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STRATABOUND BARITE- AND LEAD-ZINC-BARITE DEPOSITS IN EASTERN SELWYN BASIN, YUKON TERRITORY

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INTRODUCTION

The eastern margin of Selwyn Basin hosts several stratabound barite and barite-lead-zinc deposits of potential economic importance to the Yukon Territory. However, very little public information is available concerning these deposits and accordingly, in 1976 the Department of Indian Affairs and Northern Development Geology Section in Whitehorse, Yukon intitiated a project involving the investigation and study of several of these deposits in eastern Selwyn Basin. Three main properties were selected for study and R.C. Carne, geologist, carried out the field investigations and preparation of reports. Project logistics and field work supervision was supplied by J.A. Morin, DIAND District Geologist and field work was carried out in June, July and August, 1976. In addition, diamond drill core from the MEL, JASON and TOM properties was acquired and stored in the H.S. Bostock Core Library, Whitehorse for further study. Mr. Carne is continuing his study of the TOM deposit in an MSc thesis at the University of British Columbia, Vancouver.

GEOLOGY OF THE TOM AND JASON
ZINC-LEAD-BARITE DEPOSIT
MACMILLAN PASS, YUKON TERRITORY

BY

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DEPT. OF INDIAN AND NORTHERN AFFAIRS

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INTRODUCTION

The Macmillan Pass area, in east-central Yukon Territory, contains what promises to be some of the most valuable mineral deposits yet discovered in the Territory. In addition to the TOM and JASON stratiform lead-zinc-silver-barite deposits, the area contains one of North America's largest tungsten deposits (Mactung deposit) as well as a relatively large tonnage stratiform barite deposit (TEA deposit) presently being exploited for use as oil well drilling mud. This report specifically deals with the TOM and JASON deposits, based on field investigations carried out by the writer during July and August 1976.

General Character of the Area

The Macmillan Pass area lies along the northeastern margin of the Selwyn Basin tectonic province (Gabrielse, 1967) and within the Selwyn Mountains physiographic province (Bostock, 1948).

Elevations on the TOM-JASON properties range from 3,800 feet (1,160 metres) to over 6,600 feet (2,010 metres). Relief is generally subdued and outcrop scarce, with the exception of ridges and peaks which are often craggy where capped by resistant rock. Valley bottoms are mantled by substantial thicknesses of glacial drift and alluvium.

Wildlife abounds in the area - of the larger mammals, moose, grizzly bear, mountain caribou and wolf are most common. Areas with elevations less than 5,000 feet (1,500 metres) support a dense vegetation cover, including species of fir on well-drained slopes and stunted black spruce, willow and arctic black birch on poorly drained valley bottoms.

LOCATION AND ACCESS

The TOM and adjoining JASON claim groups are located at latitude 63°10'N and longitude 130°10'W on N.T.S. map sheet 105 O-1. The area lies approximately 9 km (5.5 miles) southwest of Macmillan Pass at the Yukon-Northwest Territories border. The North Canol Road crosses both the TOM and JASON claim groups. Vehicle access to the permanent trailer camp on the TOM property is by a 2.8 km access road from Mile 275 on the Canol Road. The main showing area on the JASON property is served by a four-wheel-drive and bulldozer tote road crossing the Macmillan River. The Canol Road is not maintained during winter months.

A gravel surfaced, 620 metre (2,000 foot) airstrip is located on the north part of the TOM property. Jeff Lake, approximately 50 km (30 miles) by road southwest of the TOM-JASON area, is suitable for use by float-equipped aircraft. A Hiller 12-E, two-passenger helicopter was based at Macmillan Pass airstrip during the 1976 field season.

PREVIOUS GEOLOGICAL WORK AND EXPLORATION HISTORY

The earliest recorded work by the Geological Survey in the region is that of E.D. Kindle who conducted a reconnaissance geological survey along the Canol Road in 1944 and 1945. Map sheet 105 O was mapped and released on Open File by S.L. Blusson in 1974.

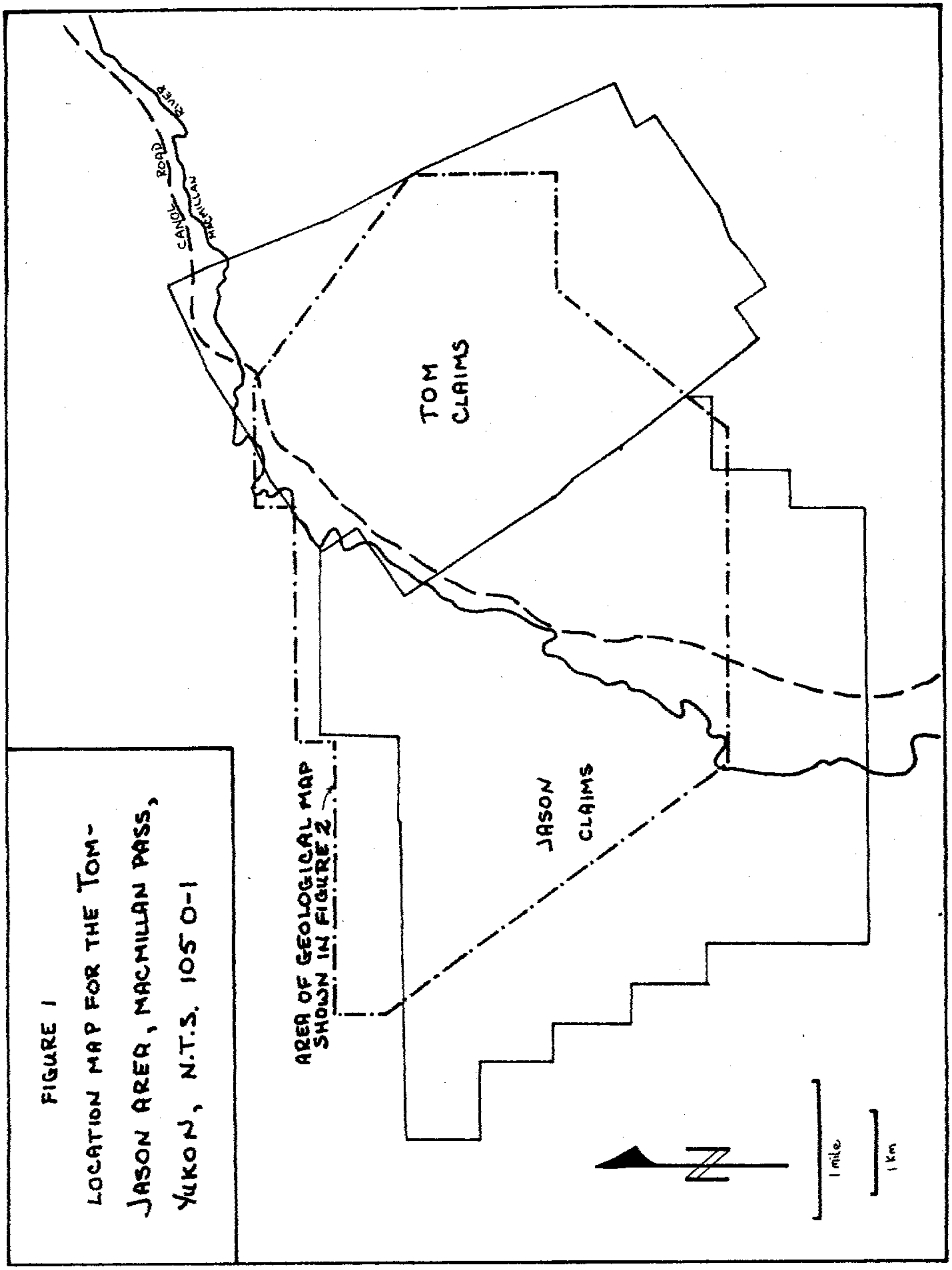

FIGURE 1

LOCATION MAP FOR THE TOM-JASON AREA, MACMILLAN PASS, YUKON, N.T.S. 105 O-1

TOM Group

The TOM group, consisting of 144 leased claims and fractions, was discovered in 1951 by prospectors working for Hudson Bay Exploration and Development. During the period 1951 to 1953, work was performed mainly on the discovery or West Zone, and it consisted of 39 diamond drill holes totalling 17,834 feet (5,436 metres). Estimated reserves at this time were 10,470,000 tons averaging 5 per cent zinc and some lead (Green, 1965). Because of falling zinc prices and its remote location, the property lay idle until 1966, when a small crew carried out a geochemical soil survey program in conjunction with geological mapping and additional prospecting.

Late in the 1967 season, an additional 5,500 feet (1,675 metres) of diamond drilling was carried out. The results of this work were encouraging and the company continued drilling on the higher grade East Zone in 1968. A total of 10,000 feet (3,050 metres) of diamond drilling in 15 holes was completed. Reserves at this time were listed at 5.1 million tons grading 8 per cent zinc, 8 per cent lead and 2.7 ounces per ton silver (Findlay, 1969).

During the 1969 season the Canol Road was rebuilt from Ross River as far as the property. In addition, an existing airstrip near the property was upgraded (Craig and Laporte, 1970). During 1970 and 1971 the two mineralized zones were further defined by a total of 6,190 feet (1,887 metres) of underground workings in conjunction with 7,753 feet (2,363 metres) of underground diamond drilling. Continued underground diamond drilling during 1972 brought the total diamond drilling footage to 38,434 feet (11,853 metres) (Archer, Cathro and Associates, Ltd., 1975).

Reserves on the TOM property are currently quoted at 8,645,000 tons averaging 8.1 per cent lead, 8.4 per cent zinc and 2.75 ounces silver per ton (Freberg, 1976). Work on the TOM property to the present has primarily consisted of maintenance to the camp buildings.

JASON Group

The 174 JASON claims, adjoining the TOM claims to the east, were staked in August of 1974. During June and July of 1975, geological mapping as well as geochemical and gravity surveys were conducted on the property by the Ogilvie Joint Venture (C.L. Smith, Brinex, Mitsubishi Metals Corp. Mitex Mines Ltd. and Ventures West Capital). Zinc and barium geochemical anomalies coincident with a gravity high led to exploratory diamond drilling in October, 1975. Seven holes were drilled for a total of 2,100 feet (640 metres). During July to October of 1976, an additional 14 holes were drilled for a total of 7,095 feet (2,163 metres). Midway through the 1976 drilling program, diamond drill hole size was increased from BQ to NQ and finally, HQ to combat excessive flattening of deep holes. This problem was not resolved satisfactorily and rotary drilling methods may be utilized for deep holes planned for the future (C.J. Sampson, pers. comm., 1976).

ACKNOWLEDGEMENTS

The writer would like to acknowledge the kind cooperation of the staff of Hudson Bay Exploration and Development Co. Ltd., in particular R.A. Freberg and R. Macintosh who extended permission to examine underground diamond drill core and provided the writer with copies of plans and diamond drill records for the TOM deposit. Ogilvie Joint Venture personnel kindly permitted examination of diamond drill core from the JASON property and provided a copy of a one inch to one thousand foot, contoured orthophoto on which mapping control was based. In addition, special thanks are due C.L. Smith for his helpful discussions on the stratigraphy of the area.

GENERAL GEOLOGY

The Tom and JASON claim groups are underlain by Devono-Mississippian shale and cherty clastic rocks tentatively correlated with Imperial Group sedimentary rocks to the north, with Besa River Formation lithologies to the south, and as a fine-grained facies equivalent of Earn Group rocks to the west. The area is characterized by an anomalous thickening of Canol Formation black shale, regionally occurring above a chert pebble conglomerate horizon, near the base of the eastern Imperial Group (S.L. Blusson, pers. comm., 1976c). These rocks have previously been informally designated as the 'Black Clastic' group by S.L. Blusson (1976a).

Shale and coarse clastic strata of the Imperial Group are underlain by black, carbonaceous, limy shale and chert of early Ordovician to Middle Devonian Road River Formation.

Carbon-rich Road River shale hosts several potentially large tonnage, stratiform lead-zinc deposits at Howards Pass (105 I-6, 11, 12). The metamorphosed equivalent of this shale may host the Grum-Swim-Vangorda deposits of the Anvil Range (105 K) (Dawson, 1977).

The sedimentary package is intruded by large stocks of Cretaceous hornblende-biotite granodiorite and associated quartz-feldspar porphyry dyke swarms. A skarn developed along the contact between one of these stocks and lower Road River strata is host for the large tonnage Mactung tungsten deposit (105 O-1, 8).

This report is concerned with the geology of the immediate area of the TOM and JASON claims. Outline of the geology map (Fig. 2) is shown, with respect to the TOM and JASON claim groups on Figure 1. Eight mappable lithologic horizons (in addition to mineralized zones) are recognized, of which units 3a, 3b, 3c, and 3d are assigned to the Canol Formation (S.L. Blusson, pers. comm., 1976c).

TABLE I: Table of Formations

Formation	Map Unit	Lithology	Approximate Thickness (Metres)
	4	silty mudstone, silty shale and calcareous, siltys andstone	100 (top not seen)
Canol Formation	3d	tuffaceous shale and tuff	0-60
	3c	welded tuff, pyritic chert cherty argillite amygdaloidal andesite (?)	0-40
	3b	carbonaceous shale, cherty argillite	30- 1300
	3a	shaly pyritic mudstone and silty shale, minor intra-formational and chert pebble conglomerate	4-40
	2	massive chert pebble conglomerate, minor chert granule conglomerate, coarse-grained chert turbidite, minor interbedded silty shale	45 (varies locally)
	1	pyritic silty shale and rhythmite, siltstone beds and minor chert pebble conglomerate and greywacke	120 (base not seen)

Unit 1

Unit 1, composed of silty shale rhythmite, outcrops at three locations in the map-area. It is well exposed in the core of an anticline bordering the north edge of the JASON property and poorly exposed erosional remnants of Unit 1 occur in uplifted fault blocks in the southwesterly portion of the map-area. On the TOM property, these rocks are exposed as float in the core of an anticline cut by a cirque.

The unit consists largely of grey and grey-brown weathering, silty shale rhythmite. The shale component is black on fresh surfaces and the silty interbeds are brown to tan-grey. Silty intervals are commonly near 1 cm in thickness, shale interbeds usually being slightly thicker. Siltstone beds abruptly increase in thickness and frequency near the top of the unit in conjunction with rare lenses of greywacke and chert pebble conglomerate, Silty units, especially thicker ones, frequently exhibit scouring and channelling of underlying shale units. Size grading is rarely present.

The siltstone interbeds are composed of a framework of unimodal, silt-size quartz grains with uniform extinction under crossed nicols. The quartz grains have ragged serrate boundaries. Sutured mutual boundaries between quartz grains form a rigid interlocking framework. In contrast, these grains have smooth mutual boundaries with pyrite crystal casts and detrital mica grains. The roughly ovoid shape of the quartz grains, coupled with their monocrystalline nature and grain boundary geometry suggests that they may be recrystallized detrital chert grains. Matrix of the rock consists of very fine-grained quartz and mica, commonly sericite.

The textural and compositional nature of the silty shale has led some field workers (Dawson, 1977; Blusson, 1976b) to call it "tuffite" or "tuffaceous shale", proposing a distal volcanic source. Until more conclusive evidence is obtained, the rock will herein be referred to by a purely descriptive term such as silty shale, rhythmite, etc.

Minor trough cross-stratification and assymetrically rippled tops developed in the silty interbeds, in association with tool marks and grooves commonly present at tops of shale interbeds, suggests that they may have been deposited under relatively high energy conditions, perhaps as turbidity current or grain flow deposits.

Unit 2

Relatively resistant unit 2 rocks are well exposed on both the TOM and JASON properties, forming prominent ridges and scarps.

The unit consists primarily of massive chert pebble conglomerate. Coarse-grained chert turbidite and minor interbedded black, silty carbonaceous shale occurs near the top.

Framework clasts in the conglomerate are poorly sorted, sand to pebble-sized, subrounded to rounded black-brown and white chert with occasional angular, lithic (shale) fragments. Up to 25 per cent of the framework grains consist of white to light grey, well-rounded pebbles of material with a volcanic (?) origin exhibiting a granular texture on a freshly broken surface. The clasts are commonly colour banded, contain abundant disseminated pyrite, and have bleached rims which have altered to clay minerals. At several locations throughout the map area, they are completely altered to a soft grey material, while in contrast the chert clasts remain fresh.

The massive nature and generally poor size sorting of clasts in the bulk of Unit 2 rocks, as well as evidence for broad scouring of Unit 1 rocks by deposition of the basal portions of the unit, indicates that they may have been deposited by a debris flow mechanism. However, the upper 10 metres of the unit, consisting of massive conglomerate, coarse-grained well sorted and graded turbidite with interbedded silty shale, suggests that a variety of depositional mechanisms were operative.

The unit averages 45 metres in thickness, although abrupt local variations in thickness occur. Contacts with the underlying rocks appear to be conformable although broad, shallow scouring of Unit 1 rocks was locally observed. No fossils were seen in Unit 2.

Unit 3a

Unit 3a is very similar, in part, to Unit 1. Best exposures occur in central regions of the JASON claims and in the southeast part of the TOM group where the entire unit, as well as the underlying contact with Unit 2 rocks, is exposed in near vertical bedding on the waterworn surface of a creek bed.

In general, the lithology consists of evenly thin bedded, brown weathering, pyritic, silty shale rhythmite, 1 cm to 2.5 cm in thickness. Pyrite is confined to silty laminae and some concretionary siltstone beds.

The unit undergoes an abrupt facies change, becoming coarser grained and less shaly, along a north-south trending zone at the easterly margin of the map area. Here, the unit consists of medium to thick bedded (0.2 metres to 1.5 metres), interbedded siltstone, mudstone, greywacke and silty shale. Intraformational conglomerate beds up to 0.6 metres thick are common. Some fine-grained, argillaceous chert pebble conglomerate lenses are present in Unit 3a on the JASON claims to the west although the unit here is generally very fine-grained with siltstone laminae appearing as very thin "pinstripes" in the shale. On the TOM property, the unit fines upward until the upper 8 metres (where it attains that thickness) is almost devoid of silty laminae.

Unit 3a rocks appear to fill in paleo-topographic lows formed by an uneven depositional surface on the Unit 2 conglomerate. Consequently, the thickness of the unit varies locally from four to forty metres. No identifiable fossils were seen from Unit 3a rocks. However, fragments of carbonized material seen in some specimens on the TOM property may be similar to Devono-Mississippian fossilized wood fragments collected from the same rocks by Sangster (1971 and pers. comm., 1976).

Unit 3b

Unit 3b underlies most of the map area but because of its recessive nature, the rocks rarely outcrop. The internal stratigraphy of Unit 3b is primarily determined from diamond drill core, especially one deep hole drilled to the base of the unit on the JASON property (D.D.H. 76-8), and from mapping of "in place float".

Unit 3b consists primarily of silvery-grey weathering, siliceous, pyritic, carbonaceous black shale. Varying proportions of silica cement in the shale produce lithologies variously described as argillaceous chert, cherty argillites, siliceous shale and carbonaceous "sooty" shale. Bedding thickness ranges from "papery-thin" (less than 2 mm) to "wide-bedded" (greater than 15 cm). Variation in bedding thickness is controlled by rapid fluctuations in silica content and/or the presence of discrete pyrite laminae.

As many as five zones of very siliceous, pyritic, baritic shale, ranging in thickness from 4 to 8 metres, are distributed evenly through a band of siliceous shale located from 240 metres to 420 metres from the base of the unit. These horizons are traceable for distances up to 3,000 metres along strike on the TOM property. Similar lithologies encountered on the north JASON claims and in DDH 76-8 near the JASON-TOM claim boundary may be correlative. The individual zones consist of 0.6 to 1.1 metre cycles of basal carbonaceous shale with "spotted" barite blebs along bedding, giving way rapidly to highly siliceous, pyritic argillite and culminating in beds of massive pyrite up to 2.5 cm in thickness. The cycles are repetitive and fairly consistent in thickness.

Along a roughly linear north-south trend parallel to the east boundary of the map area, the Unit 3b rocks undergo an abrupt facies change to rocks indistinguishable from lithologies of Unit 3a. Because of lack of outcrop in this area, these rocks have been mapped as 3a. In either case, the maximum thickness of Unit 3b at this point is 30 metres. Dramatic thickening of the Unit 3b lithologies occurs from this point to the west across the TOM and JASON properties (see Figure 3).

No fossils were found in Unit 3b. Thin interbeds of platy, fetid, black limestone found near the middle and top of the unit on the west TOM group are presently being analyzed for microfossils by the Geological Survey of Canada.

Distinctive, orange-brown weathering rocks of Unit 3c are exposed on three peaks in the southeast-central portion of the map area. They consist of interbedded grey, siliceous, welded tuff, light grey, pyritic chert, black, cherty argillite and minor amygdaloidal andesite (?) seen only as float.

The assemblage reaches a maximum thickness of 40 metres. This unit may be confined to local areas, since it was not noted in southeastern portions of the map area.

Unit 3d

Unit 3d is characterized by its overall, light powder-grey weathering colour. It consists of thinly bedded grey tuff and tuffaceous shale. The unit was only noted in the southern portion of the map area and reaches a maximum thickness of 60 metres in southwestern exposures.

Unit 4

Unit 4 is mapped as the basal portion of a very thick, monotonous sequence of medium-grained, shallow water, clastic rocks which make up the bulk of the Imperial Group locally. Brown weathering successions of silty mudstone, silty shale and calcareous silty sandstone form prominent cliffs in the southwest portion of the map area. The well developed cross stratification of these rocks suggests that they were deposited in much shallower water and/or higher energy environments than underlying strata.

Porphyry Dykes

Vertically dipping quartz-feldspar porphyry dykes intrude the sedimentary sequence of rocks and radiate from a large hornblende-biotite granodiorite stock centred 1.2 km south of the map area. The porphyry is light tan-brown in colour and weathers a distinctive orange-brown. The dykes are up to 3 metres thick and form resistant linear outcrops where they cross ridges and distinctive contrasting stripes of blocky orange talus on steep slopes.

The porphyry is composed of small (about 3 mm across) euhedral and subhedral quartz and potash feldspar phenocrysts in an aphanitic, flow-banded groundmass. Feldspar often shows strong argillic alteration, mainly to kaolinite (?) and minor sericite. The country rocks are folded and crumpled adjacent to dyke margins. Contact metamorphism of the country rocks is confined to very thin aureoles of hornfels and chilled margins in the dykes are thin, if present at all.

A few discontinuous float trains of quartz-feldspar porphyry were noted in easterly portions of the TOM property, but were not mapped.

Quartz Veins

Distinctive, rusty weathering veins of massive, white pyritic quartz cut Units 1 and 2. Veins vary in width from thin stringers to over 1.5 metres.

Discussion

A cross-section across the TOM group and southern portion of the JASON group is shown in Figure 3. Detail of the cross-section below 4,400 feet (1,340 metres) elevation is extrapolated from surface exposures 1.5 km north of the section plane and from records of diamond drill hole 76-8, 1.6 km north of the section plane.

Rapid thickening of Unit 3b to the west is evident from the section. This phenomena has been attributed to graben or trough filling by the shale (Blusson, 1976). Contorted bedding, tight isoclinal folding and large sequences of overturned bedding in conglomerate from the area of initial thickening of Unit 3b suggests that any faulting or tectonic disturbance which may have accompanied the graben formation occurred after deposition of Unit 2. In contrast, beds of Unit 3a directly overlying the contorted beds of Unit 2 are evenly laminated and undisturbed, except for occasional beds of intraformational conglomerate. In conjunction, six current directions measured for Units 1 and 2 indicate a derivation from the southwest, whereas an easterly source is indicated for Unit 3a. Also, quartz veining which may have accompanied the Devono-Mississippian deformational event, cuts only Units 1 and 2. On account of these factors, and the facies change of Unit 3b rocks into rocks identical to Unit 3a at the point of maximum thinning, Unit 3a was included in the Canol Formation, despite its similarity to the rocks locally occurring lower in the Imperial Group.

STRUCTURAL GEOLOGY

Relatively small-scale folds with subparallel, arcuate and plunging fold axes are characteristic of structures in the southwest half of the map area. Their north and south plunging axes are interpreted as overprinting of an earlier, approximately east-west trending anticline by doming and consequent folding around a large granodiorite stock immediately south of the map area. This structural interpretation suggests that the West zone and East zone mineralized horizons of the TOM group are at the same stratigraphic level and that continuity between the two has been removed by erosion. Surface diamond drill records indicate that the west limb of the isoclinal syncline enclosing the East zone is locally missing. This may be due to minor thrust faulting parallel to the axial plane of the syncline, contributing to the structural complexity of the East zone rocks.

A poorly developed foliation and well developed penetrative cleavage in the Unit 3b shales outline the axial trend of the previously mentioned east-west structure. Their attitudes are remarkably consistent, striking approximately 070° and dipping steeply to the south in the southeast corner of the map area and steeply to the north in the area north of Section A-B.

A second, less well developed fracture cleavage is commonly present near the axial planes of the smaller folds, producing "pencil-cleavage" fragments in the shale and silty shale. The axial planes of the north-south striking folds on the east TOM property dip approximately 70° west.

Structure of the rocks in the west half of the map area is relatively simple in comparison to that in the east half. The strata underlying the north part of the JASON property are folded into a major east-west trending, easterly plunging anticline-syncline pair. Resistant exposures of massive chert pebble conglomerate outline these structures well. The southern limb of the syncline is cut by a set of northeast-southwest trending block faults of unknown displacement. These faults may be subsidiary to a major northwest-southeast trending fault system thought by Ogilvie Joint Venture geologists to occur along the west margin of the map area (C.L. Smith, pers. comm., 1976).

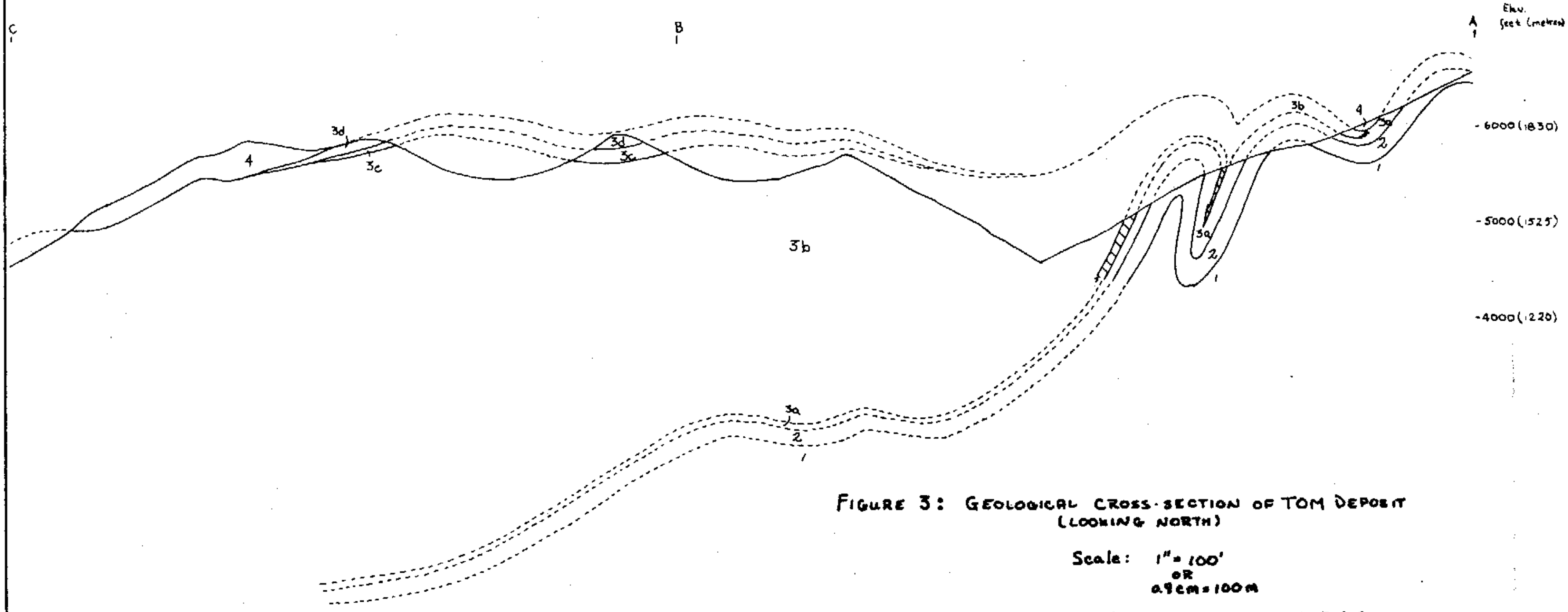

FIGURE 3: GEOLOGICAL CROSS-SECTION OF TOM DEPOSIT
(LOOKING NORTH)

Scale: 1" = 100'
OR
0.9 cm = 100 m

LOCATION SHOWN ON FIGURE 2.
LEGEND ON FIGURE 2.

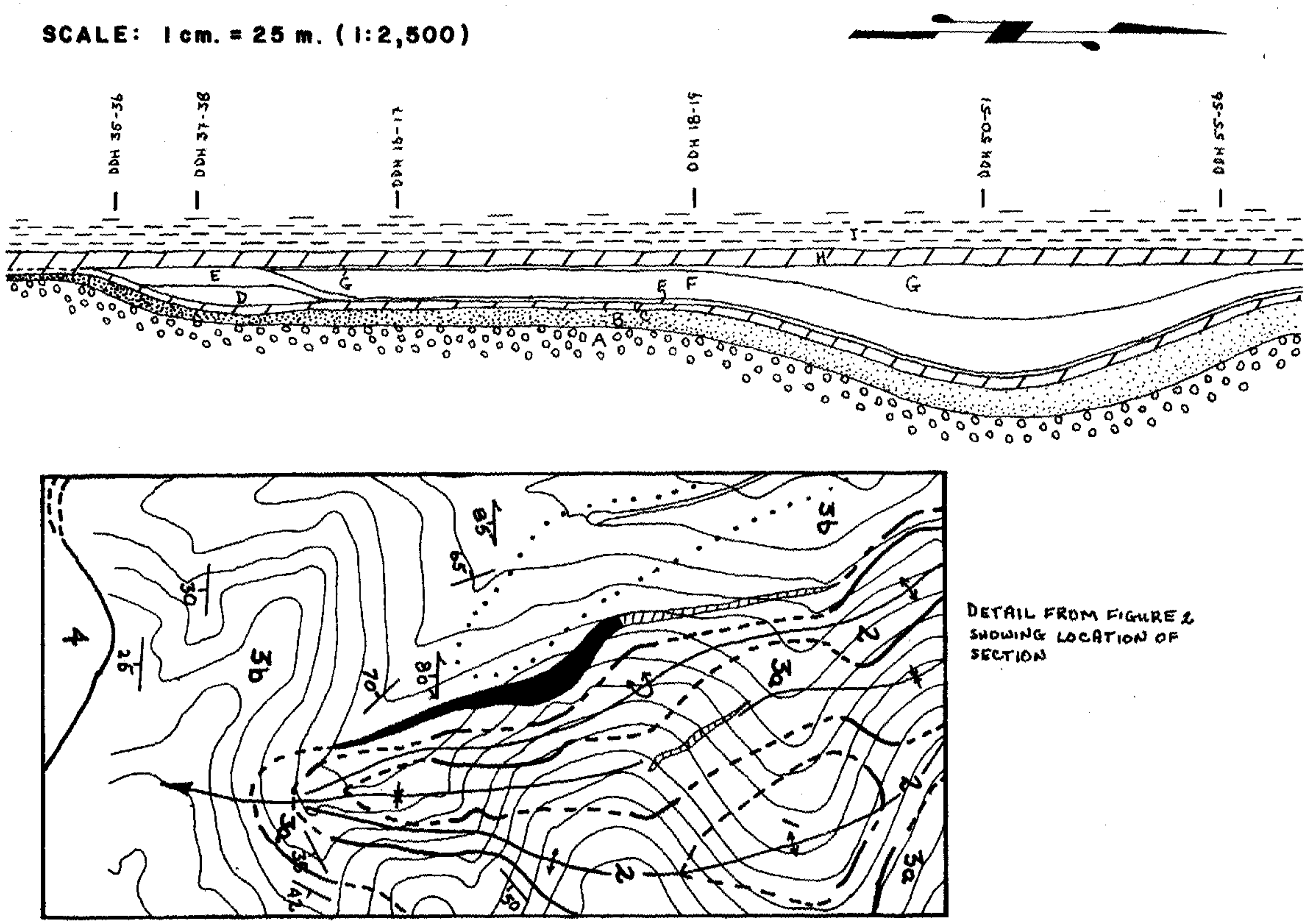

FIGURE 4a TRUE STRATIGRAPHIC SECTION OF THE TOM "WEST ZONE" ABOUT THE 4750 (ADIT) LEVEL (LOOKING WEST) (LEGEND IN TEXT)

A thrust fault is well exposed on a steep cliff face at the north-central edge of the map area. Units 2, 3 and a small wedge of highly contorted Unit 1 (?) are overthrust on an essentially undeformed package of Units 2, 3a and 3b.

ECONOMIC GEOLOGY

Three stratiform lead-zinc-silver deposits lie within the confines of the map area. The two deposits on the TOM property, the West zone and East zone together total 9 million tons of proven ore reserves grading 8.6 per cent lead, 8.4 per cent zinc and 2.7 ounces silver per ton. The extent of mineralization on the JASON property is currently under evaluation.

This discussion will concentrate on the West zone of the TOM deposit. This zone consists of four types of lead, zinc and silver mineralization enclosed in a body dipping steeply to the west. Total strike length of the mineralized horizon is over 1,100 metres. Zoning of mineralization modes and the morphology of the West zone are illustrated in Figure 4. All information regarding this deposit results from the mapping of limited outcrops and primarily from the examination of underground diamond drill core stored in the H.S. Bostock Core Library in Whitehorse and diamond drill hole plans, logs and assays kindly supplied by Hudson Bay Exploration and Development Co. Ltd.

Figure 4 illustrates a true stratigraphic section about the 4,750 (adit) level, using the top of the mineralization as an arbitrary horizontal datum plane. Within the immediate area of the mineralization, a total of nine stratigraphic horizons are recognized - four of which contain significant lead, zinc and silver values.

Unit A corresponds to the upper portion of Unit 2 of Figure 2. It consists of poorly sorted, coarse-grained, chert pebble conglomerate and minor interbedded silty shale.

Unit B consists of finely laminated black carbonaceous, pyritic shale and pyrite siltstone. Minor chert pebble conglomerate lenses and interbeds of intraformational conglomerate occur in the southernmost exposures. The thickness of the unit gradually increases to the north, accompanied by a corresponding decrease in the silty component. This lithology corresponds to Unit 3a of Figure 2.

Very siliceous, pyritic, massive black argillite is mapped as Unit C. Pyrite occurs both as ubiquitous disseminations and as nearly perfect cubes in concentrations along bedding planes.

Unit D consists of massive galena and sphalerite with minor pyrite and angular rip-up or breccia clasts of Unit C. Lead and silver have a 3:1 ratio (i.e. 3 per cent lead: 1 ounce silver per ton. Assay values range up to 13.5 per cent zinc, 30.7 per cent lead and 10.6 ounces silver per ton. Highest lead values occur at the base of the unit. At the base of the zone a conspicuous indigo tarnish and minor chalcopyrite with massive galena suggests the presence of more copper than was previously realized. The footwall contact between Units D and C is sharp and abrupt.

Unit E consists of evenly laminated black argillite, chert, and pyrite with interlaminated and disseminated galena and sphalerite. Assay values are erratic, ranging up to 20 per cent zinc and 7 per cent lead. Lead and silver maintain an almost constant 2:1 ratio and the grade of mineralization gradually decreases to the north.

The bulk of the West zone tonnage is contained in Unit F. Here, gangue is principally barite, with minor chert and siliceous argillite. Galena and honey-coloured sphalerite occur as discrete, almost monomineralic laminae within the barite. Pyrite is conspicuous by its amost complete absence. Grade varies from less than 1 per cent to over 9 per cent lead and 3.5 per cent to 10 per cent zinc. Silver is rarely present above trace amounts. The horizon is, in general, zinc-rich with the highest zinc values occurring towards the top and lead displaying the opposite trend. The unit is characterized by a complete lack of major soft-sediment deformation, except in drill hole secions 18-19 and 55-56 where intense and tight small-scale folding is common as are relatively large sized disoriented angular fragments.

Unit G presents an enigma. It is identical to Unit E, and consists of finely laminated black argillite, chert, pyrite, sphalerite and galena. However, the rocks are uniformly highly disturbed and display very contorted bedding in contrast to the even laminations of Unit E. In addition, zinc values are usually higher, ranging up to 14 per cent and lead assays are generally lower, avaraging approximately 1.5 per cent and ranging up to 4 per cent. Silver values are erratic, averaging 0.1 ounces per ton and display no obvious correlation with corresponding lead assays.

Unit E abruptly increases in thickness between diamond drill sections 18-19 and 55-56. This phenomena can be attributed to the infilling of a trough formed in previously deposited sediment. This scheme is enhanced by the abnormal degree of soft-sediment deformation in Unit F along the margins of the trough where syn-depositional faulting would have occurred. The infilling nature of Unit G, combined with the completely disrupted nature of the rocks suggests that they may have been derived from some distance, possibly to the south, and transported as a viscous, semi-rigid body. This movement may have been triggered by tectonic disturbances which must have accompanied the formation of the trough.

Unit H consists of very siliceous, pyritic, massive black argillite. It is identical to that of Unit C, except that pyrite is only present as disseminations in contrast to the high percentage of laminated pyrite cubes in the lower unit. The hangingwall contact between Unit G and Unit H is sharp and abrupt.

Carbonaceous, silver-grey weathering shales of Unit I (Unit 3b of Figure 2) overlie the West zone suite of rocks. The contact between Unit I and underlying Unit H is fairly abrupt, usually occurring over less than one metre, and defined by a sharp decrease in the silica and pyrite content of the rocks.

The northward continuation of the West zone was not included in the study because this part of the horizon was evaluated by surface diamond drilling, the core of which was not available for inspection. However, the diamond drill logs and assay values indicate that grade and mineralized width decrease gradually to the north. Mineralization is probably of a type similar to Units E and F. An abrupt thickening of the underlying conglomerate coincident with the northernmost limit of West zone mineralization may have trapped and pooled mineralizing fluids.

The East zone of the TOM deposit appears to be primarily composed of rocks and modes of mineralization comparable to Units D and E of the West zone. Minor baritic gangue was noted in logging of underground core. Intense structural deformation of the mineralization and enclosing wall rocks of the East zone, in conjunction with poor outcrop exposure, has prevented a detailed study. However, similar stratigraphy of the host rocks places the East zone at the same stratigraphic level as the West zone. The two zones may represent uneroded remnants of a continuous mineralized horizon.

Diamond drilling of the JASON group was at an initial stage during the field work period, consequently no detailed information was available. The mode and tenor of mineralization seen indicate that the barite-lead-zinc horizon at the JASON is comparable in grade and stratigraphy to Units E and F of the Tom West zone.

SUMMARY

In general, the depositional morphology of the host rocks and the morphologic and lithologic relationships between mineralized horizons of the West zone of the TOM deposit correspond closely to that observed for similar deposits at Meggen, Germany (Buschendorf and Puchelt, 1966) and Mt. Isa, Australia except for the lack of a sulphate horizon (Smith and Walker, 1971). The dramatic thickening of the host or overlying shales, the abrupt transition from barren wall rocks to stratiform sulphide mineralization, and the presence of a distal barite facies are features which characterize this type of deposit. The TOM-JASON deposits vary from the norm in that the barite facies contains significant lead-zinc mineralization. Of special interest is the gradual zonation from minor copper sulphides and massive galena at the base of the south portion of the East zone to high zinc values and low lead at the top and along strike to the north. A corresponding increase in lead-silver ratios from 3:1 to greater than 15:1 up-section and along strike to the north is also noted, possibly due to a decrease in temperature and/or an increase in ph during deposition of successively later and distal mineralization.

The relatively high pyrite and carbon content of the enveloping rocks supports the mechanism of biogenesis of lead and zinc sulphides in a euxinic-trough environment. However, the lead-zinc-silver-barite-silica assemblage in conjunction with primary mineral zoning through time as well as distance are more logically attributed to an external source, possibly of an exhalative nature along active syn-sedimentary faults.

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THE TEA BARITE DEPOSIT

Preliminary Geologic Report

By

R.C. Carne, 1976

Dept. of Indian and Northern Affairs

INTRODUCTION

The TEA barite property is underlain by marine black clastics of the Canol Formation. The stratigraphy of the deposit and the enclosing strata are correlated with stratiform Ba-Pb-Zn mineralization at MacMillan Pass, 25 km to the northeast.

The ore horizon consists principally of bedded barite with accessory interbeds of baritic limestone, witherite, limestone, chert and shale.

Bulk sampling indicates that the barite is of high quality and requires only screening prior to grinding to yield a product exceeding the minimum A.P.I. drilling mud specifications. Over 68,000 tonnes (75,000 tons) of ore are ensured from initial bulk sampling. Production of barite for drilling mud is being initiated by Yukon Barite Company Ltd. at the time of writing.

The TEA claims were mapped during the first week of August, 1976. Mapping control was provided by air photos (A 12371-345 and A 12371-344). Geology was later transferred to claim sheet 105 O-2 and photographically reduced for publication.

HISTORY

The one-hundred TEA claims were staked in August, 1975 by Welcome North Mines Ltd. The property was mapped and the barite zone was bulk sampled later that year. Barite rights to the property were subsequently optioned by Jim Dodge and later transferred to Yukon Barite Company Ltd. (J. Dodge, pers. comm. 1976).

During the summer of 1976, further prospecting and bulk sampling was carried out. Completion of an eleven km access road connecting the property with the North Canol Road was expected in mid-September, 1976. Mining and processing of the barite will commence in the spring of 1977. (J. Dodge, pers. comm. 1976).

LOCATION AND ACCESS

The property is located in southeastern Niddery Lake map area (105 O-2) in the northwestern Selwyn Mountains, approximately 130 km northeast of Ross River. Access to the property is by an eleven kilometer haulage road connecting with Mile 253.6 (Kilometer 408.3) on the North Canol Road, 197 km by road from Ross River. The Canol Road is not presently maintained during the winter months.

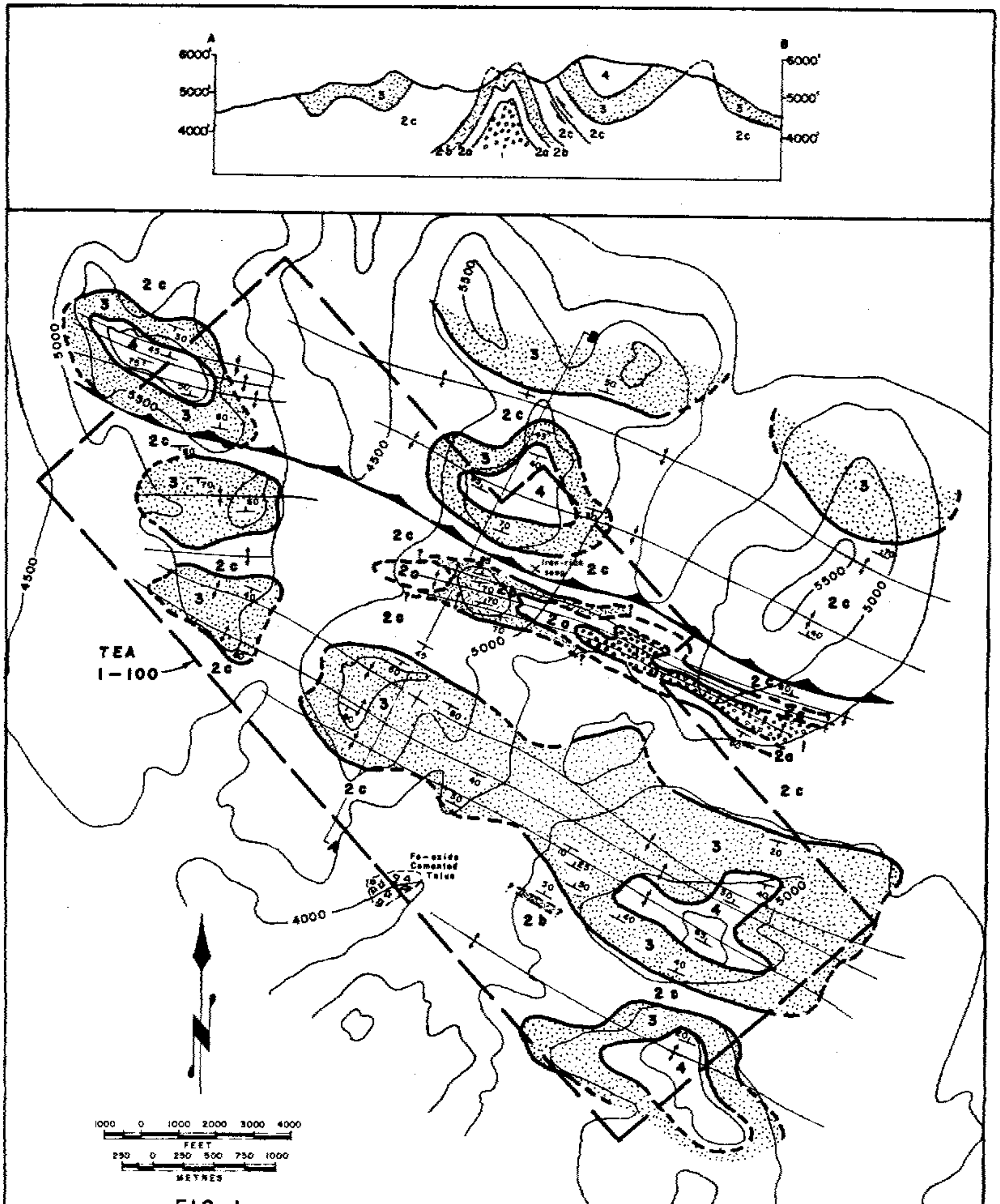


FIG. I

GEOLOGY OF THE TEA BARITE PROPERTY
105O-2

LEGEND

4	Banded grey quartzite, brown mudstone brown-grey shale, nordular barite
3	Banded black-grey quartzite, calcareous sandstone and shale, nordular barite
2c	Carbonaceous shale, siliceous shale, chert
2b	Bedded barite, baritic shale, witherite, barite, limestone, shale
2a	Siliceous pyritic shale, minor siliceous siltstone and siliceous silty shale, chert and cherty argillite
1	Chert pebble conglomerate, greywacke, chert sandstone

- Geological boundary (defined, assumed)
- Bedding (inclined, horizontal, vertical)
- Thrust fault (teeth indicate direction of dip)
- Syncline
- Anticline

PHYSIOGRAPHY

Elevations on the property range from 1,220 metres (4,000 feet) to over 1,830 metres (6,000 feet). Relief is subdued, with the exception of ridges and peaks which are often craggy where capped by resistant rock. Valley bottoms are mantled by a substantial thickness of glacial drift and alluvium. Areas with elevations less than 1,600 metres (5,300 feet) support a dense vegetation cover, including species of fir on well-drained slopes and black spruce and willow on poorly-drained valley bottoms.

GEOLOGY AND STRATIGRAPHY

Geological investigation was primarily restricted to ridge-tops where underlying strata are best exposed. The geology of the TEA claims is shown in Figure 1. The TEA property is underlain by a sequence of marine sedimentary rocks tentatively correlated with the Upper Devonian and Mississippian 'Black Clastic' group (Blusson, 1976a). Six mappable rock units were recognized, of which 2a, 2b and 2c are included in the Canol Formation (S.L. Blusson, pers. comm., 1976). All contacts appear to be conformable.

Unit 1

Unit 1 is poorly exposed in the core of an anticlinal structure cutting across a low swampy area in the east-central portion of the claim group. Exposure consists of blocky, frost-heaved rubble of primarily chert-pebble conglomerate with minor greywacke and chert sandstone.

Clasts in the chert-pebble conglomerate are poorly sorted sand-sized to pebble-sized, sub-rounded to rounded black-brown chert and white pyritic chert (?) with occasional angular lithic (shale) fragments. The matrix consists of fine-grained argillaceous material and chert grains and the cement is commonly glassy quartz.

A typical specimen consists of:

Framework grains:	- black-brown chert, subrounded	- 35%
	- white pyritic chert (?), granular texture, well rounded	- 20%
	- lithic (black siliceous shale), angular to subangular	- 10%
Matrix grains:	- sand-sized, well rounded black-brown chert	- 20%
	- sand-size black argillaceous material	- 10%
Cement:	- glassy, anhedral quartz	- 5%
		100%

TABLE I: Table of Formations

Formation	Map Unit	Lithology	Approximate Thickness (Metres)
	4	Banded grey quartzite and brown-green mudstone, brown mudstone, brown-green shale, nodular barite near base	240
	3	Banded black and grey quartzite calcareous sandstone, mudstone, nodular barite near base	180
Canol Formation	2c	Carbonaceous black shale, siliceous shale, chert	520
	2b	Bedded barite, baritic shale, grey baritic limestone, limy witherite; minor limestone, black shale and nodular barite	0(?)-90
	2a	Siliceous pyritic black shale, minor siliceous siltstone and siliceous silty shale; chert and cherty argillite	60
	1	Chert-pebble conglomerate, greywacke and chert sandstone	

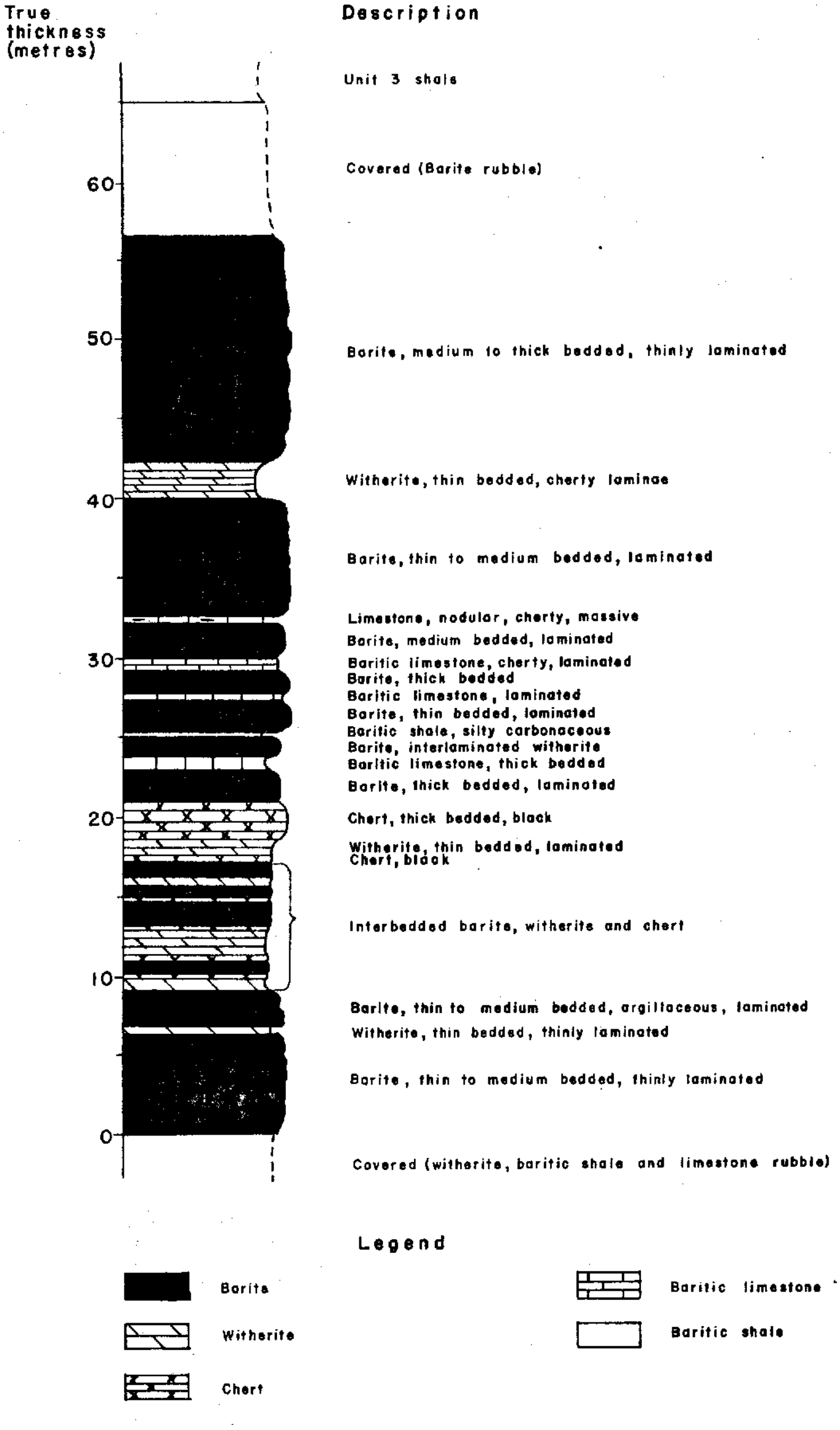


FIGURE 2: Measured section across main showing area, TEA claim group.

In some areas, the well rounded fragments of granular, pyritic chert (?) have been altered (along with the matrix material and some lithic fragments) to a soft porous material, composed primarily of clay minerals, probably kaolinite. These fragments may be composed of a fine-grained volcanic rock, which has undergone hydrothermal alteration after deposition in the conglomerate. The black-brown chert fragments are not altered.

A small percentage of the felsenmeer exposure of Unit 1 consists of very "dirty", poorly sorted and poorly cemented, porous chert sandstone and greywacke. They occur as minor interbeds or lenses throughout the unit at irregularly spaced intervals. The base of Unit 1 was not seen.

Unit 2a

Unit 2a, where exposed, consists of silver-grey weathering, thin-bedded, very fissile, pyritic black shale. Minor interbeds of siliceous siltstone and siliceous, silty shale occur near the contact with Unit 1. Silica content of the unit increases up-section to the point where the upper 20 metres consist of interbedded black carbonaceous chert and black cherty argillite.

Unit 2b

Unit 2b was observed in two locations on the property. The main showing area, in the north-central part of the claims, consists of interbedded barite, baritic grey shale with small "grape-shot" barite concretions, calcareous witherite, baritic cherty limestone and black carbonaceous shale.

Barite is commonly dark grey weathering, thick bedded and well laminated. Calcareous witherite is medium grey in colour, light to buff-grey weathering and recessive in nature, in contrast to the very resistant barite horizons. Limestone lenses and interbeds are pyritic, cherty and commonly baritic. They are characterized by their recessive nature and distinctive buff-brown weathering colour.

The base of this unit was exposed in frost-heaved rubble only, but there appears to be an upward grading from a carbonate-rich base (witherite and limestone), with grey baritic shale and black carbonaceous shale, to a sulphate-rich top (bedded barite). Minor interbedded black chert occurs throughout the section, although it appears to be most common near the base of the unit.

The true thickness of the baritic horizon is difficult to determine due to the intensity of localized isoclinal folding, combined with poor outcrop exposure. The stratigraphic thickness of Unit 2b in the main showing area is estimated to be at least 90 metres. A partial measured section across the barite zone is described in Figure 2. The stratigraphic position of the measured section cannot be precisely determined, but comparison with sections mapped elsewhere on the property place it in the upper 70 metres of Unit 2b.

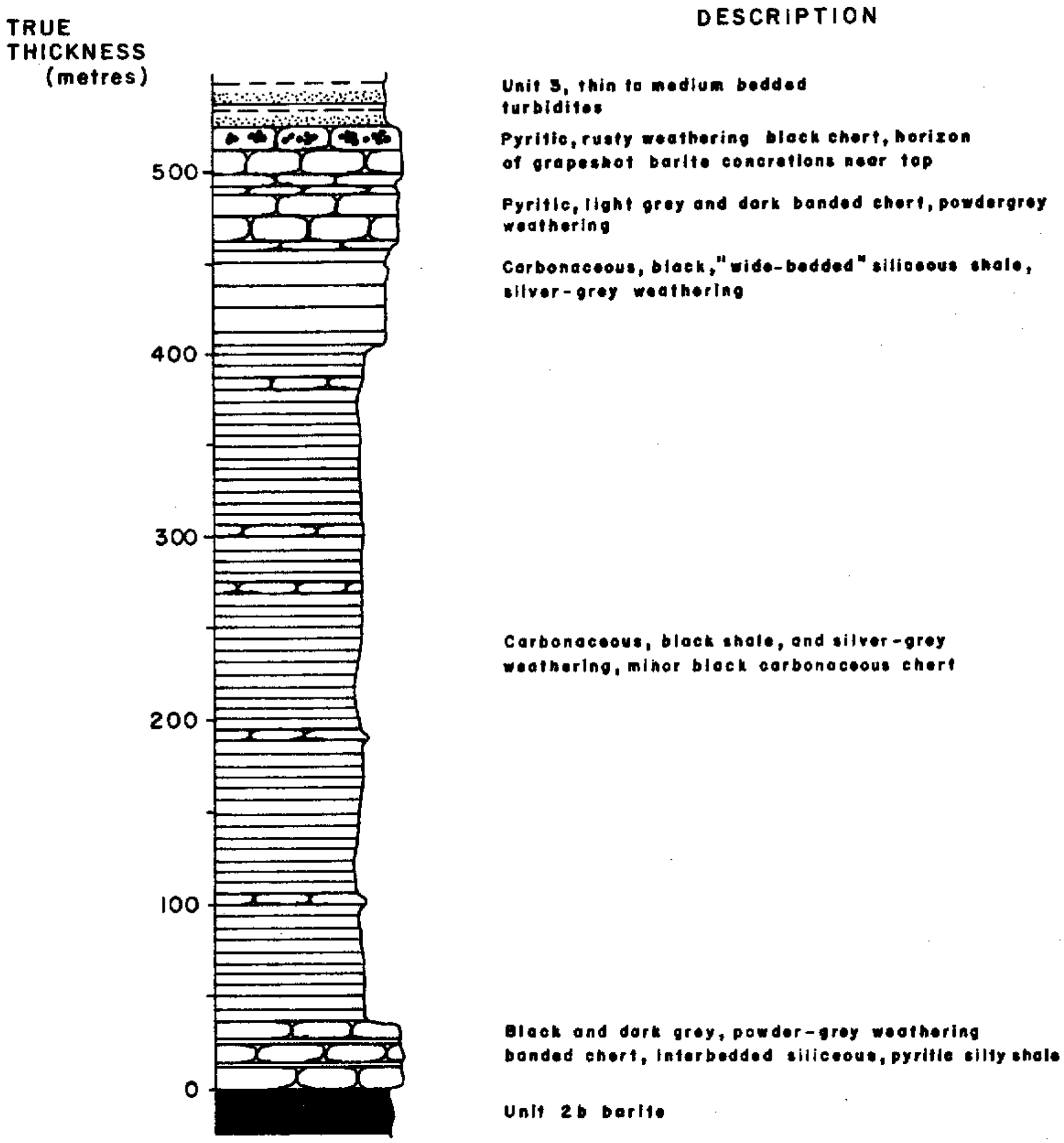
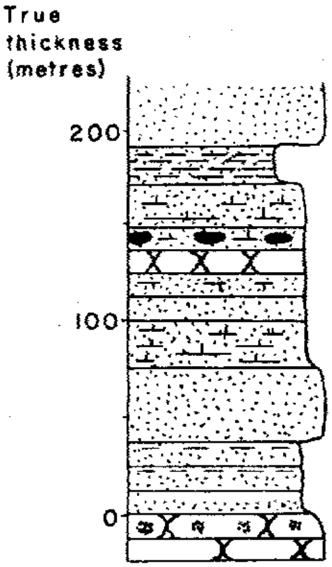


FIGURE 3: Diagrammatic section through Unit 2C (Thicknesses approximate)



Description

Unit 4 massive quartzite.

Green weathering, light grey silty mudstone.

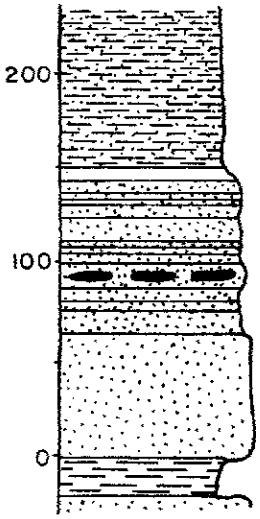
Medium to light grey, rusty brown weathering, slightly to highly calcareous silty sandstone, bioturbated and fetid; maroon weathering calcareous quartzite horizon with nodular barite, interbedded black chert.

Black and grey banded, dark rusty brown weathering massive quartzite, thickness varies laterally 15 to 45 metres.

Thin to medium bedded turbidite, coarse fraction dark grey and brown weathering, fine fraction black and dark grey weathering.

Unit 2c chert.

FIGURE 4: Diagrammatic section through unit 3.
(Thicknesses approximate)



Brown, tan-grey weathering silty mudstone

Interbedded silty quartzite, greenish brown siltstone and silty shale, rusty weathering, black silty quartzite horizon with large barite nodules.

Massive, dark grey weathering, black and medium grey banded, fine to medium grained quartzite.

Unit 3 mudstone

FIGURE 5: Diagrammatic section through unit 4
(Thicknesses approximate)

A second exposure of Unit 2b was mapped in a low-lying area 2.4 km south-southeast of the main showing area. Here, the horizon consists chiefly of buff-brown weathering, medium grey, massive, cherty limestone with lenticular interbeds of cherty, laminated witherite and minor bedded barite. Because of heavy vegetation cover, the extent of this showing was not determined, however, it has a minimum strike length of 35 metres and a true thickness of at least 8 metres.

Limestone beds from the main showing area contain Devono-Mississippian conodonts and brachiopods tentatively assigned to the same broad time range. (Dawson, 1976). No fossils were seen in the barite zone to the south, but its position in the stratigraphic column indicates a similar age. As many as three other bedded barite showings are known on the property, again at approximately the same stratigraphic level (J. Dodge, pers. comm., 1976). It is thought that the horizon is not continuous, rather it may represent localized accumulations of barium-rich sediments.

Unit 2c

Unit 2c consists of carbonaceous black shale and laminated, silty shale with minor interbedded black, carbonaceous chert. Banded dark-grey and black chert horizons occur at the base and near the top of the unit. Unit 2c is capped by a pyritic, rusty-weathering, black chert, the upper-most beds containing small "grape-shot" barite concretions. A diagrammatic section of Unit 2c is given in Figure 3.

Unit 3

Unit 3 is an assemblage of siltstone, turbidite, massive quartzite, silty shale and calcareous sandstone. Despite the abrupt change in lithology and depositional style between these sedimentary rocks of the upper and lower portions of the Imperial Group, the contact between the two appears to be conformable.

A calcareous sandstone horizon approximately three-fourths the way up the section contains large barite nodules. The nodules are ellipsoid in shape, with uniformly smooth surfaces and range up to 40 cm in length along their long axes.

A diagrammatic section of Unit 3 is given in Figure 4.

Unit 4

Unit 4 is present as a resistant cap on four peaks within the map area. The base of the unit in the northern part of the claims is marked by a thick unit of dark-grey to black and medium-grey banded, cross-bedded to massive, quartzite. The quartzite undergoes a change to the south, where it is slightly thinner, massive, and uniformly black in colour. A thick sequence of interbedded grey quartzite, greenish-brown siltstone and silty shale overlies the quartzite. A nodular barite horizon within this succession consists of flattened nodules up to 50 cm long within a thick-bedded light grey quartzite.

The upper part of Unit 4 consists of over 90 metres of monotonous, tan-grey weathering, brown silty mudstone.

A diagrammatic section of Unit 4 is given in Figure 5.

STRUCTURAL GEOLOGY

Structure on the TEA property is relatively simple (see cross-section, Figure 1a). Folds have a predominantly northwest-southeast axial trend. A parallel, north-dipping, high-angle thrust fault occurs north of the main barite showing area. In addition, intense isoclinal folding, parallel to the main axial trend, occurs in a belt immediately to the south of the thrust fault (note that only major structures are shown on Figures 1 and 1a). The effect of this folding is to increase the apparent thickness of the barite-bearing horizon in the main showing area.

Metamorphic grade is low with axial plane cleavage recognized only in the hinge zones of folded argillaceous sedimentary rocks.

ECONOMIC GEOLOGY

The property is presently undergoing development work prior to the exploitation of barite for use as drilling mud.

Material for drilling muds must be fine-ground, heavy and chemically inert. Consequently, barite used for this purpose must be free of soluble salts, contain a minimum of 92 per cent $BaSO_4$ and have a bulk specific gravity of 4.2. Ninety per cent of the ground material must pass through a 325-mesh screen (Lewis, 1970).

Bulk sampling of the barite-bearing zone in the main showing area indicates that the barite is of high quality, requiring only screening prior to grinding to meet minimum A.P.I. specifications (J. Dodge, pers. comm. 1976). Initial sampling also indicates that over 68,000 tonnes (75,000 tons) of ore grade material in the main zone are amenable to mining by open pit methods.

No lead-zinc mineralization has been reported from the TEA claims, although the stratigraphic position and sedimentary style is nearly identical to that of the TOM lead-zinc-silver deposit at MacMillan Pass, 25 km to the northeast.

SUMMARY

The TEA deposit is a relatively high grade and tonnage, bedded barite deposit of Devono-Mississippian age. The deposit is located in the Selwyn Basin geologic province, approximately 130 km northeast of Ross River, Yukon Territory.

The ore horizon consists primarily of bedded barite with accessory interbeds of baritic limestone, witherite, limestone, chert and shale.

Bulk sampling of the ore horizon indicates that the barite is of high quality and requires only screening prior to grinding to yield a product exceeding the minimum A.P.I. drilling mud specifications. Over 68,000 tonnes (75,000 tons) of ore-grade material are ensured from bulk sampling.

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GEOLOGY OF THE STRATABOUND BARITE-LEAD-ZINC DEPOSIT ON THE MEL AND JEAN CLAIM GROUP, COAL RIVER, YUKON

BY

R.C. CARNE

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS

1976

INTRODUCTION

The MEL Property was mapped during the first week of June, 1976. Additional data was supplemented from published and unpublished company reports, as well as detailed logging of several hundred feet of diamond drill core removed to Whitehorse. The assistance and co-operation of Granby Mining Corporation and Sovereign Metals Corporation is gratefully acknowledged.

LOCATION AND ACCESS

The area is located on map sheet 95 D-6 at coordinates 127°24' West and 60°21' North, about 50 miles (82 km) east-northeast of the community of Watson Lake. Otter Lake, one and one-half miles (2.5 km) to the north-northwest is accessable by float-equipped fixed wing aircraft. Several cleared areas on the property are suitable for landing by helicopter from Watson Lake. A winter tote road 28 miles long (46 km) connects the property with the Alaska Highway at Mile 590.

PHYSIOGRAPHY

Elevations on the MEL property range from 2,900 feet (885 m) to 4,000 feet (1,220 m). The area falls within the Hyland Plateau, characterized by broad, northerly trending valleys and subdued relief. The only extensive rock outcropping occurs in the western part of the area where steeply dipping, thick bedded limestones form a prominent dip-slope cliff face. The mountain slopes are heavily forested, with spruce and balsam the principle species. Drift cover is extensive, especially along valley bottoms. Bedrock outcropping in these areas is confined to small promentories around the shores of numerous ponds and small lakes.

HISTORY

The six original MEL claims were staked in 1967 and optioned to Newmont Mining Corporation, although the occurrence of barite with associated galena and sphalerite has apparently been known for some time. Work carried out by Newmont Mining Corporation during the 1967 field season consisted of bulldozer trenching and limited geological mapping. Assays were in the order of 5.0 per cent combined lead-zinc over sample widths from 7.5 to 30.0 feet (2.2 m to 9.1 m).

The claims were subsequently acquired by Empire Metals Corporation Ltd. (now Sovereign Metals Corporation). Twenty-one JEAN claims were added in March, 1973 and October, 1973. The property was optioned to Granby Mining Corporation in September 1973, although further work on the claims in 1973 was carried out by Empire Metals Corporation Ltd.. This work consisted of geological mapping, geochemical surveys, trenching and sampling for assay. During 1974 and 1975 Granby drilled eighteen holes on the property totalling 6,400 feet (1,952 m). No further work has been carried out to date.

Map sheet 95 D has been mapped and reported on by the Geological Survey of Canada (Gabrielse and Blusson, 1969).

GENERAL GEOLOGY

Stratified rocks underlying the MEL claims are lower Paleozoic carbonate and argillaceous sedimentary rocks which occupy the southern part of the Selwyn Basin. (see Figure 1). Northerly structural trends predominate.

Rocks east of the major north-south trending normal fault occupy the westerly limb of an overturned easterly verging syncline. The strata west of the fault appear to be a normal stratigraphic succession dipping gently to the southwest.

STRATIGRAPHY

Table of Formations

Period	GSC Map Unit*	Lithology	Thickness (feet)
Cambrian and Ordovician	8	dark grey, wavy banded, argillaceous and silty limestone	1000+
Lower Cambrian	5	brown, limy, pyritic phyllite	10-60
		light grey, cryptograined limestone	600
	4c	medium to dark grey calcareous shales and calcareous siltstone	800
		light buff brown, silty dolomite	?

*Paper 68-38 and Map 11-1968 (Gabrielse and Blusson, 1969)

Lower Cambrian

Unit 4c

Dolomite

This unit was found in two small outcrops along cliffs forming the northwest shore of the large pond. In these locations the unit consists of mottled, light buff brown, orange to buff orange weathering, medium crystalline, silty dolomite. Large quartz-lined vugs are common. The rocks are in part brecciated and recrystallized to coarse- to very coarse-grained limpid dolomite.

FIG. I

GEOLOGY OF THE MEL PROPERTY

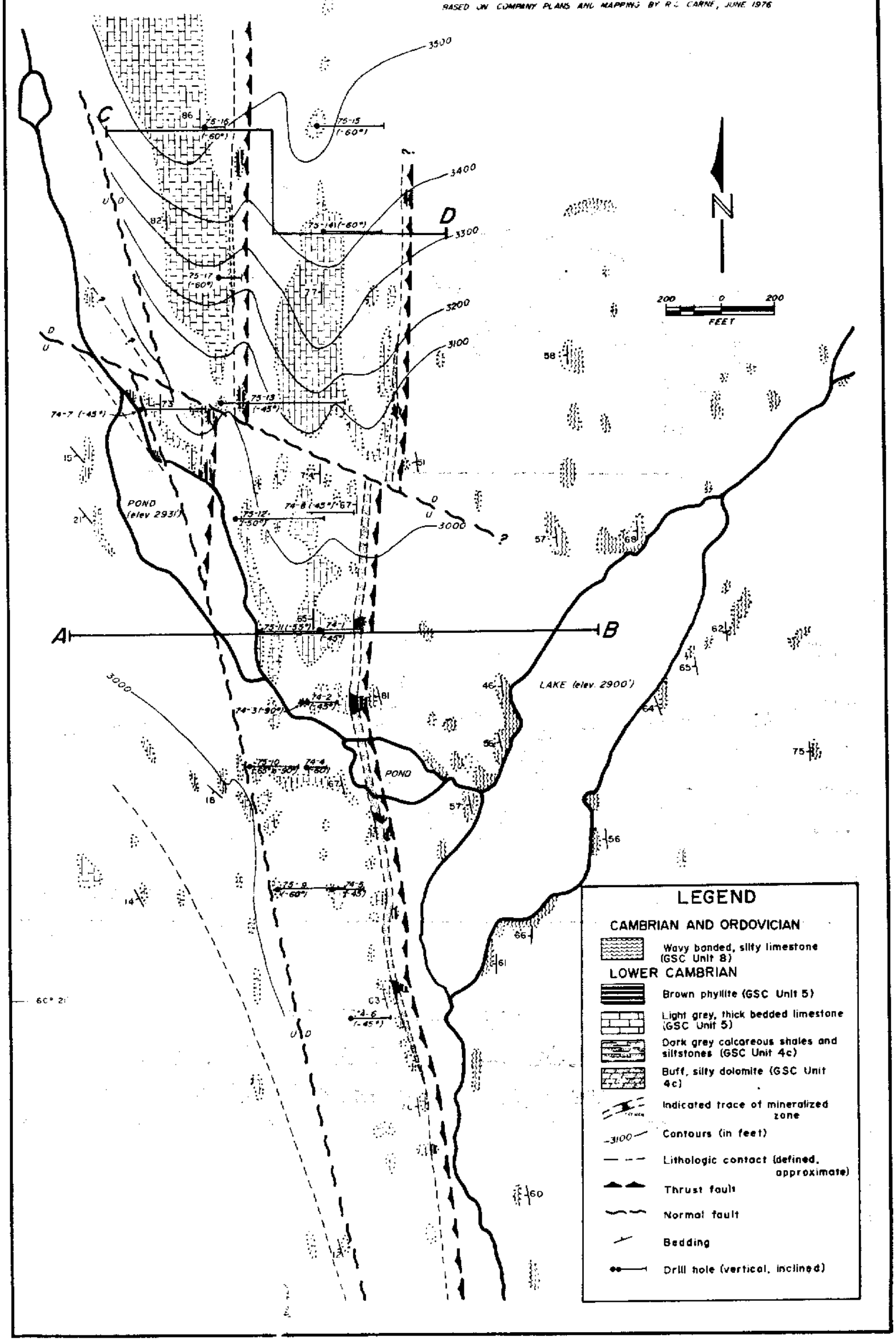
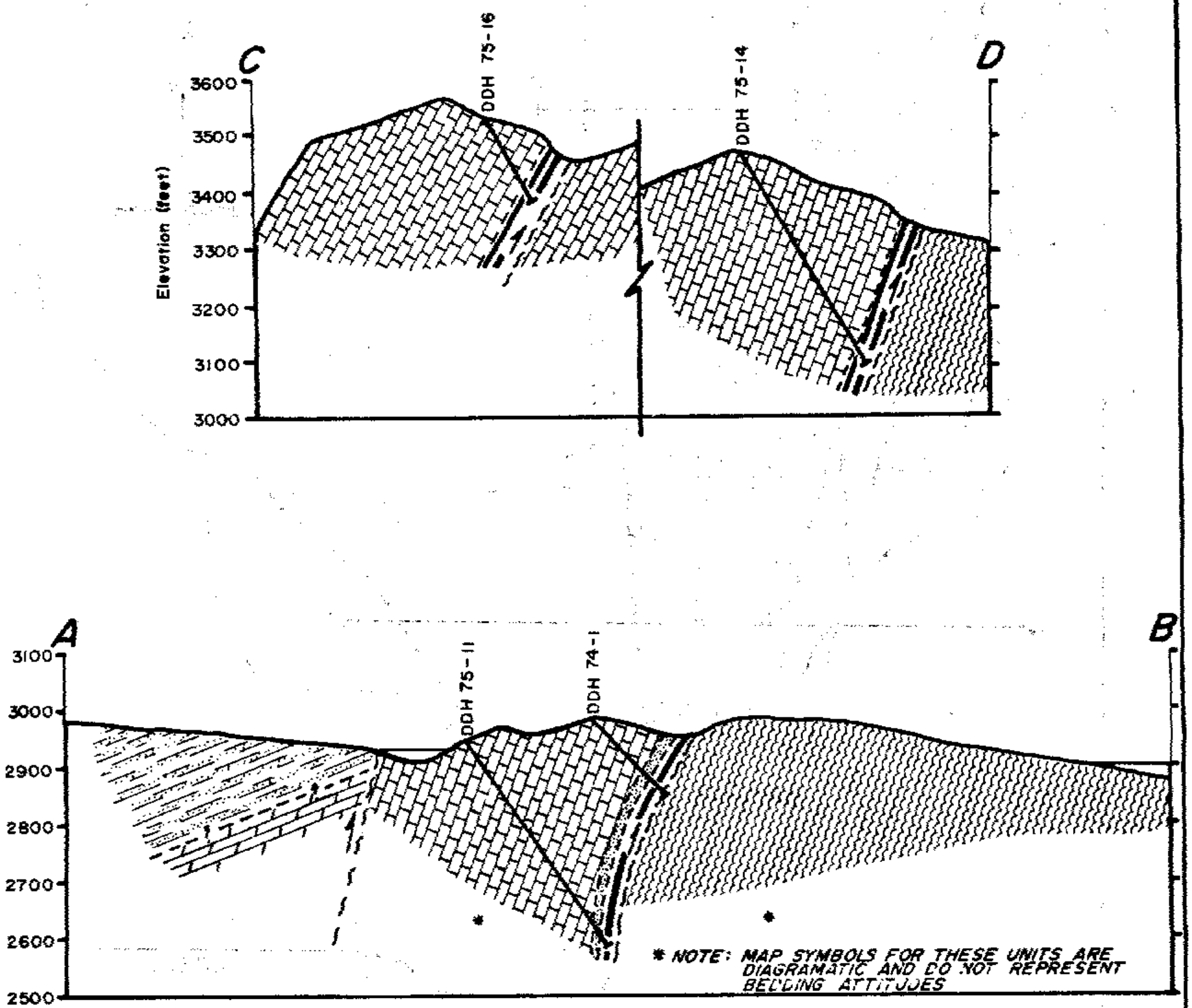


FIG. 2



MEL PROPERTY
GEOLOGICAL SECTIONS A-B and C-D
(see Figure 1 for legend and locations)

BASED ON DIAMOND DRILL HOLE DATA AND MAPPING BY R. CARNE, JUNE 1976

Calcareous Shale and Siltstone

Recessive weathering, brownish red to dark greenish grey weathering, medium to dark grey, finely laminated calcareous shale and calcareous siltstone underlie the west part of the MEL property. The siltstone laminae contain numerous pyritic bands. Adjacent to weathering surfaces and along fractures these laminae are oxidized, contributing to the brownish weathering colour of the unit. The contact between this unit and the underlying dolomite was not observed, however, it is assumed to be conformable.

Unit 5:

Limestone

Thickbedded, light grey weathering, light grey, non-fossiliferous, crypto-grained limestone forms prominent dip-slope cliffs underlying the north-central portion of the property. Irregular masses of pink, rusty brown weathering calcite spherules with a modal diameter of 3/32 inch (2 mm) are common throughout the unit although their density is highest at the base of the unit. The alignment of these masses approximately parallel to bedding, and the nearly spherical shape of the grains, suggest that they may represent replaced oolites.

The limestone is interbedded with brown and dark grey limy shale, in places altered to a brown, very fine grained, non-calcareous talcose phyllite. Shale horizons contain abundant disseminated pyrite cubes and the talcose phyllite contains disseminated pyrrhotite pseudomorphs after pyrite. Very small (less than 1 mm), angular, black fragments, common in the shales but unrecognized in the phyllites, may be tuffaceous shards.

Limestone beds range in thickness from 1.4 feet (0.4 m) to 9.0 feet (2.7 m), shale and phyllite beds range from 0.1 feet (3 cm) to 0.3 feet (9 cm) in thickness. Contacts between the limestone and shaly interbeds are abrupt and conformable. The frequency and thickness of shaly beds increases towards the stratigraphic top.

Brown Phyllite

A thin unit of recessive, brown weathering, talcose phyllite and slate was observed in bulldozer trenches at six locations on the property and in drill core. The rock consists of finely laminated, alternating bands of brown limy phyllite and light grey non-calcareous siltstone. The siltstone bands contain very thin pyritic bands which contribute to the brown weathering aspect of the unit and the phyllite displays a marked similarity in appearance with shale and phyllite interbeds in the underlying limestone. The contact between the limestone and this unit, where observed, is sharp and conformable. Stratabound barite-sphalerite-galena mineralization occurs along this contact.

Cambrian and Ordovician

Unit 8:

The eastern portion of the property is underlain by a thick sequence of medium grey weathering, dark grey argillaceous and silty limestone, characterized by wavy banding of silty layers. Bedding thickness ranges from 0.1 feet (4 cm) to 0.5 feet (15 cm). The rock has a conspicuous "swiss-cheese" texture on the weathered surface due to differential weathering of argillaceous limestone pods within an anastomosing network of resistant silty layers. The wavy banded limestone is in fault contact with older units.

STRUCTURE

The major part of the MEL property is underlain by an easterly verging, overturned syncline (see Figure 1 and 2). Gently dipping, older strata, with normal sense of younging, are uplifted by a north-northwest trending steeply dipping dip-slip fault, one of a regional series of similar faults (see Map 11-1968, Gabrielse and Blusson, 1969). The footwall of this fault is concordant with bedding in the upper limb of the overturned syncline. Subsidiary thrusting has occurred in two zones subparallel to this fault. Displacement along these thrust faults is taken up along two shaly horizons within the Unit 5 limestone. This unit may have been overthrust upon itself along the westerly thrust zone. The thrust plates form a pair of prominent ridges in the north-central part of the area.

A minor northwest-southeast trending dip-slip fault cuts the major structures in the central part of the property.

ECONOMIC GEOLOGY

Mineralization

Two parallel barite-sphalerite-galena mineralized zones are indicated by diamond drilling and bulldozer trenching. The east zone has an indicated strike length of approximately 2,800 feet (850 m) and ranges in width from 10 feet (3.0 m) to 40 feet (12.2m), while the west zone has an indicated strike length of less than 400 feet (122 m) and a width of less than 20 feet (6.1 m). Published drill indicated reserves are in the order of three million tons grading about eight per cent combined lead-zinc. (Empire Metals, 1975).

Both zones are concordant with bedding. Footwall and hanging wall contacts are fairly abrupt, although the footwall contact generally appears to be gradational over several hundred feet in both cases.

The mineralized zone in general consists of a light brown, highly sheared and brecciated, baritic phyllite. Barite content locally varies from nearly nil to massive sections up to 10 feet (3.0 m) thick containing almost pure coarsely crystalline barite.

Dark red-brown sphalerite commonly occurs as elongate spheroidal blebs arranged in roughly laminar fashion, approximately parallel to local bedding attitudes in enclosing strata. These blebs range in size from less than 0.1 inch (0.8 mm) to greater than 1.6 inches (53 mm) in diameter. Highest zinc values are obtained from zones of low barite and high phyllite content, although sporadic sphalerite is found in baritic and cherty horizons. In phyllitic breccia fragments in the barite zone, sphalerite occurs as small, elongate spheroids. The shale or phyllite is locally altered to white fibrous talc "haloes" rimming sphalerite blebs, giving the appearance of a "sphalerite-augen talc schist" (see Figure 3).

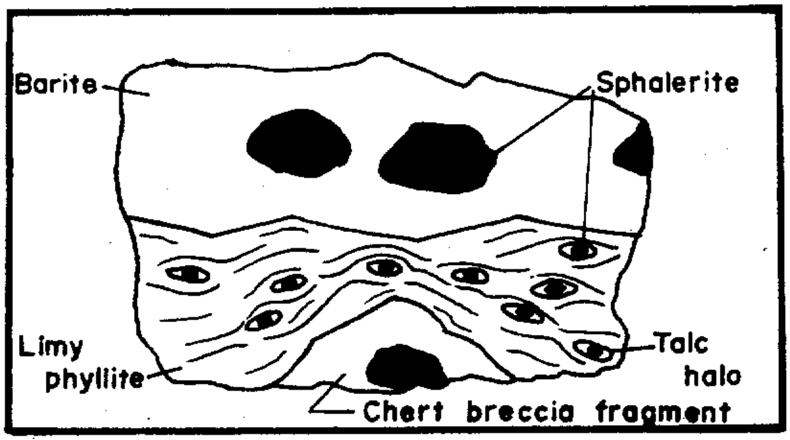


Figure 3: Sketch illustrating mode of sphalerite mineralization (actual size).

Galena occurs as irregular "wisps" and fracture fillings in purer barite zones, bounded by barite cleavage faces. The medium to fine grained crystalline galena displays contorted and sheared cleavage faces.

Pyrite and galena occur as minor fracture fillings, penetrating a short distance from the hanging wall (stratigraphic base) limestone. Pyrrhotite pseudomorphs after pyrite are ubiquitous in phyllite breccia fragments within the mineralized zone. Limonite pseudomorphs after pyrite are common in the baritic-siliceous matrix of cherty zones. The footwall of the mineralized zone (stratigraphic top) commonly consists of up to 5 feet (1.5 m) of brecciated white cryptocrystalline chert and interbedded brown limy phyllite. The remainder of the zone commonly consists of alternating bands, up to 1.6 feet (0.45 m) wide, of pure barite gangue and limy phyllitic barite.

The southernmost exposures of the main mineralized zone, as observed in a bulldozer trench near the south end of the lake and in core from DDH 74-6, contain only trace amounts of barite. Here, sphalerite, galena and pyrite mineralization occurs as fracture fillings and irregular masses in a highly sheared, siliceous shale and chert breccia zone about 7 feet (2 m) in width. The tenor of the mineralization is generally lower, averaging about 5 per cent combined lead and zinc. (Sinclair et al, 1975). Pyrite content ranges up to 5 per cent locally, mostly as disseminations in chert breccia fragments.

The mineralized zone is generally recessive weathering. Where it is exposed in bulldozer trenches, sphalerite is oxidized to a vuggy "dry-bone" smithsonite capping, leaving boxwork structures in the barite-phyllite gangue. Galena remains relatively unoxidized on weathered exposures.

A summary of diamond drilling on the MEL property to date is given below (Sinclair et al, 1976).

Hole	Footage	Interval	Ag (oz/ton)	Pb (%)	Zn (%)	$BaSO_4$ (%)
74-1	121.5-145.0	23.5	0.28	2.69	6.03	65.0
74-2	111.0-155.5	44.5	0.17	2.16	4.83	63.1
74-3	202.5-233	30.5	poor recovery - fault zone			
74-4	123.0-153.0	30.0	0.04	1.15	6.28	48.3
74-5	151.0-157.5	6.5	0.06	1.95	11.52	65.6
74-6	187.5-192.5	5.0	0.15	2.02	3.11	tr.
74-7	Drilled on west zone - no mineralization					
74-8	217.5-232.5	15.0	0.05	2.87	9.00	54.5
75-9	432.0-458.0	26.0	-	1.86	6.95	63.3
	466.5-472.5	5.0	-	2.15	3.95	-
75-10	Hole deflected - no mineralization					
75-11	363.0-417	54.0	-	2.22	3.22	53.3
75-12	477.0-497	20.0	-	1.15	5.67	35.8
75-13	650.0-652.5	2.5	-	1.15	13.50	tr.
75-14		no mineralization				
75-15		no mineralization				
75-16		no mineralization				
75-17		no mineralization				
75-18	196.0-201.5	5.5	-	0.25	0.95	-

DISCUSSION

Despite a lack of primary sedimentary textures, the stratabound mineralized zones of the MEL property may represent a recrystallized equivalent of stratiform, synsedimentary barite-zinc-lead deposits of the Selwyn Basin (e.g. TOM, Howards Pass). The size of the deposit, the lack of symmetry across the mineralized zone and the complete concordance of the mineralized zone with the bedding in the host rocks suggest that this is not a vein-type deposit. The proximity of the mineralized zones to thrust planes may have provided the temperature and pressure necessary for recrystallization of the barite, galena and sphalerite.

SUMMARY

Early Paleozoic carbonates and argillaceous sediments, which form the overturned west limb of an easterly verging broad syncline, are the host of a stratabound barite-lead-zinc deposit.

Drilling to date has indicated a mineralized zone 2,800 feet (850 m) in length with width ranging from 10 feet (3 m) to 40 feet (12 m). The deposit is concordant with bedding and is located at the contact of thick bedded limestone on the hanging wall (stratigraphic base) and limy pyritic phyllite on the footwall. Published indicated reserves based on drill core data, are in the order of 3 million tons grading about 8 per cent combined lead-zinc.

Features of the deposit observed in bulldozer trenches and in diamond drill core, suggest that this deposit may be genetically related to other stratabound barite-lead-zinc deposits occurring in the Selwyn Basin.

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GEOLOGY OF THE TOM AND JASON CLAIMS
MACMILLAN PASS AREA
YUKON TERRITORY
INDIAN & NORTHERN AFFAIRS
OPEN FILE
EGS 1976-16
FIGURE 2
AIRSTRIP
CANOL ROAD
TOM ACCESS ROAD
MACMILLAN RIVER
SYMBOLS
Mineralized float locations:
Bedding attitude; inclined, vertical, horizontal, overturned:
Slaty cleavage attitude; inclined, vertical:
Fold axis; syncline, anticline (with direction of plunge):
Fault; inferred, displacement unknown:
Thrust fault; known, inferred:
Lithologic contact; defined, approximate:
Limit of drift and vegetation cover:
SCALE
feet
1000 500 0 1000 2000 3000 4000
1 inch = 1000 feet
metres
300 200 100 0 300 600 900
0.9 cm. = 100 m.
Geology by R.C. Carne,
July and August, 1976
LEGEND
Quartz-feldspar porphyry dykes
4 Silty mudstones, silty shales and calcareous silty quartzites
3d Grey tuffaceous shales and tuffs
3c Grey welded tuffs, tuff breccia, black cherty argillite and chert
3b Black carbonaceous shales, interbedded cherty argillites and cherts; minor black, fetid limestone
Barite-lead-zinc horizon (extrapolated from diamond drill records)
3a Silty shales and rhythmites, minor chert pebble conglomerate and intraformational conglomerate
2 Chert pebble conglomerate, minor turbidites
1 Silty shales and rhythmites, minor chert pebble chert pebble conglomerate and tuff(?) near top