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SURFACE GEOLOGY, TAURUS MINE, CASSIAR B.C.

Peter B. Read and John F. Psutka

December 9, 1983

GEOTEX CONSULTANTS LIMITED consulting geologists

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A report to

TRENAMAN, SPENCER & ASSOCIATES LTD.

Peter B. Read and John F. Psutka

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1. INTRODUCTION:

Taurus Mine lies northeast of Quartzrock Creek, 8 km east of Cassiar, and a few hundred metres north of the Stewart-Cassiar Highway. An adit and a decline provide access to approximately 3,000 m of underground workings developed on three levels each about 30 m vertically apart. The drifts and stopes follow easterly-striking and steeply dipping auriferous quartz veins in ankeritized greenstone. The ore is concentrated on the property in a 150 tonne-per-day mill, and the concentrates trucked to the ASARCO refinery at Helena, Montana.

Taurus Property covers 7.25 km^2, straddles Quartzrock Creek, and ranges in elevation from 1000 m in Snowy Creek to 1800 m in the northeast corner. Below 1300 m, outcrop is sparse and restricted to creek bottoms, trenches and roadcuts, but higher, outcrop is plentiful.

Gabrielse (1963) completed the first regional geological mapping of the area and named the volcanic-rich Sylvester Group which is the host rock for the Taurus orebodies. Detailed geological investigations by Diakow and Panteleyev (1981) and Panteleyev and Diakow (1982) cover the Taurus Property and provide a geological setting for Mandy's earlier work on the placer and vein deposits of the region (Mandy, 1932; 1936; 1938). Although the work of Gordey et al. (1982) is 10 km and more southeast of the property, it gives a structural setting and stratigraphy applicable to the Taurus Property (Appendix D).

This report is based on eighteen man-days of field work by P. B. Read and J. F. Psutka between September 12 and 20, 1983. R. Trenaman requested a 1:10,000-scale geological map with an emphasis on the structural setting of the property. As a byproduct, some of the results of the 1:10,000-scale mapping of the property are applicable to the underground geology of Taurus Mine. The application yields magnitudes of fault movements of some of the faults in the mine area. The notes from the field work are in Appendix A.

During our stay at the property, E. Kraft and G. Tomaszewski showed us the underground workings and discussed various geological aspects. Later, G Tomaszewski measured the slickenside data and many of the fault dips shown in Map 2. In Vancouver, R. Trenaman shared his geological expertise and provided drill information. We are grateful for the assistance of these and other people at the property.

2. GEOLOGICAL SETTING:

In north-central British Columbia, the Sylvester Allochthon[1] comprises upper Paleozoic greenstone, chert, clastic and ultramafic rocks which have been thrust over autochthonous[2] strata of the North American continental margin in mid-Jurassic to Early Cretaceous time and later intruded by mid- to Late Cretaceous quartz monzonite of the Cassiar Batholith (Fig. 1). The Sylvester Allochthon comprises most of what Gabrielse (1963) originally mapped as Sylvester Group except for the basal portion of black shale, quartz sandstone and chert pebble conglomerate now placed in the autochthonous Devonian and older strata underlying the allochthon. In the area Gordey et al. (1982) mapped, the allochthon consists of three discrete assemblages, of which two are thrust sheets and the third lies against them along a high-angle fault. The lower thrust sheet consists of Mississippian? and Permian greenstone, and minor chert, phyllite and ultramafite. Taurus Mine lies in the lower thrust sheet. The upper thrust sheet comprises Pennsylvanian and? Mississippian black shale, sandstone, augite basalt, chert and limestone. Green or purple tuff, quartz sandstone and quartz diorite of unknown age are faulted against the two thrust sheets. The allochthon lies preserved in the core of the gentle southeasterly plunging McDame Synclinorium. East-northeasterly striking joints and faults, which may have developed during the emplacement of the allochthon, contain many of the auriferous quartz veins of the region. Others lie in the faults and subparallel structures separating the thrust sheets.

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1 Allochthon: A mass of rock which has been moved from its original site of origin by tectonic forces, as in a thrust sheet or nappe.

2 Autochthonous: Pertaining to an autochthon or to the rock of an autochthon, especially to strata that have not been displaced by overthrusting, that is composed of untravelled rocks that lie on their original basement.

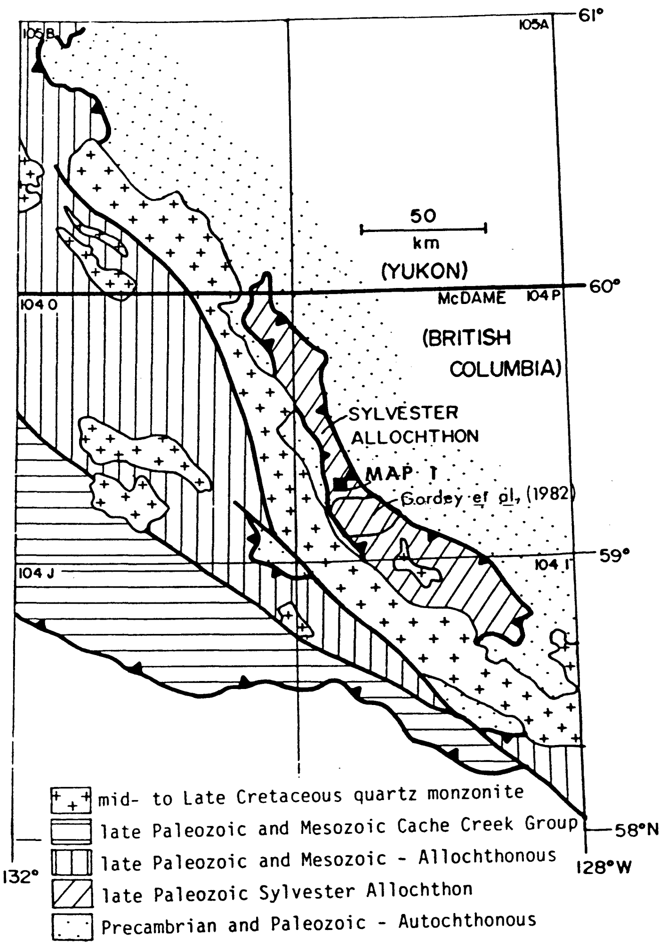


Figure 1: Location of the map and geological setting of Sylvester Allochthon. Modified from Gordey et al. (1982).

3. STRATIFIED ROCKS ON TAURUS PROPERTY:

In Gordey et al.'s (1982) lower thrust sheet, medium green intermediate to basic volcanic rocks dominate, and chert and grey siliceous and grey-green tuffaceous phyllite are minor (Map 1). For the Taurus Property, the rocks are briefly described in decreasing order of volumetric importance and not in stratigraphic order which is unknown.

(a) Unit **Mgs**

The most widespread rock unit on the Taurus Property consists of uniform aphanitic grey-green greenstone with mainly flow, and locally hypabyssal, and volcaniclastic origins. Few primary structures or textures remain except for local pillows, and rare amygdules and volcaniclastic fragments. Dark green chloritic streaks are common, and here and there impart a weak foliation.

1. Volcanic rocks:

In thin section, most of the greenstones are sparsely porphyritic (augite and/or plagioclase) meta-basalt flows (Appendix C). Little remains of the original igneous mineralogy and fabric other than strained augite phenocrysts with strong undulatory extinction, and the outlines of original plagioclase phenocrysts. These lie in a matrix rich in radiating sheaves of actinolite fibers but lacking in textural evidence of original plagioclase microlaths. Metamorphic mineral assemblages, containing chlorite, actinolite, clinozoisite-epidote, carbonate, albite, local stilpnomelane and muscovite, and rare iron-rich pumpellyite and quartz, overprint or obliterate the original igneous mineralogy and textures. Most of the metamorphic mineral assemblages are noncritical as to whether the rocks belong to the greenschist or a subgreenschist facies. Only one pumpellyite-actinolite-bearing assemblage indicates that the rocks may belong to the pumpellyite-actinolite facies rather than the chlorite zone of the greenschist facies. The original volcanic rocks were probably basalt and mostly flows.

2. Meta-intrusions:

Scattered dark green diabase, meta-gabbro and grey-green meta-quartz diorite bodies intrude volcanic rocks in the southern part of Quartzrock Creek and sediments in the settling pond and lower Snowy Creek areas (Map 1). These rocks are similar to the metavolcanic rocks in colour and weathering characteristics but lack pillows, are slightly coarser grained, and not ankeritized. The only relict igneous mineralogy and texture preserved are plagioclase laths in subophitic relationship to augite (Appendix C). A low grade regional metamorphism overprints to obliterates the original igneous minerals and textures. Plagioclase is either preserved as albite or pseudomorphed by epidote-clinozoisite and chlorite. Augite is largely converted to chlorite and calcite with only an outer zone of the original augite remaining. Some of the augite is uralitized with the resulting brown hornblende rims partly changed to pale green actinolite. Because the intrusions are thin and lack easily mapped boundaries, they are patterned on the geological map (Map 1). Contacts with the country rocks are generally parallel to sedimentary layering or foliation but cross-cutting relationships occur at the west end of the settling pond. The intrusions are metamorphosed to the same degree as the metavolcanic rocks, but are apparently undeformed. The composition of the unit ranges from a quartz-poor quartz diorite to gabbro.

(b) Unit **Mt**

The metasedimentary sequence exposed on the Taurus Property consists of chert, phyllitic chert and siliceous phyllite. Chert and phyllitic chert comprise the bulk of the metasediments. They are exposed in the southeast portion of the map area east of Snowy Creek and in the valley occupied by the settling pond (Map 1). Small exposures of bedded chert and phyllite outcrop in the northwest corner of the Taurus Property; one west of Quartzrock Creek, the other to the east, but neither could be traced north or south. At the Taurus Mine, diamond drill holes DH82-1, DH82-6, and DH82-8 intersect a thick grey chert and siliceous phyllite sequence beneath the mine workings (Map 1). On the Glen Hope Property immediately west of Quartzrock Creek and the mine, diamond drill hole QR3 bottomed in the same rocks (Wei, 1982). These drill hole intersections indicate that the sedimentary sequence passing through the settling pond probably extends northward under a thin cover of greenstone (Map 1, Section AB). The sedimentary rocks are light grey, usually bedded on a scale of 2 to 5 cm, but may be locally massive. Grey-green siliceous phyllite outcrops near the head of Snowy Creek where two tributary streams feed into the creek. In the northeast corner of the Taurus Property, two 40 to 50 m wide siliceous phyllite layers lie on the west flank of a ridge reaching 1700 m in elevation. The siliceous phyllite is well foliated, poorly bedded, and interfingers with the chert.

In thin section, the metasediments consist of fine (0.02 mm) quartz, less muscovite, minor chlorite, and dustings of carbonaceous material (Appendix C). Where the rocks are bedded, preferentially oriented muscovite and chlorite define the bedding surfaces, but where the rocks are strongly foliated, muscovite and chlorite are preferentially oriented parallel to the foliation.

(c) Lamprophyre dike (**le**):

Lamprophyre forms a dike from 1 to 5 m thick which extends at least 2.5 km eastward from 400 m west of Quartzrock Creek, through the mine and nearly to Snowy Creek on the east (Map 1). A. Panteleyev (pers. comm., 1983) said that it outcrops in the cat track to veins which show visible gold east of Snowy Creek. The medium to dark grey-green dike has a fine grain size (0.5 mm), presence of calcite amygdules, and locally granitic xenoliths which distinquish it from the greenstone.

Petrographically the lamprophyre ranges from a spessartite with augite phenocrysts to a camptonite with titanaugite phenocrysts (Appendix C). Some of the rocks lack phenocrysts and were it not for the same mineral assemblage as the phenocryst-bearing rocks, they could be called microdiorite. On surface and underground in the mine area, the lamprophyre is a spessartite composed of fine colourless (in thin section) augite, slightly sericitized albite (An_0 to An_2), and minor chloritized biotite. Locally the lamprophyre has augite phenocrysts, some of which have oriented inclusions of a medium chocolate brown amphibole. Calcite, chlorite, orthoclase, and prehnite fill amygdules. A low grade metamorphic mineral assemblage of albite, chlorite, calcite and pumpellyite overprints the relict igneous assemblage. West of Quartzrock Creek and near Snowy Creek, the lamprophyre is a camptonite composed of pleochroic pale purple-brown (in thin section) titanaugite, strong red-brown to pale brown pleochroic biotite flakes, and medium chocolate to light brown amphibole. Locally titanaugite phenocrysts contain oriented inclusions of medium chocolate brown amphibole. In sample T83-6C, serpentine completely pseudomorphs grains that may have been olivine. Minor chlorite replaces amphibole, and calcite, chlorite and prehnite fill amygdules. The plagioclase laths up to 0.5 mm long are slightly sericitized and yield compositions in the range An_3 to An_5 as determined by flat-stage methods. All of the rocks are rich in accessory apatite. The lamprophyre has metamorphic mineral assemblages similar to those of the greenstone, but unlike the greenstone, it is unfoliated, unfolded, and retains its original igneous texture.

Locally the lamprophyre dike contains 5 to 30% pink granitic xenoliths ranging from a few centimetres to a metre in size. A thin section of one shows that it is a porphyritic (quartz, plagioclase) granite crowded with embayed and partly resorbed quartz phenocrysts up to 6 mm in diameter and a few smaller plagioclase lying in a fine matrix of plagioclase, orthoclase and minor quartz (Appendix C). Accessory chlorite, stilpnomelane and allanite complete the rock.

The continuity and uniqueness of the lamprophyre dike is best established in the mine area. Thin sections from samples on either side of the Decline fault system have the same relict igneous mineral assemblage. Outside the mine area, the continuity and uniqueness of the lamprophyre dike are less certain.

On Table Mountain, biotite from a lamprophyre dike gives a K-Ar radiometric age of ~~131~~ Ma (Panteleyev, pers. comm., 1983).
110 ± 4

4. STRUCTURE:

Rocks of the Sylvester Group form a large composite thrust sheet that extends for about 200 km northwesterly and 20 km northeasterly (Fig. 1). The sheet called Sylvester Allochthon, lies in the core of McDame Synclinorium in faulted contact on autochthonous Upper Devonian shale, and older sediments of the McDame and Kechika groups. Sylvester Allochthon contains a number of thrust slices of which Gordey et al. (1982) described two. All the stratified rocks of the allochthon are folded, metamorphosed to a low grade, and complexly faulted.

(a) Folding:

Only the metasedimentary rocks of unit **Mt** retain evidence of polyphase folding in the form of folded foliations. A northwesterly striking and steeply dipping axial-plane foliation is ubiquitous in phyllite (**Mt**) but only sporadically developed in the greenstone. The bedded rocks dip moderately southwesterly and where folded have minor folds which indicate an antiform to the northeast of the map area. In the metasedimentary layer, which passes through the settling pond southeast of the mine, eight out of ten minor folds indicate an antiform to the northeast of the map area (Fig. 2). The combination of the average fold axis orientation of 320/20°NW with the N-shaped asymmetry of the minor folds indicates that the rocks of the map area lie on the southwest limb of a gentle northwesterly plunging antiform.

(b) Faulting:

Several sets of faults of differing orientation slice the rocks and quartz veins into small blocks. These are, in probable order of decreasing age: (1) gently dipping faults, (2) east-northeasterly faults, (3) northwesterly faults, and (4) northerly faults. Mine workings and diamond drill core intersect faults of these sets, but only the northerly set outcrops on surface.

1. Gently dipping faults:

Gently dipping faults are not exposed on surface or in the mine workings,

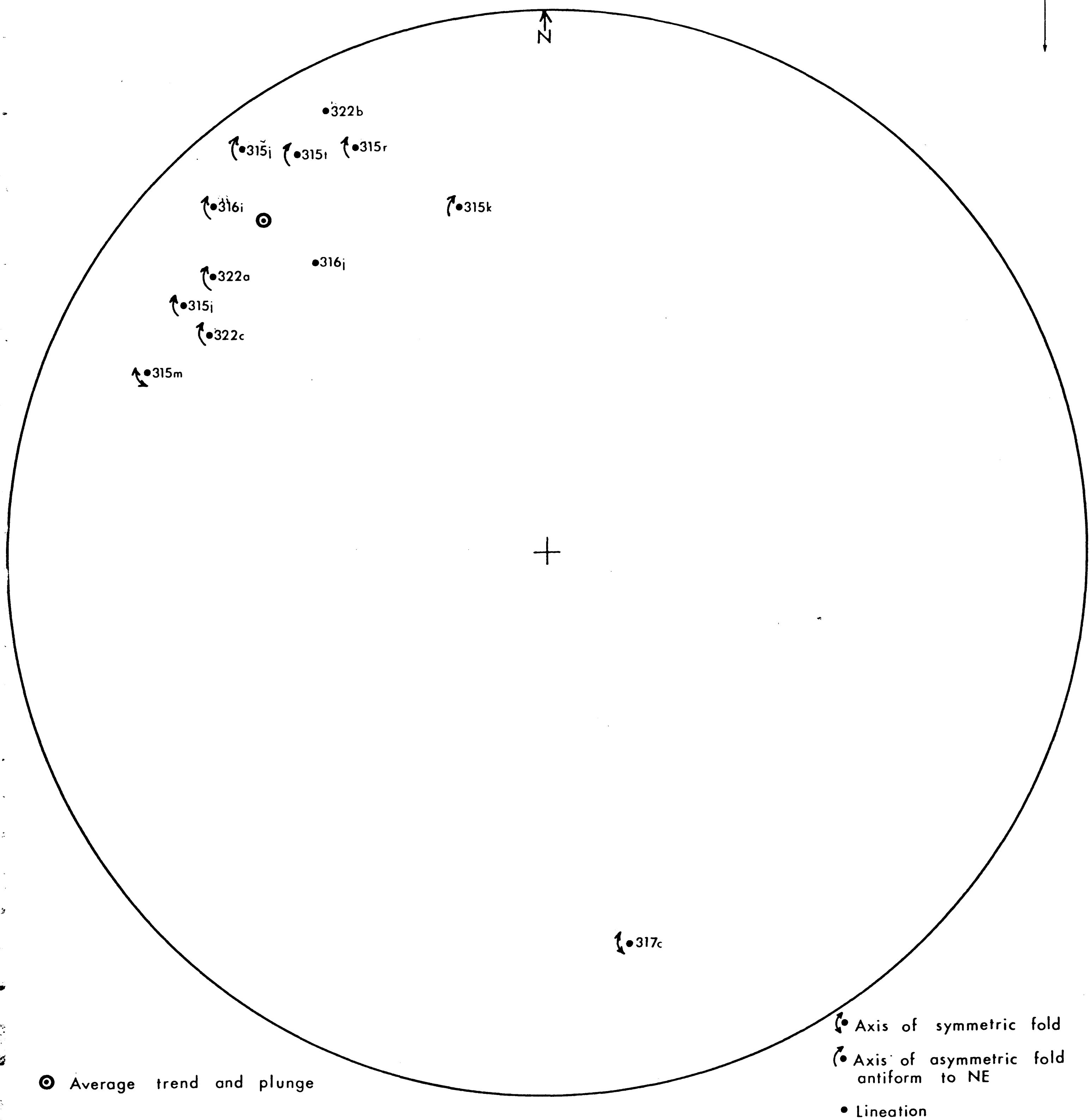


Figure 2: Lower hemisphere, equal-area projection of 10 minor fold axes and 2 bedding-axial plane intersection lineations from unit **Mt** passing through the settling pond area west of Snowy Creek. Of the 10 folds, 8 are asymmetric and indicate an antiform to the northeast and two are symmetric.

but seem necessary to explain the distribution of unit **Mt** beneath and southeast of the mine. Vertical cross-section AB is parallel, and EF, perpendicular to the average trend of the minor folds measured in unit **Mt** near the settling pond (Map 1). The average trend and plunge is 320/20°NW, and the contact between **Mt** and the overlying greenstone **(Mgs)** should plunge 20°NW in section AB and section CD (Fig. 3) if the contact is parallel to the folded bedding in the sediments. DH82-6, which intersects the contact 15 m out of the line of section, requires the contact to dip 10°NW, and DH82-1, which lies 50 m from the section, requires a dip of 7°NW. In cross-section EF (Map 1), the traces of the moderate southwesterly dipping bedding in **Mt** should extend the unit northwestward on the map through points 1206.5, 1202.5, 1191.5, 1223.5 and beyond into an area where it does not outcrop. In the settling pond area, because the contacts of unit **Mt** apparently do not follow bedding, but cross it, they are probably faults as shown in map and sections (Map 1). Drill logs DH82-1 and DH82-8 cite extensive fracturing and gouge at the contact of **Mt** against overlying **Mgs**; the lower contact has not been intersected. Other drill logs are not available to us. Although offset cannot be calculated for any fault in this set, displacements in terms of thousands of metres are probably in the correct order of magnitude.

2. East-northeasterly faults:

East-northeasterly striking and steeply dipping faults are common outside and within the mine area. Along the southwest limb of McDame Synclinorium (Fig. 1), Diakow and Panteleyev (1981, Fig. 18) mapped several east-northeasterly faults which offset the fault system at the base of Sylvester Allochthon. Within the map area, east-northeasterly faults interrupt the continuity of unit **Mt** on both sides of the upper part of Snowy Creek. At station P317p (Map 1), an outcrop blank of only 30 m separates the northwesterly striking metasediments of **Mt** from greenstones **(Mgs)** along strike. Farther northwestward, two northwesterly striking layers of siliceous phyllite **(Mt)** end abruptly in areas of sparse outcrop. In areas lacking sedimentary

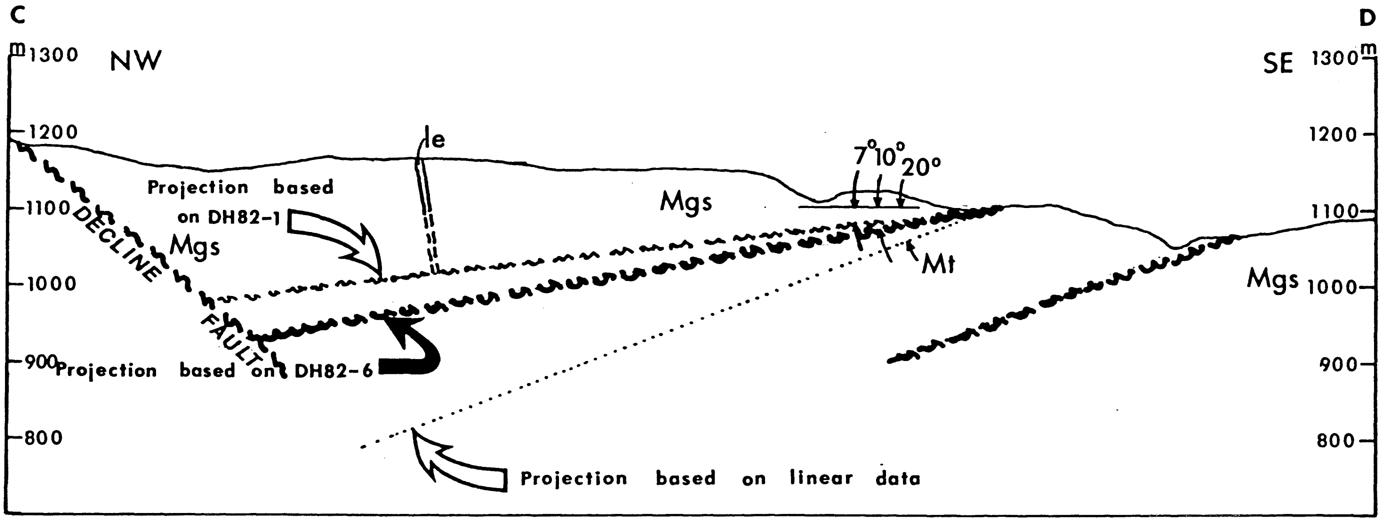


Figure 3: A vertical cross-section through Taurus Mine looking northeastward, showing three projections of the contact between the sediments (**Mt**) and greenstone (**Mgs**). Two of the projections depend upon diamond drill intersections of the contact and a third utilizes the average plunge of minor folds in the sediments.

layers, east-northeasterly faults may be present but remain undetected in the monotonous greenstone sequence. In trenches and in Taurus Mine workings, east-northeast to easterly faults subparallel the quartz veins, and if they do not lie within the quartz veins, they form one of the walls. At Taurus Mine, the faults and subparallel quartz veins strike 080 to 085°, but southwards in Wings Canyon and southeastwards in Snowy Creek, the strikes of quartz veins diminish to 055 to 065°. Lacking data to the contrary, we believe the change in strike is gradual and not the result of two intersecting quartz vein-fault systems of differing strikes. In Taurus Mine workings, some easterly striking faults along and within the quartz veins have subhorizontal slickensides. Fault displacement has not been calculated for any fault in this set, but it may be in the order of hundreds of metres of left lateral offset for the fault southeast of the settling pond.

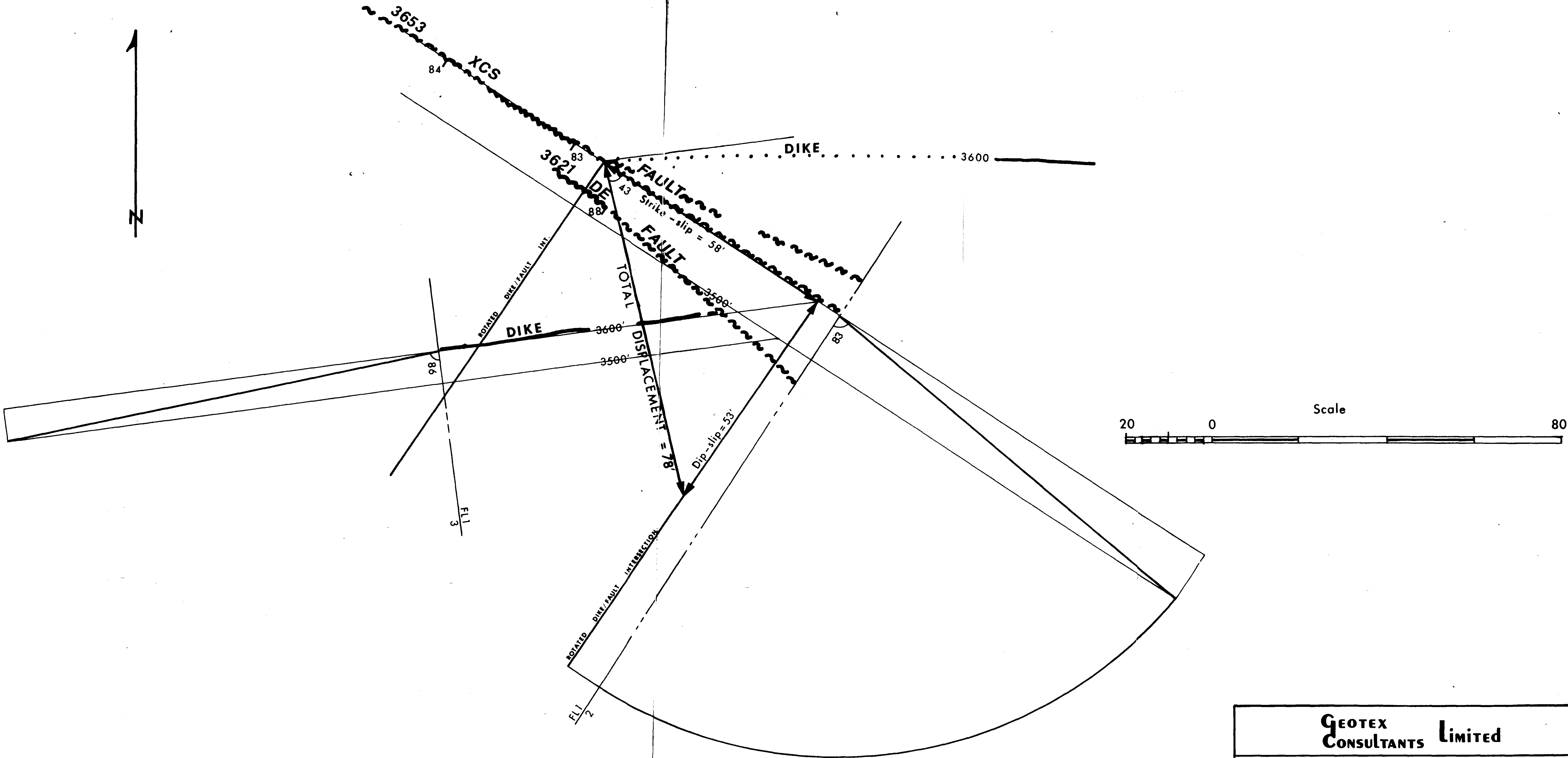
3. Northwesterly faults:

Within the map area, northwesterly striking, subvertical faults seem restricted to the Taurus Mine (Map 1). Because they offset the quartz veins, their importance in controlling the distribution of the orebodies far exceeds the tens of metres of displacement along any fault in this set. Determination of the magnitude of fault displacement is complicated by a lack of distinctive rocks in the monotonous greenstone-quartz vein sequence exposed in the underground workings. Diamond drill core and the workings intersect a steep south dipping lamprophyre in many places (Map 2). On the basis of ten thin sections of lamprophyre, which show that it is petrographically similar throughout the mine area, the lamprophyre is considered a single dike disrupted by faulting. On the basis of slickenside data provided by G. Tomaszewski (pers. comm., 1983) minimum and approximate fault displacements are calculated. Since the lamprophyre dike is nearly vertical, Map 2, which is a partial composite of the 3500'-and 3600'-levels, gives close to the minimum possible fault displacements. These are: (a) 200 feet (61 m) left lateral for 3512 XCS Fault, and

(b) 57 feet (17 m) left lateral for faults 3653 XCS and 3621 DE combined. The relevant data for 3512 XCS Fault and the method of fault solution are given in Map 3 which also shows five of the infinite number of displacement vectors possible. In 3513 DE, slickensides from 3512 XCS Fault are overprinted with one set plunging northwesterly and another southeasterly. The average of the five northwesterly plunging slickensides is 27.4°NW with a rake of 28°NW which results in a fault displacement of 237 feet (72 m). This high angle left lateral oblique-slip reverse fault has a dip-slip component of 111 feet (34 m) and a strike-slip component of 211 feet (64 m). Because of the intersecting northwesterly and southeasterly plunging slickensides, we consider the fault solution to be approximate, but know that the total displacement cannot be less than 200 feet (61 m). Similar crossing slickensides develop on 3653 XCS and 3621 DE faults. The average of the three southeasterly plunging slickensides is 42.3°SE with a rake of 43°SE. A combination of the slickenside data with the offset dike results in a calculated fault displacement of 78 feet (24 m) (Fig. 4). This right lateral oblique-slip normal fault has a dip-slip component of 53 feet (16 m) and a strike-slip component of 58 feet (18 m). Because the lamprophyre was intruded after the quartz veins and associated wallrock alteration, its displacement will record only post-dike faulting, and not any fault movement that may have occurred after development of the veins but before intrusion of the dike. For example, by applying the fault displacement determined from the offset lamprophyre dike on 3512 XCS Fault to the quartz veins, we find that the quartz vein stoped in 3513 DW, 3513 DE, 3616 DW and 3616 DE on the southwest side of the fault is the same one as that exposed in 3628 DE and 3628 DW on the northeast side of the fault (Map 2).

4. Northerly faults:

Moderate to steep easterly dipping faults form a zone named Decline Fault which extends from surface exposures at the Taurus Mine decline on the north to Wings Canyon and probably beyond to the south. Single faults in the zone outcrop on



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TAURUS PROPERTY

FAULTED LAMPROPHYRE DIKE: 3653 XCS & 3621 DE FAULTS

DATE DEC. 1983	SCALE AS SHOWN
DWN PBR	FIG. 4

the road from the mill to the crusher and in a cutbank 15 m south of the crusher. At the decline, faults range in strike from 340 to 355° and in dip from 37° to 80°NE. All the faults show approximately dip-slip slickensides, a few have near dip-slip calcite fiber growths[3], and the most gently dipping one has graphitic gouge. Tectonic breccia and fault gouge of variable thickness lie along all the faults.

Decline Fault displaces a lamprophyre dike 317 feet (97 m) right laterally. Thin sections of the lamprophyre from both sides of the fault show that it is petrographically similar across the fault (Appendix C). Slickenside data and the offset positions of the apparently unique lamprophyre dike yield 1580 feet (482 m) of reverse displacement across the fault zone (Fig. 5). Unfortunately, the trend of 092/35°SE for the slickensides is within a few degrees of the trend of the trace of the line of intersection of the lamprophyre dike on the fault. The near parallelism of the trends of the slickensides and line of intersection of the dike on the fault gives a fault solution in which the amount and direction of displacement is very sensitive to slickenside orientation (Fig. 6). If the trend of the slickensides lies between the northerly strike of Decline Fault and the easterly trend of the trace of the lamprophyre dike on the fault, the fault is reverse. If the trend of the slickensides lies between the southerly strike of Decline Fault and the easterly trend of the trace of the dike on the fault, the fault is normal. As the slickenside orientation changes from north to south across the direction of the line of intersection of the dike on the fault, the amount of fault displacement changes rapidly to infinity where the slickensides and the line of intersection are parallel, and the fault movement changes from reverse to normal as the slickenside orientation changes from northerly to southerly across the line of intersection.

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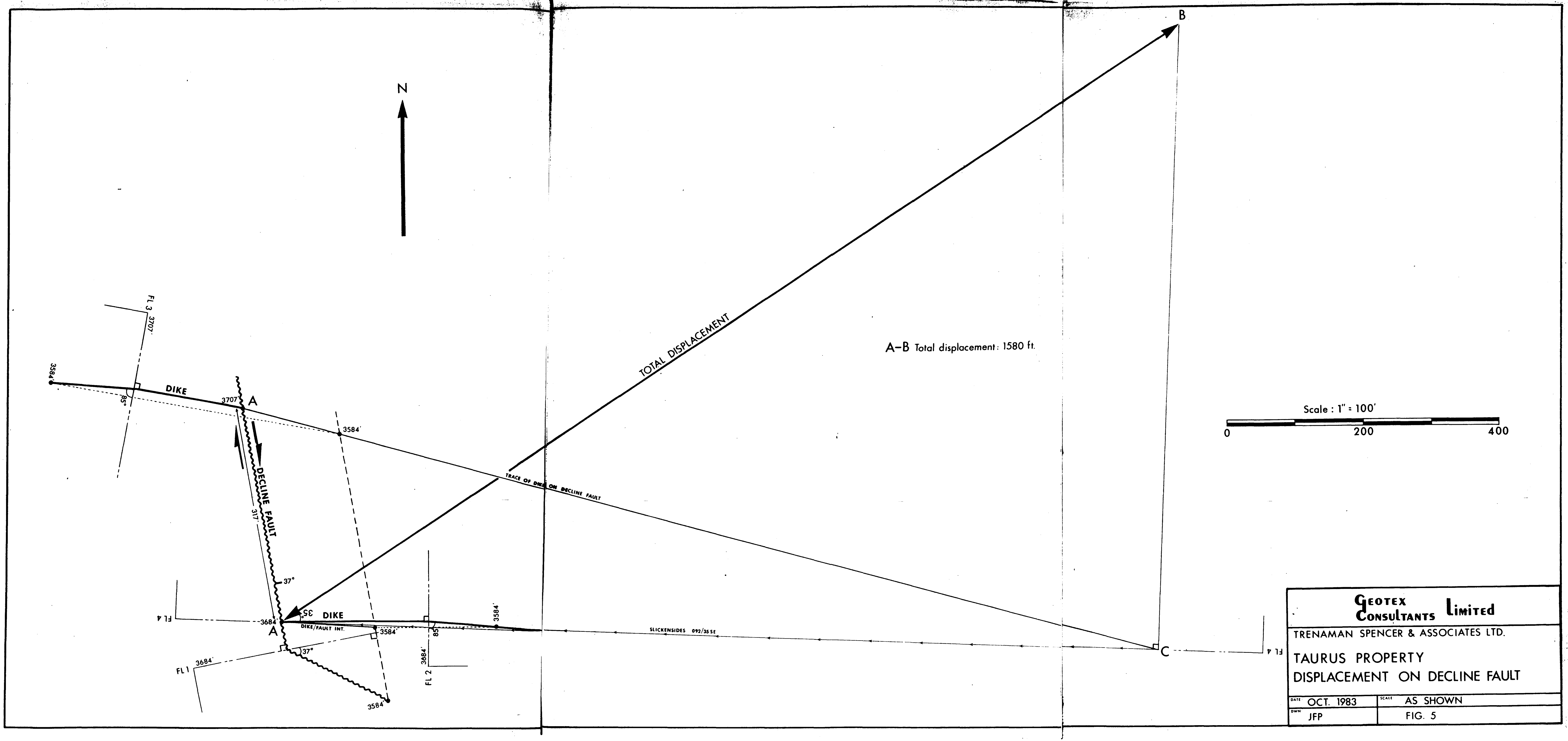
3 Fiber growth: The growth of elongate crystals across a fault plane during fault movement. The direction of elongation and curvature of the fibers indicate the direction and sense of fault movement (Durney and De Jong, 1973).



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TAURUS PROPERTY
DISPLACEMENT ON DECLINE FAULT

DATE OCT. 1983	SCALE AS SHOWN
DWN JFP	FIG. 5

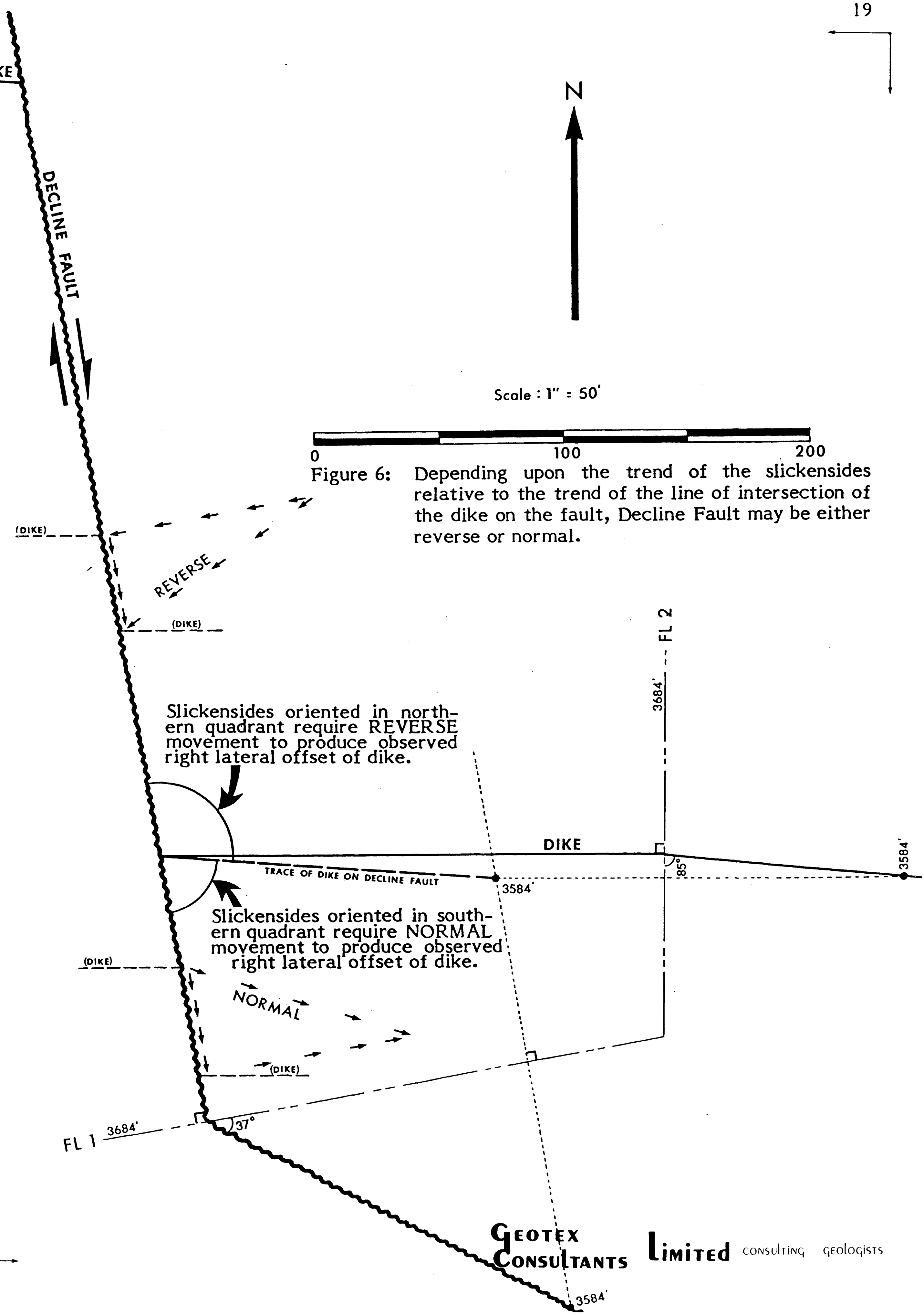


Figure 6: Depending upon the trend of the slickensides relative to the trend of the line of intersection of the dike on the fault, Decline Fault may be either reverse or normal.

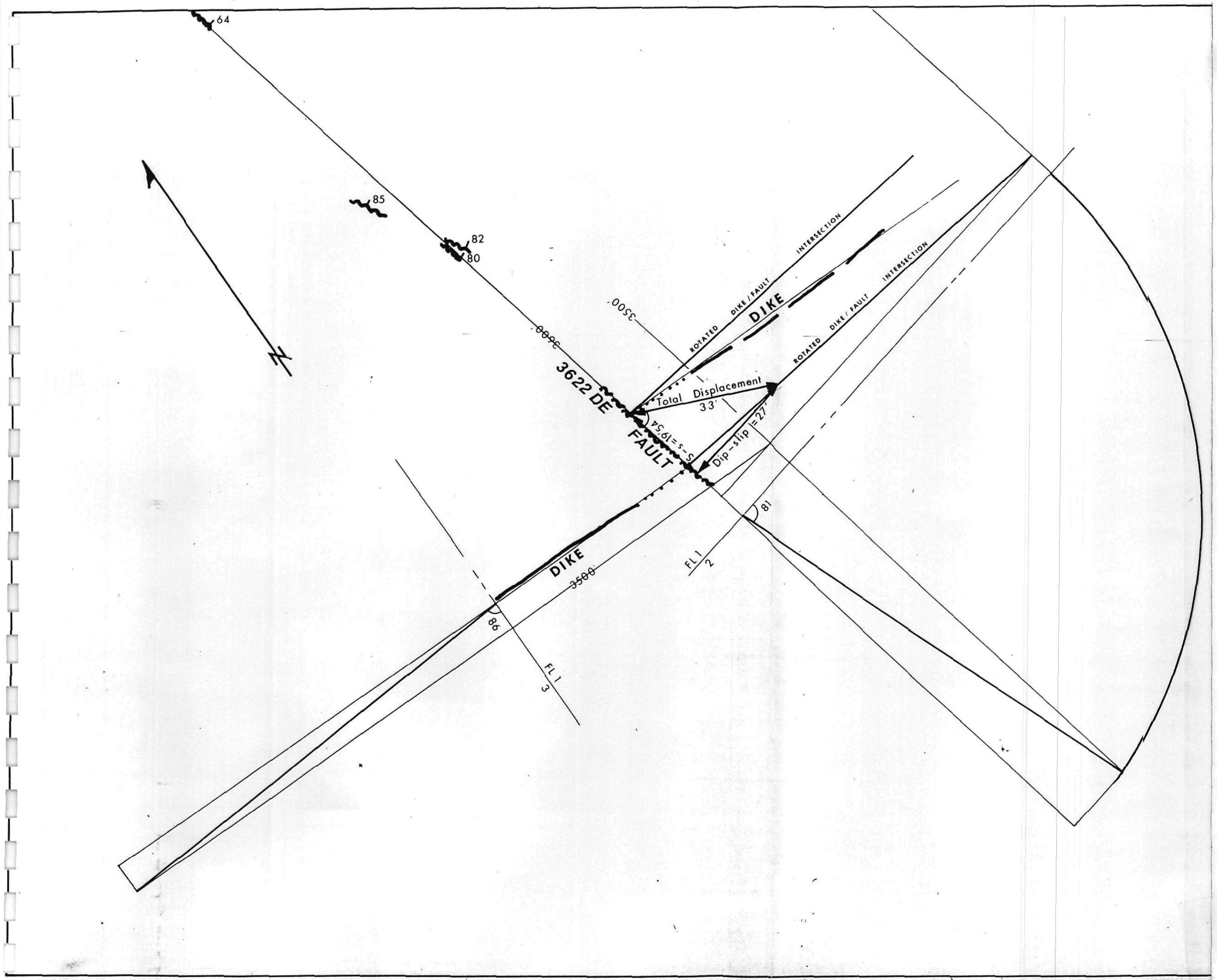
Other northerly faults include 3622 DE Fault on the 3600'-level (Map 2). Structure contours on the base of the lamprophyre are offset 19 feet (5.7 m) left laterally. Although the fault seems to continue northerly across several drifts, it has not been mapped on the 3500'-level. On 3622 DE Fault, slickensides plunge about 53°SE with a rake of 54°SE (Fig. 7). By combining the slickenside data with the offset dike we calculate a total displacement of 33 feet (10 m) for this high angle, left lateral oblique-slip normal fault which has a strike-slip component of 19 feet (5.7 m) and a dip-slip component of 27 feet (8 m). To the west of Quartzrock Creek, a camptonite lamprophyre dike outcrops northwest of point 1170.0 (Map 1). If the dike is the same one as that through the mine area, it shows 150 m (492 feet) of right lateral offset across the assumed northerly fault shown west of Quartzrock Creek.

To the south of the map area on Table Mountain, Diakow and Panteleyev (1981, Fig. 18) mapped two northerly striking and steep easterly dipping faults. They suggested (p. 60) that one of these, named Erickson Creek fault, may have offset the Jennie vein from the Vollaug vein with a throw of about 575 m. The northward projection of these faults lies very close to Decline Fault and the unnamed northerly fault west of Quartzrock Creek.

5. Relative ages of fault sets:

The four sets of faults described apparently developed sequentially. Their order of development is based on regional inference and a few surface observations in the mine area.

Because the Sylvester Group is an allochthon, <u>gently dipping faults</u> of unknown magnitude probably developed within the allochthon during its emplacement. Regional mapping by Panteleyev and Diakow (1982) showed <u>east-northeasterly faults</u> offsetting the faulted base of the allochthon. These faults may have developed during emplacement of the allochthon when parts of it probably advanced at different rates along tear faults, oriented subparallel to the direction of emplacement of the



Scale

20 0 80ft

GEOTEX CONSULTANTS LIMITED	
TRENAMAN SPENCER & ASSOCIATES LTD.	
TAURUS PROPERTY	
FAULTED LAMPROPHYRE DIKE: 3622 DE FAULT	
DATE DEC. 1983	SCALE AS SHOWN
DWN PBR	FIG. 7

allochthon. The east-northeasterly faults developed before and after the subparallel quartz veins. Prior to the quartz veins, they provided channelways for the introduction of the veins, and afterwards they produced the faulted vein margins.

The relative order of the northwesterly and northerly faults sets is uncertain as both offset quartz veins, subparallel east-northeasterly faults, and the lamprophyre dike. The partial composite plan of the 3500'- and 3600'-levels shows the north end of 3622 DE Fault of the northerly set apparently terminating against the northwesterly set (Map 2), but the apparently undeflected trace of Decline Fault suggests that the northerly set may be younger (Map 1).

5. MINERALIZATION AND FAULTING:

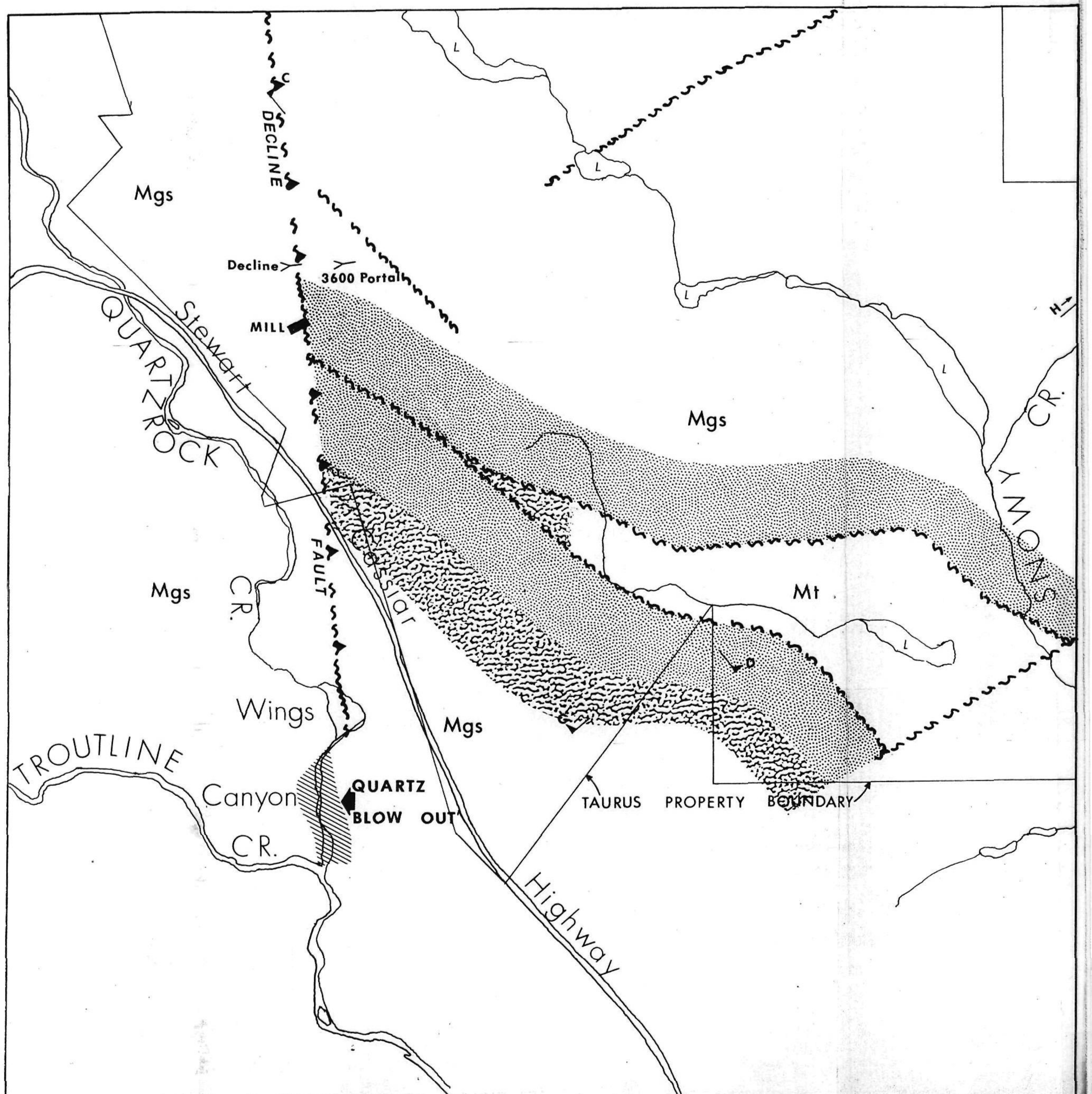
On the Taurus Property and adjacent ground, most of the quartz veins dip steeply and strike east-northeast to easterly. They are surrounded by a rusty weathering altered envelope of carbonate, muscovite, albite, quartz, and scattered pyritohedrons of pyrite (Appendix C) which is several times the thickness of the quartz veins. The alteration envelopes do not develop in the sedimentary rocks where quartz veins are relatively rare. The veins have the orientation and characteristics of those that Panteleyev and Diakow (1982, p. 158) called Type 1 veins.

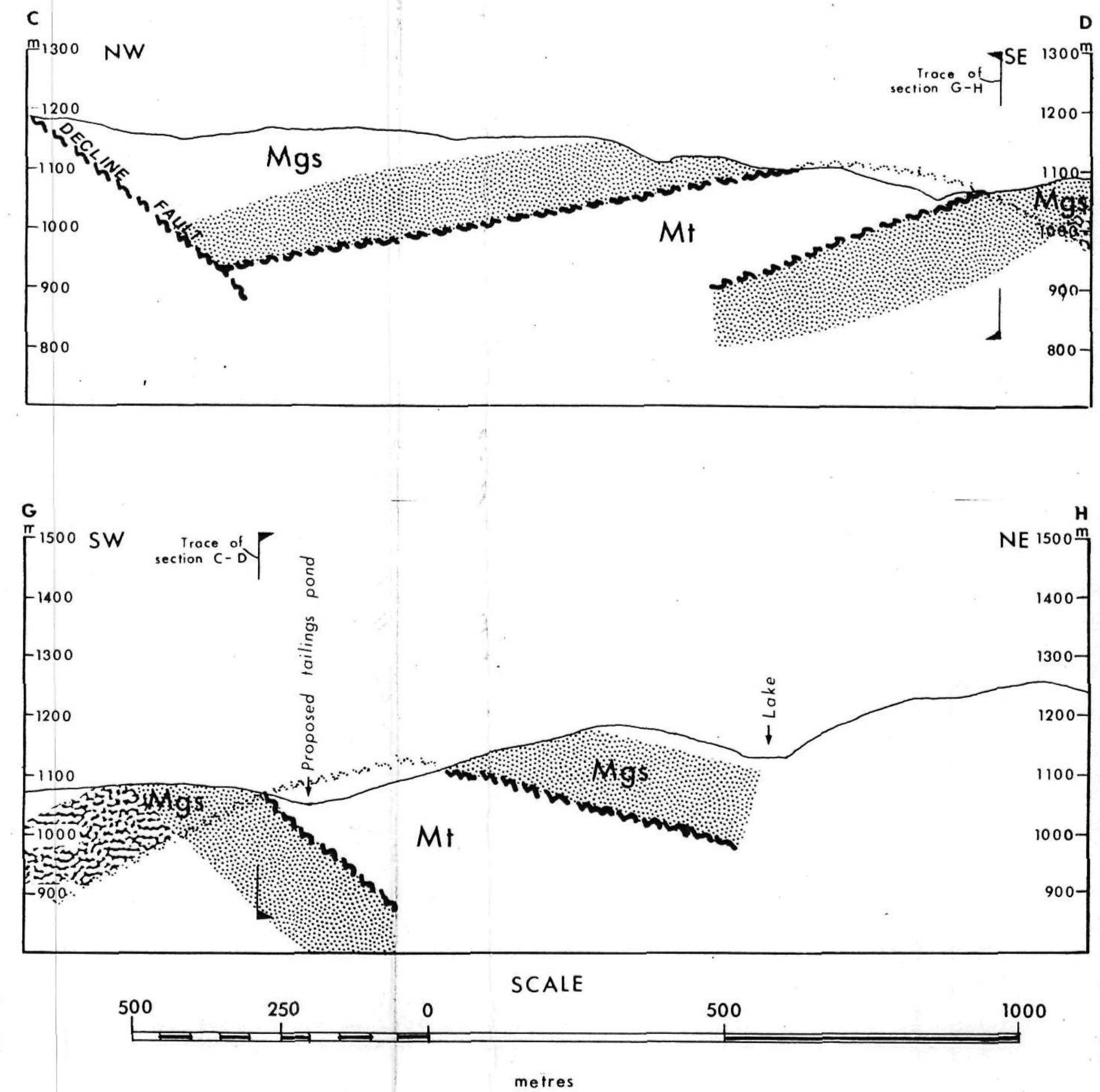
Most of the altered greenstone lies within and east of Quartzrock Creek and between the two unnamed east-northeasterly striking faults (Map 1). In Wings Canyon, an extensive quartz "blow out" in greenstone consists of closely spaced, steeply dipping quartz veins which strike east-northeasterly. Diamond drilling indicates that the quartz "blow out" lies thrust faulted on a sliver of sediments (B. Spencer, pers. comm., 1983).

On the Taurus Property, quartz veins lying along gently dipping and faulted contacts between metasedimentary and metavolcanic rocks are unknown. If these occur, they would be similar in orientation to the Vollaug and Jennie veins, which are Panteleyev and Diakow's Type 2 veins (1982, p. 160). They might be expected to occur locally along the intersection of the faulted upper and? lower contacts of the metasedimentary layer which runs through the settling pond and the steep east-northeast to easterly striking veins (Fig. 8). In the absence of sufficient outcrop, the gently dipping faults may either be planar as shown in solid fault symbols, or folded as depicted by the dotted fault symbols (Fig. 8). The two alternatives result in overlapping areas in which quartz veins may develop. The folded option yields a larger potential area southwest of the metasediment layer through the settling pond.

Within the Cassiar gold deposits, quartz veins quickly die out as they pass from metavolcanic into metasedimentary rocks (Panteleyev, pers. comm., 1983). This observation is verified in the metasediment layer through the settling pond which is devoid of easterly striking quartz veins. The metasedimentary rocks at depth beneath the Taurus Mine workings should also lack auriferous quartz veins, but the contact zone between metasedimentary and metavolcanic rocks may be favourable as indicated by the occurrence of a quartz "blow out" in Wings Canyon.

Figure 8: Zones of possible favourable locations for quartz veins at the intersection of steeply dipping east-northeast to easterly striking quartz veins and potential gently dipping veins. Two alternatives are shown: (a) gently dipping veins parallel to planar faults (solid fault symbols and dotted pattern), and (b) gently dipping veins parallel to folded faults (dotted faults and dendriform pattern).





PLANAR FAULTS OPTION

Potentially favourable prospecting ground

Planar Fault

FOLDED FAULT OPTION

Potentially favourable prospecting ground

Folded fault

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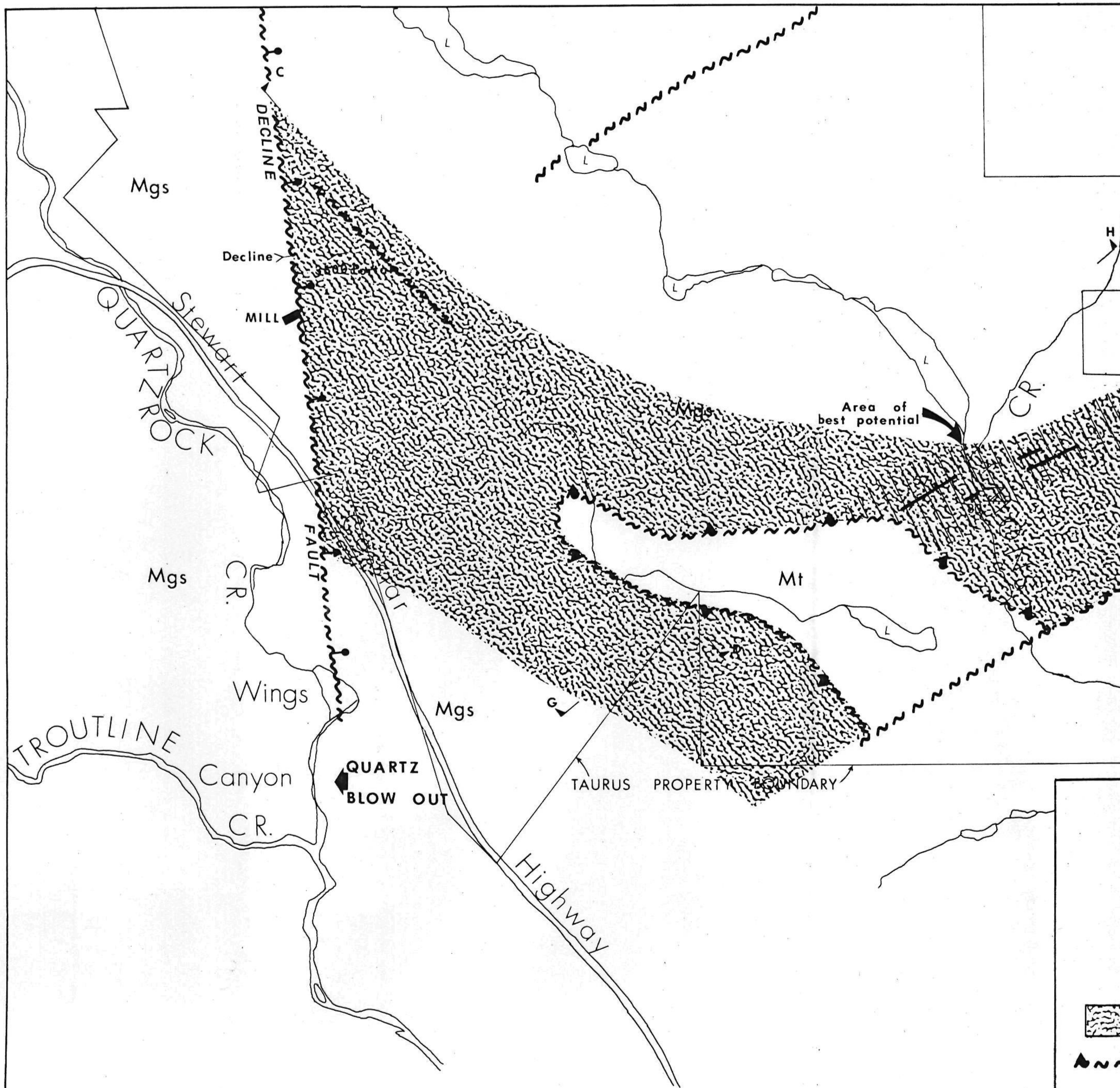
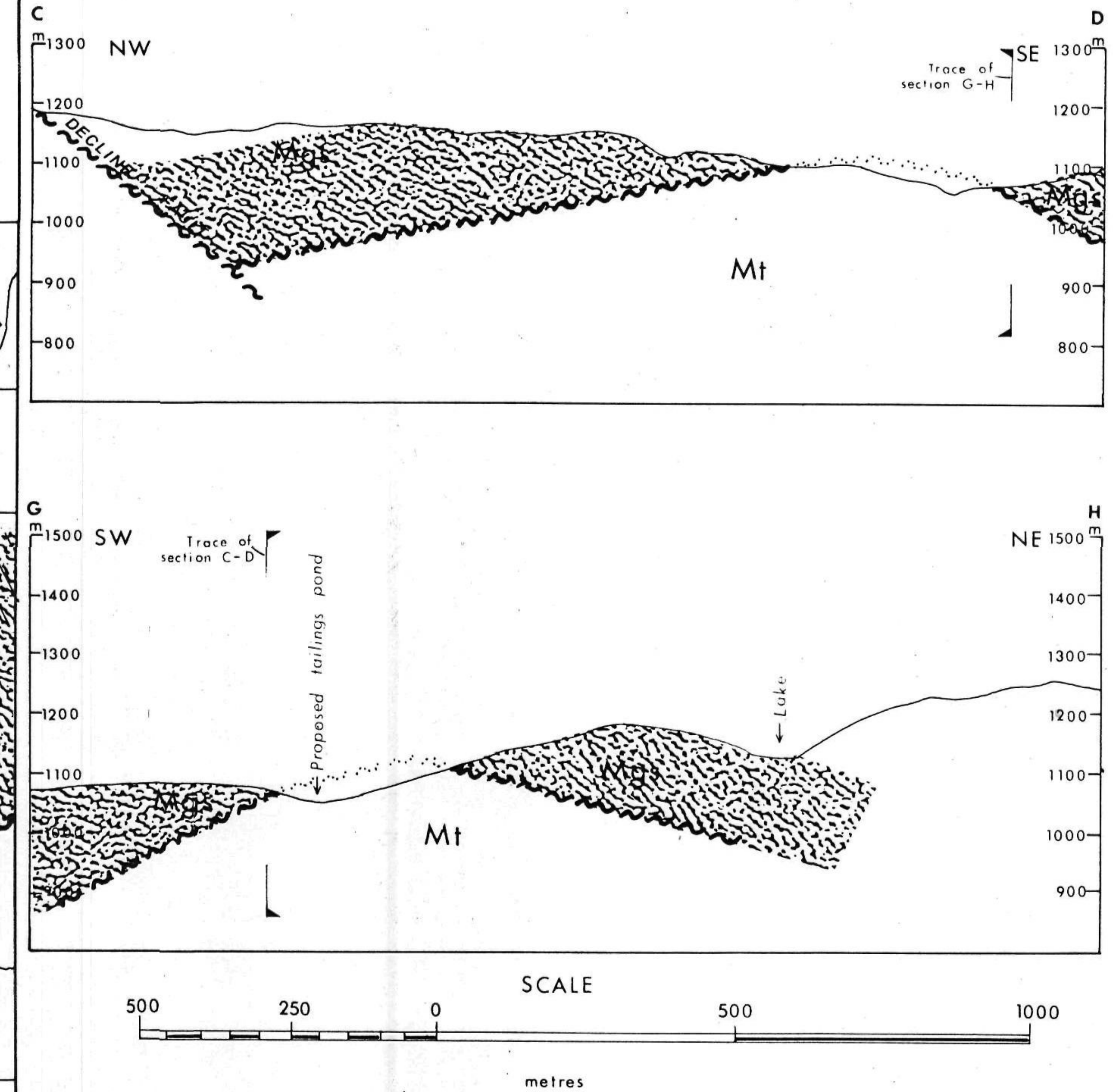
TAURUS PROPERTY
POTENTIAL PROSPECTING GROUND

DATE	NOV. 1983	SCALE	AS SHOWN
DWN	PBR		FIG. 8





FOLDED FAULT OPTION

Potentially favourable prospecting ground

Folded fault

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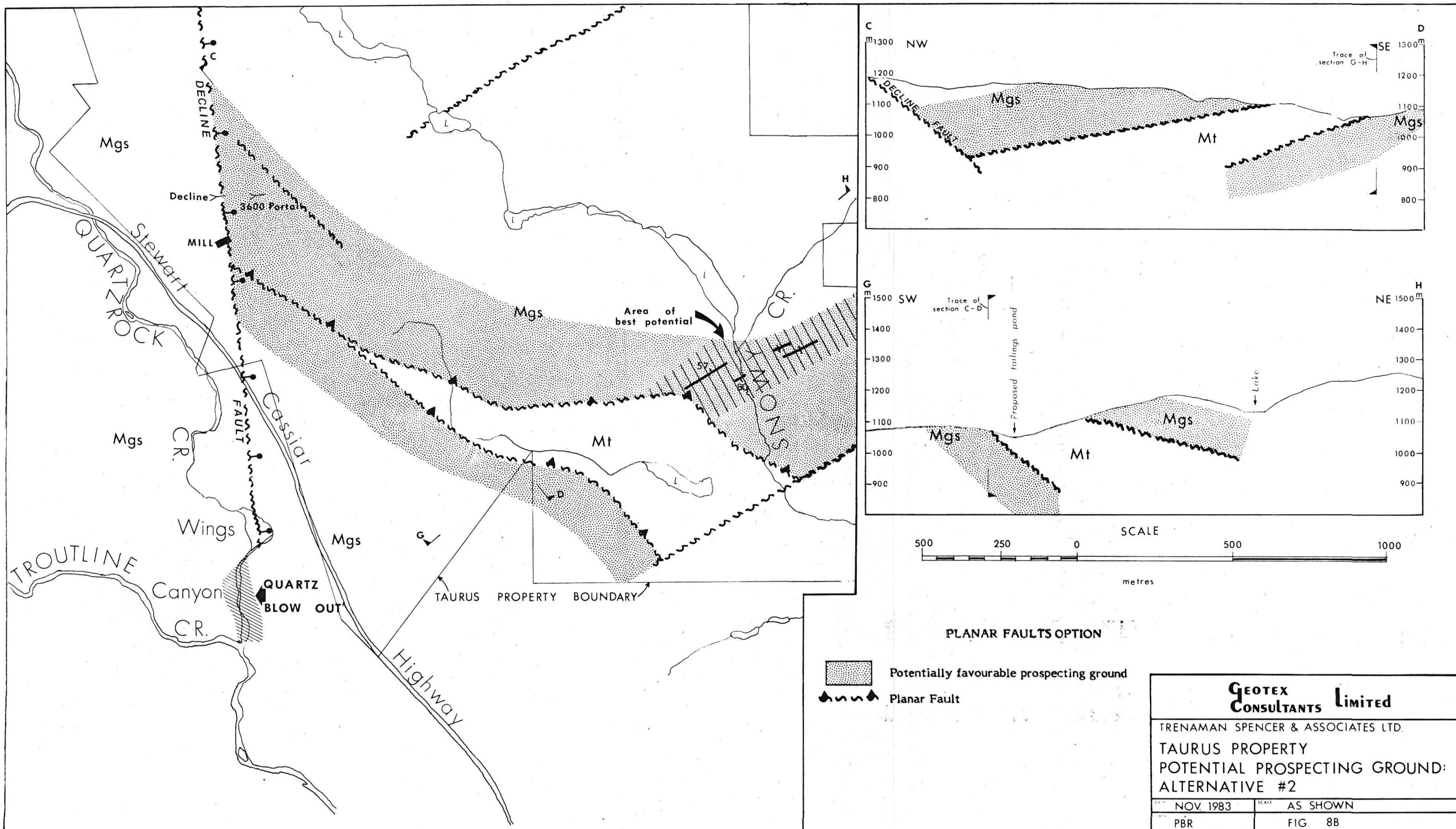
TAURUS PROPERTY
POTENTIAL PROSPECTING GROUND:
ALTERNATIVE #1

DATE NOV. 1983	SCALE AS SHOWN
DR PBR	FIG. 8A



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TAURUS PROPERTY
POTENTIAL PROSPECTING GROUND:
ALTERNATIVE #2

NOV. 1983	AS SHOWN
PBR	FIG. 8B

6. CONCLUSIONS:

1. The sequence of greenstone, siliceous phyllite and chert which underlies the Taurus Mine and property is part of the lower thrust sheet, as defined by Gordey et al. (1982), of the Sylvester Allochthon. In distinction to the mapping of Panteleyev and Diakow (1982), we find that no rocks of the upper thrust sheet, as defined by Gordey et al. (1982) underlie the mine or property. Rocks of the upper thrust sheet may underlie a region just beyond the northwest corner of the map area (Map 1).

2. In the metasedimentary rocks, bedding strikes northwesterly and dips moderately southwesterly, and foliation dips steep southwesterly to vertically.

3. In the metasedimentary rocks, minor folds have an average trend and plunge of 320/20°NW and are N-shaped in down-plunge profile. The shape indicates that the rocks on the property lie on the southwest limb of a major antiform as depicted in Diakow and Panteleyev's cross-section A-A' (1981, Fig. 19).

4. An easterly striking, steep southerly dipping lamprophyre (spessartite and camptonite) dike cuts through the mine area and across the property. Its intrusion is after the quartz veins and related hydrothermal alteration but before some of the faulting.

5. Most of the faults on the property belong to one of four sets which in order of decreasing age are: (a) gently dipping faults, (b) east-northeasterly faults, (c) northwesterly faults, and (d) northerly faults.

6. The gently dipping faults and east-northeasterly ones may be related to the emplacement of Sylvester Allochthon. The northwesterly and northerly faults cut the east-northeasterly faults, quartz veins, and lamprophyre dike.

7. A combination of slickenside data and offsets of the lamprophyre dike yield the fault displacements given in Table 1 (p. 27).

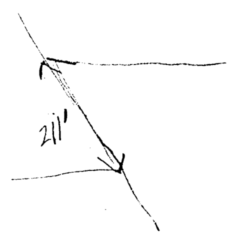
8. The presence of a quartz "blow out" in Wings Canyon indicates that the intersection of gently dipping faults and east-northeast to easterly striking quartz

veins may locally produce a favourable structural environment for the development of quartz veins. The upper and? lower faulted contact of the metasediment layer through the settling pond may present similar structural settings to the quartz "blow out" in Wings Canyon.

9. The metasedimentary rocks passing through the settling pond do not contain easterly striking quartz veins and they should not be expected to contain them at depth beneath the Taurus Mine workings.

TABLE 1: POST-DIKE MOVEMENT OF FAULTS

Fault	Minimum Displacement	Calculated Displacement Net-slip	Strike-slip	Dip-slip	Type of Fault
(a) Northwesterly Faults:					
3512 XCS	200 feet	237 ft	211 ft	111 ft	l.l.oblique-slip rev.
3653 XCS) 3621 DE)	57	78	58	53	r.l.oblique-slip nor.
(b) Northerly Faults:					
Decline	317 feet	1580 ft	600 ft	1570 ft	r.l.dip-slip rev.
3622 DE	19	33	19	27	l.l.oblique-slip nor.



7. RECOMMENDATIONS:

1. The Taurus Mine needs an investigation of post-ore faulting which should proceed in the following order:

(a) Collection of all underground data on the strike and dip of faults, and trend and plunge, and sense of movement of all fault movement indicators such as slickensides and growth fibers.

(b) Accurate underground mapping and sampling of all lamprophyre dikes, and relogging and sampling of lamprophyre in all drill holes. Some of the data in Map 2 and Appendix B are the beginning of what is required.

(c) Surface geological mapping at a scale of 1" = 20' and sampling of the exposures of the lamprophyre dike. Some of the data in Appendix C come from surfaces samples of the lamprophyre dike.

(d) Structure contouring of the base and top of the lamprophyre dike with attention paid to the thickness of the dike. Map 2 is a preliminary stage of part of such an investigation.

(e) A petrographic study of all lamprophyre samples to check if they are petrographically similar. The thin section descriptions of lamprophyres in Appendix C are part of the necessary petrographic information.

(f) If the lamprophyre dike is unique, use slickenside data and offset distances of the lamprophyre dike to solve the post-dike fault movements of all faults cutting the lamprophyre dike. Map 3 and Figures 4, 5, 6 and 7 are a preliminary stage for four faults in such a study.

(g) Application of the post-dike fault movements to the quartz veins to check if the post-dike fault movement equals the post-vein movement. If any quartz veins have unique features, such as the presence of tourmaline, muscovite, or tetrahedrite, these veins should be used to check the calculated fault displacements.

Rationale: Efficient underground exploration and exploitation require quantitative information on the fault displacements of the quartz veins. This recommendation, building on data already partly collected and presented in this report, outlines the necessary data and shows how it should be treated and checked.

2. The projection of the lamprophyre dike and significant quartz veins and faults in plan and section by the use of composite level plans and structure contouring on significant horizons such as important veins or faults.

Rationale: To upgrade the three-dimensional data on the veins and faults in the mine area, which should result in more efficient underground exploration and exploitation. As of September 1983, level plans showed few connections of the lamprophyre dike and of fault intersections among the workings and drill hole data on a level, and no vertical sections showing correlations between levels had been prepared. Composite level plans with significant geological features structure contoured, such as the partial one of Map 2, permit the use of data from underground workings and drill holes from more than one level for the projection of veins, faults and the dike on level maps and into vertical sections.

3. On the Taurus and Glen Hope properties and in the Wings Canyon area, examine all drill core which passes through the metasediment-metavolcanic boundary. Check for the presence of mylonite, fault breccia, gouge, and quartz veins at the boundary.

Rationale: Structural analysis suggests that the upper boundary between the metasedimentary layer passing through the settling pond and the overlying metavolcanic rocks should be faulted. The drill core will yield evidence to confirm or deny the faulted nature of the metasedimentary-metavolcanic boundary.

4. If the metasedimentary-metavolcanic boundary is faulted, prospecting may be best along the boundary on the greenstone hanging wall side west of Snowy Creek (Fig. 8).

Rationale: The area suggested would be at the intersection of steeply dipping east-northeast to easterly striking quartz veins and possible gently dipping type 2 quartz veins subparallel to planar or folded faults.

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APPENDIX A:

FIELD NOTES

TRAVERSE NO. 315 September 13, 1983

Trenaman and Spencer - Cassiar B.C.

P315a (1145 m). 3 m wide amygdaloidal dike rock. Boundaries not observed. Contains coarse rhyolitic or granitic xenoliths. Dike trend is 100°. Sample $P315A_1$, -dike; Sample $P315A_2$ - xenolith.

P315b (1180 m). In medium green greenstone with dark green streaks and whitish diffuse calcareous mineral spotting the rock.

P315c (1210 m). Amygdaloidal dike rock.

P315d (1155 m). In massive medium to dark green greenstone and one 0.5 m white quartz vein and ankeritic wall rock.

P315e (1155 m). Large outcrop area of SOS.

P315f (1130 m). Still in medium green greenstone with local dark green chloritic streaks. Some narrow trenched quartz veins.

P315g (1130 m). SOS with trenched quartz veins and ankeritic alteration zones.

P315h (1145 m). Came across small stream in medium green greenstone with dark green chloritic streaks. At this station in same rocks but better bulbous pillows are observed locally. Flattening of pillows? 345°/85°SW. Sample P315H.

P315i (1150 m). In medium green weakly foliated greenstone. Foliation only apparent on outcrop scale. Cannot see in hand specimen.

P315j (1080 m). In grey to light grey-green siliceous phyllite and bedded light grey chert. Bedding not always distinct. FOSSIL COLLECTION P83-62F. Sample P315J of siliceous phyllite. Open folds in outcrop indicate antiform to northeast plunge is towards the northwest. Measured bedding/cleavage and folds. Folds are fairly open locally but still have a weak axial plane cleavage. Difficult to see cleavage here because rock is cherty. But a penetrative fabric is seen trending through bedding. At hinge of folds do not see micas folded - can see edges parallel to axial plane cleavage. Conclusion - these are same phase of fold as mica cleavage seen elsewhere.

P315k (1100 m). Crossed from grey phyllite over into green volcanic rocks. Measured/bedding cleavage and a hingeline. Antiform to northeast. Contact between sediments and volcanics lies at 1120 m elevation.

P315l (1095 m). In stream in light to medium green fine grained greenstone.

P315m (1095 m). In grey siliceous phyllite. Measured bedding/cleavage and lineation. Folds are symmetrical.

P315n (1110 m). Grey siliceous phyllite.

P315o (1090 m). Back into light to medium green greenstone with dark green streaks.

P315p (1080 m). In grey siliceous phyllite.

P315q (1085 m). No outcrop.

P315r (1080 m). Last outcrop of grey siliceous phyllite on cat trail. Start seeing only volcanic rubble upslope from 1090 m. Measured bedding/cleavage and lineation, antiform to northeast.

P315s (1150 m). Small outcrop of medium green greenstone with dark green streaks.

P315t (1045 m). At contact between sediments and medium green fine grained intrusion. Measured bedding/cleavage and lineation, antiform to northeast.

P315u (1040 m). Massive fine grained intrusion.

P315v (1040 m). In light grey to light grey-green siliceous phyllitic sediments overlie volcanics at this contact. Is probably just a layer within the volcanics. North of station in stream measured a bedding. S_0 is subparallel S_1. Only see one phyllitic layer and micas are parallel to subparallel to bedding. At station P315v S_1 is parallel to bedding.

P315w (1055 m). At contact between upper side of sediments, grey siliceous phyllite below and intrusion above. Sediment band is thinning out.

P315x (1050 m). Medium green pyritized, ankeritized greenstone with only one quartz vein exposed.

P315y (1070 m). SOS.
P315z (1090 m). Ankeritized greenstone.

TRAVERSE NO. 316 September 14, 1983
Trenaman and Spencer - Cassiar B.C.

P316a (1060 m). In medium green greenstone with dark green chloritic streaks. About 30 cm wide ankeritized zone.
P316b (1060 m). Quartz vein orientation 064°/90°. Outcrop entirely ankeritized. Quartz vein 20 - 50 cm wide, continuous through outcrop.
P316c (1000 m). Light grey siliceous phyllite and phyllitic chert. Contact between siliceous sediments and greenstone trends 316°/76°NE. Southwest of sediments ankeritized rock is sheared with no preferred orientation for a width of 5 - 6 m then get into medium green greenstones. Sample $P316C_1$ grey siliceous phyllite; Sample $P316C_2$ ankeritized rock. No quartz veins here.
P316d (1070 m). Medium green greenstone with curved dark green chloritic streaks. Here still looks vaguely like pillow margins. Some possible triangular pillow junctions observed.
P316e (1070 m). In light grey phyllitic chert. Locally well bedded, no apparent foliation. Sample P316E.
P316f (1045 m). Back into massive medium green greenstone with chlorite streaks. Sample of overlying light grey phyllite. Sample $P316F_1$. Volcanics underlie sediments. Sample of intrusive pod. Sample $P316F_2$. Gabbro or diorite. This rock also identified at station P316i and its immediate area. Misidentified in the rain and snow first time through.
P316g (1080 m). Siliceous phyllite.
P316h (1075 m). Siliceous phyllite.
P316i (1090 m). In medium green greenstone with no ankeritized rock. Contact between sediments below and greenstone above lies at 1070 m. What originally was mapped as greenstone are actually fine grained dioritic or gabbroic intrusive rocks. Bedding well developed in weakly bedded cherts, foliation not developed well at all. Antiform to northeast. Sediments appear to underlie intrusion here.
P316j (1080 m). Contact between intrusion and sediments. Second look at fold confirms it is of same generation as mica cleavage. Has a mica axial plane cleavage. Intrusive rock here overlies sediments. Measured bedding cleavage and weak lineation in sediments. Quartz pods are not planar.

TRAVERSE NO. 317 September 15, 1983
Trenaman and Spencer - Cassiar B.C.

P317a (1040 m). In light grey-brown siliceous sediments. Black weathering, moderate fracture cleavage.
P317b (1055 m). In typical greenstone above sediment band. Sample of intrusion, Sample P317B.
P317c (1055 m). Intrusion/sediment contact.
P317d (1050 m). Light grey phyllitic cherts and siliceous phyllite.
P317e (1060 m). Siliceous phyllite.
P317f (1060 m). Ankerite only - no original rock but locally contains chlorite streaks. Some medium green greenstone present.
P317g (1045 m). Greenstone.
P317h (1030 m). Predominantly grey siliceous phyllites but cut by dark green fine grained dioritic dikes. Can see sediments truncated by a pod of intrusion; also see sediment xenoliths. Sample P317H of intrusion. Quartz veins in sediments trend 350°/90°.
P317i (1100 m). Siliceous phyllite.
P317j (1200 m). Crossed contact with volcanics at 1160 m. In good weakly foliated greenstone.
P317k (1130 m). Still in massive greenstone.
P317l (1130 m). Northeast trending fault must lie between sediments and volcanics. 3 m unexposed. Quartz veins in the sediments trend 067°/90°. Sediments runs smack into volcanics.
P317m (1115 m). Massive greenstone.
P317n (1125 m). Siliceous phyllite.
P317o (1250 m). Came upslope in light grey siliceous phyllites. Now in green pillowed flows. Good pillow outlines and pillow junctions.
P317p (1310 m). In light grey siliceous phyllite and phyllitic chert. Fault lies between gullies at this elevation.
P317q (1385 m). Massive greenstone with dark chloritic streaks.
P317r (1400 m). SOS.
P317s (1360 m). Now in sediments. Can get to within 1.5 m of contact and looks like sediments underlie the volcanics.
P317t (1405 m). Quartz vein in greenstone trends 057°/90°. Visible gold found in this trenched quartz vein.
P317u (1400 m). Greenstone.
P317v (1290 m). Locally pillowed greenstone.
P317w (1220 m). Greenstone with thin quartz veins with ankeritized halos. Veins trend 062°/90°.
P317x (1170 m). Massive greenstone.
P317y (1140 m). Massive greenstone. One trenched quartz vein trends 065°/90°.

TRAVERSE NO. 318 September 16, 1983
Trenaman and Spencer - Cassiar B.C.

P318a (1160 m). Massive medium green greenstone cut by quartz veins. Wall rock to quartz veins is ankertized to 2.0 m on each side. Vein trends 063°/90°.
P318b (1230 m). Massive medium green greenstone. Sample of greenstone with spherical, medium grey, slightly calcareous amygdules - Sample P318B. Sample collected at 1270 m elevation on cat track.
P318c (1330 m). Massive greenstone.
P318d (1410 m). Beginning of local ankertization in greenstone.
P318e (1490 m). Ankeritization intermitant along cat trail here. Medium green greenstone with chloritic streaks.
P318f (1450 m). Quartz veins no more than 5 cm thick, spaced at 20 - 40 cm over about 10 m width. Average about 2 cm. Extensive ankeritization. Measured foliation in ankeritized phyllite. Sample P318F of ankeritized phyllite. This phyllitic lens is no more than 5 cm wide.
P318g (1415 m). In grey siliceous phyllite structurally below greenstones. Stratigraphic contact. Sample P318G.
P318h (1430 m). Fault composed of locally 60 cm white calcite vein. Calcite fibres are oriented down dip. Hanging wall moved down - normal fault. Ankeritization appears to be chemically selective. ie. only volcanics are ankeritized. Quartz veining also is restricted to the volcanics. Less than 1% of the veins cross the contact, these are 1 - 2 cm in thickness. Two quartz pods observed in the sediments with a trend of 095°/53°N. Fractures parallel to the quartz veins continue through the contact between sediments and volcanics but quartz is predominantly restricted to the volcanics. As before 1% quartz makes it into the sediments. Fault is probably post-quartz veining as wide bands of quartz veined ankeritized rock above sediments does not contribute quartz veins to the sediments below. See diagram p. 31 in J.F.P. notebook no. 5.
P318i (1375 m). Fold folds foliation and an S_0 S_1 lineation (plunge 15° steeper than hingeline, in same direction). Light grey siliceous phyllite and phyllitic chert as seen yesterday to the east.
P318j (1375 m). At contact between sediments and volcanics. One quartz vein 4 m in length in sediments.
P318k (1445 m). Grey siliceous phyllite with fracture cleavage.
P318l (1480 m). At contact between grey sediments and greenstones with dark green chloritic streaks. No evidence of faulting at contact but can't determine whether sediments underlie or overlie volcanics.
P318m (1500 m). Massive green greenstone.
P318n (1420 m). Massive greenstone just upstream of sediments.
P318o (1465 m). Narrow (1 - 4 cm) quartz veins with ankerite alteration. Altered zone about 10 m wide.
P318p (1550 m). In heavily ankeritized, lightly quartz veined greenstone. Alteration zone 10 m wide. Sample of green and maroon streaked tuff layer. Sample P318P. Contains 1% - 5% reddish volcanic clasts 0.5 cm to 3.0 cm.
P318q (1600 m). Massive chlorite streaked greenstone.
P318r (1825 m). Massive, chlorite streaked greenstone.
P318s (1790 m). Thin grey siliceous phyllite band in massive green greenstone.
P318t (1730 m). Siliceous phyllite.
P318u (1670 m). Mainly light grey siliceous phyllite with some maroon phyllite. 0.5 - 1.0 m quartz veins parallel to foliation at the contact.
P318v (1700 m). Contact between sediments and volcanics.
P318w (1730 m). Contact between sediments and volcanics.
P318x (1725 m). Massive greenstone. Sediments continue south with small fold on

northeast side. Not a syncline - no repetion of maroon phyllite.
P318y (1700 m). Contact between sediments and volcanics.
P318z (1685 m). Other contact of sediment band. Some maroon phyllite on this contact.

TRAVERSE NO. 319

P319a (1660 m). Ankeritized zones 0.5 - 1.0 m wide spaced at 5 m intervals over 20 m in greenstone. Measured foliaton in weakly foliated volcanics southeast of station.
P319b (1660 m). Sediments pinch out here. Could they be faulted out?
P319c (1580 m). Greenstone with dark green chloritic streaks.
P319d (1465 m). SOS.
P319e (1260 m). Very sparse outcrop of SOS.
P319f (1185 m). Dike at P.B.R. station 105°/77°SW. Greenstone.
P319g (1160 m). Passed through sparse outcrop of greenstone.
P319h (1200 m). Pillowed greenstone.
P319i (1140 m). Greenstone. No dikes seen along creek section, with very few outcrop blanks to pull it through.

TRAVERSE NO. 320 September 17, 1983

P320a (1060 m). Medium green greenstone with dark green chloritic streaks.
P320b (1055 m). Light grey phyllitic chert.
P320c (1030 m). Light grey-green very weakly bedded chert. FOSSIL COLLECTION P83-63F.
P320d (1015 m). Contact between small outcrop exposure of volcanics and the siliceous phyllites and phyllitic chert.
P320e (1010 m). Light grey phyllitic chert. Antiform to southwest.
P320f (1020 m). Medium grey phyllitic chert and siliceous phyllite.
P320g (1010 m). Cannot measure any structures in cat-scraped broken outcrop of medium grey siliceous phyllite and ankeritized volcanics. Small quartz pods but cannot get orientation on these either.
P320h (1110 m). In light grey siliceous phyllite at contact with medium grained, medium green hornblende diorite intrusion (Sample P320H).
P320i (1130 m). Back into volcanics. Sediments probably underlie volcanics.
P320j (1080 m). Massive greenstone. Some intrusive rock upstream from station.
P320k (1080 m). SOS. No intrusion.
P320l (1060 m). SOS.
P320m (1050 m). Phyllitic chert.
P320n (1080 m). Top of outcrop in massive greenstone. Sediment/volcanic contact lies at 1070 m elevation below station.
P320o (1060 m). Light grey phyllitic chert.
P320p (1010 m). In grey siliceous phyllite.
P320q (970 m). Rusty, fractured grey siliceous phyllite.
P320r (950 m). Light grey-green siliceous phyllite.
P320s (970 m). Massive greenstone. Cliff top may be composed of sediments as sediment blocks are seen in talus.
P320t (980 m). Massive green greenstone. Ankeritized but no quartz veining.
P320u (1005 m). SOS.
P320v (995 m). Measured quartz vein orientation in greenstone.
P320w (1070 m). Angular greenstone blocks at bottom of trench in road.
P320x (975 m). Quartz vein 20 cm wide in ankeritized greenstone.
P320y (1100 m). Came along west side of Quartzrock Creek in no outcrop. Few outcrops on east side of creek. Now in 1 m square outcrop of rusty, pyritized ankeritized volcanics.
P320z (1110 m). Medium grey, with local light green streaked massive ultramafic intrusive? rock. Glacial erratic.

TRAVERSE NO. 321

P321a (1125 m). In light to medium green chlorite streaked greenstone. Sample P321A.
P321b (1145 m). No outcrop.
P321c (1195 m). No outcrop.
P321d (1185 m). No outcrop. Glacial boulders.
P321e (1220 m). No outcrop.
P321f (1250 m). No outcrop.
P321g (1205 m). In grey phyllitic cherts.
P321h (1220 m). No outcrop.
P321i (1190 m). Quartz veins in trench, ankeritized volcanics.
P321j (1170 m). Massive greenstone.
P321k (1150 m). Massive greenstone.
P321l (1095 m). Massive greenstone. In cat trench on west side of private drive are

fresh, angular blocks of amygdaloidal dike. Not seen in outcrop. See P.B.R. field map for location of diorite dike.

TRAVERSE NO. 322 September 18, 1983

P322a (990 m). East abutment of proposed tailings damsite. Light grey phyllites and phyllitic cherts. Antiform to northeast.
P322b (1060 m). Could only measure foliation in grey phyllite.
P322c (1055 m). Measured bedding and cleavage in light grey phyllite. Antiform to northeast.
P322d (1080 m). Siliceous phyllite, nonbedded, small outcrop in cat trail.
P322e (1050 m). In light grey siliceous phyllite.
P322f (1100 m). Light grey siliceous phyllite.

TRAVERSE NO. 323 September 19, 1983

P323a (1080 m). Massive greenstone with local ankeritized zones with 2 - 10 cm wide quartz veins. Quartz veins trend 057°/90°.
P323b (1100 m). No outcrop.
P323c (1165 m). Massive greenstone with dark green chloritic streaks.
P323d (1170 m). SOS.
P323e (1180 m). SOS.
P323f (1210 m). SOS.
P323g (1210 m). SOS.
P323h (1210 m). SOS.
P323i (1240 m). Scattered outcrops of SOS all along cut line to here and beyond.
P323j (1220 m). Massive greenstone, locally ankeritized, with quartz veins trending 088°/90°.
P323k (1205 m). At contact between medium green greenstone with dark green chloritic streaks and phyllitic cherts. Bedding parallel to foliaton. Sample P323K.
P323l (1220 m). No outcrop on strike with sediments.
P323m (1240 m). Quartz veins in ankeritized greenstone trend 086°/76°S.
P323n (1265 m). Massive greenstone with dark green chloritic streaks.
P323o (1270 m). Massive greenstone with dark green chloritic streaks. Abundant quartz veins with ankeritized wall rock. Veins trend 080°/90°. Up to 60 cm thick. One trenched vein extends for about 100 m. Sample of quartz vein with tetrahedrite. Sample P323O.
P323p (1290 m). No outcrop. Top of outcrop lies at 1280 m: massive greenstone with chloritic streaks.
P323q (1240 m). Massive greenstone.
P323r (1235 m). SOS.
P323s (1230 m). Massive ankeritic greenstone with no quartz veins exposed.
P323t (1250 m). Massive greenstone. Sample P323T.
P323u (1260 m). SOS.
P323v (1220 m). Quartz vein 1 m wide, 075°/75°SE.
P323w (1210 m). Small outcrop of greenstone.
P323x (1220 m). SOS.
P323y (1185 m). SOS.
P323z (1150 m). SOS.

TRAVERSE NO. 324 September 19, 1983

P324a (1120 m). Massive greenstone.
P324b (1140 m). SOS.
P324c (1125 m). SOS.
P324d (1170 m). SOS.
P324e (1235 m). Intermitent outcrops of SOS between 1170 m and here.
P324f (1230 m). SOS.
P324g (1205 m). No outcrop. Glacial deposits.
P324h (1160 m). No outcrop.
P324i (1120 m). No outcrop.
P324j (1125 m). No outcrop.

TRAVERSE NO. 83-73

September 11, 1983
Cloudy with showers

T1 (1130 m). On left bank of Quartzrock Creek, 30 m upstream from Cassiar Highway bridge, medium green massive greenstone with lenses up to 1 cm thick of dark green chlorite-rich material. Sample T83-1.

T1a (1110 m). Scraped off area with a diamond drill hole casing projecting from the ground. Same rock as last station except for minor (1 ft thick) agglomerate lens.

T1b (1120 m). In same greenstone as last station. Outcrop to northeast is ankeritized next to a 0.4 m wide quartz vein. One small outcrop shows part of an arcuate chlorite-rich streak 1 cm thick which may be parts of pillow rims.

TRAVERSE NO. 83-74
Barometer: - 25 m

September 12, 1983
Cloudy

T2 (1175 m). In medium green greenstone with chloritic lenses and streaks.
T2a (1210 m). No outcrop.
T2b (1200 m). Possible outcrop of medium green aphanitic greenstone with a white chert rounded "clast".
T2c (1070 m). On left bank of Quartzrock Creek in medium green aphanitic, chloritic streaked greenstone.
T2d (1160 m). On left bank of Quartzrock Creek in the same medium green aphanitic, chloritic streaked greenstone which here is ankeritized around a 0.2 m thick quartz vein.
T2e (1055 m). Medium green aphanitic greenstone.
T2f (1060 m). Spotty outcrops of a medium green aphanitic greenstone down an old bulldozer track.
T2g (1050 m). On left bank of Quartzrock Creek. Just upstream for 100 ft came through a fine grained (0.5 - 1 mm) meta-gabbro(?). Sample T83-2G. Around here is light green and unbedded, chloritic streaked aphanitic dust tuff. Sample T83-2G1.
T2h (1040 m). On left bank of Quartzrock Creek in light green aphanitic tuff.
T2i (1020 m). On left bank after outcrop changed into rusty weathering altered greenstone with finely disseminated pyrite and quartz. Sample T83-2I. The rocks are intensely faulted.
T2j (1015 m). In same rusty weathering pyritized (less than 5%) silicified ankeritized greenstone.
T2k (1030 m). In a rusty weathering, pyritized (less than 5%) silicified, ankeritized greenstone with prominent thin (0.1 to 0.4 m) thick quartz veins representing 10% of the ankeritized greenstone outcrop.
T2l (1005 m). In same ankeritized, pyritized greenstone with 60% of the rock being quartz veins. Continuing downstream, the quartz becomes intensely fractured.

T3 (1000 m). In the same akeritized greenstone with greater than 60% quartz veins. Here on edge of zone where quartz veins diminish quickly in rusty weathering akeritized greenstone with 5% pyrite as pyritohedrons 2 - 10 mm in diameter. Sample T83-3.
T3a (995 m). Continuing on in the same ankeritized greenstone with quartz veins representing 5% of the rock and 0.1 to 0.3 m thick. Note between station T2l and T3, quartz veins change dip direction.
T3b (985 m). Although the rock weathers rusty, quartz veins are less than 1% of the rock and pyrite is inconspicuous. Right here on a 8 m long outcrop vein quartz of unknown attitude.
T3c (985 m). After 150 m outcrop blank in a medium grey unbedded phyllite. Sample T83-3C.
T3d (990 m). Medium grey unbedded phyllite.

TRAVERSE NO. 83-75
Barometer: 0 m

September 13, 1983
Cloudy with rain

T4 (1015 m). West end of outcrop is slumped medium grey phyllite in unknown and unexposed contact with medium green aphanitic greenstone.
T4a (1015 m). Along the north side of the small lake in intensely fractured and ankeritized rock.
T4b (1020 m). From the east end of the westernmost lake in medium green aphanitic greenstone. The akeritization and intense fracturing is restricted to the west. Only a fracture cleavage remains in the greenstones here.
T4c (1015 m). Outcrop continues as in station T4b to this point where fracturing, ankeritization increases and a few thin (less than 0.1 m) quartz veins appear.
T4d (1040 m). Ankeritized greenstone which is intensely fractured.
T4e (1020 m). Medium grey phyllite float in bulldozer ditch.

T5 (1105 m). Upstream in outcrop of medium green greenstone with chloritic-rich streaks.
T5a (1140 m). At creek junction. Most of the way since last station in ankeritized greenstone with one quartz vein 100 yards back and 1 m thick.

TRAVERSE NO. 83-76
Barometer: - 25 m

September 14, 1983
Heavy clouds,
snow flurries with some sun in pm

T6 (1145 m). Medium grey-green aphanitic greenstone with chloritic streaks.
T6a (1155 m). Same medium grey-green aphanitic greenstone with chloritic streaks, here with a quartz vein 0.4 m thick with 1 m ankeritized greenstone on its margins.
T6b (1155 m). Mainly scattered outcrops of ankeritized greenstone - no quartz veins seen - on way to here. Here in usual medium grey-green greenstone.
T6c (1155 m). Through unaltered greenstone and into fine grained (1 mm) hornblende (50%) diorite dike with sparse (1%) amygdules and rare small (4 cm) granitic zenoliths. Sample T83-6C. Exposure is 5 m wide.
T6d (1145 m). Medium grey-green greenstone which locally weathers warty and has partly exposed chlorite-rich rims suggestive of pillow lavas. Sample T83-6D of pillow rim. PHOTO GEOLOGY (1) of pillow lava.
T6e (1165 m). Indefinitely warty-weathering pillow lavas.
T6f (1165 m). Along in medium green greenstone in scattered outcrops. No sign of westward extension of dike although I traversed the 280° projection in almost complete outcrop twice.
T6g (1140 m). Very scattered outcrops of medium green greenstone.
T6h (1145 m). In ankeritized greenstone with a 0.5 m thick quartz vein.
T6i (1100 m). Ankeritized greenstone with 1.5 m wide quartz vein.
T6j (1145 m). Down cat track and trench in ankertized greenstone with rare, thin (less than 0.2 m) quartz veins to here. On uphill contact of medium grey siliceous phyllite with rare float of rhodonite.
T6k (1130 m). Back into medium green greenstone. The cat track and trench ends at 1125 m in ankeritized greenstone with thin quartz veins.
T6l (1140 m). On ridge crest in continuous exposure of medium green, slightly foliated greenstone. Outcrop blank between here and trench which has grey phyllite at this altitude.
T6m (1140 m). Down cat track in no outcrop, but much medium grey siliceous phyllite float at 1155 m.
T6n (1210 m). On cat track in no outcrop.
T6o (1195 m). On cat track in no outcrop.
T6p (1150 m). On cat track in no outcrop.
T6q (1200 m). On possible outcrop of medium green greenstone.
T6r (1170 m). Medium green aphanitic greenstone with possible pillow lava shapes.
T6s (1150 m). Medium green aphanitic greenstone.
T6t (1130 m). Medium green aphanitic greenstone with obvious pillow lava forms in outcrop. PHOTO GEOLOGY (1).
T6u (1165 m). Medium green aphanitic greenstone with chloritic streaks.
T6v (1155 m). Ankeritized greenstone.
T6w (1170 m). Medium green chlorite-streaked greenstone. Here a 0.2 m thick quartz vein with less than 1 m width of ankeritized greenstone on its margins.
T6x (1165 m). Still in unaltered medium green aphanitic greenstone with chloritic streaks.
T6y (1170 m). In same unaltered medium green aphanitic greenstone with chloritic streaks but here with pillow lava forms in outcrop.
T6z (1165 m). In medium green aphanitic greenstone with chloritic streaks.
T6aa (1180 m). In medium green aphanitic greenstone with chloritic streaks.
T6bb (1190 m). In medium green aphanitic greenstone with chloritic streaks to here where a light green bedded tuffaceous argillite outcrops.
T6cc (1195 m). Trench exposes medium green aphanitic greenstone.

TRAVERSE NO. 83-77
Barometer: - 5 m

September 15, 1983
Cloudy with snow flurries

T7 (1175 m). Rusty weathering, closely fractured greenstone mainly ankeritized but no quartz veins observed.
T7a (1175 m). In medium green aphanitic greenstone.
T7b (1180 m). Ankeritized greenstone with a few quartz veins less than 0.1 m thick.
T7c (1180 m). Light to medium green aphanitic greenstone with chloritic streaks.
T7d (1180 m). Lightly ankeritized, rusty weathering greenstone with little quartz vein material in float.
T7e (1180 m). Light to medium green aphanitic greenstone with chloritic streaks.
T7f (1320 m). No outcrop from 1190 m to here.
T7g (1180 m). Base of outcrop of light green aphanitic greenstone.
T7h (1430 m). Rusty weathering ankeritized greenstone.
T7i (1460 m). Light green aphanitic greenstone.
T7j (1525 m). Light green aphanitic greenstone.
T7k (no station recorded).
T7l (1470 m). Light green aphanitic greenstone.
T7m (1525 m). Light green aphanitic greenstone.
T7n (1540 m). Light green aphanitic greenstone.
T7o (1500 m). Light green aphanitic greenstone.
T7p (1500 m). Well formed aphanitic medium green greenstone pillow lavas.
T7q (1525 m). Light green aphanitic greenstone.
T7r (1685 m). Light green aphanitic greenstone.
T7s (1715 m). Light green aphanitic greenstone.
T7t (1180 m). Medium grey-green aphanitic, massive greenstone.
T7u (1570 m). Continuing in light to medium green aphanitic greenstone with chloritic streaks.
T7v (1550 m). Down through light to medium green aphanitic greenstone with chloritic streaks to here on medium grey phyllitic chert.
T7w (1530 m). At top contact of medium grey siliceous phyllite against greenstone. At least a 0.3 m thick quartz vein here.
T7x (1490 m). Definite greenstone outcrop here.
T7y (1470 m). On lowest outcrop of medium green aphanitic greenstone.
T7x1 (1590 m). Medium green aphanitic greenstone.
T7y1 (1540 m). Medium green aphanitic greenstone.
T7z (1450 m). Medium green aphanitic greenstone.
T7aa (1370 m). Medium green aphanitic greenstone.
T7bb (1280 m). Medium green aphanitic greenstone.
T7cc (1190 m). Medium green aphanitic greenstone.

TRAVERSE NO. 83-78 September 16, 1983
Barometer: + 75 m Cloudy with snow flurries

T8 (1140 m). Medium green aphanitic greenstone.
T8a (1155 m). In trench in a 1.5 m thick quartz vein in ankeritized greenstone.
T8b (1175 m). In medium green aphanitic greenstone with chloritic streaks ankeritized to north of station.
T8c (1175 m). In medium green greenstone with ankeritized material to south of station.
T8d (1165 m). On cat track in ankeritized greenstone.
T8e (1150 m). On cat track in ankeritized greenstone. Sample T83-8E weakly ankeritized greenstone with ankerite rhombohedra developed.
T8f (1195 m). Trench 10 to 20 ft deep, 300 ft long parallel to ridge crest exposing no outcrop.
T8g (1195 m). On cat track in no outcrop.
T8h (1195 m). On cat track in no outcrop.
T8i (1190 m). In 10 ft deep trench in no outcrop.
T8j (1185 m). Light green aphanitic greenstone with chloritic streaks.
T8k (1185 m). In slightly foliated light green aphanitic greenstone with chloritic streaks.
T8l (1180 m). At edge of outcrop of light green aphanitic greenstone with chloritic streaks.
T8m (1200 m). For ½ way this way from last station in the same light green aphanitic greenstone with chloritic streaks, but here in trench with no outcrop.
T8n (1180 m). Light green aphanitic greenstone.
T8o (1170 m). Continuing down cat track in light green aphanitic greenstone which is locally ankeritized.
T8p (1135 m). In bulldozer cleared area of ankeritized greenstone with quartz veins.
T8q
T8r (1125 m). In medium green aphanitic greenstone ankeritized near quartz veins. The fault parallels the vein on the hanging wall side but a north trending fault cuts vein and the first fault off.
T8q (1135 m). In ankeritized greenstone with quartz veins.

T9 (1130 m). 50 ft east of entrance to decline in 1 m thick crush and gouge zone in medium green aphanitic greenstone and ankeritized greenstone. The crush zone is greater than 5 m thick and involves crushed quartz veins and graphitic, slickensided surfaces. PHOTO GEOLOGY (3) looking south across entrance to decline and fault system. PHOTO GEOLOGY (1) looking south across entrance of decline to fault system. PHOTO GEOLOGY (1) looking east to quartz veins and a fault in the left hand side of the picture which is probably cut off by the northerly trending fault system. PHOTO GEOLOGY (2) looking north at north trending faults which show drag. The drag indicates that the faults are normal dip slip motion and this agrees with calcite fibres in one fault system.
T9a (1135 m). In mixed, medium green aphanitic greenstone and ankeritized greenstone.
T9b (1180 m). Up trench in mixed, medium green and ankeritized greenstone. Here on outcrop to west of trench in medium green aphanitic greenstone.
T9c (1175 m). In medium green aphanitic greenstone on cat track.
T9d (1170 m). Still on cat track and trenches in medium green aphanitic greenstone which is locally ankeritized.
T9e (1170 m). At end of trench showing no outcrop.
T9f (1180 m). On cat track in no outcrop.
T9g (1185 m). Light green aphanitic greenstone with chloritic streaks.

T9h (1185 m). In a trench in medium green greenstone. Locally ankeritized around 1 - 3 cm thick quartz veins.
T9i (1165 m). In trenches in cat track with no outcrop.
T9j (1162 m). In trench exposing quartz vein for at least 100 m along strike. Vein at least 1 m thick in ankeritized greenstone. Sample T83-9J of quartz vein with tetrahedrite? or what? Polished section for mineral deterimination.
T9k (1170 m). Continuing along quartz vein which is at least 2 m thick in medium green greenstone - not ankeritized. Sample T83-9K. For polished section. In outcrop blank of at least 50 ft and then a trench exposing medium grey siliceous phyllite on the strike projection to the east of where the quartz vein lies exposed.
T9l (1120 m). In trench in probable outcrop of medium green aphanitic greenstone. Quartz present is barren with no tetrahedrite? so that this probably is not a quartz vein of station T9j and T9k.
T9m (1150 m). In medium green aphanitic greenstone with chloritic streaks exposed in cat track.
T9n (1180 m). Light green aphanitic greenstone.
T9o (1100 m). On lowest outcrop of medium green aphanitic greenstone.
T9p (1100 m). At base of slope in fine grained (1 mm) hornblende (50%) amygdaloidal diorite dike. Sample T83-9P.

TRAVERSE NO. 83-79
Barometer: + 45 m

September 17, 1983
Sunny and cold

T10 (1130 m). In medium greenish grey fine grained (less than 0.5 mm) amygdaloidal (calcite) diorite dike in ankderitized greenstone. The dike is not ankeritized and therefore is post mineralization. Sample T83-10.
T10a (1130 m). Trench in ankeritized greenstone. The south end of the trench shows a lot of diorite dike float.
T10b (1130 m). In bulldozer cut in ankeritized greenstone with amygdaloidal, granitic xenolith-bearing fine grained (1 mm) diorite dike. Sample T83-10B. Sample T83-1KAr for radiometric dating.
T10c (1120 m). On a crop of amygdaloidal diorite dike with medium green aphanitic greenstone on the south side.
T10d (1075 m). On left bank of Quartzrock Creek in medium green aphanitic greenstone with chloritic streaks.
T10e (1075 m). 5 m wide diorite or perhaps it should be diabase dike in ankeritized greenstone with 0.3 m thick quartz vein south of the dike and a 0.8 m thick vein north of the dike.
T10f (1075 m). Upstream from diabase dike in light to medium green aphanitic greenstone with chloritic streaks.
T10g (1130 m). Light to medium green aphanitic greenstone.
T10h (1160 m). Light to medium green aphanitic greenstone.
T10i (1130 m). Light to medium green aphanitic greenstone, locally ankeritized.
T10j (1120 m). Light to medium green aphanitic greenstone, locally ankeritized.
T10k (1115 m). At base of outcrop in ankeritized greenstone with quartz vein float.
T10l (1145 m). In mafic-rich amygdaloidal diabase dike. Sample T83-10L within light to medium green aphanitic greenstone. The dike is about 3 m thick and strikes about 075° to 080°.

TRAVERSE NO. 83-80
Barometer: - 10 m

September 18, 1983
Cold, high overcast, sleet in pm

T11 (1130 m). In bulldozer trench in medium green aphanitic greenstone.
T11a (1150 m). At base of outcrop in medium green aphanitic greenstone.
T11b (1190 m). In medium green aphanitic greenstone.
T11c (1160 m). Light to medium green aphanitic greenstone with chloritic streaks.
T11d (1115 m). In trench exposing barren quartz vein over 1 m thick in ankeritized greenstone. The vein is of uncertain orientation. Another trench almost at water's edge of quartz rock creek exposed two veins, one a meter thick and the other about 3 m thick in ankeritized greenstone. The quartz does not carry the tetrahedrite(?) of station T9j and T9k.
T11e (1100 m). On left bank of Quartzrock Creek, medium green aphanitic greenstone.
T11f (1100 m). On left bank of Quartzrock Creek in light green aphanitic greenstone with chlorite pseudomorphs after augite(?). Sample T83-11F.
T11g (1110 m). In roadcut of ankeritized greenstone with a few quartz grains 2 -6 cm thick.
T11h (1100 m). On left bank of Quartzrock Creek in a 5 m thick quartz vein in ankeritized greenstone.
T11i (1100 m). On left bank of Quartzrock Creek in light green aphanitic greenstone with thin (2 - 4 cm) thick quartz veins with ankeritized greenstone halo.
T11j (1135 m). At edge of outcrop of light to medium green aphanitic greenstone with chloritic streaks.
T11k (1170 m). At edge of outcrop of light to medium green aphanitic greenstone with chloritic streaks.
T11l (1150 m). At edge of outcrop of light to medium green aphanitic greenstone with chloritic streaks.
T11m (1210 m). Light to medium green aphanitic greenstone with chloritic streaks.
T11n (1270 m). Very sparse outcrop between station T11m and here. All outcrop the same - light green aphanitic greenstone with chloritic streaks.
T11o (1360 m). No outcrop from 1310 m to here.
T11p (1475 m). No outcrop from T11o to here. Here in light green aphanitic greenstone.
T11q (1510 m). Light green aphanitic greenstone.
T11r (1440 m). Light green aphanitic greenstone.
T11s (1440 m). Light green aphanitic greenstone.
T11t (1380 m). Light green aphanitic greenstone.
T11u (1340 m). Light green fine grained meta-diorite.
T11v (1275 m). Light green aphanitic greenstone.

T12 (1095 m). On Cassiar Highway in roadcut exposing medium green aphanitic, chlorite-specked and streaked greenstone with 0.3 m thick quartz vein with ankeritized greenstone margins.
T12a (1090 m). Light green aphanitic greenstone.
T12b (1085 m). Light green aphanitic greenstone.
T12c (1070 m). Light to medium green chlorite specked and streaked aphanitic greenstone and locally fine grained meta-diorite. Sample T83-12C.

TRAVERSE NO. 83-81
Barometer: - 10 m

September 19, 1983
Rain

T13 (1090 m). Angular blocks - at least 8 up to 0.3 m in diameter of diabase dike and slumped outcrop of medium green aphanitic greenstone of chloritic streaks.
T13a (1090 m). Quartz vein ankeritized greenstone surrounding it.
T13b. Dike in angular debris up to 1 ft in diameter in an 8 ft deep trench at 185 ft at a bearing of 170° from the surface man-way which comes from the 3600 ft level. Man-way surface elevation: 1170 m. Debris in trench at 1162 m.

Position of diorite dike: 70 ft at 160° from the 3600 ft portal to the end of the diorite dike. The farthest east diorite outcrop is 300 ft at a bearing of 092°. The coordinates of the 3600 ft portal are 10080E, 11250N. The surface man-way has coordinates 10670E, 11440N.

T14 (970 m). In medium grey phyllite.
T14a (985 m). Medium green aphanitic greenstone.
T14b (990 m). Medium grey phyllite in scattered outcrops.
T14c (965 m). Right bank of Trout Line Creek in medium grey and grey-green phyllite.
T14d (950 m). Medium green aphanitic greenstone.

The following are notes from underground workings in the Taurus Mine:

3500 ft level: Diorite dike exists. Its southern contact is at 23 ft along the right (east) wall from survey station B058 and its northern wall is about 3 ft south of the intersection with the drift on the east wall.

Bearing of decline is 072°.

Sample T3600 of "tourmaline"-bearing vein. Check in oils.

APPENDIX B:

DRILL LOGS OF LAMPROPHYRE - BEARING HOLES

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE		**Collar Elevation:**	3520 ft
Location:	3500 Level		**Bearing:**	180°
Drill Hole:	UH112		**Inclination:**	-12°
Mine Coordinates:	10202 ft E		**Length:**	125 ft
	11204 ft N		**Logged By:**	Taurus

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
66.0	69.0	le	Dike rock.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3503 ft
Location:	3500 Level	**Bearing:**	180°
Drill Hole:	UH113	**Inclination:**	-12°
Mine Coordinates:	10148 ft E	**Length:**	66 ft
	11200 ft N	**Logged By:**	Taurus

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
58.0	66.0	**le**	Dike rock.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project: TAURUS GOLD MINE
Location: 3500 Level
Drill Hole: UH114
Mine Coordinates: 10107.5 ft E
11198 ft N

Collar Elevation: 3501.5 ft
Bearing: 181°
Inclination: -10°
Length: 66 ft
Logged By: Taurus

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
56.5	66.0	le	Dike rock.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project: TAURUS GOLD MINE
Location:
Drill Hole: UH79-1
Mine Coordinates:

Collar Elevation: 3602 ft (approx.)
Bearing: 013°
Inclination: -48°
Length: 232 ft
Logged By: J.F. Psutka

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	20.0		Not cored.			
20.0	63.5	**Mgs**	Undifferentiated greenstone.			
63.5	84.0	**le**	Lamprophyre dike with rounded pinkish granitic xenoliths 30 cm diameter. Lamprophyre is dark grey-green, locally amyg-daloidal. Grain size 0.5 to 1.0 mm.	70.0 84.0	Sample UH79-1 70.0 ft Lower contact occupied by 2.0 cm white quartz vein.	 45°
84.0	232.0	**Mgs**	Undifferentiated greenstone.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project: TAURUS GOLD MINE
Location:
Drill Hole: UH79-2
Mine Coordinates:

Collar Elevation: 3600 ft (approx.)
Bearing: 000°
Inclination: -50°
Length: 215 ft
Logged By: J.F. Psutka

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	4.0		Not cored.			
4.0	10.0	le	Dark green lamprophyre dike. Amygdules to 2.0 mm.	9.0	Sample UH79-2 9.0'	
10.0	225.0	Mgs	Undifferentiated greenstone.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3604.5 ft
Location:		**Bearing:**	196°
Drill Hole:	UH80-13	**Inclination:**	-38°
Mine Coordinates:	10354.26 ft E	**Length:**	300 ft
	11268.89 ft N	**Logged By:**	Taurus

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
214.0	237.5	le	Dike rock.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3606.0 ft
Location:		**Bearing:**	350°
Drill Hole:	UH80-14	**Inclination:**	-40°
Mine Coordinates:	10327.92 ft E	**Length:**	240 ft
	11163.79 ft N	**Logged By:**	Taurus

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
59.5	61.5	le	Pyroxenite dike.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES LTD.

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3608.4 ft
Location:		**Bearing:**	016°
Drill Hole:	UH80-15	**Inclination:**	-61°
Mine Coordinates:	11120.53 ft E	**Length:**	176 ft
	10295.20 ft N	**Logged By:**	Taurus

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
2.0	8.0	le	Dike rock.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3599.2 ft
Location:		**Bearing:**	000°
Drill Hole:	UH80-20	**Inclination:**	-45°
Mine Coordinates:	09614.52 ft E	**Length:**	325 ft
	11102.48 ft N	**Logged By:**	Taurus

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
37.0	58.0	le	Dike rock.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project: TAURUS GOLD MINE
Location:
Drill Hole: UH80-23
Mine Coordinates: 10152.24 ft E
11112.93 ft N

Collar Elevation: 3616.5 ft
Bearing: 000°
Inclination: -57°
Length: 315 ft
Logged By: Taurus

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
34.0	53.0	le	Dike rock with granitic clasts.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3638.1 ft
Location:	South of 3600 Level Portal	**Bearing:**	000°
Drill Hole:	DH82-1	**Inclination:**	-46°
Mine Coordinates:	10355.86 ft E (VR0460810mE)	**Length:**	1002 ft
	10904.78 ft N (VR6570460mN)	**Logged By:**	J.F. Psutka

Length from	to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	20.0		Not cored.			
20.0	273.5	**Mgs**	Undifferentiated greenstone.			
273.5	288.8	**le**	Medium green amygdaloidal lamprophyre dike. Locally cut by 10 cm and less pink granitic dikelets and 1 to 3 cm calcite veins. Country rock is pyritized and quartz veined.	273.5	Upper contact with greenstone is fine grained chill margin. 1.0 cm polished chlorite shears.	45°
				277.5	to 278.5 ft: Light green gouge zone. Silty, not clayey.	05°
				280.0	Thin section DH82-1 280.0' shows a porphyritic (augite) augite-bearing spessartite with relict plagioclase laths (An_1). A low grade metamorphic assemblage of pumpellyite, chlorite, epidote and carbonate fills amygdules (Appendix C).	
				288.8	Lower contact. 2.0 cm chlorite	05°
288.8	1002.0	**Mgs & Mt**	Undifferentiated greenstone and metasedimentary rocks.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3773.61 ft
Location:	East of 3600 Level Portal	**Bearing:**	000°
Drill Hole:	DH82-2	**Inclination:**	-47°
Mine Coordinates:	11069.38 ft E	**Length:**	549 ft
	11251.37 ft N	**Logged By:**	J.F. Psutka

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	24.0		Not cored.			
24.0	48.5	**Mgs**	Undifferentiated greenstone.			
48.5	62.0	**le**	Medium grey locally amygdaloidal (calcite) lamprophyre dike.			
65.0	74.0		Breccia and some clay gouge.	65.0	to 74.0 ft: Drill runs are only 2 to 3 ft in length here.	
74.5	75.5		Dike material.		May be caved material.	
75.5	549.0	**Mgs**	Undifferentiated greenstone.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3599.4 ft
Location:	50 m southwest of 3600 Portal	**Bearing:**	000°
Drill Hole:	DDH82-3	**Inclination:**	-53°
Mine Coordinates:	09885.86 ft E (VR0460660mE)	**Length:**	405 ft
	11031.61 ft N (VR6570510mN)	**Logged By:**	J.F. Psutka

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	22.0		Not cored.			
22.0	182.0		Undifferentiated greenstone.			
182.0	198.0		Medium grey amygdaloidal (calcite) lamprophyre (spessartite) dike. Dark green subrounded and subangular clasts 2 mm to 6 mm; xenoliths of coarse granitic material 1 cm to 30 cm. Upper and lower contacts are very fine grained and amygdaloidal over 30 cm. Truncates quartz vein at upper contact.	182.0	Upper contact. 5 cm crush and silty gouge zone.	45°
				198.0	Lower contact. 10 cm silty gouge and polished and slickensided chlorite shears. Base occupied by 2 cm calcite vein.	45°
				195.0	Thin section DDH82-3 195.0' shows about 10% augite phenocrysts (2.5 to 3.0 mm in diameter) with optically oriented medium chocolate brown hornblende inclusions in a matrix of grains 0.2 to 0.4 mm in diameter consisting of major augite and slightly sericitized plagioclase (An_2) with chlorite nearly completely pseudomorphing dark chocolate brown biotite. Apatite forms euhedral prisms up to 0.3 mm long. Amygdules up to 3.5 mm in diameter contain a calcite core rimmed by chlorite and prehnite (Appendix C).	

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3563.04 ft
Location:	West of Decline Portal	**Bearing:**	000°
Drill Hole:	DDH82-4	**Inclination:**	-47°
Mine Coordinates:	09245.00 ft E	**Length:**	525 ft
	11238.17 ft N	**Logged By:**	J.F. Psutka

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	21.0		Not cored.			
21.0	221.5	Mgs	Undifferentiated greenstone.			
221.5	239.0	le	Medium grey lamprophyre dike. Entire recovered dike is uniformly fine to medium grained, with a grain size of 0.5 to 1.5 mm.	221.5	Upper contact. Numerous chlorite slips around contact. Contact not intact.	
				235.0	Sample DDH82-4 235.0'	
				239.0	Lower contact. Appears to be sheared but no fault material recovered. Xenolith at contact is truncated at contact.	
239.0	525.0	Mgs	Undifferentiated greenstone.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project:	TAURUS GOLD MINE	**Collar Elevation:**	3513.21 ft
Location:	West of Decline Portal	**Bearing:**	000°
Drill Hole:	DDH82-5	**Inclination:**	-45°
Mine Coordinates:	09061.04 ft E	**Length:**	418 ft
	11181.66 ft N	**Logged By:**	J.F. Psutka

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	12.0		Not cored.			
12.0	300.0	**Mgs**	Undifferentiated greenstone.			
300.0	318.0	**le**	Medium grey lamprophyre dike. Wall rock hornfelsed. Less than 1 cm pink granitic xenoliths (1%). 4 cm lamprophyre dikelet about 30 cmabove upper contact.Grain size 0.5 to 1.5 mm.	300.0	Upper contact. 2 mm chlorite slip at contact.	40
				318.0	Lower contact. Chloritic slips (2 - 4 mm) at contact.	20°
318.0	418.0	**Mgs**	Undifferentiated greenstone.			

*Angle between pole to plane and core axis

TRENAMAN, SPENCER & ASSOCIATES

Project: TAURUS GOLD MINE
Location:
Drill Hole: DH82-7
Mine Coordinates: 10076.75 ft E
10931.97 ft N

Collar Elevation: 3590.4 ft
Bearing: 000°
Inclination: -45°
Length: 402 ft
Logged By: J.F. Psutka

Length from	Length to	Rock Unit	Lithology	ft.	Primary or Tectonic Structure	Angle*
0.0	402.0	**Mgs**	Undifferentiated greenstone.	253.0	to 260.0 ft: Abundant slickensided calcite filled shears and polished chloritic slips throughout.	
				258.0	Thin section DH82-7 258.0' shows a meta-basalt flow lacking relict igneous minerals, but composed of a low grade metamorphic assemblage of epidote, actinolite, chlorite, albite and carbonate (Appendix C).	
				294.0	to 295.0 ft: 1.0 ft of angular fault breccia in area where dike should have been intersected.	

*Angle between pole to plane and core axis

APPENDIX C

THIN SECTION PETROGRAPHY

UNIT Mgs: VOLCANIC ROCKS

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	DDH82-7 258.0'	**Latitude:**	
UTM Coordinates:	VR0460410mE	**Longitude:**	
	VR6570463mN	**Notebook:**	Drill Log DDH82-7
Station:		**Collector:**	J.F. Psutka

Location: At 1130 m, 97 m due south of the 3600' portal.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Chlorite-actinolite-epidote-carbonate-albite green schist.

Thin Section: Alteration Assemblage:

1. Epidote:
   Pleochroic yellow-green twinned prisms with $2V_X$ = large. Grains are up to 0.2 mm long.
2. Actinolite:
   Pleochroic medium to pale green fibres preferentially oriented to define a foliation. The fibres are up to 0.3 mm long and have low second order interference tints.
3. Chlorite:
   Medium to light green either almost isotropic to orange-purple anomalous interference tints which are present in clots up to 0.3 mm long that are parallel to the foliation.
4. Albite:
   Xenoblastic grains less than 0.05 mm in diameter with very rare albite twinning with a $2V_Z$ = large.
5. Carbonate:
   Poikiloblastic carbonate up to 0.3 mm in diameter which is un-twinned.

Remarks: No relict igneous mineralogy or texture remains.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P315H	**Latitude:**	
UTM Coordinates:	VR0461315mE	**Longitude:**	
	VR6570205mN	**Notebook:**	#5, p. 27
Station:	P315h	**Collector:**	J.F. Psutka

Location: At 1145 m, 200 m northeast of the present tailings pond.

Rock Unit: **Mgs**, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Porphyritic (augite) meta-basalt flow overprinted by a chlorite-actinolite-stilpnomelane-epidote-carbonate-albite low grade metamorphic assemblage.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:
   Colourless grains to 0.3 mm in diameter with a strong undulatory extinction.

Alteration Assemblage:

1. Chlorite:
   Pale to medium green pleochroic flakes with berlin blue interference tints.
2. Stilpnomelane:
   Dark to light golden brown pleochroic flakes up to 0.05 mm long which lack birds eye extinction.
3. Actinolite:
   Pale green to colourless fibres, length-slow, Z against c = about 10°, up to 0.08 mm long.
4. Carbonate:
   Xenoblastic grains less than 0.05 mm long.
5. Albite:
   Xenoblastic grains less than 0.2 mm long of which some have a few albite twins.

Remarks:

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P318B	**Latitude:**	
UTM Coordinates:	VR0462595mE	**Longitude:**	
	VR6570340mN	**Notebook:**	#5, p. 30
Station:	P318b	**Collector:**	J.F. Psutka

Location: At 1233 m level, 500 m west of Berube's vein.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Porphyritic (augite, plagioclase) meta-basalt flow overprinted by a chlorite-actinolite-epidote-carbonate low grade metamorphic assemblage.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:
   Subhedral grains to 0.3 mm in diameter with strong undulatory extinction.
2. Plagioclase:
   Subhedral laths to 0.5 mm in diameter completely pseudomorphed by the alteration assemblage.

Alteration Assemblage:

1. Actinolite:
   Pale green to colourless fibres which are length-slow with Z against $c = 10^{o}$.
2. Carbonate:
   Xenoblastic grains less than 0.1 mm in diameter.
3. Chlorite:
   Pale green flakes less than 0.05 mm long with berlin blue interference tints.
4. Epidote:
   Prismatic to xenoblastic granules less than 0.05 mm in diameter.
5. Amygdules:
   Amygdules up to 1 mm in diameter composed of carbonate and less than ¼% quartz.

Remarks:

TRENAMAN SPENCER & ASSOCIATES LTD.

Project: TAURUS PROPERTY

NTS Sheet: 104P/5

Field No.: P318P

Latitude:

UTM Coordinates: VR0462505mE
VR6571690mN

Longitude:

Notebook: #5, p. 31

Station: P318p

Collector: J.F. Psutka

Location: At 1545 m on the north branch of Snowy Creek.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Green and red layered tuff composed of a low grade metamorphic assemblage consisting of chlorite-epidote-albite-carbonate-quartz.

Thin Section: Alteration Assemblage:

1. Quartz:
   Xenoblastic grains less than 0.02 mm in diameter.
2. Carbonate:
   Rhomb-shaped untwinned porphyroblasts up to 0.8 mm in diameter or clots of porphyroblasts all of which are slightly poikiloblastic.
3. Chlorite:
   Medium to pale green flakes, almost isotropic and less than 0.02 mm in length.
4. Epidote:
   Pale yellow-green to colourless granules 0.05 mm in diameter.
5. Albite:
   Xenoblastic grains, unaltered, untwinned and biaxial with a large 2V.

Remarks: A good fragmental texture remains.

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Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P321A	**Latitude:**	
UTM Coordinates:	VR0459360mE	**Longitude:**	
	VR6572335mN	**Notebook:**	#5, p. 33
Station:	P321a	**Collector:**	J.F. Psutka

Location: At 1120 m on the west side of Quartzrock Creek, 2.00 km upstream from the Cassiar highway bridge.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Aphyric meta-basalt flow overprinted by a chlorite-actinolite-stilpnomelane-carbonate-quartz-epidote-albite low grade metamorphic assemblage.

Thin Section: Alteration Assemblage:

1. Carbonate:
   Xenoblastic grains less than 0.1 mm in diameter in veinlets and lenses.
2. Epidote:
   Pale yellow-green to colourless prismatic grains and granules with low second order interference tints.
3. Chlorite:
   Medium to pale green flakes to 0.1 mm long with anomalous berlin blue interference tints; length-slow.
4. Actinolite:
   Radiating sheaves of pale green to colourless fibres which are length-slow with Z against c = 10 to 15°.
5. Quartz (less than ¼%):
   Unaltered xenoblastic grains less than 0.05 mm in diameter in some lenses of alteration minerals.
6. Stilpnomelane (less than ¼%):
   Dark to light golden brown pleochroic flakes 0.1 mm long lacking birds eye extinction.
7. Muscovite:
   Colourless flakes with parallel extinction and length-slow with $2V_X$ = 25 to 35°.
8. Albite (1 to 2%):
   Xenoblastic untwinned, unaltered grains with a large 2V.

Remarks:

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-2G1	**Latitude:**	
UTM Coordinates:	VR0460535mE	**Longitude:**	
	VR6569715mN	**Notebook:**	#20, p. 3
Station:	T2g	**Collector:**	P.B. Read

Location: On left bank of Quartzrock Creek, 620 m upstream from the junction with Troutline Creek.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Porphyritic (plagioclase) meta-basalt flow overprinted by a chlorite-pumpellyite-actinolite-muscovite-clinozoisite-quartz-albite-carbonate low grade metamorphic assemblage.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Plagioclase:
   Euhedral laths up to 1.2 mm long which are unzoned and yield a centered bisectrix flat stage plagioclase determination of An_5.

Alteration Assemblage:

1. Pumpellyite:
   Mixed positive and negative elongation, pleochroic bluish green to very pale green. On the margin of veins with anomalous clove brown and berlin blue extinction tints. Relief is positive with respect to chlorite.
2. Muscovite:
   Colourless flakes up to 0.1 mm long.
3. Chlorite:
   Pale green to very pale green with anomalous berlin blue interference tints. Relief negative with respect to pumpellyite.
4. Carbonate:
   Xenoblastic grains less than 0.2 mm in diameter.
5. Quartz (less than ¼%):
   Xenoblastic, unaltered grains which are uniaxial positive and 0.2 mm in diameter.
6. Actinolite:
   Pale green to colourless radiating sheaves up to 0.2 mm long composed of fibres. Present in matrix to plagioclase phenocrysts but not in veins which contain pumpellyite.
7. Clinozoisite:
   Lemon yellow interference tints, colourless grains with a refractive index of about 1.7.

Remarks:

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Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-3	**Latitude:**	
UTM Coordinates:	VR0460725mE	**Longitude:**	
	VR6569130mN	**Notebook:**	#20, p. 4
Station:	T3	**Collector:**	P.B. Read

Location: On the left bank of Quartzrock Creek at the mouth of Troutline Creek.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Totally altered greenstone consisting of muscovite-quartz-carbonate-pyrite which is locally known as listwanite.

Thin Section: Alteration Assemblage:

1. Pyrite (8%):
   Euhedral pyritohedrons up to 1.0 mm in diameter.
2. Quartz:
   Unaltered, uniaxial negative, xenoblastic grains less than 0.2 mm in diameter with very slight undulatory extinction.
3. Muscovite:
   Colourless, randomly oriented flakes less than 0.2 mm long with $2V_X = 35^o$.
4. Carbonate:
   Xenoblastic, untwinned grains up to 0.8 mm in diameter.

Remarks: This totally altered greenstone does not contain albite.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-6D RIM	**Latitude:**	
UTM Coordinates:	VR0462000mE	**Longitude:**	
	VR6570455mN	**Notebook:**	#20, p. 6
Station:	T6d	**Collector:**	P.B. Read

Location: At 1140 m northwest of the first lake northwest of Snowy Creek.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Porphyritic (plagioclase, augite?) meta-basalt pillow lava overprinted by a chlorite-actinolite-clinozoisite-carbonate low grade metamorphic assemblage.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Plagioclase:
   A few euhedral intensely altered laths up to 1.0 mm long.

Alteration Assemblage:

1. Chlorite:
   Medium green to pale green flakes up to 0.2 mm long with anomalous berlin blue interference tints. Probably completely pseudomorphs original augite.
2. Calcite:
   Xenoblastic grains up to 0.2 mm in diameter in veinlets.
3. Clinozoisite:
   As prismatic colourless grains in veinlets.
4. Actinolite:
   Radiating sheaves of prismatic grains up to 0.1 mm long which are length-slow and have Z against c = 12°. They form the groundmass to the intensely altered plagioclase phenocrysts.
5. Stilpnomelane:
   Dark reddish brown to light brown pleochroic flakes less than 0.05 mm long which lack birds eye extinction.

Remarks:

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Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-8C	**Latitude:**	
UTM Coordinates:	VR0460880mE	**Longitude:**	
	VR6570680mN	**Notebook:**	#20, p. 11
Station:	T8c	**Collector:**	P.B. Read

Location: At 1175 m, approximately 70 m northwest of the 3600 surface manway.

Rock Unit: **Mgs,** unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Altered porphyritic (plagioclase) meta-basalt flow overprinted by a chlorite-carbonate-albite-opaque mineral cut by a vein of chorite-muscovite-carbonate.

Thin Section: Alteration Assemblage:

1. Carbonate:
   Untwinned, rhomb-shaped porphyroblasts up to 1.2 mm in diameter.
2. Albite:
   Rarely twinned, xenoblastic grains less than 0.1 mm in diameter which gives a centered bisectrix plagioclase determination of An_8. It's best developed in a vein of alteration material.
3. Chlorite:
   Medium to pale green flakes with anomalous bluish grey interference colours.
4. Opaque minerals (3%):
   Anhedral grains scattered throughout.
5. Muscovite:
   Colourless flakes up to 0.4 mm long only in the vein of altered material.

Remarks:

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Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-11F	**Latitude:**	
UTM Coordinates:	VR0459885mE	**Longitude:**	
	VR6571115mN	**Notebook:**	#20, p. 16
Station:	T11f	**Collector:**	P.B. Read

Location: At 1095 m on the left bank of Quartzrock Creek, 730 m upstream from the Cassiar highway bridge.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Porphyritic (augite, plagioclase which is completely pseudomorphed) meta-basalt flow overprinted by a chlorite-actinolite-clinozoisite-carbonate metamorphic assemblage.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:

As subhedral phenocrysts up to 0.3 mm in diameter with $2V_Z = 50^o$ with moderate dispersion showing r greater than v. Augite has strong undulatory extinction and is locally altered to chlorite.

Alteration Assemblage:

1. Chlorite:

Pale green to colourless flakes with anomalous berlin blue interference tints, length-slow. Fills cracks in augite.

2. Actinolite:

Sheaves of colourless prismatic flakes which are length-slow and have Z against c = 15^o. They are present in the groundmass around the relict augite phenocrysts.

3. Clinozoisite:

Granules to prismatic grains with lemon yellow interference tints less than 0.1 mm in diameter which together with calcite and muscovite completely pseudomorph a few subhedral laths of plagioclase up to 1 mm long.

4. Calcite:

Xenoblastic untwinned grains sparsely scattered.

5. Muscovite:

Colourless flakes less than 0.1 mm long.

Remarks:

UNIT Mgs: META-INTRUSIONS

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P316F2	**Latitude:**	
UTM Coordinates:	VR0462110mE	**Longitude:**	
	VR6569690mN	**Notebook:**	#5, p. 28
Station:	P316f	**Collector:**	J.F. Psutka

Location: At 1040 m on the north side of the settling pond.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Medium grained (1 to 3 mm) uralitized augite gabbro.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:
   Colourless mineral with refractive index about 1.7, $2V_Z = 50$ to 60^o. Dominantly replaced by chlorite with optically oriented residua remaining. There are entire pseudomorphs up to 1.5 mm in diameter completely composed of chlorite.
2. Hornblende:
   Medium green-brown to pale green stubby prismatic grains, a few of which have augite cores up to 0.8 mm long.
3. Plagioclase:
   Some highly altered but subhedral twinned laths up to 1.5 mm long with a flat stage centered bisectrix determination of An_0.

Alteration Assemblage:

1. Clinozoisite:
   Colourless grains with berlin blue interference tints.
2. Chlorite:
   Pale green flakes, 0.1 mm long in clots replacing augite. Intense berlin blue interference tints.
3. Calcite:
   Anhedral clots up to 1.0 mm in diameter.
4. Actinolite:
   Pale green to colourless pleochoric fibres, Z against c = 15^o, up to 1.0 mm long.
5. Quartz (less than 1%):
   Anhedral, unaltered grains less than 0.1 mm in diameter.

Accessory Minerals:

1. Sphene:
   In grains to 0.2 mm in diameter.

Remarks: Metamorphic overprint strong and consists of chlorite-actinolite-clinozoisite-quartz-albite-carbonate.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P320H	**Latitude:**	
UTM Coordinates:	VR0463350mE	**Longitude:**	
	VR6569830mN	**Notebook:**	#5, p. 32
Station:	P320h	**Collector:**	J.F. Psutka

Location: At 1110 m east of Snowy Creek and south of Berube's vein.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Medium grain (2 - 3 mm) meta-gabbro.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Plagioclase

Slightly dusted, unzoned subhedral laths up to 3 mm long. Flat stage, centered bisectrix method yields An_3.

2. Quartz (3%):

Anhedral, unaltered grains up to 0.8 mm in diamter with undulatory extinction. The grains are interstitial to plagioclase.

Alteration Assemblage:

1. Chlorite:

Pale green pleochroic flakes and clots up to 1 mm in diameter. Intense berlin blue interference tints. Probably totally replaces original mafic minerals.

2. Carbonate:

Fine, less than 0.05 mm anhedral grains present as clots and veins in plagioclase and chorite.

3. "Leucoxene":

Fine grained clots up to 1 mm in diameter which do not extinguish and have a cloudy white colour.

Accessory Minerals:

1. Apatite:

Slender hexangonal prisms up to 0.2 mm long which are length fast.

Remarks: Mafic minerals are totally replaced by chlorite and carbonate the plagioclase is now albite (An_3).

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-2G	**Latitude:**	
UTM Coordinates:	VR0460720mE	**Longitude:**	
	VR6569730mN	**Notebook:**	#20, p. 3
Station:	T2g	**Collector:**	P.B. Read

Location: On the left bank of Quartzrock Creek, 620 m upstream from the mouth of Troutline Creek.

Rock Unit: Mgs, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Porphyritic (augite) fine grained diabase dike.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:
   Colourless grains showing normal interference tints in subhedral grains up to 0.5 mm of which some have a subophitic texture with what used to be plagioclase laths. $2V_Z = 50^o$.

Alteration Assemblage:

1. Actinolite:
   Pale green to colourless prismatic grains with Z against c = 15 to 20^o. Two cleavages at 56^o.
2. Quartz:
   Anhedral grains 0.05 to 0.1 mm in diameter in clots up to 0.4 mm in diameter.
3. Chlorite:
   Very pale green flakes with anomalous berlin blue interference tints.
4. Clinozoisite:
   Colourless twinned prismatic grains to granules with lemon yellow interference tints.
5. Sphene or "Leucoxene":
   Clots of extreme positive refractive index and extremely high relief.

Remarks: Locally augite phenocrysts with subophitic plagioclase remains.

UNIT Mt

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P316F1	**Latitude:**	
UTM Coordinates:	VR0462110mE	**Longitude:**	
	VR6569690mN	**Notebook:**	#5, p. 28
Station:	P316f	**Collector:**	J.F. Psutka

Location: At 1040 m on the north side of the settling pond.

Rock Unit: **Mt**, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Chlorite-muscovite siliceous phyllite.

Thin Section:

1. Quartz:
   Xenoblastic grains less than 0.02 mm in diameter in stringers and scattered throughout the rock.
2. Muscovite:
   Oriented flakes 0.01 mm in length outlining bedding and a foliation which strongly transposes the bedding.
3. Chlorite:
   Pale green flakes defining bedding and foliation.

Remarks: Muscovite and minor chlorite define a highly transposed bedding. Chlorite and muscovite lie in the foliation transposing the bedding. The foliation appears synmetamorphic.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P318G	**Latitude:**	
UTM Coordinates:	VR0463195mE	**Longitude:**	
	VR6570935mN	**Notebook:**	#5, p. 31
Station:	P318g	**Collector:**	J.F. Psutka

Location: At 1410 m level in the southeast branch of Snowy Creek.

Rock Unit: Mt, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Muscovite quartz phyllite with 5% carbonate porphyroblasts.

Thin Section:

1. Quartz:
   Xenoblastic grains less than 0.05 mm in diameter with rare angular clasts to 0.3 mm in diameter.
2. Muscovite:
   Fine colourless flakes with medium first order interference tints.
3. Carbonate (5%):
   Porphyroblasts up to 0.5 mm in diameter with "limonitic" margins.

Remarks: Appears to be cut by mylonitic streaks.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-3C	**Latitude:**	
UTM Coordinates:	VR0460965mE	**Longitude:**	
	VR6568645mN	**Notebook:**	#20, p. 4
Station:	T3c	**Collector:**	P.B. Read

Location: On the east bank of Quartzrock Creek, 560 m downstream from the mouth of Troutline Creek.

Rock Unit: Mt, unnamed upper Paleozoic unit of the lower thrust sheet

Lithology: Chlorite-muscovite-quartz phyllite.

Thin Section:

1. Muscovite:
   Flakes less than 0.02 mm long with a preferred orientation outlining bedding.
2. Chlorite:
   Flakes less than 0.02 mm long with a preferred orientation outlining bedding.
3. Quartz:
   Xenoblastic grains less than 0.03 mm in diameter with moderate undulatory extinction and grains 0.1 to 0.2 mm in diameter which are anhedral and present in crosscutting sweats.
4. Graphite?:
   Opaque dustings.

Remarks: The thin section as a whole shows bedding disrupted by a crossing surface which is widely spaced from 5 to 10 mm and looks like a pre- to syn-metamorphic foliation.

UNIT 1e, LAMPROPHYRE DIKE

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	DDH82-1 280.0'	**Latitude:**	
UTM Coordinates:	VR0460810mE	**Longitude:**	
	VR6570460mN	**Notebook:**	Drill Log DDH82-1
Station:		**Collector:**	J.F. Psutka

Location: At 1140 m, 120 m at 160° from the 3600' portal.

Rock Unit: le, lamprophyre dike

Lithology: Porphyritic (augite), augite spessartite with sparse amygdules of pumpellyite, chlorite eipidote and carbonate.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:
   a) As subhedral colourless grains up to 0.4 mm long.
   b) Subhedral colourless phenocrysts up to 1.0 mm long.
2. Plagioclase:
   Dusty subhedral laths less than 0.4 mm long which give a centered bisectrix flat stage composition determination of An_1.

Alteration Assemblage and Amygdules:

1. Pumpellyite:
   Pleochroic pale grass green to colourless fibres with mixed positive and negative elongation. The grains have strong dispersion with r much much less than v. $2V_Z = 60°$.
2. Chlorite:
   Medium to pale green pleochroic flakes, length-slow, berlin blue grey interference tints.
3. Epidote:
   Greenish-yellow to colourless pleochroic prismatic grains.
4. Carbonate:
   Xenoblastic grains less than 0.1 mm in diameter.

Remarks: Low grade metamorphic overprint contains pumpellyite in amygdules.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	DDH82-3 195'	**Latitude:**	
UTM Coordinates:	VR0460660mE	**Longitude:**	
	VR6570510mN	**Notebook:**	Drill Log DDH82-3
Station:		**Collector:**	J.F. Psutka

Location: DDH82-3 at 195'.

Rock Unit: le, lamprophyre dike

Lithology: Porphyritic (augite), augite, chloritized biotite "olivine" spessartite.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:
1. Augite:
   a) Euhedral grains up to 2.5 to 3.0 mm with optically oriented medium chocolate brown hornblende inclusions.
   b) Subhedral grains less than 0.4 mm in diameter with no hornblende inclusions.

Alteration Assemblage:
1. Chlorite:
   Pale green pleochroic flakes up to 0.5 mm long completely pseudomorphing original biotite? 1 grain has a few dark brown biotite residua.
2. Epidote:
   Pleochroic yellow-green grains.
3. Plagioclase:
   Thin laths up to 0.6 mm long which are lightly sericitized. A flat stage centered bisectrix plagioclase determination gives An_2.
4. Serpentine:
   Clots up to 0.4 mm in diameter composed of light to medium grey interference tint, length-slow flakes.
5. Amygdules:
   Amygdules are composed of chlorite, calcite and prehnite. These fill amygdules up to 3.5 mm in diameter which have calcite cores rimmed by chlorite and prehnite.

Accessory Minerals:
1. Apatite:
   Euhedral hexagonal prisms up to 0.3 mm long.

Remarks: Has augite phenocrysts with optically oriented hornblende inclusions.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	P315A2	**Latitude:**	
UTM Coordinates:	VR0460805mE	**Longitude:**	
	VR6570545mN	**Notebook:**	#5, p. 27
Station:	P315a	**Collector:**	J.F. Psutka

Location: At 1150 m, 70 m at 120° from the 3600' portal.

Rock Unit: le, lamprophyre dike

Lithology: Porphyritic (quartz, plagioclase) rhyolite inclusion.

Thin Section: The minerals present are subdivided according to whether they are phenocrysts or matrix.

Phenocrysts:

1. Quartz:
   Anhedral, embayed and partly resorbed phenocrysts up to 6.0 mm in diameter. They are uniaxial positive and unaltered.
2. Plagioclase:
   Anhedral embayed phenocrysts up to 2.5 mm in diameter which are dusted with alteration products. Flat stage centered bisectrix determination gives An_0.

Matrix:

1. Quartz:
   Anhedral, unaltered interstitial grains less than 0.1 mm in diameter.
2. Plagioclase:
   Dusty altered laths less than 0.2 mm long.
3. Orthoclase:
   Less than 0.2 mm long subhedral laths dusted with alteration. They are untwinned with negative relief with respect to albite.

Accessory Minerals:

1. Allanite?:
   2V large and indeterminate, pleochroic yellow-brown to green-brown grains with refractive indices about 1.7.
2. Oxychlorite:
   Red-brown pleochroic flakes without velvety extinction.
3. Zircon:
   One grain.

Remarks: Locally the lamprophyre dike has up to 30% inclusions up to 0.5 m in diameter.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	NTS Sheet:	104P/5
Field No.:	T83-1KAr	Latitude:	
UTM Coordinates:	VR0460530mE	Longitude:	
	VR6570585mN	Notebook:	#20, p. 14
Station:	T8310b	Collector:	P.B. Read

Location: At 1130 m on the first outcrop of the lamprophyre dike west of Decline Fault.

Rock Unit: le, lamprophyre dike

Lithology: Fine grain (0.5 mm) equigranular augite lamprophyre (spessartite).

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:
1. Augite:
   Colourless subhedral grains with inclined extinction with Z against c = about 43°. Two cleavages at 88° and $2V_Z$ = 55°. The grains are up to 0.6 mm long with first order orange as the maximum interference tint. No dispersion or anomalous interference tints.
2. Plagioclase:
   Subhedral, unzoned, slightly dusty grains which yield flat stage centered bisectrix plagioclase determinations of An_2 and An_0.
3. Biotite:
   A few flakes pale to medium red-brown with birds eye extinction.

Alteration Assemblage:
1. Chlorite:
   Medium to pale green flakes which are length-slow and have medium grey interference tints. Clots are interstitial to plagioclase.
2. Calcite:
   Interstitial anhedral grains locally replacing augite.
3. Pumpellyite:
   Grass green to colourless fibres which have mixed positive and negative elongation and anomalous berlin-blue to cinnamon-brown interference tints. $2V_Z$ = moderate.
4. Epidote:
   Yellow-green pleochroic grains.
5. Prehnite:
   Colourless radiating sheaves with a refractive index of about 1.6 and $2V_Z$ = moderate.
6. Orthoclase:
   Large (5 mm) anhedral sericitized untwinned grains.

Accessory Minerals:
1. Apatite:
   Slender hexagonal prisms up to 1.0 mm long.

Remarks: Lacks the phenocryst phase of T83-6C.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	NTS Sheet:	104P/5
Field No.:	T83-6C	Latitude:	
UTM Coordinates:	VR0462175mE	Longitude:	
	VR6570435mN	Notebook:	#20, p. 6
Station:	T6c	Collector:	P.B. Read

Location: At 1155 m on the northeast side of Snowy Creek valley.

Rock Unit: le, lamprophyre dike

Lithology: Fine grain (0.5 mm) porphyritic (augite, biotite) augite, hornblende, biotite "olivine" lamprophyre (camptonite).

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration and amygdule assemblage.

Relict Igneous:
1. Titanaugite:
   Strong dispersion r much much greater than v. Pleochroic with Y = very pale pink-brown in subhedral grains less than 0.5 mm long. $2V_Z = 55^o$. Some phenocrysts are up to 2 mm in diameter.
2. Biotite:
   Pleochroic flakes which are strong red-brown to pale brown poikiolitic flakes up to 1 mm long which are marginally oxidized and darkened.
3. Hornblende:
   Pleochroic medium chocolate brown to pale brown grains present as optically oriented inclusions within coarse titanaugite phenocrysts only.
4. "Olivine":
   Clots up to 1 mm in diameter now totally pseudomorphed by serpentine.
5. Plagioclase:
   As thin laths up to 0.5 mm long, unzoned but largely sericitized. A flat stage centered bisectrix plagioclase determination gives An_5.

Amygdules:
1. Prehnite:
   Fills amygdules as radiating sheaves with refractive indices about 1.63 and a moderate $2V_Z$.

Accessory Minerals:
1. Apatite
   Slender prisms up to 0.6 mm long.

Remarks: Most obvious in this rock are two stages of titanaugite: (a) an early phenocryst phase with oriented inclusions of hornblende, and (b) a late phase of titaniferous augite up to 0.5 mm without hornblende inclusions and forming the groundmass of the rock.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-9P	**Latitude:**	
UTM Coordinates:	VR0460380mE	**Longitude:**	
	VR6570595mN	**Notebook:**	#5, p. 14
Station:	T9p	**Collector:**	P.B. Read

Location: At 1100 m, 200 m at 060° from the Stewart-Cassiar Highway bridge across Quartzrock Creek.

Rock Unit: le, lamprophyre dike

Lithology: Porphyritic (augite) augite spessartite overprinted by a pumpellyite-prehnite-calcite-epidote-serpentine low grade metamorphic assemblage.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Augite:

a) Subhedral, colourless grains up to 1.5 mm in diameter.

b) Subhedral to anhedral colourless grains less than 0.4 mm in diameter.

2. Plagioclase:

Subhedral, unzoned grains altered with clinozoisite, pumpellyite, and prehnite. Centered bisectrix flat stage composition determination gives An_0 and X' against the perpendicular to a = An_6.

Alteration Assemblage:

1. Pumpellyite:

Radiating sheaves of fibres which are mixed length-fast and length-slow, pleochroic grass green to colourless with slight berlin blue and clove brown interference tints. $2V_z$ = moderate.

2. Epidote:

Pleochroic pale yellow-green granules less than 0.2 mm in diameter.

3. Serpentine:

Medium green to pale green clots up to 0.8 mm in diameter of flakes with opaques which probably completely pseudomorph olivine.

4. Calcite:

The twinned shaped rhombs have the positive refractive index parallel to the long diagonal of the rhomb. Present as xenoblastic grains up to 0.8 mm in diameter.

5. Prehnite:

As a cloudy alteration product of plagioclase phenocrysts which show radiating extinction which is length-fast and $2V_z$ is moderate.

Remarks: Prehnite-pumpellyite facies assemblage.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-10	**Latitude:**	
UTM Coordinates:	VR0460620mE	**Longitude:**	
	VR6570550mN	**Notebook:**	#20, p. 14
Station:	T10	**Collector:**	P.B. Read

Location: At 1130 m at the bend on the road to the crusher at 270° from the 3600' portal.

Rock Unit: le, lamprophyre dike

Lithology: Porphyritic (titaniferous augite) biotite (½%) hornblende (3%) "olivine" augite camptonite.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage.

Relict Igneous:

1. Biotite (less than 0.5%):
   Pleochroic flakes from deep red-brown to pale brown, partly altered to chlorite.
2. Hornblende (4%):
   Pleochroic prisms with pale brown to chocolate brown but no shades of green. As subhedral prisms up to 0.2 mm long.
3. Augite:
   a) Pale pink-brown subhedral prisms 1.0 mm in diameter. Slight berlin blue to clove brown anomalous extinction colours.
   b) Pale pink-brown subhedral to anhedral grains. 0.1 to 0.3 mm grains.
4. Plagiocase:
   Slightly sericitized subhedral microlaths less than 0.2 mm long which are unzoned.

Alteration Assemblage:

1. Chlorite:
   Anomalous orange-purple interference tints for grains which are length-fast, medium to pale green pleochroic flakes up to 0.2 mm long that are spatially associated with biotite and hornblende.
2. Serpentine:
   Medium to pale green pleochroic flakes and clots up to 0.2 mm in diameter. The flakes are length-slow medium to pale grey interference tint and with refractive index slightly lower than chlorite where the two are in contact. Completely pseudomorphs original olivine.
3. Carbonate:
   Anhedral grains less than 0.02 mm replacing matrix.

Amygdules: Carbonate

Remarks: Serpentine completely pseudomorphs olivine. The augite is present both in the groundmass and as scattered phenocrysts.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	T83-10L	**Latitude:**	
UTM Coordinates:	VR0459590mE	**Longitude:**	
	VR6570705mN	**Notebook:**	#20, p. 15
Station:	T101	**Collector:**	P.B. Read

Location: At 1145 m, 300 m north of the Stewart-Cassiar Highway, 450 m west of Quartzrock Creek.

Rock Unit: le, lamprophyre dike

Lithology: Fine grained equigranular hornblende, titanaugite "olivine" camptonite dike with chlorite-calcite-prehnite amygdules.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration assemblage and amygdules.

Relict Igneous:

1. Hornblende:

Pleochroic grains with Z = medium chocolate brown, X = pale brown. Z against c = 12°, 0.2 to 0.4 mm long grains.

2. Titanaugite:

Pleochroic grains 0.2 to 0.4 mm long with $2V_Z$ = 50° which are pleochroic with Y = pale purple-brown. The dispersion is very strong with r very much greater than v resulting in strong berlin blue to clove brown interference tints.

3. Plagioclase:

Thin altered laths up to 0.6 mm long which give a centered bisectrix flat stage plagioclase determination of An_3.

Alteration Assemblage:

1. Chlorite:

Partly replaces hornblende but there is no sign of chlorite replacing biotite.

2. Epidote:

As granules within plagioclase.

3. Amygdules:

Amygdules are 0.5 to 1.0 mm in diameter and consist of calcite, chlorite and prehnite.

4. Serpentine:

Medium to pale green, length-slow flakes probably completely pseudomorphing olivine.

Remarks: Lacks the phenocryst phase of T83-6C unless the "amygdules" are olivine phenocrysts completely replaced by calcite and serpentine, but it has the medium chocolate brown hornblende here as individual grains and not as inclusions in augite.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	1066A	**Latitude:**	
UTM Coordinates:	VR0460917mE (10727ftE)	**Longitude:**	
	VR6570568mN (11255ftN)	**Notebook:**	
Station:		**Collector:**	G. Tomaszewski

Location: In 3672 XCS on the 3600' level in Taurus Mine.

Rock Unit: le, lamprophyre dike

Lithology: Porphyritic (sparse augite), augite, chloritized biotite spessartite with a low grade metamorphic assemblage of prehnite-pumpellyite-chlorite-calcite-epidote-albite overprinted.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration and amygdule assemblage.

Relict Igneous:

1. Augite:
   a) Rare, subhedral colourless phenocrysts up to 1 mm long.
   b) Subhedral, colourless grains 0.4 mm long.
2. Biotite:
   Pleochroic dark red-brown to light brown flakes up to 0.3 mm long which are nearly completely chloritized.
3. Plagioclase:
   Subhedral, unzoned laths dusted with alteration products. A flat stage, centered bisectrix determination yields An_7.

Alteration Assemblage:

1. Pumpellyite (2%):
   Pleochroic grass green to colourless radiating sheaves with fibers which are mixed length-fast and length-slow.
2. Prehnite:
   Very dusty, radiating sheaves with low second order interference tints and $2V_Z$ = moderate.
3. Chlorite:
   Medium to pale green pleochroic flakes which are length-slow and have berlin greyish blue interference tints.
4. Epidote:
   Pleochroic greenish yellow to colourless grains 0.1 mm long.
5. Calcite (less that ¼%):
   Xenoblastic, twinned grains less than 0.2 mm in diameter.

Accessory Minerals:

1. Apatite:
   Slender hexagonal prisms up to 1.0 mm long.

Remarks: Prehnite-pumpellyite facies assemblage.

TRENAMAN SPENCER & ASSOCIATES LTD.

Project:	TAURUS PROPERTY	**NTS Sheet:**	104P/5
Field No.:	1067A	**Latitude:**	
UTM Coordinates:	VR0460862mE (10547ftE)	**Longitude:**	
	VR6570561mN (11231ftN)	**Notebook:**	
Station:		**Collector:**	G. Tomaszewski

Location: In 3653 XCS on the 3600' level in the Taurus Mine.

Rock Unit: le, lamprophyre dike.

Lithology: Equigranular, fine grain (0.4 mm) titanaugite, hornblende, chloritized biotite camptonite with calcite-chlorite filled amygdules.

Thin Section: The minerals present are subdivided according to whether they are relict igneous or part of the alteration and amygdule assemblage.

Relict Igneous:

1. Hornblende:
   Pleochroic medium to pale golden brown, subhedral unaltered prisms up to 0.4 mm long. $2V_X = 60^o$.
2. Titanaugite:
   Pleochroic pale purple-brown subhedral prisms up to 0.4 mm long.
3. Biotite:
   Pleochroic flakes deep reddish brown to pale brown up to 0.3 mm long which are about 50% chloritized.
4. Plagioclase:
   Subhedral laths which are moderately to heavily sericitized. Too altered for a composition determination.

Amygdules:

Up to 2 mm in diameter and filled with calcite and chlorite.

Accessory Minerals:

1. Apatite:
   Slender hexagonal prisms up to 0.4 mm long

Remarks: Has the best hornblende for radiometric dating of all the samples of lamprophyre dike collected to date.

APPENDIX D:

REPRINT OF: "STRATIGRAPHY AND STRUCTURE OF SYLVESTER ALLOCHTHON, SOUTHWEST McDAME MAP AREA, NORTHERN BRITISH COLUMBIA"

STRATIGRAPHY AND STRUCTURE OF SYLVESTER ALLOCHTHON, SOUTHWEST McDAME MAP AREA, NORTHERN BRITISH COLUMBIA

Project 770016

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Gordey, S.P., Gabrielse, H., and Orchard, M.J., Stratigraphy and structure of Sylvester Allochthon, southwest McDame map area, northern British Columbia; in Current Research, Part B, Geological Survey of Canada, Paper 82-1B, p. 101-106, 1982.

Abstract

The Sylvester Allochthon in southwestern McDame map area is composed of at least three discrete mildly deformed fault bounded assemblages overlying autochthonous strata of the North American miogeocline. A basal thrust sheet of greenstone, chert, shale and serpentinite of Mississippian? and Permian age is overlain by another thrust sheet of Pennsylvanian to Permian augite porphyry basalt, shale, chert, and limestone, and undated shale and sandstone. The two assemblages have little in common stratigraphically, implying considerable distance between their original depositional sites. A third assemblage of lapilli tuff, quartz diorite, and quartz sandstone and shale of unknown age is in steep fault contact with the other assemblages. It may comprise a separate thrust sheet, or be autochthonous with respect to either of the dated sequences and entirely older or younger. Age control is not strict enough to rule out other major thrust faults within any of the three assemblages.

Introduction

The Sylvester Allochthon in north-central British Columbia comprises upper Paleozoic chert, greenstone, clastic and ultramafic rocks thrust over autochthonous or parautochthonous strata of the North American continental margin in mid-Jurassic to Early Cretaceous time (Fig. 14.1), and intruded later by mid- to Late Cretaceous quartz monzonite. The relationship between the Sylvester Allochthon and allochthonous Paleozoic and Mesozoic strata to the southwest (Gabrielse and Dodds, 1982) and to the Cache Creek Group farther southwest (Monger, 1975) is uncertain. Those assemblages are roughly equivalent in age and gross lithology but stratigraphic and faunal differences (Monger and Ross, 1971) appear numerous. In general Sylvester Group rocks seem much less disrupted by tectonism than those of the Cache Creek Group.

The Sylvester Allochthon comprises most of what was originally mapped as autochthonous Sylvester Group by Gabrielse (1963). Pyritic black shale, and minor chert-quartz sandstone and chert-pebble conglomerate included in the basal part of the group were excluded when strata above this level were later considered allochthonous (Gabrielse and Mansy, 1980). Gabrielse (1963) recognized and described all the major lithologies within the group, but the scale of his work did not allow subdivision. Diakow and Panteleyev (1981) subdivided and briefly described part of the Sylvester Group in the northwest part of the present area.

To document the stratigraphy and structure of the allochthon a strip across it was mapped at 1:50 000 scale in an area known to be structurally simple, and thought to expose relatively high stratigraphic levels (Fig. 14.2). In this region the allochthon is composed of three discrete assemblages preserved in a gentle syncline above autochthonous Upper Devonian pyritic black siliceous shale which, in turn, is underlain by Devonian dolostone and limestone (units A, B, and C: Gabrielse, 1963; Gabrielse and Mansy, 1980). The basal assemblage (lower thrust sheet), of Mississippian? and Permian age, consists of shale, chert, greenstone, and serpentinite. Strata which are partly time equivalent and include sandstone, shale, augite basalt, chert and limestone form an upper thrust sheet. Lapilli tuff, purple lapilli tuff, gritty quartz sandstone and quartz diorite of unknown age are in steep fault contact with the other two assemblages.

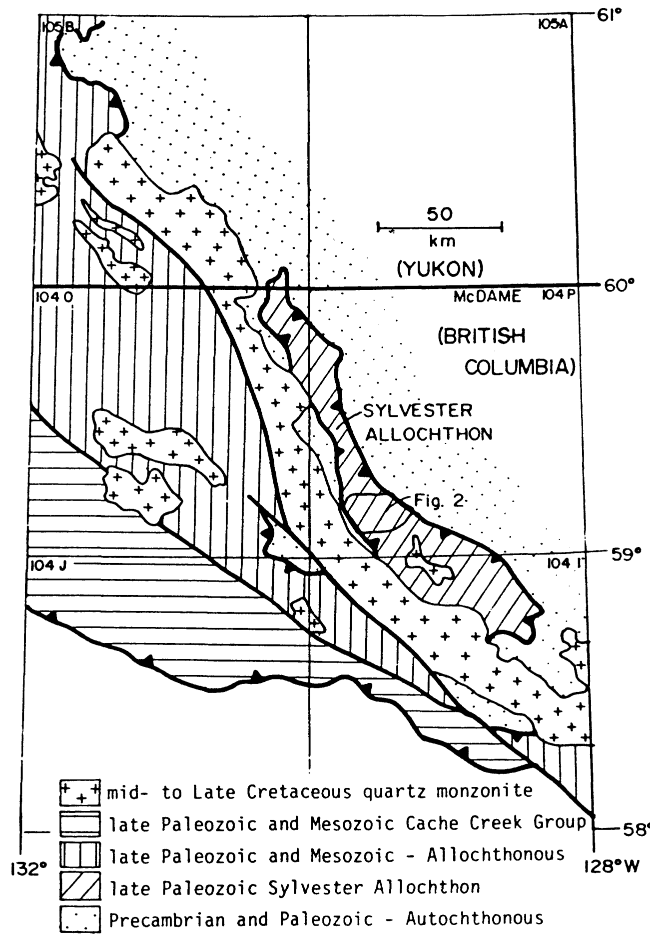

Figure 14.1. *Location and geological setting of Sylvester Allochthon. Modified from Tipper, Woodsworth and Gabrielse (1981).*

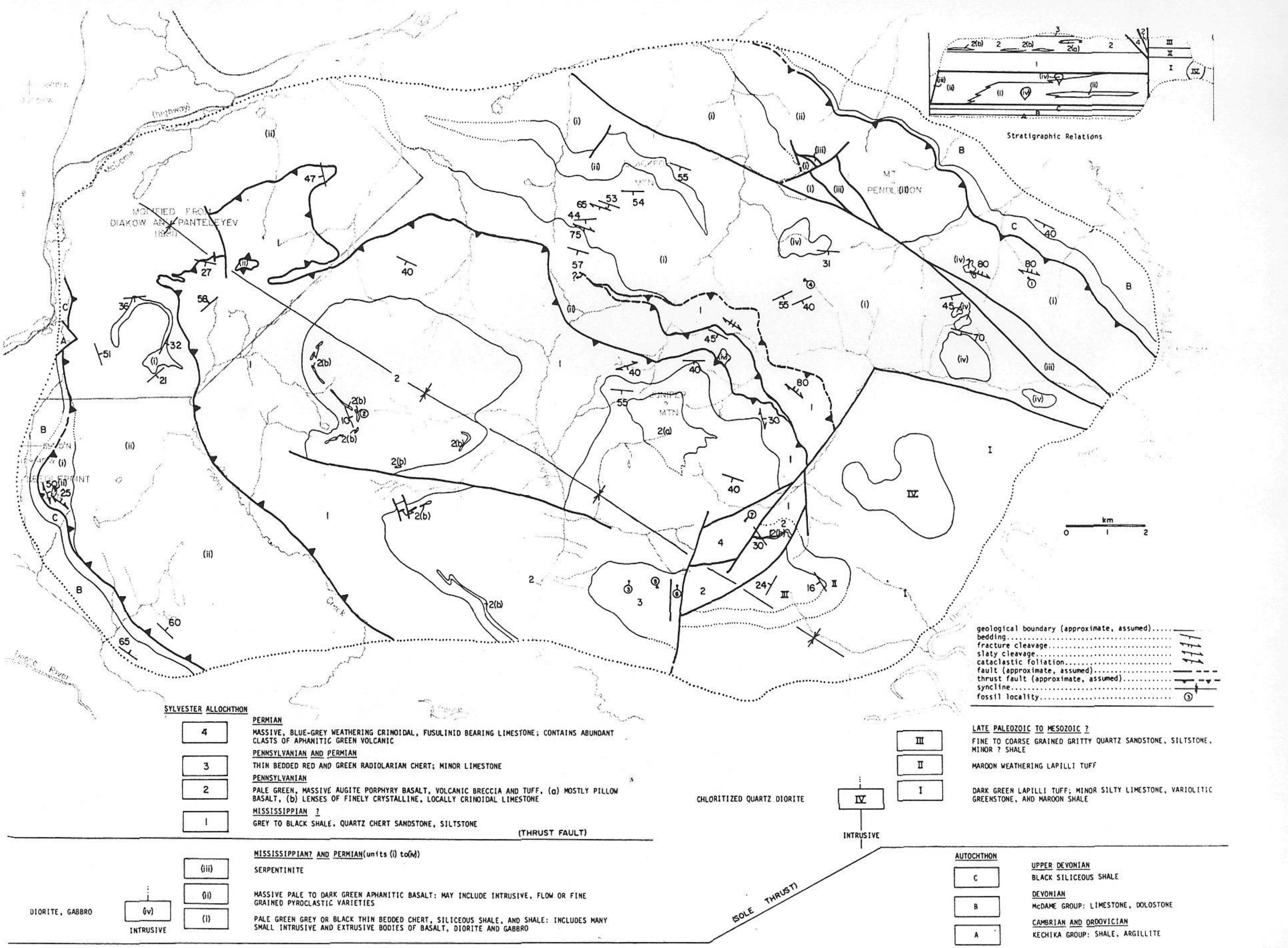

Figure 14.2. *Geological map across central Sylvester Allochthon, southwestern McDame map area. Location shown in Figure 14.1.*

Allochthon Stratigraphy

Lower Thrust Sheet (units (i) to (iv))

Dark weathering, well laminated, uniformly thin bedded shale, siliceous shale and grey to pale green chert form unit (i), which locally includes thick members of massive shale. The only limestone seen, a bed 2 m thick, yielded conodonts of Carboniferous, probably Mississippian age (Table 14.1, no. 1). Thin bedded black chert southeast of Blackfox Mountain contains Lower Permian conodonts (Table 14.1, no. 4). As the unit has no recognized base, its thickness is unknown, but apparently about 600 m+. The structure, however, may be complex; marker horizons are absent.

Dark grey-green weathering, aphanitic, pale green, massive volcanic rocks form unit (ii). The origin of most of the unit, whether intrusive, extrusive or pyroclastic, is not discernible in outcrop, although tuffaceous textures are evident locally. Thin section study shows that at least some of the volcanics are of 'flow type' composed of highly saussuritized plagioclase surrounding a few per cent of unaltered augite. Tremolite, chlorite, carbonate and epidote group minerals form an extensive alteration assemblage. Small to large intrusive and (?) extrusive bodies of unit (ii) greenstone are numerous within unit (i) and suggest that the two units may be partly temporal equivalents. The thickness of unit (ii) is unknown but is probably at least as thick as unit (i), i.e. 600 m+. Serpentinite of unit (iii) is spatially associated and in contact with unit (ii) greenstone, and is not found with volcanic rocks in the upper thrust plate.

Unit (iv) consists of medium grained equigranular gabbro, typically containing 10 to 15 per cent augite in a matrix of highly saussuritized plagioclase with rare hornblende, biotite and minor quartz. The euhedral to subophitic augite shows minor alteration to tremolite. Patchy carbonate and scattered chlorite are common alteration minerals. Numerous intrusive bodies of unit (iv) cut strata of unit (i) and may be related to eruption of unit (ii) greenstone.

Upper Thrust Sheet (units 1 to 4)

Unit 1 is composed of dark to black recessive weathering shale, siltstone and lesser sandstone. The sandstone is a fine- to coarse-grained, moderately sorted wacke, and consists of subrounded to subangular quartz and chert in equal abundance, with rare squashed mud clasts and detrital muscovite. Most of the chert grains contain some argillaceous material as expressed by crowded platelets of white mica. Quartz grains have silica overgrowths. Petrographically the sandstones are remarkably similar to Upper Devonian and Mississippian clastic rocks of the autochthonous succession. The unit is so recessive that bedding style and other features are not easily studied. Thickness is probably about 300 m+.

Green-grey weathering volcanic rocks of unit 2 overlie unit 1 along a sharp contact. They consist of augite porphyry basalt, breccia and tuff (Fig. 14.2), with lenses of crinoidal limestone. In most places the rocks are massive and breccia or tuffaceous texture is seen only on suitably weathered surfaces. A sequence of basalt flows 60 m ± thick with well developed pillows was noted south of Juniper Mountain (Fig. 14.3), and near the peak and on the west slope of the mountain. All rock types within the unit are very well indurated. In thin sections of the porphyry the augite is relatively fresh, but the matrix of tiny interlocking feldspar crystals is completely altered, with epidote and chlorite being common alteration products. Unit 2 volcanics can be distinguished easily from those of unit (ii) by their structural and stratigraphic position and their plentiful augite phenocrysts. About 70 m above the base of unit 2 lenses up to 20 m thick of grey weathering crinoidal limestone (unit 2b) locally yielded Lower Pennsylvanian conodonts (Table 14.1, no. 2). The thickness of unit 2 is estimated at about 600 m ±.

South of Juniper Mountain unit 2 is overlain by thin bedded red and green chert and minor limestone of unit 3. Both red and green chert range from relatively pure to argillaceous with thin bands and laminae of tuffaceous? material. Thicker interbeds consist of graded fine sand and silt. The limestones within unit 3 are at least several metres thick, are white weathering, massive, and finely crystalline; one yielded Middle Pennsylvanian conodonts (Table 14.1, no. 3). The underlying volcanics of unit 3 are thus bracketed between Early and mid-Pennsylvanian. Another limestone and chert from the unit yielded Lower? Permian conodonts (Table 14.1, no. 5, 6). The thickness of the red and green chert that may either lie above the younger limestone or separate the two limestones is now known. The thickness of the unit including the limestone members is difficult to estimate because of tight folding but the exposed thickness appears to be about 100 m ±.

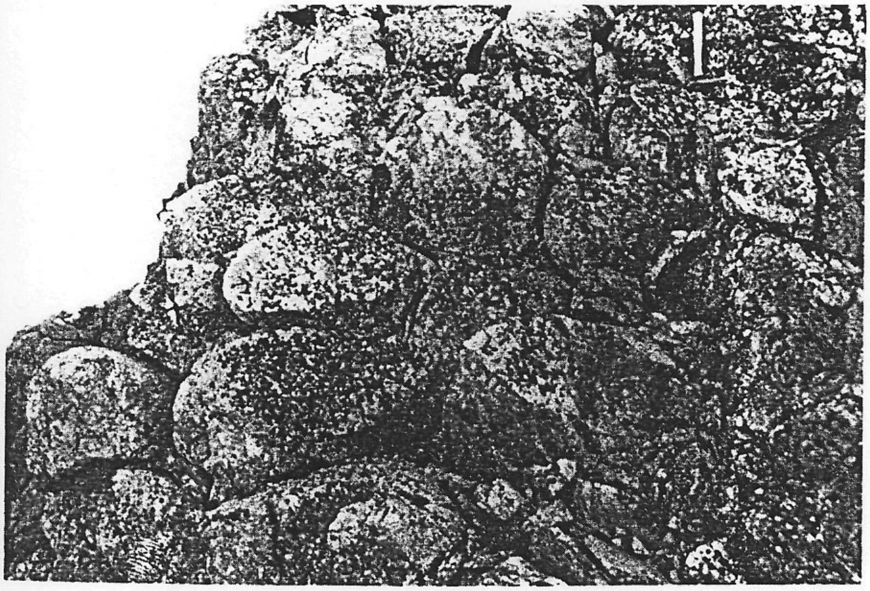

Figure 14.3

Well developed pillows in unit 2(a) augite porphyry basalt.

Table 14.1

Fossil determinations and age assignments for conodont collections from southwest McDame map area, Sylvester Allochton

No.	GSC No.	Lat./Long.	Unit	Lithology	Fauna and Age
1.	C-087675	59°12.3'N; 129°18.2'W	(i)	limestone	*'Spathognathodus'* cf. *'S.' stabilis* (Branson & Mehl), *Metalonchodina* sp. Age: ?Mississippian
2.	C-087676	59°10.5'N; 129°36.2'W	2	limestone	*Idiognathoides* cf. *I. sinuatus* Harris & Hollingsworth, *Neognathodus bassleri* Harris & Hollingsworth, *N. symmetricus* (Lane), *Gnathodus*? n. sp. Age: Early Pennsylvanian
3.	C-087677	59°08.2'N; 129°29.0'W	3	limestone	*Idiognathodus delicatus* Gunnel, *Neognathodus medadultimus* Merrill, *Streptognathodus*? sp., *'Neogondolella' laevis* (Kosenko & Kozitskaya), *'N.'* sp., *Gnathodus*? spp. Age: Middle Pennsylvanian
4.	C-087682	59°12.2'N; 129°24.2'W	(i)	chert	*'Neogondolella' bisselli* (Clark & Behnken) - *'N.' idahoensis* (Youngquist, Hawley & Miller) group Age: Early Permian
5.	C-087679	59°08.1'N; 129°28.2'W	3	chert	age and fauna same as C-087682
6.	C-087680	59°08.1'N; 129°27.7'W	3	limestone	age and fauna same as C-087682
7.	C-087678	59°09.0'N; 129°25.8'W	4	limestone	age and fauna same as C-087682
8.	C-087683	59°02'N; 128°47'W	-	chert	age and fauna same as C-087682

Numbers 4 to 8 are all low diversity fragmented neogondolellid faunas which are not well enough preserved to be confident of species determination. Fragments display characteristics of the group which includes the two named species as 'evolutionary end members' of a series that is in need of substantial taxonomic clarification, with particular emphasis on ontogenetic changes.

1 to 7 correspond to locations on Figure 14.2
8 is from northern Cry Lake map area (104I)
Identifications and age assignments by M.J. Orchard

Blue-grey weathering limestone of unit 4 is commonly a coarsely crystalline crinoidal or fusulinid hash. It contains abundant angular clasts, up to 1.5 m across, of orange weathering, fine grained, green volcanic rock both scattered within the limestone and as concentrations along certain horizons outlining bedding. Below a sharp contact at the base of the limestone are pebbly sandstone and minor pebble volcanic-clast conglomerate a few metres thick. Small 'flames' of the sandstone project upward into the limestone. Unit 4 is fault bounded and its relationships with other units remain uncertain. It yielded conodonts dated broadly as Permian (Table 14.1, no. 7), perhaps equivalent in age to the limestone within the chert of unit 3. The unit is at least 200 m thick.

Assemblage of Unknown Age (units I to IV)

Units I to IV form an assemblage in steep fault contact with those previously described. Unit I consists of massive, dark brown, recessive weathering, weakly cleaved and somewhat poorly indurated fragmental volcanic rock, mostly lapilli tuff. Within the volcanics thin interbeds of thin bedded to massive limestone up to 20 m thick, make up about 5 per cent of the unit. The limestone ranges from argillaceous to fairly pure, and from finely crystalline to sugary textured. Minor members include clean quartz sandstone (locally associated with the limestone), maroon siltstone, shale, and chert, and fine grained variolitic volcanic rock. The unit is probably at least several hundred metres thick although structural repetitions are possible but cannot be documented because of a lack of structural and stratigraphic data.

Unit I is apparently overlain by distinctive maroon to purple-red weathering tuff (Unit II) about 100 m± thick which contains lapilli-size fine grained green volcanic fragments in a maroon to purple fine grained matrix. The upper and lower contacts are not exposed.

Overlying? unit II is fine- to coarse-grained, fairly pure, medium bedded quartz sandstone, calcareous sandstone, and shale (Unit III). The sandstone is moderately sorted and consists of monocrystalline and polycrystalline undulose quartz, and 5 to 10 per cent microcline and plagioclase. The matrix is extensively recrystallized to a mat of fine grained felsic minerals, mostly quartz, and abundant white mica. Fine grained green volcanic tuff and coarse grained diorite are found within the unit but their extent and distribution are unknown. The top of the unit is not exposed, but its thickness is probably at least 70 m.

Unit IV is a small intrusive body of medium grained quartz diorite. It consists of about 5 per cent completely chloritized mafic mineral(s) (originally hornblende?), 15 per cent quartz, minor interstitial microcline, and highly saussuritized plagioclase. Augite occurs as scattered small unaltered crystals within the chlorite masses. The rocks of unit I are not significantly metamorphosed at the contacts with the quartz diorite.

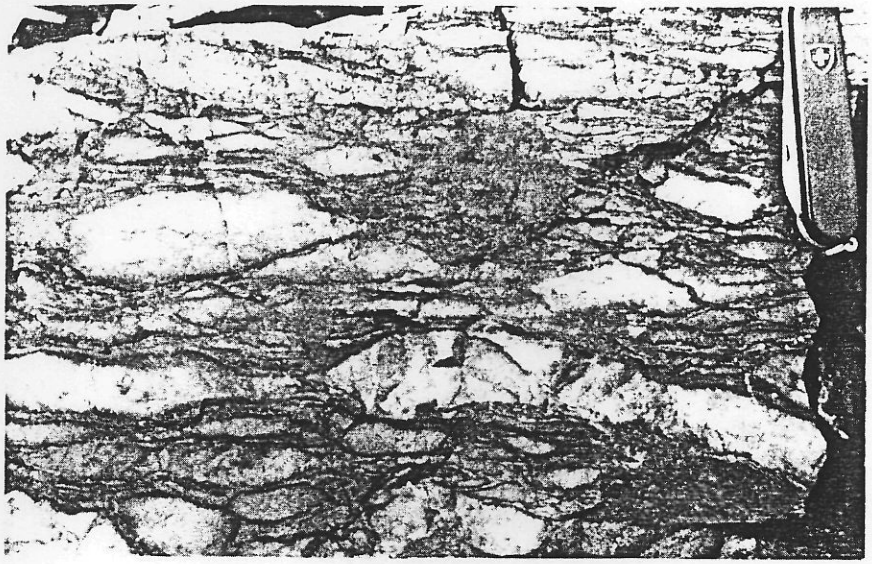

Figure 14.4

Chert augen within argillaceous matrix; cataclastic texture seen in rocks of unit (i)? near base of Sylvester Allochthon at Needlepoint Mountain.

Structure

The Sylvester Allochthon is preserved as a mildly deformed, flat, imbricated sheet within a broad synclinorium. Deformation possibly related to the sole fault was seen only near Needlepoint Mountain. There, a lens of (unit (i)?) shale, chert, and minor tuff or tuffaceous sandstone above the sole thrust has a weak transposition fabric. Augen of chert and tuffaceous sandstone developed from disruption of competent beds are set in a sheared and rodded shale matrix (Fig. 14.4). The rock commonly splits along irregular surfaces showing a well developed microrodding and wrinkle lineation. The lineation and the long axes of chert and sandstone augen generally trend northwest – southeast and plunge gently in either direction. Where the rock is more strongly transposed a gently dipping planar cataclastic foliation is developed containing the linear elements. The foliation generally has a shallow northeast dip and seems concordant with the underlying sole thrust. The sole thrust is not exposed. Rocks of the autochthon immediately beneath are recessive weathering, pyritic, black siliceous shale.

Deformation within the allochthon is mild and heterogeneous, although the effects of possible structural repetition on stratigraphic thickness cannot be assessed. Unit (i) locally shows slaty cleavage and fracture cleavage, but minor folds were not seen. Local thick members of massive shale contrast with the well bedded nature of most of the unit. The massive character may have been structurally produced but the rocks do not possess consistent planar or linear structural elements. In unit 1 some small outcrops of shale are not cleaved and display fine sedimentary lamination, yet in others tight folds and slaty cleavage are developed. Thin bedded chert and minor limestone of unit 3 are highly contorted southwest of Juniper Mountain. The competent volcanic rocks of unit 2 beneath are apparently undeformed, as are the greenstones of unit (ii).

A thrust fault is thought to separate units (i) to (iv) from units 1 to 4 because of older over younger relationships indicated by conodont ages. Unit (i) includes strata at least as young as Permian whereas unit 2 of the upper thrust sheet is in part demonstrably Lower Pennsylvanian. The contact of upper and lower thrust plates is sharp although not well exposed where seen by the authors. Diakow and Panteleyev (1981, p. 61) state that where examined by them "the contact in many areas appears to be a plane of dêcollement (possibly a major thrust fault). Argillite beds along the contact are crumpled, and locally contain large boudins of dyke material". Conodont ages seem to indicate a normal younging upward succession for the upper thrust sheet. Age control, however, is not strict enough to rule out other thrust faults within either the upper (e.g., at base of unit 2) or lower thrust plates. East of Juniper Mountain units of both lower and upper thrust sheets are repeated. Although tentatively shown as resulting entirely from imbrication, it is unclear exactly how the observed distribution was produced.

The lower and upper thrust sheets, broadly equivalent in age, seem to have little in common stratigraphically, which implies a significant distance between their original sites of deposition.

The relationship of the two dated assemblages with the third is not known. The latter may form a separate allochthonous slice of equivalent age or it may be autochthonous with respect to either of the dated assemblages and be entirely older or younger. The contacts of units I to III within the third assemblage are presumably stratigraphic. The possibilities that the units themselves are discrete thrust slices or alternatively that they young systematically upwards in depositional sequence cannot be demonstrated without paleontological control.

Regional Relationships within Sylvester Allochthon

The stratigraphic and structural complexities of the Sylvester Allochthon described above imply that two important volcanic and or subvolcanic units seem to be present. The most widespread and structurally lowest is commonly spatially related with ultramafic rocks. It underlies most of the rugged peaks southeast of Mount Pendleton, extending through southern McDame map area and into Cry Lake map area. The other, of Pennsylvanian age, appears to be less extensive.

Limestone units (including these described here) of Late Mississippian (Late Visean to Early Namurian; Mamet and Gabrielse, 1969), Pennsylvanian, Permian and Triassic (Gabrielse, 1963) ages have been identified within the allochthon. Their distribution suggests the allochthon consists of discontinuous lithological units complicated by low and high angle faults perhaps related to its emplacement.

The steep fault marked by discontinuous sheared serpentinite bodies southwest of Mount Pendleton can be traced southeastward into Cry Lake map area where its continuation is marked by a conspicuous lineament and the occurrence of more ultramafic pods and lenses. Near the boundary of McDame and Cry Lake map areas it separates rocks as old as Late Mississippian (Nizi Formation) to the west from rocks as young as Permian to the east (see Table 14.1, no. 8). Thus it may represent the sole fault of another major imbrication within the allochthon.

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