedded grey - cream - pink dolomitic shales, siltstones, mudstones - (Crimson Creek Formation) presumably due to their more favourable chemistry.

black pyritic and graphitic slates (Oonah Beds) Pyrite may provide a favourable environment for ore deposition.

blue grey - grey calcareous fine sandstones - quartzites (micaceous in part) - (Oonah Beds) Presumably due to their chemistry and also their competency i.e. fracture readily under sufficient pressure exposing a large surface area to imposing mineralising fluids.

(ii) Unfavourable units :

Ore zones have been observed to narrow when passing through the following units :

purple and green shales, siltstones and mudstones

presumably due to their unfavourable chemistry.

(iii) Favourable structure :

The ore bearing structure appears to be a series of steeply dipping parallel 320 - 330^{o} True striking shear zones. One ore body appears to be confined in what may be a shallow dipping thrust fault. (i.e. the Apollo lode)

Insufficient drilling and development has been carried out to determine the pitch and shape of the lenses within the lode zones. The pitch and shape have probably been governed to some extent by the movement direction on these shears as well as by the type of rock through which the shears are passing.

Due to the poor outcrop and the deformation of most rocks at Dundas the fault patterns are still, to say the least, obscure.

The main shear line associated with the Kosminsky - South Comet bodies has a number of discontinuities; these may or may not represent post mineralisation faulting. Discontinuities might be linked by a number of structures (i.e. gashes en echelon, cymoid curve, diagonal link) and may merely indicate a change in rock properties through which the shear is passing. These may occur down dip as well as along strike.

Structure overall is still displayed by some of the topographic features in the Dundas area and it is felt that a structural analysis of some more detailed air photos (colour) could prove fruitful in solving some of the problems related to the ore deposits.

Colour photos in addition would help to locate further lines of gossan and signs of old prospecting and may indicate some vegetative anomalies over mineralisation.

The main disadvantage is the thickness of vegetation which may exclude the observation of lines of gossan on the photos.

(c) Ore Features

(i) Mineralogy - Two assemblages are apparent but they may be largely governed by host rocks.

α assem-blage
(Sulphides : galena, sphalerite with minor pyrite.
(Gangue : abundant ankerite - mangonosiderite with variable quartz (apparently host dependant to some degree) and minor calcite and magnesite.

β Assemblage (Sulphides : pyrite, galena and sphalerite with minor jamesonite
(Gangue : ankerite - manganosiderite with variable quartz.

N.B. Gangue is much less abundant in this second assemblage.

The α assemblage is typical of the Lunar Landing and the Main South Comet and Lucky lodes where they are passing through carbonate rich rocks of the Crimson Creek Formation and the Dundas Group.

The β assemblage is typical of the Charley Brown and Snoopy lodes and is approached in the Lunar Landing lens in the two most southern intersections.

The proportions of Pb and Zn vary considerably from one intersection to the next as does the proportion of pyrite. In fact there is probably a continuous series of types between the end members.

Cadmium :

Where zinc is an important component of the lodes cadmium is present in the proportion of 1/150th - 1/220th of the amount of zinc. These proportions are particularly constant for any one particular lode i.e. Lucky Lode 1/150, 1/166, 1/166.

Antimony :

The percentage of antimony in all the lodes increases with the depth of intersections as well as its being apparent in the Charley Brown and Snoopy lodes as the mineral jamesonite. This increase in Sb may represent a metallurgical problem since there are penalties for antimony in Pb. e.g. South Comet Main Lens at the -150' level in South Comet 2A shows an interval 684'3" - 687' containing 5% Pb, 6% Zn and 0.46% Sb.

(ii) A generalised order of deposition of minerals appears to be :

ore minerals :
1. pyrite
2. sphalerite
3. galena

gangue minerals :
1. quartz
2. siderite (often manganiferous)
3. calcite

Local variations to this sequence are more than likely. The ore has not as yet been subjected to a detailed mineralogical study and observations have been confined to drill core, hand specimens and assay data.

(iii) Texture :

Ore minerals; Galena and sphalerite are extremely coarse grained throughout. Pyrite where present tends to be less coarse.

The Snoopy and Charley Brown lodes contain some finer grained galena and jamesonite and it is possible that grainsize may be governed partly by depth and may also be a function of the host i.e. an abundance of carbonate may have had little restriction on crystal growth being easily replaced or dissolved.

Gangue : Carbonate gangue materials and quartz are also coarsely crystalline.

Although the ore deposits so far met with are all fissure deposits fine grained syngenetic pyrite has been observed in quite large bands in some of the Oonah rocks. Strata bound deposits are still a possibility which should not be overlooked.

(iv) Replacement :

The following observation may be significant :

i.e. centre of CO_3, ring of sphalerite, ring of galena and finally a rim of pyrite.

This type of ore assemblage has been observed in the South Comet Mine. This suggests that the order of deposition should place pyrite last and not first which is the normal hydrothermal position for this mineral.

D. II

(d) Persistence of ore at depth :

Lode horizons at present intersected appear to maintain the same order of widths down to approximately 700' A.S.L. i.e., a 1,000' vertical range. Since widths are so variable along strike the lodes may behave in a similar fashion down dip. As yet there is little data pertaining to the pitch and shape of ore shoots. The deepest intersection made so far occurred in South Comet 2A which cut the Main South Comet lens at approximately 700' A.S.L. Some core was lost but the mineralised width was only 5' and did not appear as multiple lenses as was expected. A large amount of weakly disseminated material occurred on the hanging wall side but was not significant.

This suggests a narrowing of the lode channels at depth. However, (i) at the point of South Comet 2A intersection the enclosing rocks were not particularly favourable; (ii) intersections have been observed to narrow from 30' to 2' over a strike distance of only 200'. Only two holes (S.C.2A & K.H.9) have been designed to make intersections at depth and the other hole K.H.9 showed no reduction in expected mineralised width. Such limited statistical data should not be given too much weight.

More drilling is necessary below 700' A.S.L. before anything concrete can be said about the depth extension of the ore bodies. It seems feasible that the lode channels will remain open for at least half the already indicated 1,000 ft. vertical range.

If this does not happen the tonnages available at Kosminsky - South Comet will be severely diminished and the pressure will be on lateral mineralised lines to supply the extra tonnage needed for an economic venture.

(e) Possibility of the termination at depth of the Kosminsky ore lenses by a low angle thrust.

Discussion on possibility of termination at depth of Kosminsky Ore Lenses by a low angle thrust.

1. The possibility of a thrust was first suggested by Finucane in 1947 to explain the capping of Cambrian rocks on Kosminsky Hill.

2. (i) Drilling on Kosminsky Hill reveals that to the north, i.e. K.H. 2 and 2A the Cambrian capping is thin (approximately 400') and underlain by PG quartzites and slates.

(ii) K.H. 2 did not intersect strong mineralisation down dip from the Kosminsky ore lens and this suggested at first that mineralisation may have been terminated by thrusting. However a closer study revealed that K.H. 2 didintersect mineralisation which although weak is directly correlatable with the down dip projection of the Lunar Landing Lens.

(iii) It is obvious from this intersection and from an adit driven south into the north slope of the hill that the lode is contained between a Precambrian foot wall and a Cambrian hanging wall at these levels, that is, mineralisation is associated with a fault which has brought the PC east side up against the Cambrian.

3. Hence it seems certain that whether the Cambrian - Precambrian surface be a thrust or unconformity it predates the confining structure of the ore lens, and should not terminate mineralisation.

4. Other drill holes on Kosminsky Hill present an extremely complex picture as regards formation lithologies and structure. The data suggests an extremely irregular Precambrian surface. This can be explained by an irregular erosion surface, folding of some related uniform surface such as a thrust plane or of some irregular surfaces for that matter, block faulting of any type of surface, a combination of any of the above 3.

The latter is probably nearest the truth. This tends to support the downward continuation of the ore lens since :

(i) if the surface is an erosion surface then it cannot terminate the channel of mineralisation,

(ii) if it is a folded surface cutting off mineralisation one would expect folding of the main Lunar Landing lens also. However, the ore lens is remarkably constant in both dip and strike where information is most dense.

(iii) if it is a block faulted surface then it becomes necessary to use the mineralised faults to explain this movement.

CONCLUSIONS

Existing information definitely supports the theory that the mineralised ore channels extend in depth below the Precambrian surface whether it be a thrust or unconformity etc.

(f) The possibilities of the formation of large pipes of ore at the intersection of two lode channels either laterally or vertically.

The Lunar Landing and Apollo lodes if present interpretations are correct should intersect down dip at the - 670'level. In K.H. 9 weakly disseminated galena was visible in the drill core for the entire 200' interval separating the Lunar Landing and Apollo intersections. This was not so apparent in K.H.1 where the two lodes were further apart.

It seems possible that this trend of increasing percentage of sulphide will continue as the two lodes approach intersection, giving rise to a large body of ore about this intersection.

This is a well known type of occurrence in vein and fissure deposits and there is no obvious reason why it should not happen here. There is perhaps a 75% chance that it will. (McKinstry- Mining Geology p. 326).

A similar type of down dip intersection could occur between the above ore channels and those at Kosminsky Hill West. Dips and strikes of the latter are however much less well known.

Intersections of the N.N.W. striking shears or ore channels with favourable structure along strike could also prove to be of interest. As yet poor exposure, limited correlation of rock types, and widespread deformation has limited accurate fault location. Topography has been of some assistance.

(g) Shears along the limbs of folds - p. 333.

Position of openings - changes in structure etc. - p. 319.

Openings of an irregular fault fissure - p. 321

Vein structure within the pattern.

E. <u>Application of Geophysical Methods</u> :

<u>INTRODUCTION</u>

Initially the self potential and magnetic methods were chosen for reconnaissance in the Dundas area. The first of these methods has shown some correlation with now known ore deposits while the latter has successfully shown the limits and possible attitude and shape of existing ultrabasic intrusions.

After some analysis of the self potential methods the results and their ambiguities it seemed necessary to try other possible devices. A reconnaissance electromagnetic surveying instrument was purchased and tested in the Dundas area, but failed to give strong anomalies.

The B.M.R. has since completed a survey in the Dundas area using the V.L.F. method which is an electromagnetic method using low frequency radio waves as a source (N.W. Cape). Where conductor strike is suitable as it is at Dundas some good correlations have been obtained. The method shows excellent response to broad shear zones with which the ore deposits of the Dundas area are mainly associated. It is cheap and faster than the self potential method.

A number of test lines have been run using the I.P. method and good anomalies were obtained over known intersections. This method is expensive and topography and climate are inhibitive in the Dundas area.

Discussion :

The Self Potential Method

Survey problems :

The control of survey results has proved difficult. Combination of individual profiles to form a contoured plan often shows large amounts of misclosure. These amountsappear to be caused by changes in the ground conditions during the survey and are probably related to water table fluctuations.

Instrument operators have experienced great difficulty in maintaining good ground contacts in areas of ironstone surrounding ultra-basics and a great deal of time had to be spent preparing pot holes.

These types of errors led to the choice of either base station and long wire method of survey or a short wire overlapping method. In the former, the rough topography necessitated the use of walkie talkies. Spurious potentials associated with water seepage often upset the results. The latter method overcame the communication problem but suffered from the point of view of speed and its liability to cumulative errors. The probability of cumulative errors is greatly reduced by the overlapping of readings and spurious potentials are minimised.

Where walkie talkies are available the base station and long wire method is probably best. Spurious readings can be avoided by moving pot to a close by position and taking another reading. If possible an area with a small potential gradient should be selected for the base station. (In areas where potentials tend to fluctuate over short periods the short wire overlapping method is probably preferable).

Interpretation :

Self Potential gradients tend to be very large throughout most of the Dundas area. Anomalies appear to be caused by topographic features, groundwater seepage, graphitic and pyritic shales and to a certain extent by sulphide deposits. Unfortunately the anomalies due to Pb - Zn deposits are only second order except perhaps where they are associated with pyrite. Sphalerite does not conduct and galena tends to become covered with a coating of non conductive cerussite on oxidation. Considering the oxidation - reduction potential of Pb the normal self potential effect to be expected is not very high. Thus unless pyrite is present a large anomaly would not be expected.

Anomalies resulting from topography can generally be recognised since they tend to be broad effects confined to isolated steep sided topographic features.

Groundwater seepage after heavy rain has upset surveys on a number of occasions and the only solution has been to wait for things to dry out.

Graphite and pyrite regularly produce large effects of up to 1 volt. Anomalies which appear to arise from them are numerous in the PC Oonah Quartzite and Slate and the self potential method may be of use in revealing some of the broader structural trends. It seems unavoidable that all electrical methods will fail in this environment and the only solution is to test each anomaly by detailed geochemistry.

It is suspected that often a broad topographic effect will obscure a smaller anomaly arising from a Pb-Zn body. For this reason self potential results may be more fruitful if exhibited as profiles. A choice of contour interval often tends to obscure minima which although small may occupy significant positions along a conductor's strike.

A plate, Plate No. 1/262 is enclosed in this report which illustrates self potential profiles in the Kosminsky Hill Area together with the outcrop of known sulphide gossans.

It should be noted that large self potential anomalies would be expected from pyrrhotite - tin deposits which occur in this vicinity.

The Magnetic Method :

Survey Problems :

Little difficulty has been encountered in carrying out drift controlled surveys in the Dundas Area. An M.F.1 Fluxgate magnetometer was used. Surveys proceeded at good speed and it was quickly established that its uses were confined to the location of ultrabasics and any possible pyrrhotite deposits. The Pb-Zn deposits are decidedly non magnetic.

Interpretation :

Both contour maps and profiles of results have been studied. Ultrabasic contacts have been interpolated half way between maximum and minimum values about the body. Attitudes of ultrabasic contacts have been assumed from the profile shape where the body is generally aligned along the magnetic meridian. There is little transverse magnetisation to be considered in this case.

Magnetic contour maps have been found useful for inferring further structural information as may be indicated by any discontinuities in Ultrabasic contacts.

There is a possibility of overlooking pyrrhotite deposits as they may lie at the serpentinite contacts as at Mt. Razorback. However, a coincident self potential or other electrical geophysical anomaly would be expected to indicate the presence of pyrrhotite. Also in most cases geochemical traverses are to be run over the ultrabasic contacts in the search for nickel and samples are automatically analysed for Sn.

The R.E.M. Method :

Survey Problems :

The main problems with the McPhar R.E.M. Unit at Dundas were ones of orientation and communication. The latter was easily overcome by the use of walkie talkies but the former was much more formidable. The anomalies caused by differences in altitude between transmitter and receiver and also by misalignment of the transmitter were found to be apparently as large as those caused by sulphide bodies. Duplicate surveys produced differing profiles and only broad effects such as zones of poor null etc. were recurrent.

The lack of response of the sulphide bodies which seldom produced dip angles in excess of 6^{o} is possibly due to lack of power of the transmitter, poor conductivity contrast or a screening effect caused by the near surface position of the water table.

The instrument requires further trial on more accurately controlled grid lines. It is probably better applied to tracing an extension of ore where the transmitter can be set up over a known gossan outcrop.

Interpretation :

Interpretation is done from profiles and is reasonably simple where the transmitter and receiver operate broadside. A crossover in dip angles can be expected to overlie the conductor.

If conductive overburden is a suspected cause of such a crossover the use of dual frequencies and an expanding transmitter receiver separation can be used to check this out.

Null widths are an indication of the amount of out of phase component and hence give an indication of the conductivity of a body.

The V.L.F. Method :

Survey Problems :

In direct contrast to the R.E.M. method this one does not suffer from any appreciable orientation errors and of course there is no problem of communication as the transmitter is fixed in position and the survey equipment consists merely of a receiver tuned to the desired transmitter frequency. Surveying can be carried out quickly and results are duplicable.

The only real survey problem is the required conductor strike which for best effect must be towards N.W. Cape. Other V.L.F. radio trans-mitters are in existence in Japan and Hawaii but may be a little too distant to be used effectively.

The depth penetration of the V.L.F. method although it should theoretically be great appears to be limited to about 100' in theDundas area. (See B.M.R. record V.L.F. - E.M. Test Survey Dundas, Tasmania, 1970, by W.J. Langron and P.J. Gillespie).

Interpretation :

Interpretation is by means of profiles which exhibit all frequencies of data measured and later by contours of the first discreet derivative. This latter process eliminates low frequency effects such as those which may result from topography and inflexion points become positive peaks. Positive values are contoured and used in interpreting conductive zones.

A map, Plate No. 61, is enclosed showing these contours in relation to the Kosminsky Hill lode outcrop. These results were obtained by the B.M.R. in March 1970. Correlation with surface outcrop of the Lunar Landing lode is very good.

The I.P. Method :

Survey Problems :

Main problems are roughness of topography inaccessibility and adverse weather. The latter causes difficult ground conditions and at times it is hard to get sufficient current to penetrate for accurate results.

Interpretation

As with previously discussed electrical methods pyritic and graphitic shale will cause ambiguities in interpretation.

CONCLUSIONS

The magnetic method is applicable to areas where ultrabasic contacts are obscured by large deposits of ironstone and to areas where Pyrrhotite - Sn deposits are a possibility.

The best and cheapest electrical reconnaissance method appears to be V.L.F. in preference to S.P. which is difficult to interpret and control.

The I.P. method because of its expense should be limited to outlining reconnaissance geophysical and detailed geochemical anomalies with the idea of obtaining more specific drilling targets.

C. PROPOSALS FOR IMMEDIATE ACTION

See Geophoto Minerals Reports 1970/38 and 1970/38A.

Of the steps outlined under this heading in Report 1970/38A, the following have been completed :

1(a) Geological plans and sections have been brought up to date. See Plates.

1(b) The most reliable interpretations on correlation of mineralised intersections have been made although ambiguities still exist. Controlled drilling will be necessary to eliminate these. See Plates.

Intersections have been projected along a proposed dip as supported by drilling to a median (-200 ft.) level.

1(c) The best interpretation of faults has been made from all existing data. Cross faulting seems to exist between the K.H.2 to K.H.4 section and the K.H.7 to K.H.8 section, and also between this latter section and the main South Comet section. These faults strike north-east to east-north-east.

2. and 3. A mine grid has been planned, oriented closely to the mean strike of lodes. Some discontinuity in grid strike is proposed for the South Comet section where lode strike is more north of west, that is, grid 330° instead of the 320° proposed for the Kosminsky Hill sector.

A topographic survey (barometric ?) giving accurate levels and locations for all existing and immediately proposed diamond drill holes, and also all existing adits and drives, is immediately necessary so that accurate level plans can be drawn up for precise control of all future drilling (drill to plan levels and specific sections at regular intervals along strike).

It is proposed to project all existing drill data and adit development data to the nearest level plan and transverse section, giving consideration to dip and strike. Some errors will arise from the unknown azimuth deflection of the exploratory diamond drill holes. A transverse section will be drawn for every 100 ft. of strike and a level plan for every 100 ft. vertically. Eventually, as prove-up drilling proceeds, these will need to be closed to 50 ft. intervals.

It is considered that a further number of exploratory holes outlined elsewhere in this report be drilled to solve specific geometrical problems and ambiguities before the construction of the planned mine grid is attempted. These exploratory holes will be drilled to specific sections and levels, on the proposed mine grid, however, so that the data obtained can be directly integrated with the prove-up drilling program to follow. This integration will be feasible providing, of course, that the extra holes do not invalidate the previous interpretation entirely.

4. Also preceding construction of a mine grid, it is considered that detailed channel sampling at regular intervals along existing adit backs be undertaken to supplement drill hole assay data. This type of work would be invaluable and would give some idea of the persistence in width and grade of shoots along strike. Detailed geological mapping should proceed in conjunction with this sampling program and be used in constructing previously proposed sections.

The South Comet workings and the various adits and drives on Kosminsky Hill should all be subjected to the above proposals. One problem will be the fact that the whole width of lode horizons may not be exposed on backs in existing workings so that a rather incomplete picture will be obtained. Some development work may be necessary to expose them.

Minor development work would also be useful from existing drives from a lode correlation point of view and a consultant mining engineer could be employed to supervise. A small number of miners would be readily available to do this work as the company has already been approached by a few Zeehan locals with considerable mine experience.

Crosscutting in the South Comet workings would provide information on lens correlation and also on grade of ore. It would also facilitate the construction of accurate plans and sections.

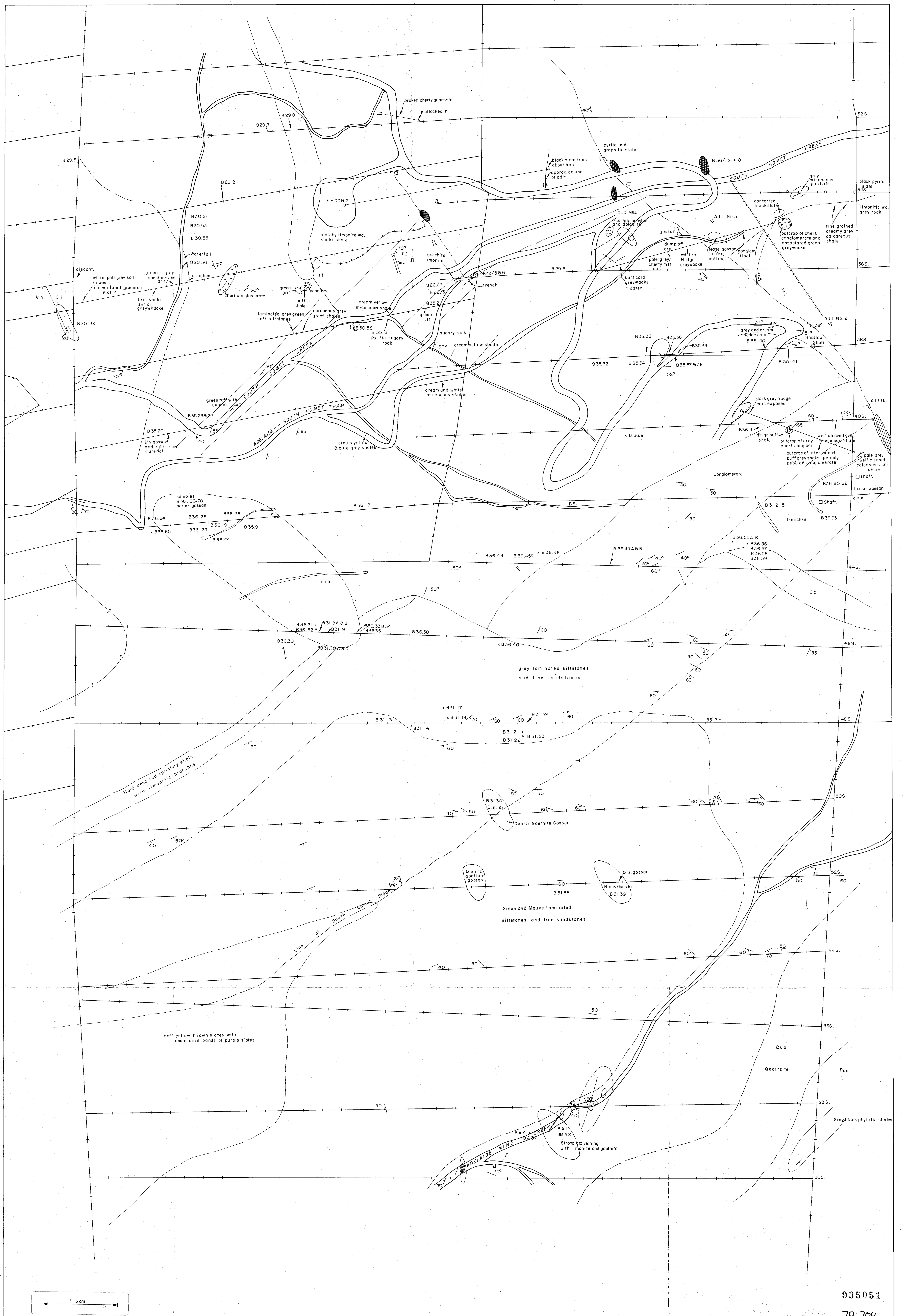
5. Bulk sampling : Bulk samples for metallurgical testing could be readily obtained through J. Smyth for the South Comet section. (He has recently been doing some development in the low level adit and may have some ore stacked which could be used for this purpose).

REFERENCES

Geophoto Minerals Report 1970/38 - 38A	J.H. Rattigan
Geology of the Dundas District, Tasmania	J. Elliston
Geological Survey Explanatory Report for Zeehan One Mile Geological Map Series	A.H. Blissett
Mining Geology	McKinstry
Textures of the Ore Minerals	Edwards
B.M.R. Record No. V.L.F. - E.M. Test Survey Comet and Sylvester Areas, Tasmania	W.J. Langron and P.J. Gillespie

PLANS

1. Geology South Comet sheet
2. Geology Comet - Kosminsky sheet
3. S.P. Contours Comet - Kosminsky - MISSING. NOT WITH THIS REPORT
4. S.P. Profiles Superposed on Kosminsky Gossan Lines
5. V.L.F. Contours showing relation to Kosminsky Gossan Lines
6. -200' Level Projection of Orebodies in Kosminsky South Comet Zone (shown in relation to surface gossans) with plan of proposed mine grid and section lines showing proposed drilling at discontinuities.
7. Longitudinal Section showing drilled and proposed holes
8. Summary of Drill Hole Intersections



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SOUTH COMET GRID GEOLOGIC MAP

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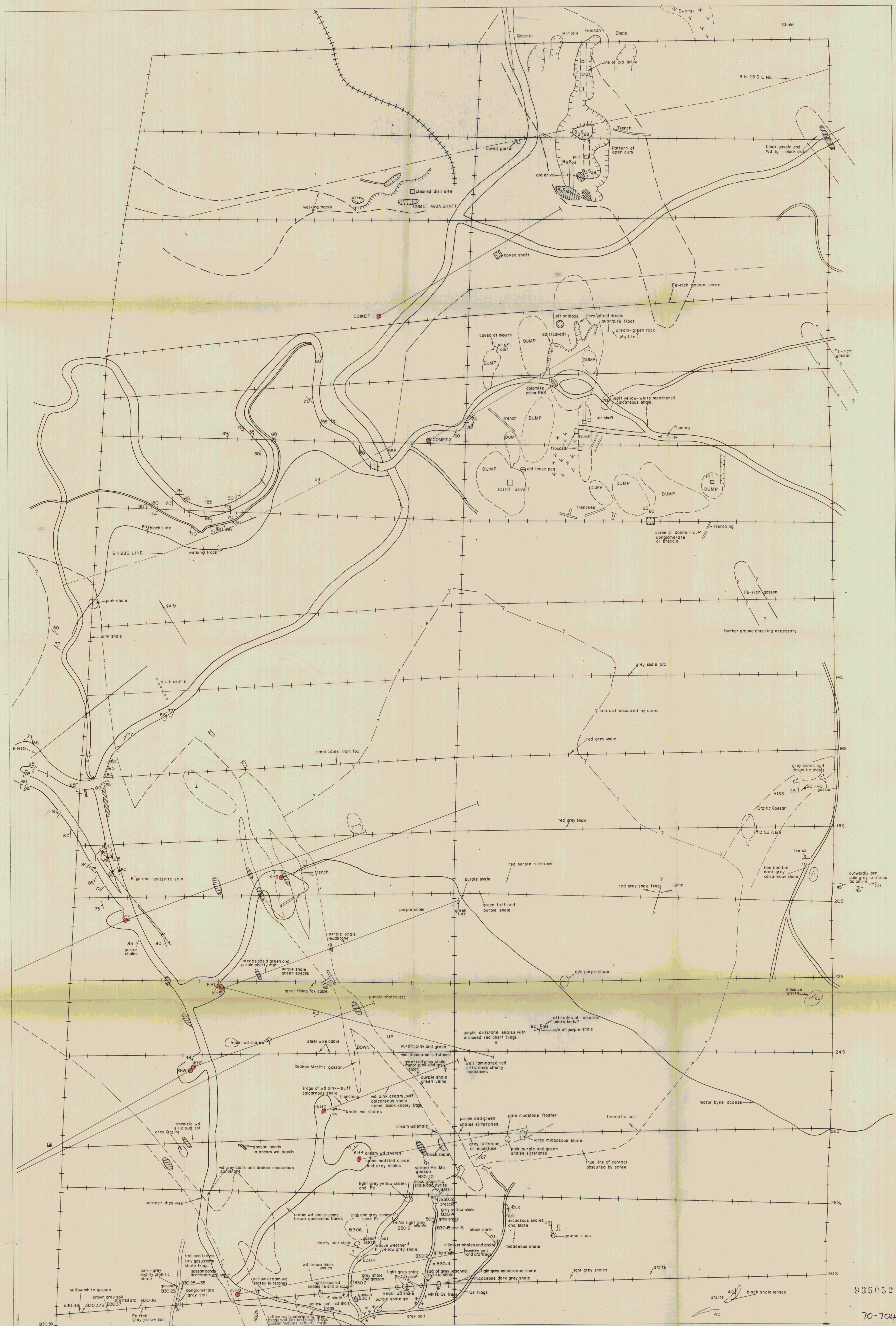

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COMET·KOSMINSKY GRID
GEOLOGIC MAP

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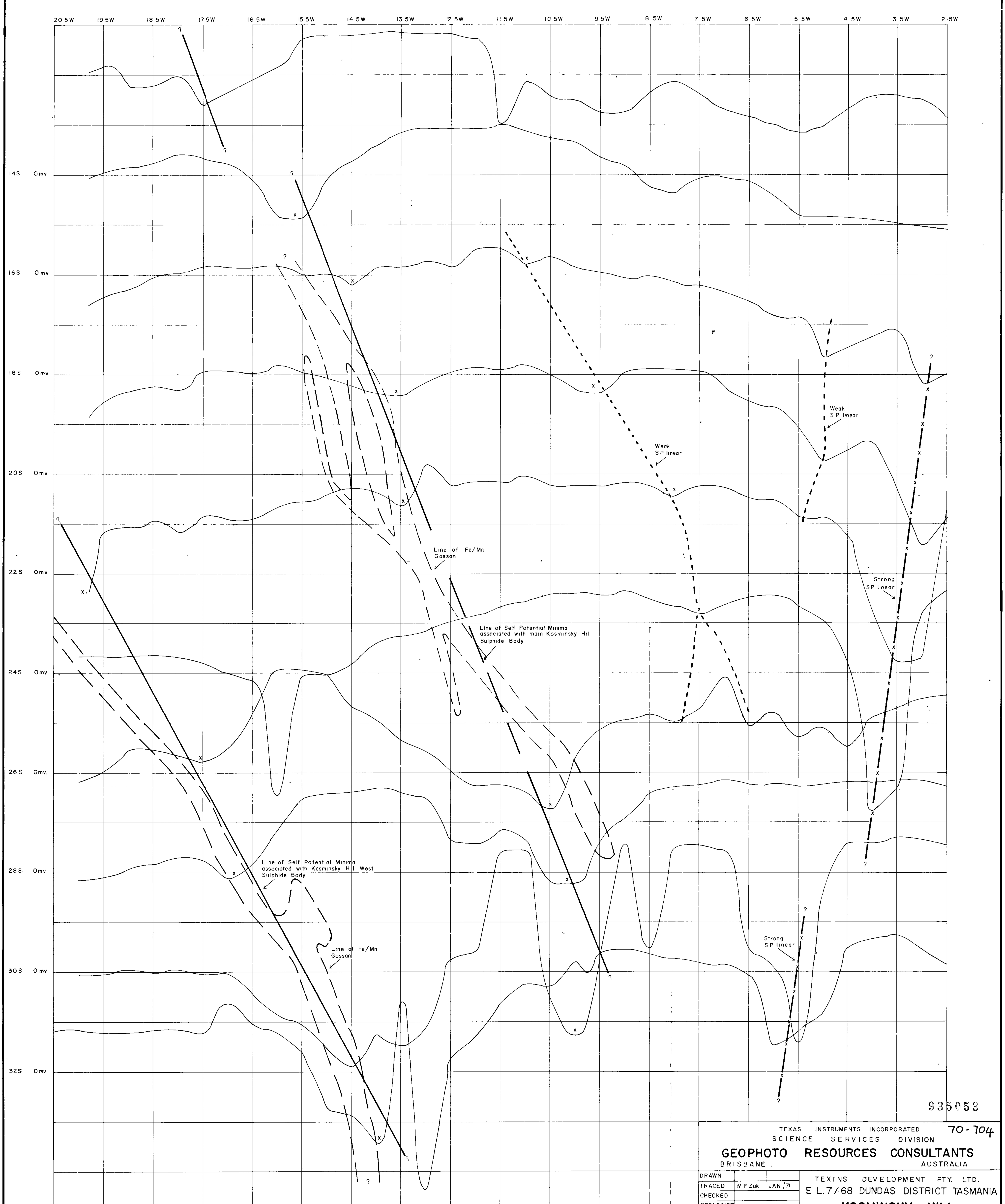

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KOSMINSKY HILL 2232

LODE OUTCROP

WITH S.P. PROFILES

PROJECT 7/68 DRAWING NO 1/262

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KOSMINSKY HILL LODE OUTCROP WITH V.L.F. CONTOURS

2231

PROJECT 7/68 DRAWING NO. 1/261


TRUE NORTH
FE-MN GOSSANS OF COMET LINE
COMET 1
COMET 2
APPOLLO LENS
Appears to dip at slightly less than 50° W
QTZ RICH FE-MN GOSSAN
UNDIFFERENTIATED IRONSTONE OUTCROP AND SCREE
LEGEND
OUTCROP OF TRUE SULPHIDE GOSSAN AND/OR FRESH SULPHIDE (GALENA SPHALERITE PYRITE)
OUTCROP OF GOSSAN OF COMET TYPE
FRIABLE CHOCOLATE GOSSAN CLAY WITH COARSE BLACK FE-MN GOSSAN CONTAINING TRACES OF Ag & Pb.
PROPOSED CORRELATION OF DRILL HOLE INTERSECTIONS PROJECTED TO -200' LEVEL ALONG A UNIFORM TRUE DIP OF 65° W.S.W.
NOTE:
Exception is APPOLLO LENS which has been projected on basis of a dip of 50° W.S.W. to improve correlation. (Poor correlation assuming 65° dip might be due to hole Azimuth Deflection.)
WEAKLY DISSEMINATED ZONES
DIAMOND DRILL HOLE SURFACE TRACE
DENOTES VERTICAL PROJECTION OF INTERSECTION
PROPOSED DIAMOND DRILL HOLE SURFACE TRACE.
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TEXINS DEVELOPMENT PTY. LTD.
E.L.7/68 DUNDAS DISTRICT, TASMANIA
COMET — KOSMINSKY — SOUTH COMET LINE ORE BODIES
PROJECT 6/68
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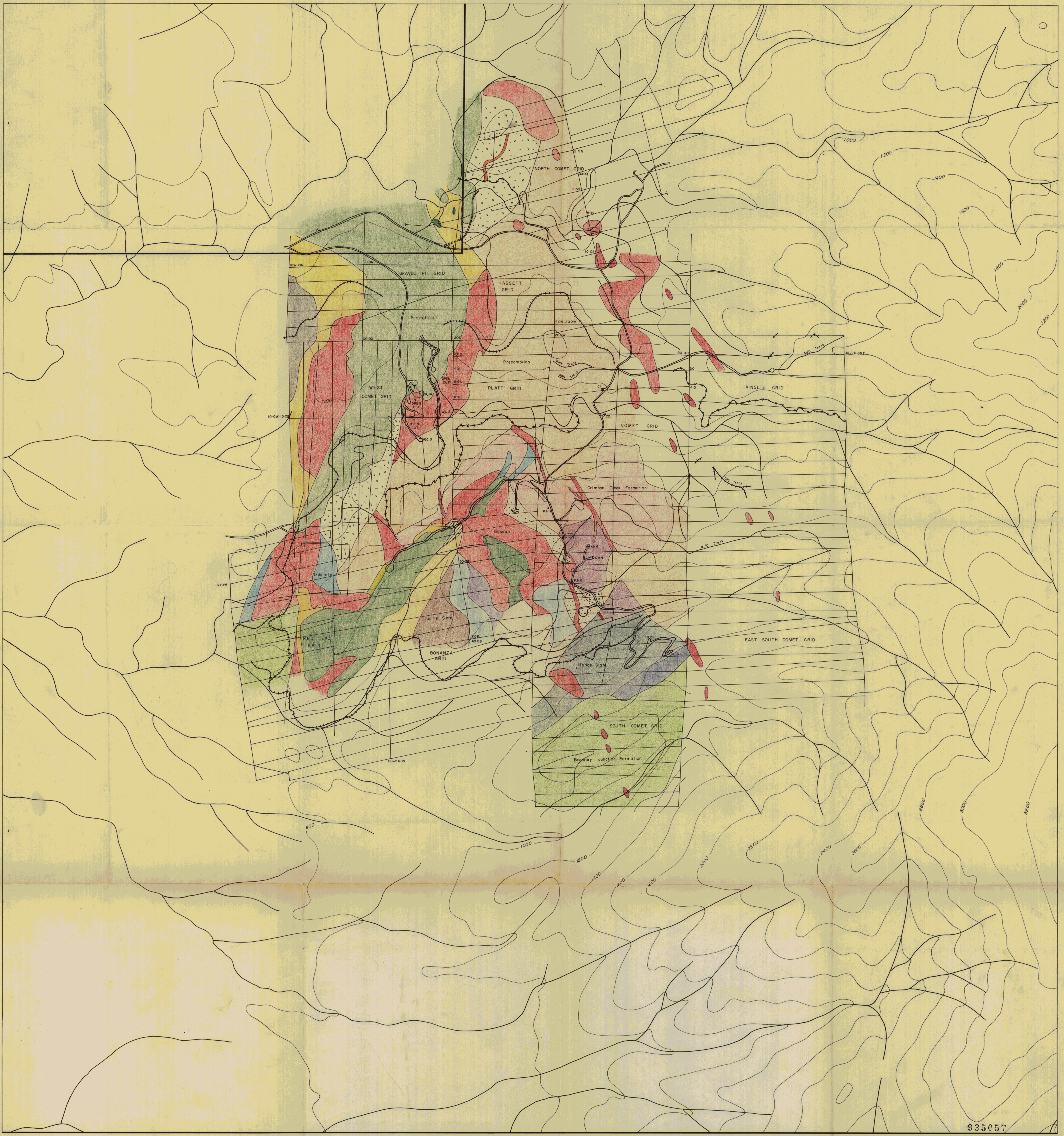
KOSMINSKY-SOUTH COMET AREA

LONGITUDINAL SECTION

PROJECT 7/68 DRAWING NO 1/238

2226



LEGEND

- Ironstone Gossan Formations not correlating with ultrabasics.
- Siliceous serpentine contact zones. Quartz veined chert etc.
- Brewery Junction Formation
- Razorback Conglomerate
- Hodge Slate
- Transition
- Red Lead Conglomerate
- Judith slate and tuff
- Dolomite breccia filling-green stained dolomite
- Serpentinite
- Talc Formation
- Basic-intermediate tuffs and lavas. Minor associated acid rocks.
- Pyritic red jasper
- Mottled crimson-blotchy limonitic sandstones, grits or tuffs.
- Crimson Creek Formation; purple, green, grey mudstone, siltstones, shales and tuffs. Pink, cream grey dolomite and dolomitic siltstones.
- Crimson Creek Formation; cream-khaki weathered siltstones and shales, dolomitic in part.
- Quartzite-dolomite.
- Precambrian-quartzite, slates, micaceous shales
- Concert Schist

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CENTRAL DUNDAS AREA GRIDDING AND GEOLOGY

PROJECT 7/68 DRAWING NO. 1/245