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VOLUME I - TEXT

SUMMARY REPORT - ROBB LAKE PROJECT, 1972
Liard Mining Division, British Columbia (NTS 94-B)

For: Robb Lake Joint Venture
By: Cordilleran Engineering Limited
Date: December 31, 1972

ORIGINAL

Cordilleran Engineering Limited

MINERAL EXPLORATION MANAGEMENT AND
ENGINEERING CONSULTANTS

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SUMMARY REPORT

ROBB LAKE PROJECT, 1972

Liard Mining Division
British Columbia

(N.T.S. 94 - B)

VOLUME I

FOR

ROBB LAKE JOINT VENTURE

BY

CORDILLERAN ENGINEERING LIMITED
1418 - 355 Burrard Street
Vancouver 1, B.C.

DECEMBER 31, 1972

TABLE OF CONTENTS

PAGE

VOLUME I

TABLE OF CONTENTS - VOLUME II

APPENDICES

TABLE OF CONTENTS - VOLUME II

Appendices (cont'd)

TABLE OF CONTENTS - VOLUME III

TABLE OF CONTENTS - VOLUME IV

LIST OF PLATES AND FIGURES

TABLE OF CONTENTS - VOLUME IV
Geological Plans of Showings (cont'd)

CLAIM MAPS: (McElhanney Associates)

CORDILLERAN ENGINEERING LIMITED

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December 31, 1972

Robb Lake Joint Venture Executive Committee

- Dr. F. B. Whiting
- Mr. J. M. Newell
- Dr. G. W. Mannard
- Mr. Reid Craig, Jr.
- Mr. A. F. Reeve

Gentlemen:

We are pleased to enclose herewith our report on the 1972 exploration project at Robb Lake conducted by our company.

This report is necessarily lengthy in order that all aspects of the work done could be thoroughly documented. Time did not permit, but the data is available, to conduct additional studies such as structural interpretation to help to define trends of the mineralized zones.

During late December the decision was taken to apply additional assessment work to certain mineral claims. This change is reflected in Appendix "C" but not on the claim map, Plate 12. A revised map will be forwarded.

Finally, I would like to thank all the people involved with this project for their cooperation and hard work. My special appreciation goes to Owen Hairsine, Mike Hamilton and Gordon Webb who in large part are responsible for the compilation of this report.

Your comments and inquiries are invited.

Yours very truly

CORDILLERAN ENGINEERING LIMITED

J. W. Stollery, P.Eng.
Vice President

JWS/z
Encl: 4 volumes

CORDILLERAN ENGINEERING LIMITED

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February 9, 1973.

Robb Lake Joint Venture Executive Committee

- Dr. F. B. Whiting
- Mr. J. M. Newell
- Dr. G. W. Mannard
- Mr. H. Reid Craig, Jr.
- Mr. A. F. Reeve

Gentlemen:

Further to the introductory letter of our report on the 1972 exploration project at Robb Lake, we are pleased to enclose a revised claim map. Would you kindly discard Plate 12, Volume IV and replace it with this revision.

On scanning the report we have noted the following errors and omissions:

1. Robb 53 Fr: Expiry date is August 14, 1985 not 1975. See Volume II, Appendix "C", Part A, Page iii.
2. Table of Contents - Volume IV, Plate 5 - DDH Section QR not OR.
3. Table of Contents - Volume IV Plates 8 and 9 should be referred to as Structural Sections not DDH Sections.
4. Table of Contents - Volume IV.
   Add Figure 10 - Talis Mountain Showing.

We suggest you attach this letter to your copy of the report.

Yours very truly

CORDILLERAN ENGINEERING LIMITED

J. W. Stollery, P.Eng.

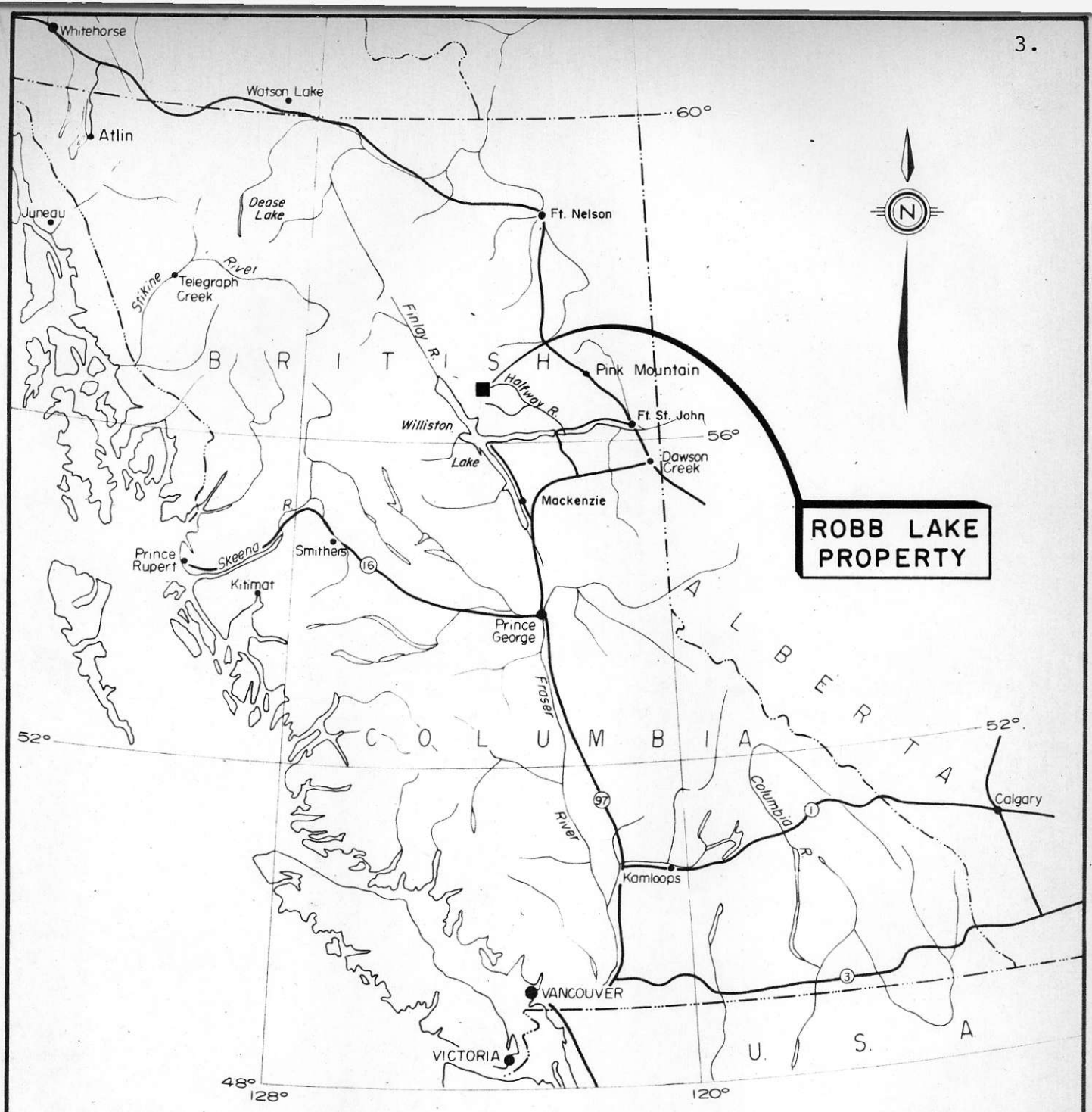
JWS/z
Encl. 1 revised map (Plate 12)

INTRODUCTION

This report has been written for the Robb Lake Joint Venture at the request of the participants. It describes a comprehensive exploration programme carried out on the Venturer's claim holdings in the Robb Lake Area, N.T.S. 94-B, British Columbia, during 1972 by Cordilleran Engineering Limited.

A block of more than 900 claims was explored by prospecting, geological mapping, geochemistry, geophysics, trenching and diamond drilling. Total expenditures for 1972 were $522,584.87. The results of this work are presented in detail and continued exploration is recommended for 1973 at an estimated cost of $520,000.

Due to the large quantity of documentary material, this report is presented in four volumes as detailed in the Table of Contents.



LOCATION MAP

ROBB LAKE JOINT VENTURE

SCALE

MILES 300 150 0 300 600 900 MILES

CORDILLERAN ENGINEERING LIMITED
1418 – 355 BURRARD ST.
VANCOUVER

INTRODUCTION (cont'd)

Photo No.1 Base Camp - July, 1972
Looking Northwest

Photo No.2 Mississippi Creek, Base Camp, Diamond Drill Sites and General Exploration Area. Looking Northwest.

INTRODUCTION (cont'd)

Photo No.3 Airstrip, Lower Camp and Halfway River. Looking West.

Photo No.4 Robb Lake - Looking East.

HISTORY

During the fall of 1971 zinc-lead mineralization was discovered four miles east of Robb Lake (56°55'N latitude, 123°40'W longitude). From September through October, Ecstall Mining Limited, Arrow Inter-America Corporation and Peregrine Exploration Ltd. located over 900 claims covering the discovery area.

By agreement dated December 14, 1971 the Robb Lake Joint Venture was entered into between the three companies to pool and explore their respective holdings. Effective May 17, 1972 Peregrine Exploration Ltd. amalgamated with Windermere Exploration Ltd. (NPL) resulting in a new company Barrier Reef Resources Ltd. (NPL) replacing Peregrine as a member of the Joint Venture.

Cordilleran Engineering Limited, Vancouver, B.C. was engaged by the venture early in 1972 to undertake the exploration of the Robb Lake property as directed by the Executive Committee: Ecstall Mining Limited - Mr. J.M.Newell

HISTORY (cont'd)

and Dr. G. W. Mannard; Arrow Inter-America Corporation - Dr. F. B. Whiting and Mr. H. Reid Craig Jr.; and Barrier Reef Resources Ltd. (NPL) - Mr. A. F. Reeve.

OPERATIONS

Detailed planning and organization began in mid-February. In late March, approximately 80 tons of fuel, camp supplies and drilling equipment were moved by Otter aircraft from Pink Mountain, Mile 143 on the Alaska Highway, to a winter strip on the Halfway River, two miles east of Robb Lake.

Between May 17 and June 15 the material on the winter strip was lifted to the campsite location on Mississippi Creek at 5,300' A.S.L. and a thirty-man camp constructed. Field work began June 5.

From this base camp the following operations were carried out:

GEOLOGICAL MAPPING

Approximately 28 square miles were mapped at scales of 1"=500' and 1"=1,000'. In addition, 16 mineral showings were mapped at 1"=100'.

OPERATIONS (cont'd)

STRATIGRAPHIC FIELD WORK

A total of 8 sections were measured and several traverses were made in an attempt to determine recognizable sub-units within the local Middle Devonian sequence.

SURVEYING

A location line survey of approximately 400 claims and the abandonment and restaking of 194 claims was undertaken. Diamond drill hole locations and geological stations for mapping control were also surveyed.

GEOPHYSICS

An induced polarization test survey of approximately 10,000 line feet was undertaken to establish response in areas of known mineralization.

A two line seismic survey was run in the valley of the Halfway River and on the alluvial fan west of Mississippi Creek to determine overburden depths.

GEOCHEMISTRY AND LINECUTTING

A 56 line-mile grid was cut in the Halfway River valley and used to control a soil geochemical survey. Several test lines were also run over selected sections of the property. In total, 1,604 soil samples were submitted for analysis. During the

OPERATIONS (cont'd)

2nd week of July, Texas Gulf conducted a geochemical orientation survey.

To establish natural trace element levels in the Robb Lake area 1 fish liver, 1 fish flesh, 8 water and 7 silt samples were taken.

DIAMOND DRILLING AND SITE PREPARATION

A total of 14,922 feet were drilled in 29 holes using two Boyles BBS-12A diesel powered drills with AQ wireline equipment. Several hole locations required elaborate preparation.

PROSPECTING, TRENCHING, CHIP SAMPLING

Limited prospecting resulted in the discovery of 9 new mineral showings. Seventeen surface rock-chip samples were cut from 10 showings. It was necessary to blast 8 trenches on 4 of the showings to guarantee fresh samples.

AIRSTRIP

In late September a 3,000' x 150' airstrip was constructed parallel to the Halfway River near the junction of Mississippi Creek and the base camp was moved to this location.

LOGISTICS

Field operations were serviced by float-equipped Beaver and Otter aircraft to Robb Lake from MacKenzie, 110 air-miles to the south.

OPERATIONS (cont'd)

WEATHER

During the field season of 141 days (May 17 to October 4) a total of 15 days were lost due to inclement weather. Robb Lake was ice free on June 17 and frozen again on the night of October 9.

VISITORS

During the course of the field season the following persons were authorized to visit the project:

- Dr. R. Yole, Carleton University
- Dr. I. Thompson & Assistant, B.C.Department of Mines
- Dr. D. Sangster, Geological Survey of Canada
- Dr. L. Jones, Canadian Superior Exploration Ltd.
- Mr. T. Horsley, Conwest Exploration Ltd.

In addition to the above, various representatives of the Joint Venture participants, other than the Management Committee visited the project.

GEOLOGY

INTRODUCTION

The Robb Lake area is situated along the eastern edge of the Rocky Mountains near the headwaters of the Halfway River. The area of interest includes approximately 28 square miles of rugged alpine terrain which is underlain by a thick sequence of folded and faulted Middle and Lower Paleozoic sedimentary rocks.

The region is physiographically characterized by mature topographic development and typical trellis drainage patterns. Evidence of extensive alpine glaciation during the Pleistocene is reflected in the deeply disected mountain ranges, extensive fluvial glacial deposits (eskers and moraines), and remnant cirque glaciers near Mount Kenny.

Elevations range from about 4,000 feet (Halfway River) to 7,750 feet (Texas Ridge) with local relief averaging

GEOLOGY - Introduction (cont'd)

about 2,000 feet. A considerable portion of the area is above timberline (5,200 feet) and has good exposure. However, the Halfway River Valley and several major tributaries are covered by dense conifer forests with few outcrops.

The Halfway River Map-Area (N.T.S. 94-B) has been studied and mapped by Irish (G.S.C. Paper 69-11). The 1"=4 mi. scale reconnaissance geological map, which resulted from this study, provided a rough stratigraphic and structural basis for detailed mapping during the 1972 field season.

A regional geological map of the Robb Lake area was produced using a 1"=1,000' scale orthophoto base with superimposed topographic contours. However, because of the awkward size of the complete map, the results have been presented on a 1"=2,000' scale (Plate 1) base map. More detailed mapping on a 1"=500' scale (Plate 2) topographic base was conducted in the valley of Mississippi Creek in the vicinity of the known lead-zinc showings and drill holes. Each major showing was also mapped on a scale of 1"=100' using Brunton compass and tape traverse methods.

GEOLOGY (cont'd)

STRATIGRAPHY

Nine recognizable stratigraphic units, ranging in age from Ordovician to Mississippian, were mapped and are described in ascending stratigraphic order as follows:

ORDOVICIAN

The Ordovician rocks are comprised of light grey to tan, very thin-bedded sediments including platy argillaceous limestone, nodular limestone, siltstone, and calcareous shale. Burrow structures were noted in several localities; however, the strata are not generally fossiliferous. The thickness of this section was not determined, but is estimated to be at least 2,000 feet. The generally non-resistant brown weathering nature of the rocks (see Photo No.6), is probably the most important criteria for distinguishing this unit from the overlying Silurian; however, the contact is gradational and in most localities can only be placed within broad limits. The basal (Cambrian) contact was not observed.

SILURIAN (Nonda Formation)

Two distinct Silurian lithofacies were recognized and mapped separately; however, the lithologies

GEOLOGY - Stratigraphy (cont'd)

and thicknesses vary considerably due to rapid facies changes over relatively short distances.

- Lower Unit

The lower "sand facies" unit is generally light grey, thick-bedded to massive, very dolomitic quartz sandstone. The sand grains are well sorted, well rounded, and there is an increase in sand content and thickness toward the south.

- Upper Unit

The overlying Silurian rocks are composed of diverse lithologies, but are commonly medium to dark grey, thin to very thin-bedded, micro-crystalline dolostone and cherty limestone. Some beds contain silicified tetracorals, brachiopods, and crinoids. Abundant remains of Halysites, an important Ordovician-Silurian index fossil, were found in several localities. Local disharmonic folding in thin-bedded strata was observed in the upper part of this formation. Although no stratigraphic sections were measured, this unit is probably at least 1,000 to 2,000 feet thick.

DEVONIAN

LOWER DEVONIAN (Unit D)

The Lower Devonian disconformably overlies the Silurian and is represented by a light grey, thin to thick-bedded, commonly cross-bedded sandy dolostone and quartz sandstone unit measuring 220 feet thick.

GEOLOGY - Stratigraphy (cont'd)

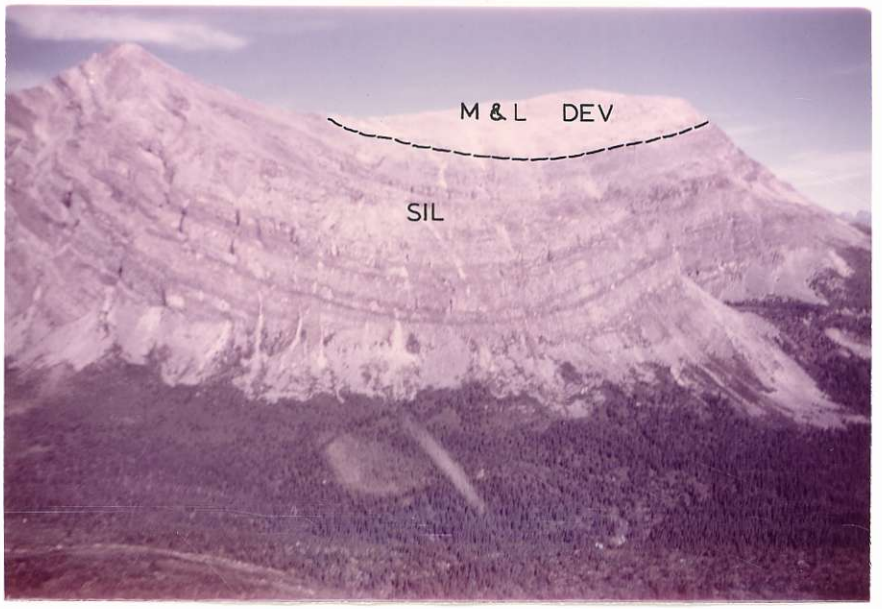


Photo No.5 Thick section of Silurian rocks exposed 3 miles NW of base camp. Small erosional remnant of Middle and Lower Devonian (Units C and D) caps the syncline.

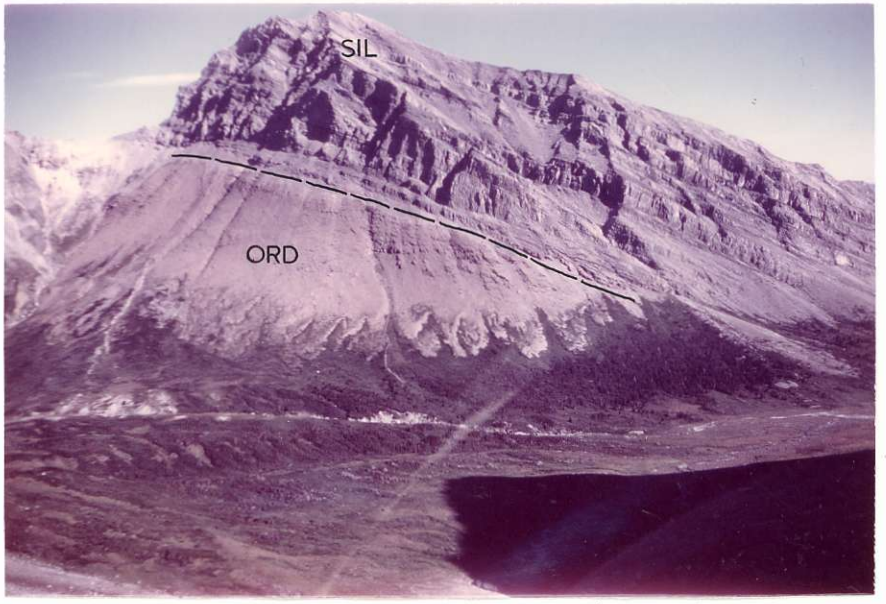


Photo No.6 Thrust fault cutting Silurian-Ordovician rocks 3 miles NW of base camp.

GEOLOGY - Stratigraphy (cont'd)

MIDDLE DEVONIAN

The Middle Devonian section, which is economically the most important, is discussed in detail by A. H. Taylor under the heading Stratigraphic Field Work, Appendix "D". Three mapable units (A, B and C) are recognized.

- Unit C

This unit is approximately 1,050 feet in thickness and consists of light tan to grey, fine-to medium-crystalline, thick-bedded, locally arenaceous dolostone. There is a general increase in sand content downward and a disconformity occurs at the base of the unit. Large brachiopod casts, "zebra" textured dolostone, and minor tabular limestone are found in the upper part of the unit. Collapse breccia and extensive mineralization are found in the upper 300 feet.

- Unit B

Unit B is comprised of light grey, thin-bedded, fine-to coarse-crystalline dolostone. This unit is, in part, very similar to Unit C and is best identified by stratigraphic position rather than lithology. Unit B varies from 1,000 to 1,200 feet in thickness and appears to thin toward the west and north. The lower 30 to 40 feet is generally very thin-bedded, sandy dolostone with local mudcracks and was used as a marker horizon since it occurs near the same stratigraphic level as the mineralization. Well developed "zebra" textures were observed in the middle and upper portions of Unit B.

GEOLOGY - Stratigraphy (cont'd)

- Unit A

Unit A consists of dark grey, thin-bedded, fossiliferous dolostone and limestone and is 140 to 160 feet thick. Minor mineralized breccia occurs in some localities, but there is considerable evidence of a disconformity between Unit A and Unit B.

UPPER DEVONIAN (Besa River Shale)

The Besa River Shale occurs immediately above the Middle Devonian carbonate strata and is typically non-resistant, tan to black, very thinly laminated calcareous shale with some minor argillaceous limestone beds. This unit appears to be at least 1,500 to 2,000 feet thick in the Robb Lake area, but exact measurements were not possible due to incomplete sections resulting from faulting. The basal contact with the Middle Devonian is conformable and somewhat gradational.

The Besa commonly exhibits well developed axial plane cleavage reflecting regional structural trends. This feature sometimes obscures the original bedding making it difficult to accurately determine the attitude of the strata.

MISSISSIPPIAN (Prophet Formation)

The Prophet Formation conformably overlies the Besa River Shale and is commonly medium-to dark-grey, thin-bedded, cherty limestone and dolostone with some argillaceous limestone and shale. Extensive exposures

GEOLOGY - Stratigraphy (cont'd)

of this resistant unit occur on the east edge of the property.

GEOLOGY (cont'd)

STRUCTURAL GEOLOGY

Intense Late Mesozoic (Laramide) deformation has resulted in a regional structural style that is characterized by predominantly northwest trending fold axes and low angle thrust faults. Most of the faults dip toward the southwest with major displacement due to compressional forces directed toward the northeast. The following structural features are recognized and are shown on the regional geological map (Plate 1).

TENNESSEE MOUNTAIN ANTICLINE

The Middle Devonian rocks occur primarily within a broad, slightly assymetrical, southeast plunging anticline referred to as the Tennessee Mountain Anticline. The fold axis trends roughly northwest with dip values averaging 25 to 35 degrees on the southwest flank, and 30 to 45 degrees on the northeast flank. Numerous small folds are superimposed on the major structure.

Older Silurian rocks are exposed in the core of the anticline toward the northwest (see Photo No.7). The Besa River Shale overlies the Middle Devonian on the northeast side of the anticline in the trough of a shallow syncline and also

GEOLOGY - Structural Geology (cont'd)

Photo No.7 Looking SE along the axis of the Tennessee Mountain Anticline.

Photo No.8 Looking NW along the valley of Mississippi Creek. Silurian-Ordovician rocks are thrust on the Middle and Upper Devonian along the West Thrust.

GEOLOGY - Structural Geology (cont'd)

occurs on the southwest flank. The structural relationships of this feature are best illustrated on the 1"=500' scale cross-sections (see Plates 8 and 9).

WEST THRUST

The Middle and Upper Devonian has been truncated on the west where the Ordovician-Silurian rocks have been thrust toward the northeast. This major thrust fault can be traced for over eleven miles along a northwest trend.

In the area immediately west of Mississippi Valley the West Thrust appears to have a dip of at least 20 to 30 degrees. The displacement, some of which is undoubtedly taken up by numerous secondary faults, is difficult to measure but is probably between 2,000 and 4,000 feet.

EAST FAULTS

Two prominent northwest trending, high angle reverse faults (see Photo No.9) cut the Middle and Upper Devonian east of Mississippi Creek near Talis Mountain. One fault is unique in that it dips toward the east at approximately 60 degrees. The displacement was determined to be at least 300 feet.

A second parallel fault occurs about 2,000 feet to the northeast. This fault dips toward the west and marks the northeast boundary of the Middle Devonian. Both faults can be followed for at least five miles.

GEOLOGY - Structural Geology (cont'd)

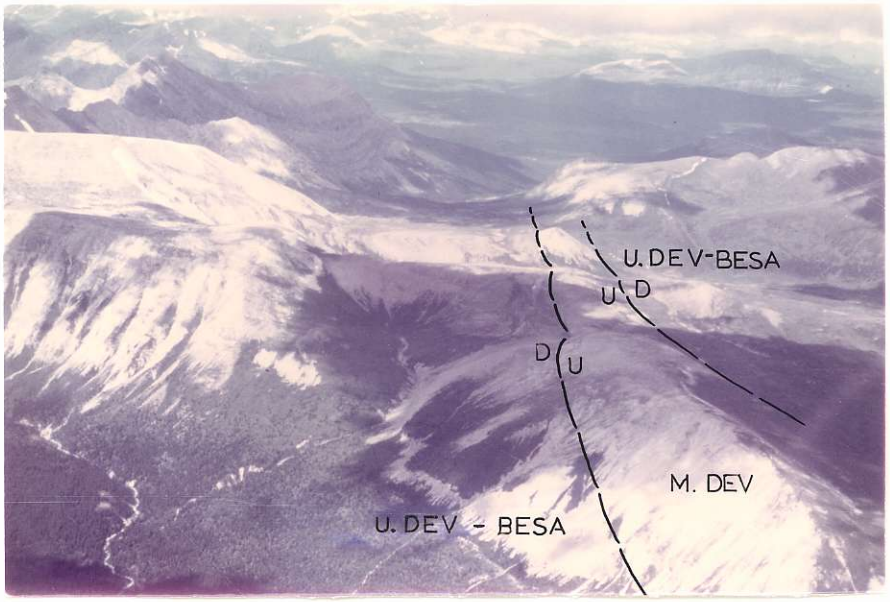


Photo No.9 Looking NE along the East Faults.

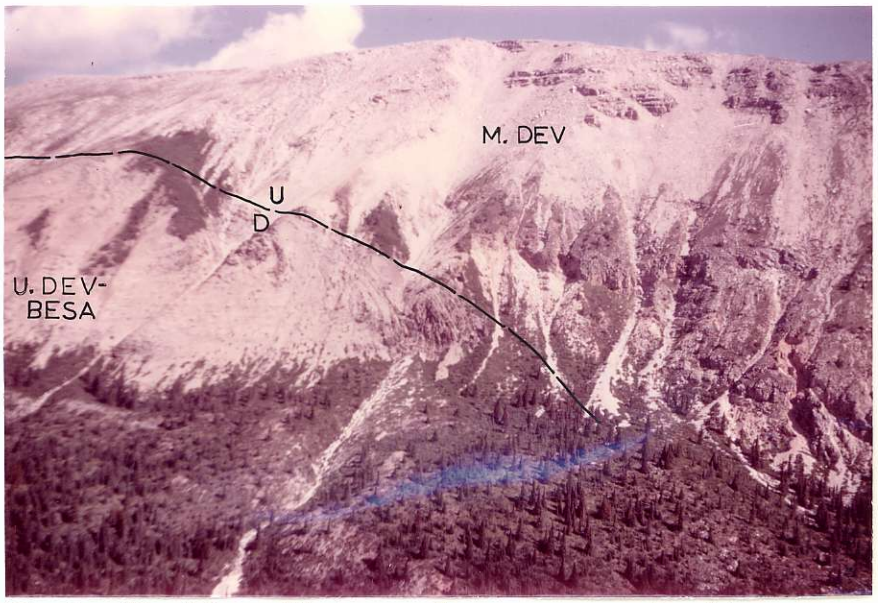


Photo No.10 High angle reverse fault on Talis Mountain.

GEOLOGY - Structural Geology (cont'd)

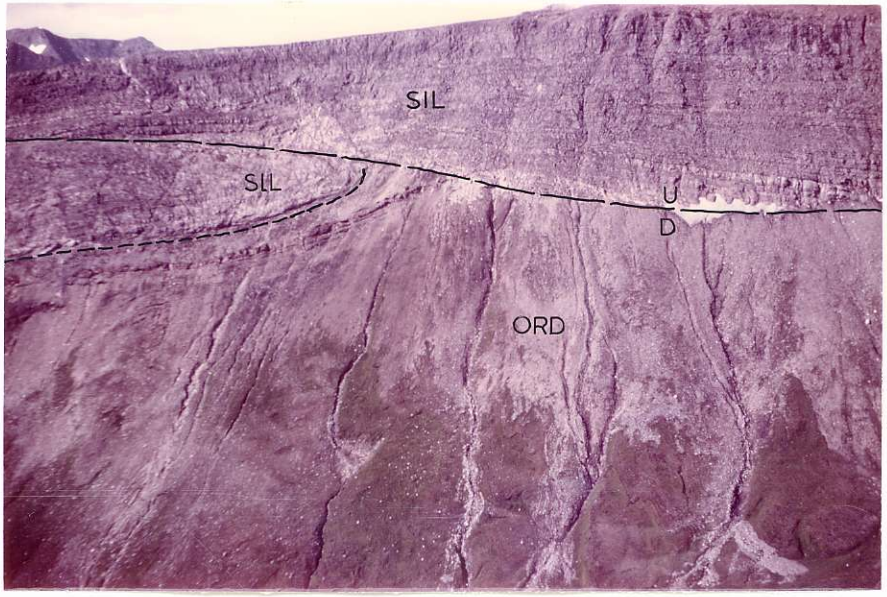


Photo No.11 Ordovician-Silurian section cut by thrust fault two miles SW of base camp.

Photo No.12 Overturned folds in Silurian-Ordovician rocks two miles SW of base camp.

MINERALIZATION

General

Widespread zinc and lead sulphide mineralization occurs in the carbonate rocks of Middle Devonian age located NE of Robb Lake in the vicinity of Mississippi Creek. The mineralization is typically red to greenish yellow, colloform or crystalline sphalerite with lesser amounts of galena occurring as irregular bodies within crudely stratiform dolomitized "collapse" breccia. This breccia is characterized by angular to subangular dolostone fragments in a matrix of coarse crystalline, white, secondary dolomite and can be classified according to the average or predominant size of the fragments: fine (less than 1"), medium (1"-6") and coarse (more than 6"). The dolostone fragments vary in color from light to dark grey with fine-to coarse-crystalline textures. Although white dolomite is the most common matrix, white sparry calcite, and fine black argillaceous and bituminous matrix material occur in some places. In the mineralized localities sphalerite and galena are important matrix constituents. Other minerals include secondary hydrozincite

MINERALIZATION - General (cont'd)

which is abundant in some heavily weathered outcrops, minor smithsonite (see Appendix "K") and a considerable amount of pyrite and/or marcasite with secondary limonite which occurs in most of the mineralized areas. In addition, widespread minor amounts of pyrobitumen occur in vugs and cavities in porous dolostone and breccia.

Sulphide mineralization sometimes occurs as fracture filling with secondary dolomite in otherwise non-brecciated dolostone. These fractured areas, referred to as "crackle breccia", probably reflect partial collapse with only slight displacement and are a common feature in the vicinity of major collapse structures. Local deformation in overlying units caused by the removal of support can be observed in some places.

The breccias vary considerably in thickness and range from brecciated interbeds, having a thickness of one foot or less, to large scale "chaotic" or "breakthrough" breccias over 400 feet thick. The best known zinc-lead mineralization occurs in the vicinity of the larger breccias.

A total of 16 major zinc-lead showings have been discovered; however, minor traces of mineralization occur in many other localities in the Middle Devonian outcrop area, which includes roughly 10.5 square miles. All of the major

MINERALIZATION - General (cont'd)

Photo No.13 Fine breccia with weak ZnS mineralization at Lower Showing.

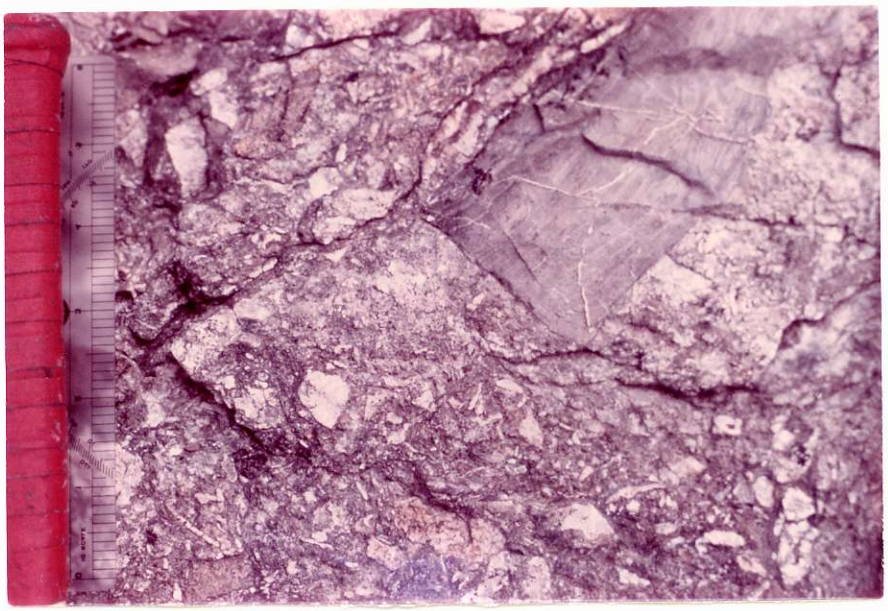


Photo No.14 Medium breccia with strong ZnS mineralization in outcrop at the North Face Showing.

MINERALIZATION - General (cont'd)

known showings (except the North Face) occur along a 5.5 mile-long outcrop trend following the southwest flank of the Tennessee Mountain Anticline.

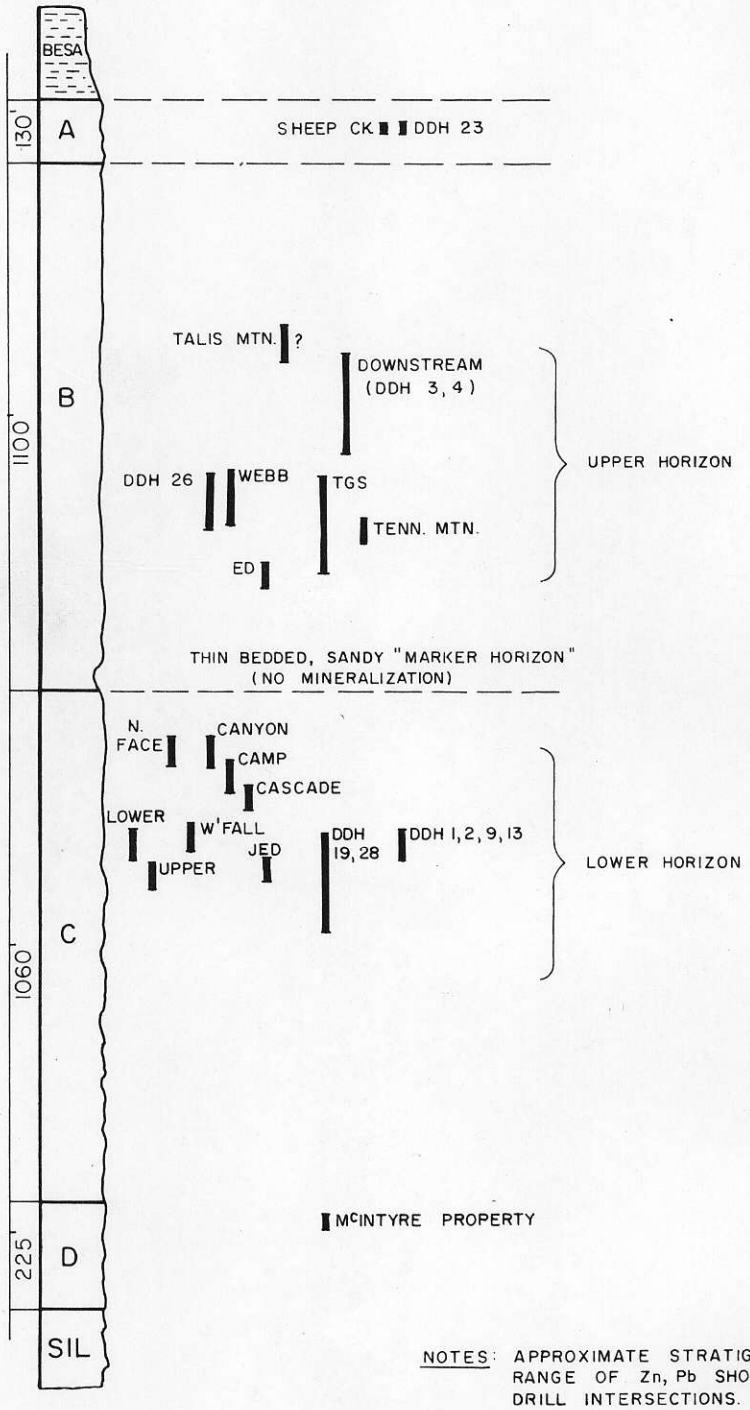
The mineralization occurs over a stratigraphic interval of approximately 2,200 feet within Units A, B and C. The most significant showings are found in the upper 400 feet of Unit C and the middle 600 feet of Unit B. Two mineralized horizons are indicated and appear to be separated by approximately 300 feet of section. The breccia host rocks appear to be much more extensive within these stratigraphic intervals and this accounts for the fact that these are favourable horizons. The approximate stratigraphic distribution of the various showings is illustrated on Figure A following.

Follows page 28.

STRATIGRAPHIC SECTION

MIDDLE DEVONIAN

1" = 400'



NOTES: APPROXIMATE STRATIGRAPHIC POSITION AND RANGE OF Zn, Pb SHOWINGS AND MAJOR DRILL INTERSECTIONS.

FIG. A

MINERALIZATION (cont'd)

ZINC-LEAD OCCURRENCES

Each of the 16 showings was mapped at a scale of 1" = 100' by Brunton Compass and tape traverse. Surface rock-chip sampling results and diamond drill hole locations are also shown on these plan maps (see Figures 1-16, Volume IV).

LOWER SHOWING

(See Figure 1)

LOCATION: 79,740N, 51,030E ELEVATION: 5,770'

MINERALIZATION: Weak to locally strong sphalerite occurs with minor galena and FeS_2 in dolomitized breccia in outcrops along Mississippi Creek. The mineralization occurs primarily in medium breccia with a matrix composed of white secondary dolomite containing fine crystalline red and yellow sphalerite. The best exposure measures 300 feet by 50 feet; however, weak sphalerite mineralization in intermittent outcrops can be followed along the creek for about 2,500 feet.

SURFACE ROCK-CHIP SAMPLING:

Four trenches were cut in outcrops along the creek. The best results from each trench are as follows:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	13'	3'	9.10
2	5'	1'	10.65
3	21'	3'	3.71
4	2'	1'	2.66

ave 6.47%

3 . ×

9 . 1 =

27 . 3 *

27 . 3 + M

10 . 65 + M

3 . ×

3 . 71 =

11 . 13 *

11 . 13 + M

2 . 66 + M

51 . 74 * M

51 . 74 ÷

8 . =

6 . 4675 *

MINERALIZATION - Zinc-Lead Occurrences
Lower Showing (cont'd)

DRILLING: DDH 1, 2, 7, 9, 11, 13, A-1, A-2, A-3, A-4. Also DDH 12, 14 (not shown on 1"=100' scale map).

The best intersections are summarized as follows:

Drill Hole #	Depth From - To	Length	Est. of True Thickness	%Zn-Pb
1	270.0'-290.0'	20.0'	15'	6.1
2	470.0'-510.0'	40.0'	15'	8.1
9	334.0'-344.2'	10.2'	9'	26.1
13	128.0'-143.7'	15.7'	12'	5.0
A-4	56.0'- 71.0'	15.0'	13'	7.13

INTERPRETATION: The drilling results show more extensive and higher grade mineralization than indicated by surface exposures. The breccia host rock appears to have a true thickness of at least 350 feet in the vicinity of Hole 1, 2 and 9 all of which collared in breccia. Intersections of breccia in Holes 7 and 12 indicate a somewhat gradual thinning (180 to 200 feet thick) toward the northwest. Traces of low-grade mineralization were encountered in these holes.

The breccia apparently thins more rapidly to the southeast as indicated by Hole 11 where only thin, locally brecciated strata were intersected. However, further to the southeast, mineralization was again encountered in Hole 13 where the breccia is about 200 feet thick. About 50 feet of barren breccia occurs in the top of Hole 14.

From these results there appears to be some relationship between the thickness of the breccia and the mineralization. The best mineralization occurs in the thickest breccia units. The distribution of mineralization within the breccia is somewhat irregular, but the highest grade seems to occur near the bottom of a "run" of mineralization. This is suggested by the intersections in Holes 1, 2 and 9.

Surface observations indicate that there may be some correlation between mineralization and a prominent set of fractures striking roughly N 05°W, 80E. Mineralization seems to be more abundant in places where the fractures are closely spaced, i.e. 1" to 3". Both open and dolomite-filled fractures having this same orientation were noted. However, the geometrical distribution of the drill hole intersections and surface showings suggests an east-northeast to northeast trending mineralized zone. Additional drilling will be required to define these zones.

The distribution of FeS_2 on the surface and in the drill holes indicates that there is probably some peripheral zonation. This was also confirmed by the IP results.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

UPPER SHOWING

(See Figure 2)

LOCATION: 80,350N, 53,350E ELEVATION: 6,750'

MINERALIZATION: Weak to locally strong sphalerite and galena occur in dolomitized medium-to coarse-breccia on the northwest ridge of Tennessee Mountain. The best mineralization occurs in an outcrop measuring 200 feet x 150 feet on the southwest side of the ridge. Steep talus slopes cover much of the area.

Most of the mineralization consists of colloform sphalerite with considerable white secondary dolomite surrounding individual breccia fragments. Abundant hydrozincite and traces of pyrobitumen were found. Widespread limonite stains due to traces of FeS_2 were noted.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	51'	28'	11.72

DRILLING: None.

INTERPRETATION: Although this showing was not drilled, it has considerable potential, as indicated by the surface rock-chip sampling. The breccia host rock is at least 100 feet thick and can be followed for about 900 feet to the north side of the ridge crest. It is interesting to note that the Pb/Zn ratio is considerably higher at this locality.

Three remarkable similarities exist between the Upper and Lower Showings:

1) The breccia (and mineralization) gradually diminishes toward the northwest.
2) The breccia disappears rather adruptly toward the southeast.
3) Although the evidence is somewhat subjective, the mineralization appears to be trending northeast.

The drill site at GEO STA 21 is located in a suitable position to test this hypothesis.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

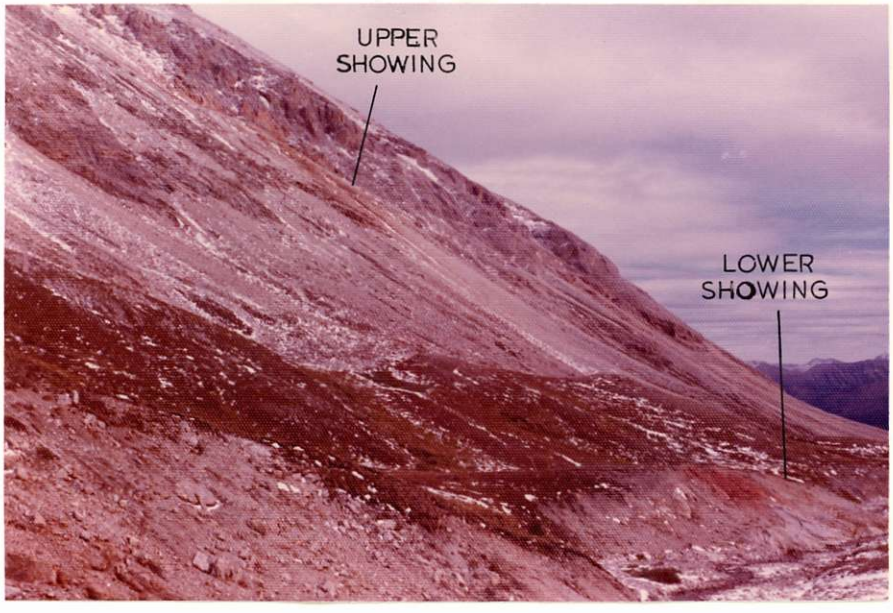


Photo No.15 Lower and Upper Showings with limonite gossans due to weathering iron sulphides.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

WATERFALL SHOWING

(See Figure 3)

LOCATION: 79,050N, 54,350E ELEVATION: 6,296'

MINERALIZATION: Widespread mineralization occurs in dolomitized coarse breccia near a prominent waterfall on the southwest side of Tennessee Mountain. The best showing is characterized by moderate to locally strong sphalerite with minor galena and occurs within an outcrop area measuring 200 feet by 200 feet. The breccia host rock contains light mineralization for 1,000 feet along a south-southeast trend from the main showing. No significant mineralization was observed to the north.

The breccia matrix is mostly white secondary dolomite with abundant vugs, some of which contain individual crystals of sphalerite. Abundant traces of FeS_2 and pyrobitumen were noted.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	40'	22'	8.5

DRILLING: DDH 27, no mineralized intersections.

INTERPRETATION: The main outcrop is one of the best exposed and most consistently mineralized showings on the property; however, the terrain is quite steep making prospecting and drilling somewhat difficult. The thickness of the breccia varies considerably as indicated by surface exposures and the intersection in Hole 27. A thickness of at least 350 feet is indicated by the drill hole, but to the SE of the unit appears to be about 150 feet thick.

The absence of mineralization to the north, together with the results from Hole 27, suggests that the mineralization may be trending east-west. A potential drill site exists 400 feet east of the main showing.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

NORTH FACE SHOWING

(See Figure 4)

LOCATION: 82,100N, 55,950E ELEVATION: 6,795'

MINERALIZATION: Strong sphalerite and minor galena occurs in dolomitized fine to coarse breccia on the north side of Tennessee Mountain. The best mineralization is found within an outcrop area measuring 300 feet by 150 feet at the top of an extensive talus slope. The nature of the breccia is somewhat unique in that it contains very little white secondary dolomite and is composed of mostly sphalerite with some black bituminous matrix.

A massive, medium-grey, fine crystalline limestone bed (about 50 feet thick) occurring near the top of the breccia in the vicinity of the main showing, contains very light traces of possibly indigenous sphalerite. The genetic implications of this are discussed in a subsequent part of this report.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	28'	24'	6.93
2	13'	12'	10.90
3	10'	9'	2.03

DRILLING: DDH 5; did not reach target depth due to permafrost.

INTERPRETATION: This showing contains some of the most impressive surface exposures of mineralization on the property and it is the only major known occurrence on the northeast limb of the Tennessee Mountain Anticline. The breccia host rock is about 200 feet thick at this locality, but cannot be followed laterally due to extensive talus slopes.

A prominent set of fractures trending N 35°E, occur in the mineralized area and may be related to the mineralization, but the lack of continuity of mineralization along this direction indicates that the predominant trend is more likely oriented east-west or possibly southeast. Several deep drill holes along the top of the cirque will be required to evaluate the area.

15'/1.5%

```
24.×
6.93=
166.32*

166.32+M
12.×
10.9=
130.8*

130.8+M
9.×
2.03=
18.27*

18.27+M
315.39*M

315.39÷
45.=
7.00866666666*
```

MINERALIZATION - Zinc-Lead Occurrences
North Face Showing (cont'd)

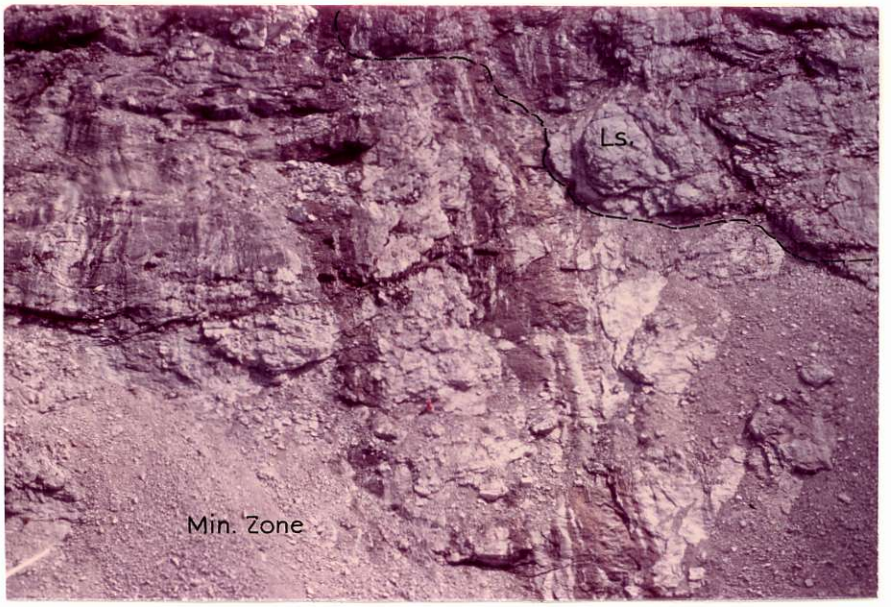


Photo No.16 North Face Showing. Medium-grey tabular limestone unit is visible in upper right hand corner.

0.*

18.9+
20.71+
39.61*

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

39.61÷
2.=
19.805*

WEBB SHOWING

(See Figure 5)

LOCATION: 74,800N, 57,100E ELEVATION: 5,750'

MINERALIZATION: Very strong sphalerite and galena occurs as stratiform lenticular bodies and in fractures in dolostone on the north side of Webb Ridge. This occurrence is unique in that there is very little breccia directly associated with the mineralization. The fracture veins vary from 1/8 inch to 4 inches in width and contain massive Zn-Pb mineralization with minor amounts of white secondary dolomite. The veins are quite irregular and have variable orientations.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	13'	10'	18.90
2	12'	10'	20.71

19.81/10'

DRILLING:

Drill Hole #	Depth From - To	Length	Est. of True Thickness	% Zn-Pb
26	247.2'-260.4'	13.2'	13'	6.5
	294.0'-302.8'	8.8'	8'	11.3

INTERPRETATION: The surface showings and intersection in drill hole 26 indicate the presence of a northeast trending mineralized body having a width of at least 150 feet and an indicated length of over 300 feet. The overall grade of the mineralization at this locality is exceptionally high and the area has obvious potential. Additional drilling will be required.

The geometry of the mineralized body suggests that it may have developed as cave-like solution openings enlarged along bedding planes and fractures which were subsequently filled with mineralization. The irregular nature and size of the fractures (up to 4 inches wide) indicates that they were probably tension fractures, perhaps resulting from partial collapse of the surrounding rocks. Minor amounts of breccia containing traces of mineralization are found nearby. There is also some evidence of post-mineralization fracturing accompanied by minor brecciation and dolomitization.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

CAMP SHOWING

(See Figure 6)

LOCATION: 76,700N, 57,450E ELEVATION: 5,453'

MINERALIZATION: Weak to locally strong sphalerite and minor galena occur in very coarse breccia on the south side of Tennessee Mountain 800 feet northeast of the 1972 base camp. The best (strong) mineralization occurs within a relatively small outcrop area measuring 30 feet by 50 feet; however, widespread weak mineralization is found over an area measuring roughly 700 feet by 400 feet. Limonite stains due to weathering FeS_2 are also widespread.

Numerous large scale collapse features can be observed at this showing. Massive blocks of dolostone over 10 feet across are found in fine-to coarse-breccia matrix which is commonly mineralized. Fractures occurring in the vicinity of the breccia contain varying amounts of mineralization. Large crystals of sphalerite and galena (up to 1/2 inch) were also found in numerous vugs and cavities together with secondary dolomite.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	30'	9'	9.82

DRILLING: DDH 17, 18

INTERPRETATION: The drill holes were located down dip from the showings and are shown on the cross section (Plate 5). Scattered light mineralization was encountered in Hole 17 with a few 1 to 2 foot sections averaging 2 to 3 per cent Zn-Pb. No mineralization was found in Hole 18.

The breccia host bed is about 100 to 130 feet thick, as indicated by the surface exposures and the intersections in Hole 17. However, there are extensive unmineralized breccias at several different stratigraphic levels which are separated by partially brecciated intervals.

Although the overall grade of mineralization is rather low, additional exploration of the area is warranted both up dip and down dip from the known occurrences. The absence of mineralization in Hole 18 indicates that the main trend is possibly northeast or north-northeast.

MINERALIZATION - Zinc-Lead Occurrences
Camp Showing (cont'd)

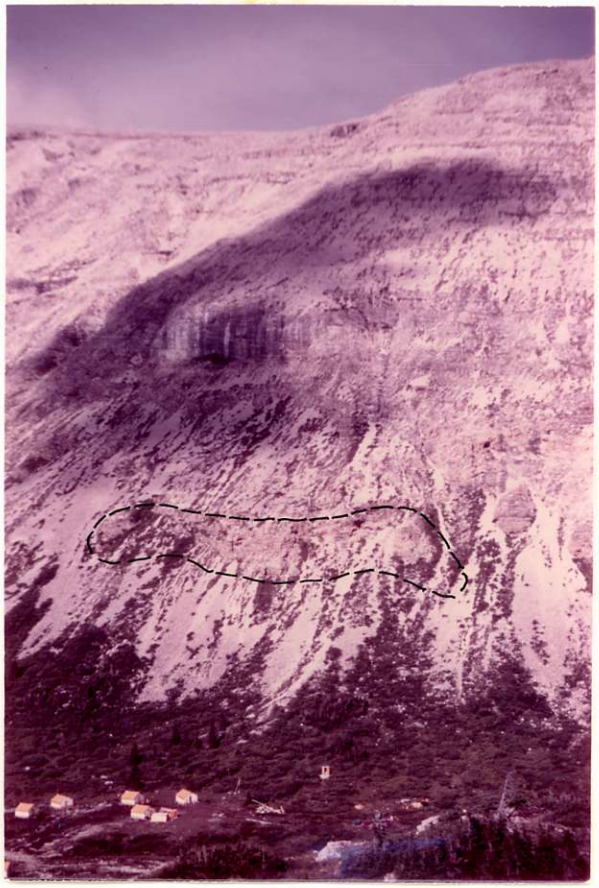


Photo No.17

Camp Showing with approximate boundary of mineralized zone.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

TGS SHOWING

(See Figure 7)

LOCATION: 81,700N, 48,600E ELEVATION: 6,542'

MINERALIZATION: Moderate to locally strong sphalerite and galena occur in fine to medium breccia on the southwest side of Texas Ridge. The mineralization occurs near the base of a somewhat discordant breccia unit which cuts up section toward the south and can be followed in continuously exposed outcrops for 1,200 feet. Traces of mineralization are found in intermittent outcrops for an additional 1,000 feet toward the south. Fine black matrix and FeS_2 are commonly found in the basal part of the breccia unit and limonite stains are widespread.

An unusually fine crystalline green type of sphalerite occurs at this locality but, as in the other showings, both red and yellowish-green varieties can be found. Toward the south, in outcrops along Mississippi Creek, the breccia is characterized by a considerable amount of white quartz matrix. Some pockets up to one foot in diameter contain well developed quartz and galena crystals.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	23'	13'	4.80
2	15'	8'	3.88

10.5 | 4.45

DRILLING: DDH 8, 10.

INTERPRETATION: This locality has the longest continuous exposure of mineralization on the property, but steep terrain, heavy snow cover until late in the season, and inadequate drill sites make it a difficult area to explore. The location of the drill holes was dictated primarily by topography and both holes are located a considerable distance from the mineralized outcrops. In addition, Hole 10 did not reach its target depth. It should also be noted that the best mineralization, located approximately 700 feet north of Geologic Station 18, was not sampled.

The breccia host bed is at least 50 feet thick and, in some places, probably over 100 feet. Because of the relatively high stratigraphic position of this showing (in Unit B) with respect to the nearby Lower Showing, there is a possibility of mineralization in the underlying upper portion of Unit C.

0. A

13.×

4.8=

62.4*

62.4+M

8.×

3.88=

31.04*

31.04+M

93.44*M

93.44÷

21.=

4.44952380952*

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

DOWNSTREAM AND CASCADE SHOWINGS

(See Figure 8 & 9)

LOCATION: 74,100N, 61,300E ELEVATION: 4,050' (Downstream)
75,420N, 59,650E ELEVATION: 5,100' (Cascade)

MINERALIZATION:

Downstream Showing:

Weak to locally moderate sphalerite with minor galena is found in outcrops and as float along Mississippi Creek, one mile downstream from the 1972 base camp. The breccia host rocks are heavily fractured and outcrops are poorly exposed due to extensive forest cover. A talus slope, located 100 feet northeast of Hole 3, contains some massive sphalerite occurring as float. Minor amounts of FeS_2 are also found here.

Cascade Showing: Weak sphalerite and traces of galena occur in fine to coarse breccia 200 feet downstream from a prominent cascade on Mississippi Creek. The poorly exposed outcrops are heavily fractured and contain traces of FeS_2 and pyrobitumen. A prominent north trending monoclinal fold crosses the creek at this point.

SURFACE ROCK-CHIP SAMPLING: None.

DRILLING: DDH 3, 4, 6, 19, 20, 28 and 29.
The best results are summarized as follows:

Drill Hole #	Depth From - To	Length	Est. of True Thickness	% Zn-Pb
19	577.5'-587.5'	10.0'	10'	15.0
19	645.3'-660.5'	15.2'	15'	5.0
19	686.0'-700.0'	14.0'	14'	4.3
19	757.2'-765.3'	8.1'	8'	15.2
28	443.8'-453.1'	9.3'	9'	8.5
29	numerous short 1 to 2' sections averaging 1 to 11.4%			

INTERPRETATION: Drill hole 3 intersected breccia with very weak traces of mineralization, but a shear zone was encountered and the hole was terminated at a depth of 277 feet. Similar low-grade results were obtained from Hole 4; however, the shear zone was penetrated and the hole was

MINERALIZATION - Zinc-Lead Occurrences
Downstream and Cascade Showings (cont'd)

completed to a depth of 786 feet. The exact attitude of the fault is uncertain, but it is believed to be trending northwest and dipping steeply toward the west. The breccia has an indicated thickness of over 400 feet at this location; however, some of the section may be repeated due to faulting. In any case, the breccia is at least 300 feet thick.

The breccia host unit appears to be thinning toward the south as indicated by Hole 20 which encountered 130 feet of breccia with scattered low-grade mineralization. Toward the northwest this same unit maintains a thickness of at least 200 feet as indicated by Holes 6, 19, 28 and 29. The mineralized sections in Holes 19, 28 and 29 also indicate a significant increase in grade toward the south of the Cascade Showing and to the west of the Downstream Showing. Proceeding northwest from the Downstream Showing, the breccia cuts down section through the Unit B - Unit C contact and occurs in the suboutcrop between Holes 3, 4, 6, 28 and 29. Undoubtedly some of it has been removed by erosion.

Although the drilling indicates only low-grade mineralization in the vicinity of the surface showings (Holes 3, 4 and 6), the results in Holes 19, 28 and 29 are quite encouraging. Additional exploration in this area and further to the southwest is warranted.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

TALIS MOUNTAIN

(See Figure 10)

LOCATION: 73,500N, 67,000E ELEVATION: 6,700'

MINERALIZATION: Weak sphalerite and galena occur in well exposed outcrops of fine to medium breccia near the summit of Talis Mountain. No significant concentrations of high-grade mineralization were observed, but the weak mineralization is quite abundant. The breccia is rather poorly developed and occurs primarily as local pockets and thin partially brecciated interbeds containing white secondary dolomite and calcite matrix. Some mineralization was also found in thin dolomite-filled fractures. Traces of FeS_2 were noted in several places.

SURFACE ROCK-CHIP SAMPLING: None.

DRILLING: None.

INTERPRETATION: Although the surface showings are not particularly impressive, the area deserves some attention. Because of the relatively high stratigraphic position (Unit B), consideration should be given to the possibility of more favourable horizons at depth (Unit C). In addition, the lower forest covered southwest side of the mountain has not been adequately prospected and widespread geochemical response is indicated by the soil sampling.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

CANYON SHOWING

(See Figure 11)

LOCATION: 76,750N, 54,750E ELEVATION: 5,425'

MINERALIZATION: Weak to locally moderate sphalerite and minor galena are found in outcrops along Mississippi Creek, 1,700 feet upstream from the 1972 base camp. The mineralization occurs in medium to coarse breccia and in fractures with secondary dolomite. Abundant FeS_2 and pyrobitumen are found in the vicinity of the showings.

SURFACE ROCK-CHIP SAMPLING: None.

DRILLING: DDH 15 - No mineralized intersections.

DDH 16 - Numerous short 1 to 2 foot sections averaging 1-6% Zn-Pb.

INTERPRETATION: The breccia host unit has an indicated thickness of approximately 250 feet near Hole 16, and thins toward Hole 15 to the northwest. This showing can be correlated reasonably well with the nearby Camp Showing which is at the same stratigraphic level. The results from Hole 16 are not spectacular, but additional drilling to the south and southwest should be considered.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

TENNESSEE MOUNTAIN

(See Figure 12)

LOCATION: 78,700N, 59,400E ELEVATION: 6,600'

MINERALIZATION: Scattered weak galena mineralization is found on a wide plateau near the top of Tennessee Mountain. The mineralization occurs in local breccia and fractures and is accompanied by heavily weathered traces of sphalerite and FeS_2. The mineralized horizon is well exposed along a northwest trend for 700 feet.

SURFACE ROCK-CHIP SAMPLING: None.

DRILLING: None.

INTERPRETATION: The exposed showings have very little potential. However, because of the high stratigraphic position (Unit B), the area is of interest since more favourable horizons (Unit C) are present at depth in the core of the anticline.

An IP test line was run across the plateau and produced no response. Deep drilling will be required to explore the area.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

ED SHOWING

(See Figure 13)

LOCATION: 86,497N, 44,857E ELEVATION: 7,470'

MINERALIZATION: Strong sphalerite with moderate galena are found in breccia on the west side of Pine Point Mountain. The breccia host rocks are mostly medium textured with a considerable amount of quartz and black argillaceous matrix. Individual sphalerite grains are quite irregular and appear to be fragmental. This texture is quite different from that observed at most of the other showings, with the possible exception of the North Face Showing. The best mineralization occurs within an area measuring 150 feet by 40 feet, but traces of weak mineralization can be followed for an additional 300 feet to the northeast.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	18'	12'	15.36

DRILLING: None.

INTERPRETATION: This showing is very impressive. Trenching exposed a heavily mineralized breccia having a thickness of at least 12 to 15 feet. The base of the structure was not exposed and there is reason to believe that the unit may have an even greater thickness beneath the talus.

The assay results are encouraging and include several 2 to 4 foot sections averaging 20 to 30% Zn-Pb. Additional detailed mapping, trenching, prospecting and drilling will be required to evaluate the area and determine the trend of the mineralized body.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

JED SHOWING

(See Figure 14)

LOCATION: 90,244N, 40,790E ELEVATION: 6,519'

MINERALIZATION: Weak to locally moderate sphalerite with some galena occurs in medium breccia exposed in a steep narrow gully located approximately 0.5 miles northwest of Pine Point Mountain. Most of the mineralization is found within an area measuring roughly 100 feet by 100 feet. The breccia occurs in irregular pockets and is not as well developed as in other localities. The matrix consists of white secondary dolomite and a considerable amount of post-mineralization calcite. There are some 1/4 inch veinlets of sphalerite and galena in fractures in the surrounding nonbrecciated dolostone and abundant traces of FeS_2. There is a notable absence of zebra rock at this location.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	86'	24'	5.5

DRILLING: None.

INTERPRETATION: Much of the area in the vicinity of the showing is covered by talus and the trend of the mineralized unit is unknown. The assay results appear to be somewhat higher than visual estimates of grade. The showing is not very impressive; however, the area has not been completely prospected.

MINERALIZATION - Zinc-Lead Occurrences
Jed Showing (cont'd)

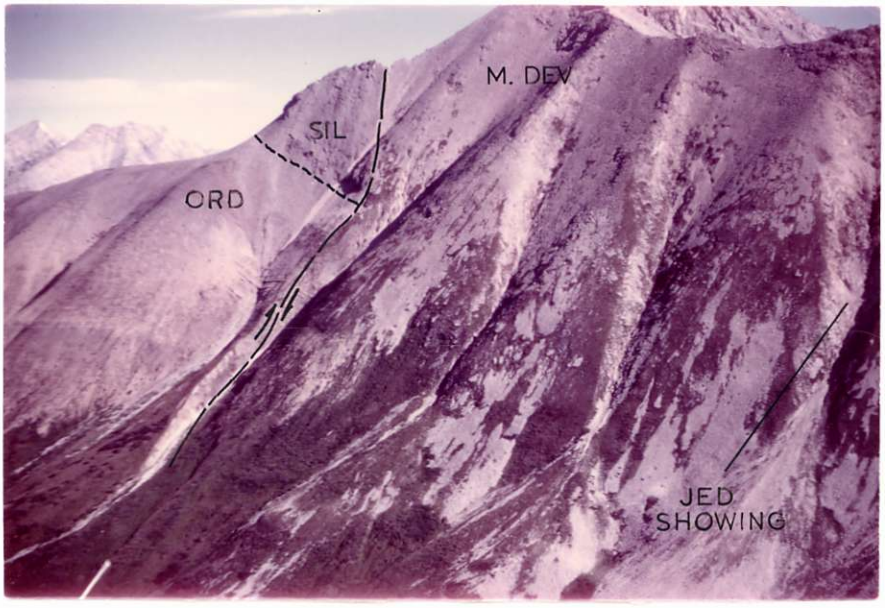


Photo No.18 Middle Devonian truncated by Silurian-Ordovician at the Jed Showing.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

SHEEP CREEK SHOWING

(See Figure 15)

LOCATION: 75,600N, 62,500E ELEVATION: 5,700'

MINERALIZATION: Weak sphalerite with traces of galena are found in outcrops along Sheep Creek. The mineralization occurs in irregular 1 to 3 inch fractures filled with white secondary dolomite and minor amounts of breccia. Traces of what appears to be indigenous sphalerite and FeS_2 were noted in a dark grey to black, thin bedded, fine crystalline sandy dolostone unit which occurs in the vicinity of the showing. The mineralization is limited to an area measuring 100 feet by 50 feet, but much of the surrounding area is covered.

SURFACE ROCK-CHIP SAMPLING: None.

DRILLING: None.

INTERPRETATION: The showing is quite small but is of interest because of its stratigraphic position (Unit A). The mineralization may be due to locally remobilized zinc derived from a nearby source bed. This is probably the same bed which was encountered in the top of Hole 23. The occurrence of possible primary mineralization has broad genetic implications and the area should be studied in more detail. Also, more favourable horizons are present at depth. A prepared drill site is located 200 feet east of the showing.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

MONOCLINE SHOWING

(See Figure 16)

LOCATION: 77,600N, 60,350E ELEVATION: 5,850'

MINERALIZATION: A small quantity of moderate sphalerite is found in well exposed outcrops on the southwest side of Tennessee Mountain. The mineralization occurs in the base of a comformable breccia bed which has a thickness of six feet. The matrix includes white secondary dolomite and, near the base, black argillaceous matrix. Traces of FeS_2 and pyrobitumen were noted.

SURFACE ROCK-CHIP SAMPLING:

Trench	Length	Estimated True Thickness	% Zn-Pb
1	2'	2'	5.28

DRILLING: None.

INTERPRETATION: The showing is believed to have very little potential, however, because of the relatively high stratigraphic position (Unit B), the possibility of mineralization in more favourable horizons (Unit C) beneath Tennessee Mountain should be considered.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

MISSISSIPPI CREEK

DDH 21, 22, 23

(not mapped on 1"=100' scale)

LOCATION: 71,401N, 63,511E ELEVATION: 4,597.7'

MINERALIZATION: A small amount of moderate mineralization was uncovered by trenching a strong lead-zinc anomaly (14,400 ppm Zn) located in a forested area on the southwest bank of Mississippi Creek. Heavily weathered sphalerite and galena with secondary calcite were found in a black dolostone bed.

SURFACE ROCK-CHIP SAMPLING:

None. The trench (3' x 3') was considered too small to give a representative sample.

DRILLING: DDH 21, 22, 23.

INTERPRETATION: Drill Hole 23 was located close to the prospect trench and collared in the mineralized bed. The core shows a black sandy highly calcareous dolostone bed containing what appears to be indigeneous sphalerite. The top 7 feet of the drill hole assayed 1.39% Zn but the remainder of the hole was barren. This is a possible source bed and is discussed further under "Notes on Genesis".

Drill Hole 22, located 700 feet northwest of Hole 23, contained only a trace of low-grade mineralization at a depth of 130 to 135 feet, and Hole 21 was essentially barren.

None of the three drill holes intersected a breccia unit. However, it should be noted that since all of these holes collared in Unit A, or near the top of Unit B, that the favoured stratigraphic intervals were not reached. Deeper drilling will be required to properly test this area.

MINERALIZATION - Zinc-Lead Occurrences (cont'd)

HALFWAY RIVER

DDH 24, 25

(not mapped on 1"=100' scale)

LOCATION: 66,829N, 69,835E ELEVATION: 4,361.5'

MINERALIZATION: Scattered traces of sphalerite were noted in extensive breccia outcrops along the Halfway River near the East Faults. However, except for the river banks, most of the area is covered by alluvium and dense forest.

SURFACE ROCK-CHIP SAMPLING: None.

DRILLING: DDH 24, 25.

INTERPRETATION: The drilling results indicate that the breccia occurring in this area is at least 200, and possibly greater than 300 feet in thickness. However, only very weak traces of mineralization were encountered. Hole 25 drilled through a thrust fault and into the Besa Shale.

Although the results from these holes are not encouraging, the area is not yet adequately tested. Nearby geochemical anomalies occur on the north side of the river.

GEOCHEMISTRY

SAMPLING

A total of 1,333 soil samples were collected in the Halfway River Valley and analyzed for zinc and lead. This method was used in an attempt to establish geochemical targets for further exploration in an area underlain by Middle Devonian carbonate rocks covered by thick vegetation. Where possible, samples were taken from the B horizon at 200 foot intervals along lines 400 feet apart (56 line miles). The samples were dried and sieved to -80 mesh and analyzed using atomic absorption techniques. The results are shown on Plates 10 and 11.

In addition to the grid described above, three test lines were sampled previously to determine the feasibility of using geochemical methods in the area. The first line (182 samples, slide fines) tested the base of extensive talus slopes along the south bank of Mississippi Creek. The samples were taken at an average depth of 3 to 5 inches. The two additional test lines (89 soil samples) were located near the

GEOCHEMISTRY - Sampling (cont'd)

Halfway River. All of these results are included on Plates 10 and 11.

Three test pits illustrated on the following page were dug and the various soil horizons sampled to establish sampling procedures. The soils are typically mountain podzols with well developed A, B and C horizons. In one pit, distinct B_1 and B_2 horizons were also observed. Test Pit #1, located in an anomalous area near drill hole 29, shows that zinc is definitely enriched in the B horizon. The results from the other pits, located in non anomalous areas, are somewhat erratic. Test Pit #3 suggests that in areas underlain by Besa Shale the A horizon is enriched in zinc. In all cases lead and cadmium values increase with depth.

The following statistical methods were used to analyze the data: the normal background for each element was determined as the arithmetic average (mean) in parts per million. The threshold value was taken as the background plus two standard deviations*. The anomalous level was calculated as the background plus three standard deviations, and any value exceeding the background plus five standard deviations was considered to be

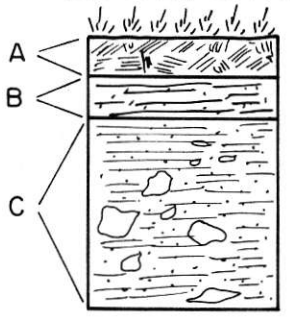
*The standard deviation, $s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n - 1}}$
where n = number of samples,
and the arithmetic mean $\bar{x} = \frac{x_1 + x_2 + x_3 + \ldots . xi}{n}$

SOIL PROFILES

TEST PIT 1

(L644E, 686N)

WELL DEVELOPED PROFILE LOCATED IN ANOMALOUS AREA UNDERLAIN BY MIDDLE DEVONIAN.



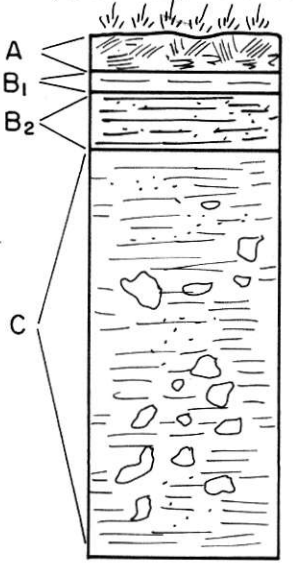
GEOCHEMICAL ANALYSES (ppm)

Pb	Zn	Cr	Cd
66	228	13	2·3
104	460	20	2·2
265	335	12	3·8

TEST PIT 2

(L644E, 686N)

WELL DEVELOPED PROFILE LOCATED IN AREA UNDERLAIN BY MIDDLE DEVONIAN.

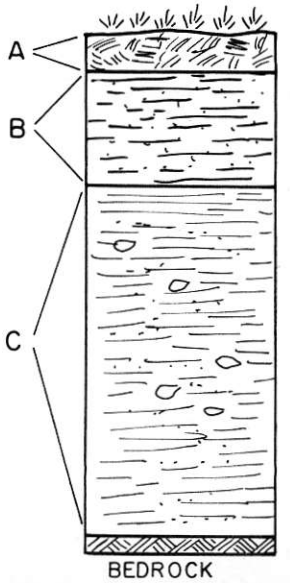


Pb	Zn	Cr	Cd
6	35	6	1·2
4	12	ND	0·3
16	40	11	1·0
43	72	27	1·8
60	38	8	3·7

TEST PIT 3

(L644E, 686N)

WELL DEVELOPED PROFILE LOCATED IN AREA UNDERLAIN BY BESA RIVER SHALE.



Pb	Zn	Cr	Cd
31	280	11	1·8
54	200	24	1·9
72	156	22	2·9
73	100	9	3·8
74	120	8	3·8
82	149	8	4·0

VERTICAL SCALE:
1" = 10"

GEOCHEMISTRY - Sampling (cont'd)

strongly anomalous. Because of the large anomalous population of data (see Frequency Distribution) high values were not included in the initial standard deviation calculation. The final results (Plates 10 and 11) have been contoured to provide a more graphic interpretation of the data.

Zn

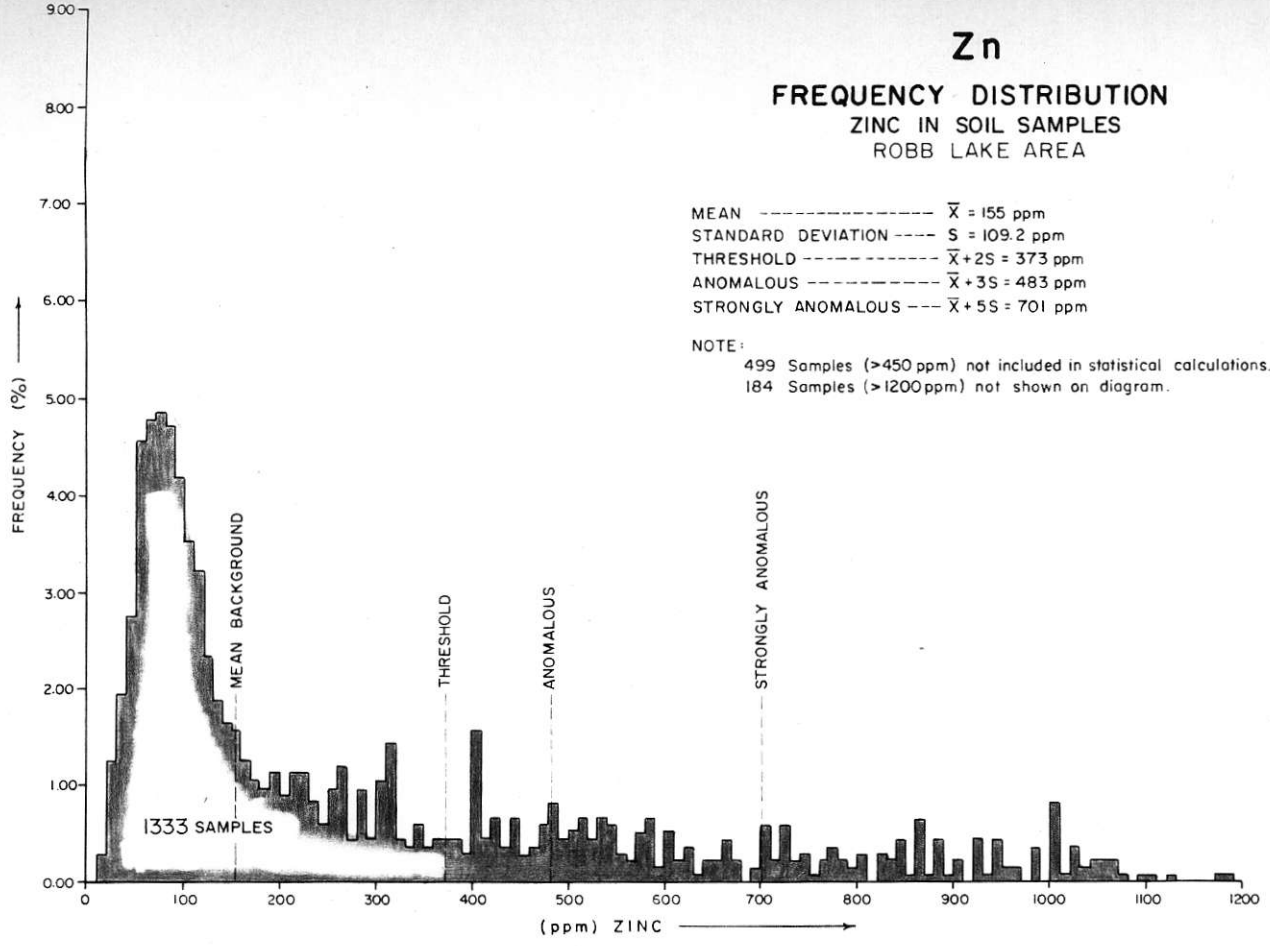
FREQUENCY DISTRIBUTION

ZINC IN SOIL SAMPLES

ROBB LAKE AREA

MEAN ---------- $\bar{X}$ = 155 ppm
STANDARD DEVIATION ---- S = 109.2 ppm
THRESHOLD ---------- $\bar{X}$ + 2S = 373 ppm
ANOMALOUS ---------- $\bar{X}$ + 3S = 483 ppm
STRONGLY ANOMALOUS --- $\bar{X}$ + 5S = 701 ppm

NOTE:
499 Samples (>450 ppm) not included in statistical calculations.
184 Samples (>1200 ppm) not shown on diagram.



Pb

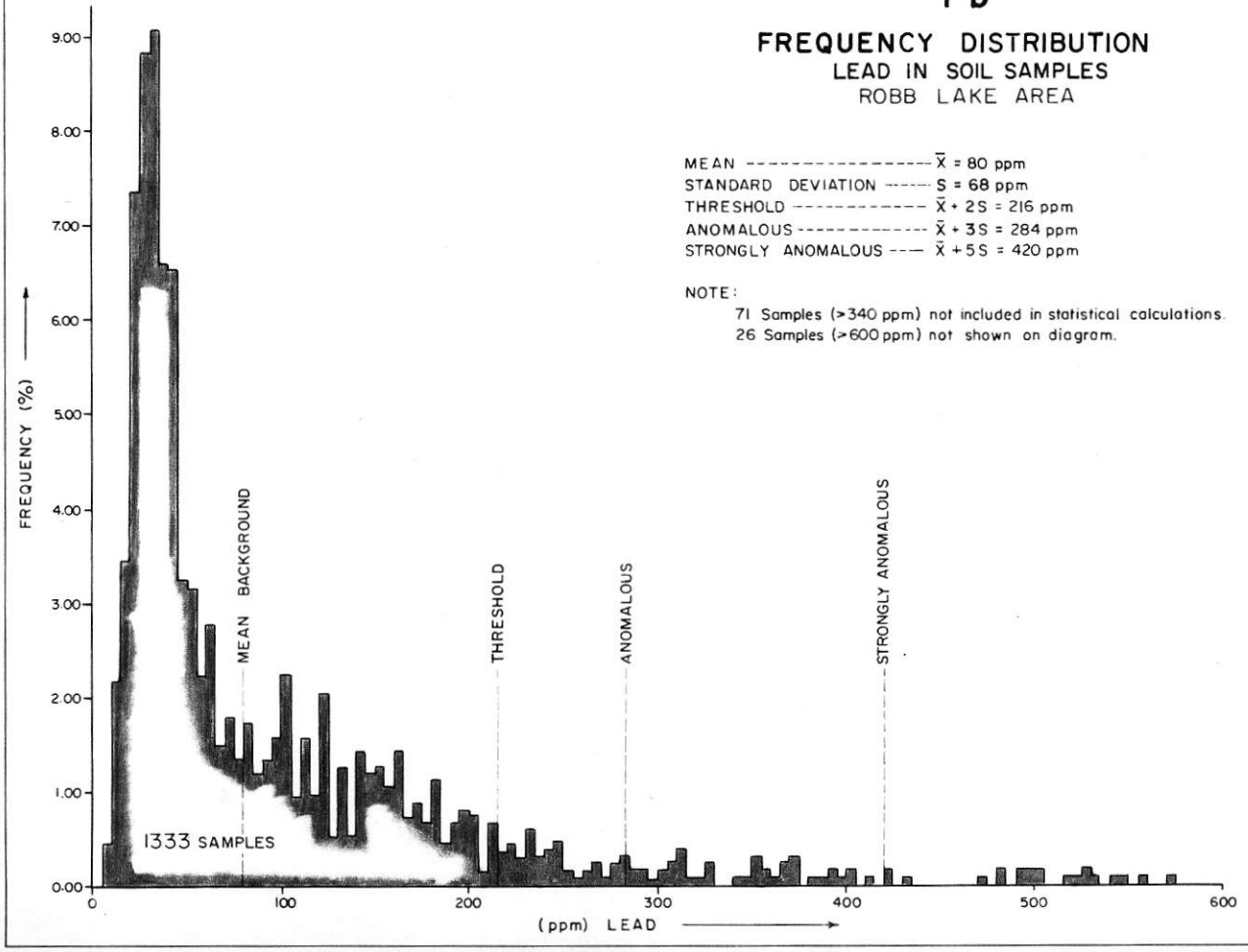
FREQUENCY DISTRIBUTION

LEAD IN SOIL SAMPLES

ROBB LAKE AREA

MEAN ---------- $\bar{X}$ = 80 ppm
STANDARD DEVIATION ----- S = 68 ppm
THRESHOLD ---------- $\bar{X}$ + 2S = 216 ppm
ANOMALOUS ---------- $\bar{X}$ + 3S = 284 ppm
STRONGLY ANOMALOUS --- $\bar{X}$ + 5S = 420 ppm

NOTE:
71 Samples (>340 ppm) not included in statistical calculations.
26 Samples (>600 ppm) not shown on diagram.



GEOCHEMISTRY (cont'd)

ANOMALIES

The anomalies have been subdivided or grouped into seven areas for discussion purposes (see Plates 10 and 11). The geochemical response is quite high for both zinc and lead, with zinc showing somewhat more widespread distribution. The soil sample anomaly distribution for the grid (excluding the three test lines) is as follows:

Total samples anomalous in zinc	32.8%
Total samples anomalous in lead	6.9%
Zinc anomalies confirmed by anomalous lead ...	18.3%
Lead anomalies confirmed by anomalous zinc ...	87.0%

Mechanical and chemical migration, and secondary concentration in swamps is evident and has been taken into consideration. Several significant areas of interest are recognized and warrant follow-up work. It is important to note that the absence of a geochemical anomaly does not necessarily eliminate or even reduce the potential of any given area since mineralization is found over such a wide stratigraphic interval. Significant deposits could exist at depth beneath

GEOCHEMISTRY - Anomalies (cont'd)

geochemically "dead" areas. This is particularly true in the valley of the Halfway River where the Middle Devonian carbonate strata are characterized by relatively low dips.

AREA 1

The anomaly in this area is related to extensive mineralization (Lower Showing). However, at the sample locations the overburden depth is about 50 feet as indicated by the diamond drill holes. As a result of this the anomaly is relatively weak.

AREA 2

The high zinc and lead values along 1,500 feet of test line are believed to be caused by downslope movement of abundant mineralization at the Webb Showing located roughly 500 to 600 feet south of the test line. Many massive sphalerite boulders were found in the talus slopes below the showing.

AREA 3

Two known showings occur within this area and can be correlated with the geochemical results. The Monocline Showing, located on the north edge of the area, is a possible source for much of the widespread zinc dispersion. The Cascade Showing is roughly coincident with a geochemical high at the west edge of the area. Two additional peaks are recognized on the north side

GEOCHEMISTRY - Anomalies (cont'd)

of Mississippi Creek and, together with the Cascade Showing high, fall along a northwest-southeast trend. These two peaks occur in a forest-covered area which is underlain by a very favourable stratigraphic horizon (Upper part of Unit C) and should be considered as possible drill targets. The southeast trend suggests that this may be the surface outcrop of the mineralized breccia that was encountered in the drill holes south of Mississippi Creek (DDH 6, 19, 28 and 29).

AREA 4

The rather erratic zinc and lead anomalies do not indicate a definite target; however, there is at least 20 to 50 feet of overburden cover. Drill holes 6, 19 and 28 indicate that mineralization occurs at depth and that this is an area of prime interest.

AREA 5

This includes anomalies which are underlain by Middle Devonian rocks (Unit A). Minor mineralization occurs in black calcareous dolostone at this stratigraphic level and is found in outcrops at the Sheep Creek Showing, located on the north edge of Area 5, and also in drill hole 23 near the south end of the area. The extensive zinc anomaly in the vicinity of hole 23 may be resulting from local remobilization and concentration of zinc derived from this dolostone source bed. A swamp is found within the anomaly, but the area cannot be discounted because mineralization was discovered by trenching part of the anomaly

GEOCHEMISTRY - Anomalies (cont'd)

near drill hole 23.

The high stratigraphic position of the anomaly is not encouraging, since the known mineralization at this level is very limited; however, upward migration along fractures or "leakage" of metal from more favourable horizons at depth (Unit C) cannot be ruled out.

AREA 6

This area is located near the Downstream Showing and is probably, in part, due to dispersion from this source. In addition, Sheep Creek enters Mississippi Creek just upstream from the anomaly and is probably contributing alluvium containing zinc and lead. However, the anomalous sample locations should be prospected.

AREA 7

Strong zinc and lead anomalies occur at the south end of Talis Mountain. The widespread high zinc values suggest that mechanical dispersion from the Talis Mountain Showing is a possible source; however, the unusually high zinc values and coincident high lead values may be associated with a more local source. Much of the area is underlain by favourable Middle Devonian carbonate rocks and is forest covered.

The east and west side of the area are underlain by the Besa River Shale. Anomalies occurring here may be the result

GEOCHEMISTRY - Anomalies (cont'd)

of downslope movement of zinc and lead bearing colluvium from the Middle Devonian carbonates on top of the Besa. This is suggested by the coincidence of zinc and lead. Analyses indicate that the black shale beds in the Lower Besa contain anomalous zinc but a notable absence of lead. Thus, an anomaly in both zinc and lead or only lead, would probably be related to the Middle Devonian carbonates rather than the Besa Shale. A strong lead anomaly with moderate zinc is recognized at the east edge of Area 7 and should be checked out.

A strong zinc anomaly, found in the southwest part of Area 7, occurs on the Besa in the vicinity of a swamp. This anomaly is possibly due to a shale source, but should be investigated by prospecting since the values are quite high (up to 20,000 ppm Zn) and the area is forest covered.

AREA 8

The anomalies in this area are somewhat isolated, but are of interest since they occur in a heavily forested area underlain by favourable Middle Devonian rocks (Unit B). The overburden depth is believed to be shallow, especially at the north end of the area, and trenching may reveal the origin of the anomalies. In addition, the area has not been drilled and the geochemical peaks are obvious targets.

AREA 9

A large part of this area is covered by poorly drained swampy regions which show high zinc (up to 47,500 ppm)

GEOCHEMISTRY - Anomalies (cont'd)

and part of the anomaly is undoubtedly due to secondary concentration of zinc in organic matter. Numerous small springs feed the swamp and ground water seepage is one possible source of the zinc. An interesting lead anomaly, roughly coincident with a larger zinc anomaly, is recognized at the north edge of the area. The region is underlain by favourable Middle Devonian rocks (Unit A and B) and, pending prospecting and trenching drilling targets could be developed.

AREA 10

Several zinc and lead anomalies occur just north of the Halfway River near drill holes 24 and 25. The anomalies are rather irregular but are underlain by Middle Devonian carbonate rocks and should be prospected and trenched prior to drilling. Traces of mineralized breccia were observed in outcrops along the Halfway River.

GEOCHEMISTRY (cont'd)

Regional Orientation Survey

A geochemical orientation programme was conducted by Dr. Paul B. Trost (Texas Gulf) during early July. The purpose of this study was to determine which trace elements would be best suited for stream sediment sampling and also examine the geochemical influence of black shale beds. Dr. Trost's complete report is contained in Appendix "E".

The following conclusions were made:

1. Very little of the mechanical and chemical weathered metals from the sulphides is presently entering the stream waters.

2. The high aqueous mobility of zinc is also well reflected by its high mobility in the stream sediment samples.

3. All samples should be analyzed for zinc, lead and chromium, with "guess-timated" thresholds of zinc 250 ppm, lead 50 ppm. A chromium content in excess of 80 ppm is most likely indicative of a shale influence.

4. The trace element contents of the lower and middle Besa Shale appear fairly low, as compared to most other shales and, therefore, should not adversely affect the interpretation of stream sediment anomalies.

GEOCHEMISTRY
Regional Orientation Survey (cont'd)

5. There were not sufficient iron or manganese oxides present in the stream sediment to necessitate any correction for these two elements.

6. Soil sampling of the stream banks in areas of anomalies should be conducted in the follow-up programme during the assessment of all stream sediment anomalies. Such soil bank sampling in the Mississippi Creek area proved extremely useful in delineating which bank was contributing to the stream sediment anomaly. The interpretation of the stream sediments did not appear to be unduly affected by the screen size analyzed. Thus, analysis of the -80 mesh appears reasonable for all work.

Subsequent to the orientation programme, additional rock-chip samples of the Besa River Shale were collected by Cordilleran personnel and analyzed for zinc, lead, chromium and cadmium. The following results indicate that the black argillaceous limestone beds, oocurring in the lowermost part of the Besa, contain high concentrations of zinc and cadmium, as well as chromium. The genetic implications of this are discussed in a subsequent part of this report.

ROCK-CHIP SAMPLES - BESA RIVER SHALE

Sample No.	Zn ppm	Pb ppm	Cr ppm	Cd ppm	Lithologic Description	Stratigraphic Position	Location
1	45	30	29	2.8	dk grey, very thin-bedded calcareous shale	Lower Besa	Sheep Creek
2	38	38	17	2.8	dark brown, thinly laminated calcareous shale	Lower Besa	Sheep Creek
3	255	10	20	1.0	black, thinly laminated calcareous shale	Approx. 15' above basal contact	Sheep Creek
4	36	36	29	3.0	black, thinly laminated argillaceous limestone	Approx. 12' above basal contact	Sheep Creek
5	3300	24	39	100.0	black, very thin-bedded argillaceous limestone	Approx. 10' above basal contact	Sheep Creek
6	2450	21	70	81.0	black, thin-bedded argillaceous limestone with FeS_2	Approx. 5' above basal contact	Sheep Creek
7	20	49	22	5.0	black, thin-bedded argillaceous limestone	Approx. 3' above basal contact	Sheep Creek
8	81	30	37	2.5	light tan, thinly laminated calcareous phyllitic shale	Middle Besa	2000' SW of Base Camp
9	75	28	89	2.2	light tan, thinly laminated calcareous phyllitic shale	Middle Besa	2000' SW of Base Camp
10	47	20	30	1.8	light tan, thinly laminated calcareous phyllitic shale	Middle Besa	2000' SW of Base Camp
11	57	29	27	2.6	light tan, thinly laminated calcareous shale	Middle Besa	East side of Talis Mountain
12	58	32	34	2.5	grey, calcareous phyllite	Middle Besa	S of Halfway River

GEOCHEMISTRY (cont'd)

MERCURY

A total of 10 soil samples and 10 rock samples of drill core were selected and analyzed to evaluate the possibility of using mercury as a "pathfinder" to locate zinc and lead mineralization. The unique vapour phase dispersion characteristics of mercury might allow recognition of anomalies in areas covered by glacial drift and alluvium such as the Halfway River Valley where the use of direct indicators, such as zinc and lead are somewhat limited.

The following results indicate a definite association with respect to mercury in both rock and soil samples. Background Hg in the soil samples ranges from about 20 to 35 ppb and anomalous values from 45 to 100 ppb. Heavily mineralized samples contain over 1000 ppb Hg. The contrast between background and anomalous response is quite sufficient to allow detection of anomalous areas. It is interesting to note that samples M-7, 8 and 9 were collected from an area having an overburden thickness of about 50 feet. There is presently insufficient data to determine the exact mode of occurrence of the Hg in the samples. In addition to vapour dispersion,

GEOCHEMISTRY - Mercury (cont'd)

Hg commonly occurs as a soluble chloride complex which could possibly account for some of the high values. Stream sediments at the mouth of Mississippi Creek contain 54 ppb Hg as opposed to 32 ppb at Robb Lake and various points along the Halfway River. In any case, this method should definitely be given further consideration.

Mercury Analyses

Drill Core Intersections Containing Strong Zn-Pb Mineralization

Sample No.	Drill Hole No.	Depth From - To	Hg ppb
7123	1	270.0' - 280.0'	550
7139	2	500.0' - 510.0'	1100
7163	6	175.5' - 177.9'	450
7233	9	337.0' - 344.2'	1300
7242	13	128.0' - 135.2'	1100
7274	16	160.5' - 162.0'	1800
7280	19	577.5' - 580.0'	1500
7347	26	294.0' - 298.2'	650
7380	28	445.8' - 451.6'	500
7409	29	93.0' - 94.1'	1000

GEOCHEMISTRY - Mercury (cont'd)

SOIL SAMPLES - B HORIZON

Sample No.	Zn ppm	Pb ppm	Hg ppb	Location
544E-690N	52	39	40	Background area - no mineralization
552E-698N	77	32	20	Background area - no mineralization
552E-704N	78	33	30	Background area - no mineralization
556E-706N	90	31	30	Background area - no mineralization
584E-720N	6500	40	50	Anomalous area - S of Webb Ridge
608E-738N	2950	71	100	Anomalous area, Mississippi Creek
636E-716N	3000	1040	100	Anomalous area near DDH #23
M-7	940	120	60	Anomalous area near DDH 1 and 2 Overburden thickness = 50 feet
M-8	620	92	50	Anomalous area near DDH 1 and 2 Overburden thickness = 50 feet
M-9	770	123	40	Anomalous area near DDH 1 and 2 Overburden thickness = 50 feet

STREAM SEDIMENT SAMPLES

(See Environmental Geochemical Sampling)

GEOCHEMISTRY (cont'd)

Environmental Survey

One fish flesh, one fish liver, 7 stream sediments and 8 water samples were collected and analyzed to determine the natural trace element concentrations prior to any possible contamination. The results, which are contained in Appendix "H" indicate that the metal content of the stream water at all sampled locations is well within acceptable limits for human consumption. The fish samples contained traces of mercury (0.31 to 0.25 ppm), however, this is still below the maximum acceptable level of 0.5 ppm as set out by the Provincial Government.

GEOPHYSICS

An induced polarization test survey was carried out by Texas Gulf, Inc. (Appendix "F"). About 10,000 feet of IP traverses were run, parallel to and normal to the strike of the mineralized beds. The object of the test was to determine the chargeability response of selected mineralized zones.

Clearly defined anomalies with peaks of two to four times background and corresponding resistivity lows were obtained in the "Lower" and "Downstream" areas. Subsequent drilling within the anomalies (holes 1, 2, 3, 4, 9 and 13) indicated that they were produced by zones 40' to 80' thick, containing 5% or more FeS_2, associated with sphalerite and galena about 100 feet below the surface.

There is no geological evidence in outcrop or drill core to suggest that anything other than FeS_2 (and to a minor extent galena) is the source of anomalous IP response. The association of iron sulphides with sphalerite and galena

GEOPHYSICS (cont'd)

is sufficiently persistent to make effective use of IP as a shallow exploration tool.

Seismic profiles, also run by Texas Gulf, Inc., indicate overburden depths of 90 feet beneath the alluvial fan west of Mississippi Creek at 5,550 feet A.S.L. and 25 to 40 feet in the Halfway River Valley.

NOTES ON GENESIS

In recent years many theories have been proposed regarding the origin of zinc-lead deposits in carbonate rocks. Classification systems based on various type-occurrences, such as Mississippi Valley, East Tennessee, Pine Point, etc., have been utilized and several "models" have been devised to explain similarities between the various deposits. While it is beyond the scope of this report to review all the contemporary ideas and relate them specifically to the Robb Lake occurrence, it is appropriate, however, to examine features which suggest a possible origin for the mineralization.

The basic concepts of sedimentary basin evolution are well known to petroleum geologists and, more recently, to those engaged in base metal exploration. Beales and Jackson (1967), have summarized much of the current thinking on the subject as it relates to zinc-lead deposits, and this work provides a good "jumping off point". At the risk of exposing personal prejudice, the following discussion is included in an attempt to explain observed features (Robb Lake) and,

NOTES ON GENESIS (cont'd)

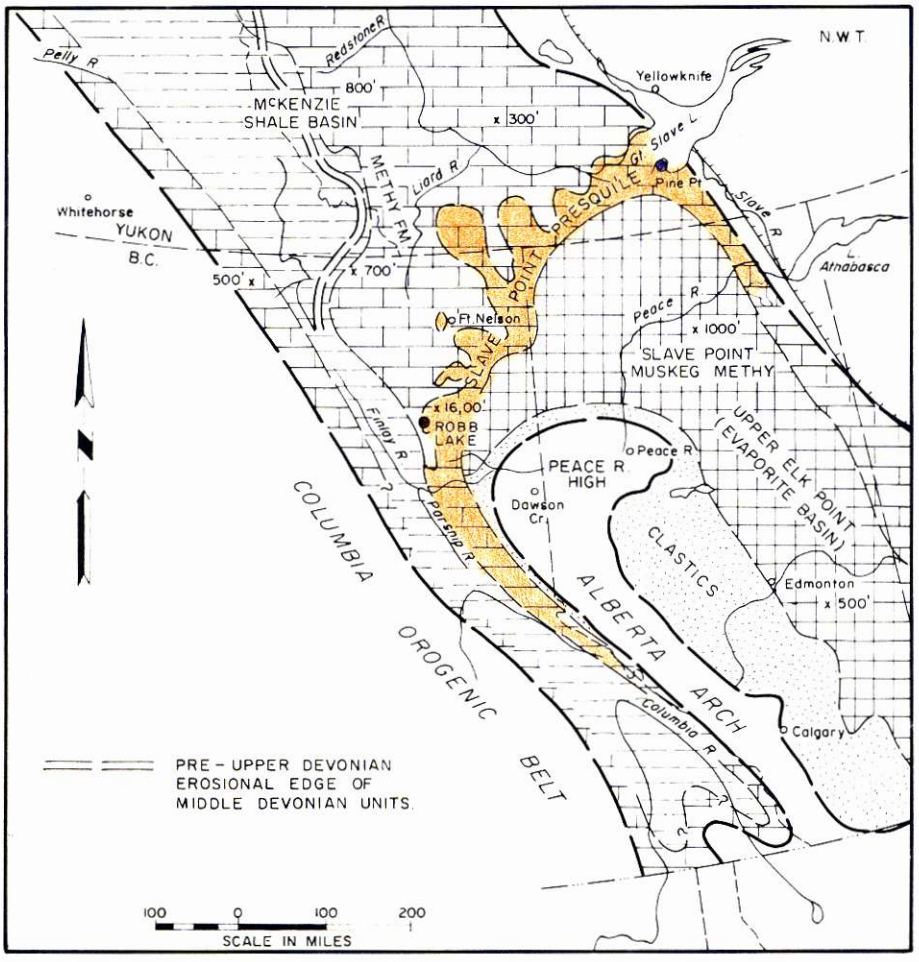
hopefully provide a rough framework within which future ideas can be developed. Because of the preliminary nature of the present work, sound evidence is presently insufficient or, at best, rather crude.

The Devonian history of northeastern British Columbia can be summarized as a gradual marine transgression which reached a maximum during the Late Devonian and was terminated by uplift and erosion at the end of the Devonian. A thick sequence of marine shales and carbonates accumulated in rapidly subsiding areas toward the west (McKenzie Shale Basin) and shallow-water carbonates and evaporites were deposited in a more restricted environment on the stable platform areas toward the east (Elk Point Evaporite Basin). During the Middle Devonian, an elongate "reefal" sequence (Presqu'ile Formation) formed a barrier or supratidal shoal between the evaporite basin and the shale basin. The following paleogeographic map, illustrates the regional relationships. [For detailed background information on the Devonian stratigraphy and history the reader should refer to studies by Taylor, et.al. (1970) and the International Symposium on the Devonian (1967)].

The Pine Point deposits occur mainly within the Presqu'ile Formation and, to a lesser extent, in the underlying

PALEOGEOGRAPHIC MAP

(MIDDLE DEVONIAN)



MOD. A.S.P.G. 1969

NOTES ON GENESIS (cont'd)

Pine Point Formation. The Presqu'ile "reef" was characterized by high permeability and formed a paleoaquifer which served as a natural "plumbing system" for metal-rich connate waters expelled from shale source beds in the subsiding basin. In the marine environment, metallic cations were precipitated as sulphides, or adsorbed on, and absorbed in, accumulating sediments. Appropriate burial with associated compaction released metals to the connate fluids by desorption, by cation exchange in clays, and by recrystallization of carbonates and clays during diagenesis.

The metal was probably transported by a soluble chloride complex in Na-Ca-Cl brines moving through porous and permeable zones. The ore solutions are believed to have mixed with sulphide-bearing fluids derived locally and precipitated the orebodies. (Beales and Jackson, 1967). A similar mechanism is visualized as the ore-forming process at Robb Lake.

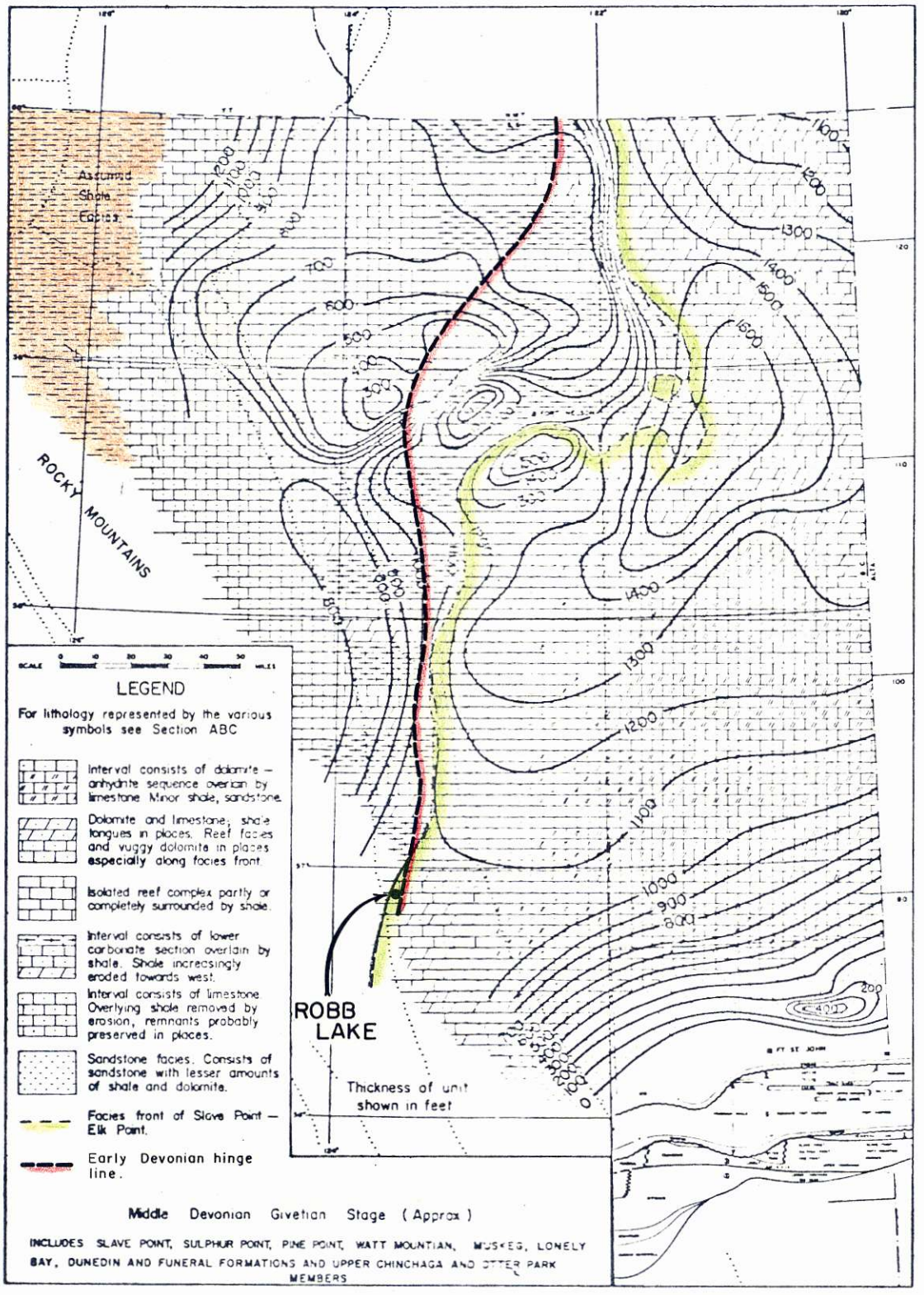
Pine Point and Robb Lake are located in a similar paleogeographic setting near the hinge line of the sedimentary basin. The two areas are separated by a distance of some 400 miles, however, rough stratigraphic correlations can be made. The Elk Point - Slave Point facies front is located

NOTES ON GENESIS (cont'd)

near Robb Lake and closely approximates the basin hinge line (Griffin, 1967). This relationship is illustrated on the enclosed isopach-lithofacies map. It is interesting to note that the shale-out is probably located much farther toward the west. Whether Units A or B at Robb Lake are actually Presqu'ile equivalent is uncertain. In any case, the mineralization at Robb Lake shows a wide stratigraphic distribution and appears to be in a somewhat earlier time-stratigraphic unit than the Pine Point deposits.

The Besa River Shale represents an on-lap facies equivalent to the Funeral Shale and is probably the source of the mineralizing fluids. The occurrence of metal-rich black argillaceous limestone and shale in the Lower Besa and black sandy calcareous dolostone in Unit A support this hypothesis. Beales and Jackson determined that "a five per cent compaction of 1,000 feet of sediment, over an area available for de-watering of 75,000 square miles, could supply enough water, at a metal concentration of only 10 ppm, to have a total metal content of 100 million tons". One possible alternative interpretation is that the metal-bearing black shales and black dolostone represent accumulations of eroded mineralization, however, there is very little evidence for a disconformity between Unit A and the Besa.

ISOPACH - LITHOFACIES MAP



INTERNATIONAL SYMPOSIUM ON THE DEVONIAN SYSTEM, 1967

NOTES ON GENESIS (cont'd)

The occurrence of possible primary sphalerite in limestone near the North Face Showing may also be significant. Although limited in extent, this may have been an additional source bed, depending on the areal distribution and over-all metal content.

The disconformities at the base of Unit A and at the base of Unit B are believed to be important factors in the formation of the solution-collapse breccias. Two possible cycles of breccia formation are suggested by the two major mineralized breccia horizons, each located beneath a disconformity. The primary solution openings probably developed during these periods of subareal exposure. Soluble limestone or evaporites may have played an important role in the initial stages of development. Gypsum and anhydrite were not observed at Robb Lake, but these minerals are known to occur in the Stone Formation to the north.

The occurrence of sulphates in the strata would have provided a convenient source for H_2S, a vital constituent in the ore-forming process. The sulphates, in the presence of hydrocarbons would support the growth of sulphate reducing bacteria and produce H_2S.

NOTES ON GENESIS (cont'd)

The complex process of solution, brecciation, and secondary dolomitization probably involved periodic refluxion of magnesium-rich brines and fresh water from the platform area to the east. However, it is interesting to note that the Peace River High was above sea level during most of the Devonian and, as a result, the paleoenvironment east of Robb Lake may not have been as restricted as in the Elk Point Basin.

In any event, the permeable breccia channelways were well established prior to mineralization. The major breccias are confined to the valley of Mississippi Creek and only minor local breccia occurs north of Texas Ridge. These units provided a relatively narrow "escape route" for mineralizing fluids expelled from the shale basin during the on-lap sequence. Mineralization most likely occurred during the Late Devonian, possibly contemporaneous with the deposition and diagenesis of Unit A and the Lower Besa.

There are many similarities between the zinc deposits, located in Eastern Tennessee and the occurrences at Robb Lake. These deposits occur in collapse breccias in carbonates of Lower Ordovician age that are believed to have developed

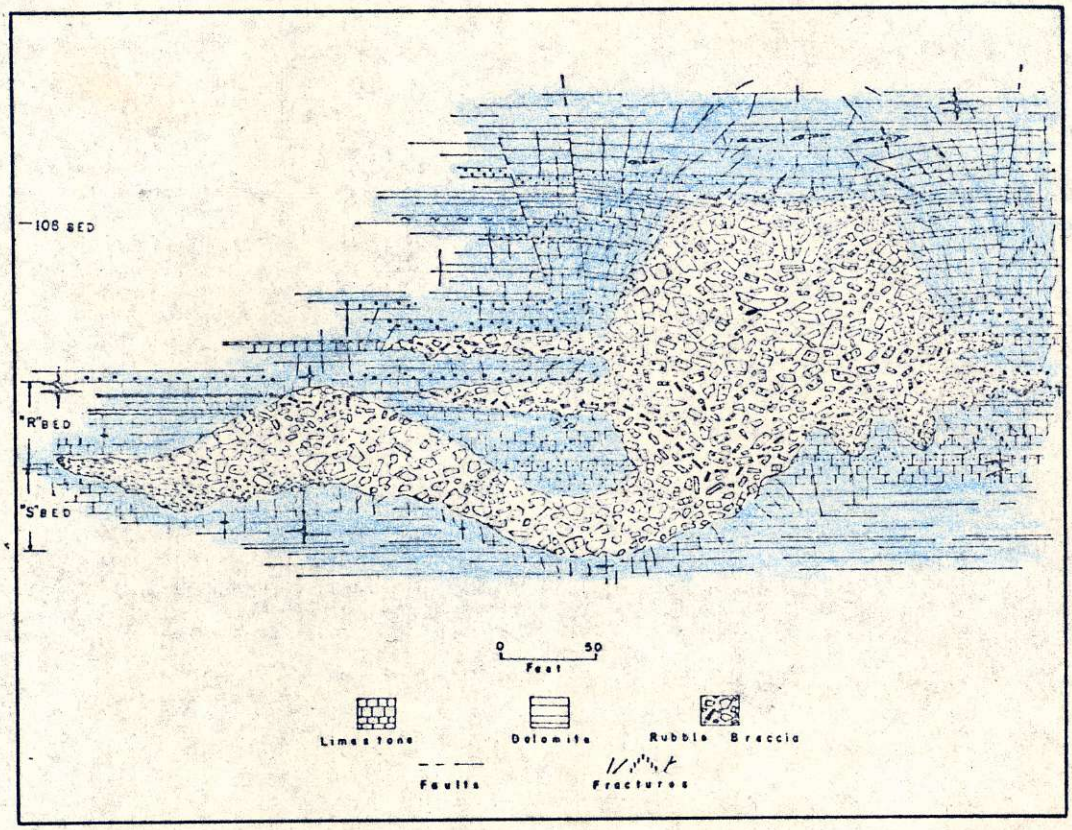
NOTES ON GENESIS (cont'd)

beneath a major unconformity. The overall configuration of these irregular breccia units is remarkably similar to the mineralized breccias at Robb Lake and is best illustrated on the following section (after McCormick, 1969).

The relationship between structural features and mineralization at Pine Point has been demonstrated by Campbell (1966). Although the evidence is subtle, this is probably also a factor at Robb Lake. Closely spaced, roughly vertical fractures which trend N 05° East and N 05° West occur in several mineralized localities and are parallel to the orientation of the basin hinge line. Both pre- and post-ore features are observed and may indicate recurrent movement along basement faults. Some fractures are "healed" with secondary dolomite and others are open.

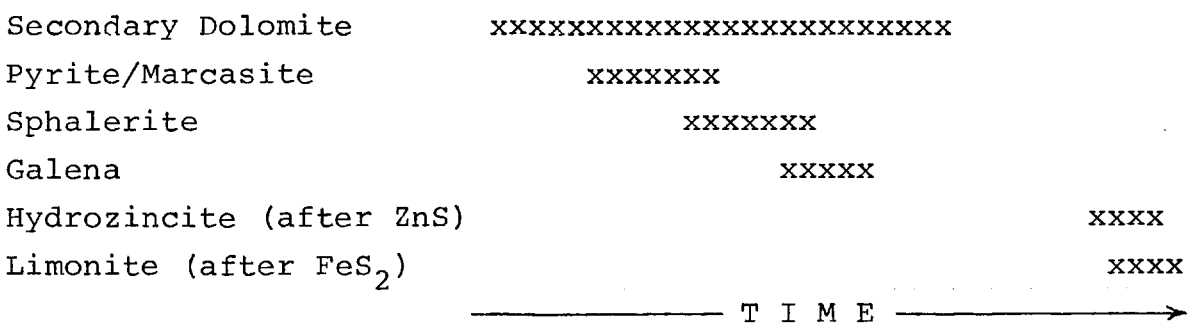
Mineralized textures observed at numerous localities on the Robb Lake property indicate a fairly consistent paragenetic sequence of deposition. Textures observed in outcrops at the Camp Showing and in drill core from Hole 26 (Webb Showing) are illustrated in Figure B, page 83. The mineral paragenesis can be summarized as follows:

GENERALIZED SECTION THROUGH AN ORE-BEARING BRECCIA BODY IN THE NEW MARKET MINE



NOTES ON GENESIS (cont'd)

Mineral Paragenesis

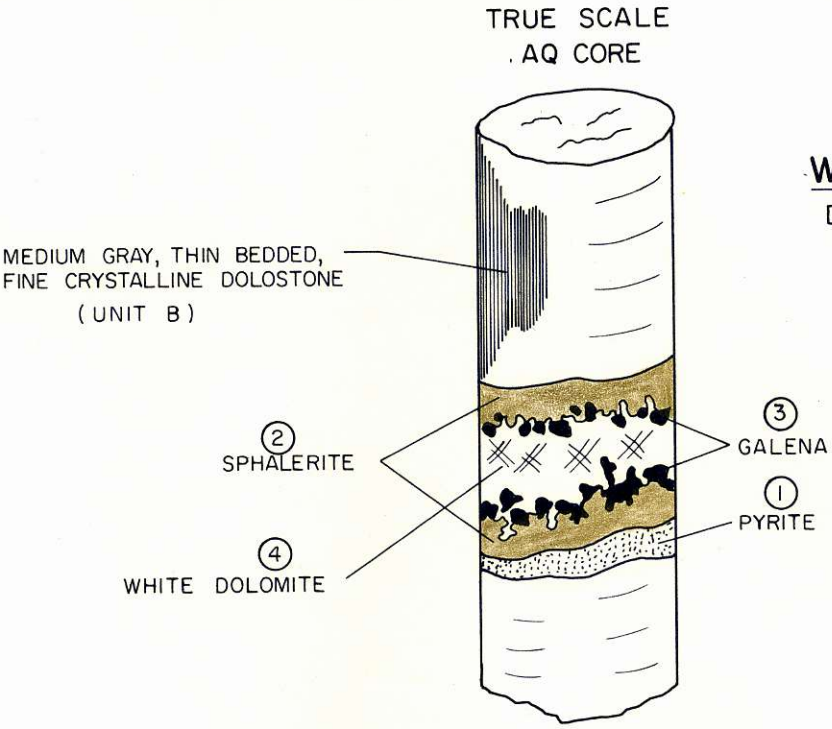


"Snow-on-roof" textures (See Core Logging, Volume III), observed at numerous localities and in drill core, indicate that gravimetric separation occurred during precipitation of the ore minerals. This would account for the fact that the best grade mineralization is commonly found near the base of the breccia zones.

Fluid inclusion studies (Roedder, 1968) at Pine Point indicate that the temperature of deposition was about 90 - 100° C. Solid evidence to support any of the various ideas regarding genesis (Robb Lake) must await detailed studies of the ore textures, lead and sulphur isotopes, fluid inclusions, fractures, and other geologic features, so that other paramaters can be developed in what appears to be a complex metallogenic history.

MINERALIZED TEXTURES

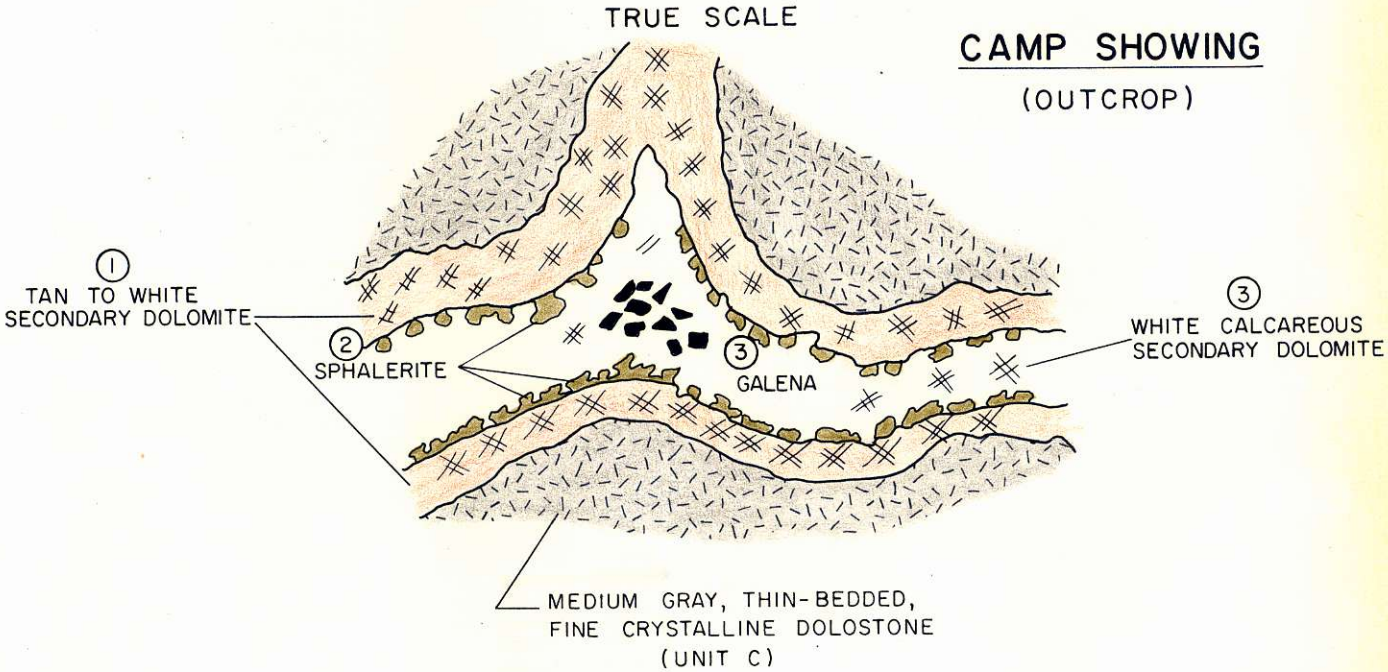
FIG. B



WEBB RIDGE SHOWING

DIAMOND DRILL HOLE 26

(DEPTH 257·5 FT.)



CAMP SHOWING

(OUTCROP)

ECONOMIC CONSIDERATIONS

The zinc and lead at Robb Lake occurs in a number of irregular zones rather than in a single mineralized body. There is presently insufficient information to accurately calculate the overall grade and tonnage contained in these zones; however, limited data (see Figure C, page 87) from the 8 best showings indicates an average grade of 11% combined Zn-Pb with an average thickness of 15 feet. The potential for mineralized bodies containing much higher grade is demonstrated by the Webb Showing where sphalerite and galena occur as a massive strataform body in relatively non-brecciated units.

The widths of the 8 zones which appear to be trending east northeast range from 30 feet to 300 feet and average approximately 180 feet. The length is difficult to estimate. Intersections in holes 19 and 28 (Cascade Showing) are over 700 feet apart, and continuously mineralized exposures at the TGS Showing are over 1,000 feet in length. However, correlations between the Lower and Upper Showings suggest that actual length could exceed 3,000 feet. If the known thickness

ECONOMIC CONSIDERATIONS (cont'd)

and estimated widths of these 8 showings are assumed to have a length of 1,000 feet, then an indicated 2,000,000 tons of 11% combined Zn-Pb presently exists. However, if the length of the mineralized zones does, in fact, exceed 3,000 feet, then possibly 6,000,000 tons can be inferred. The length is a critical factor and presently available data is somewhat subjective.

It is significant to note that cadmium occurs as a minor constituent in the sphalerite and is a potential economic commodity. Assays show an average of .03 to .05% Cd in the mineralized intersections. Very minor traces of silver are also present.

In order to give the above considerations some perspective it is interesting to note the developments at Pine Point. In the 1930's, 2,898 feet of diamond drilling and 26,600 feet of churn drilling indicated that the surface showings expressed small pockets of good grade mineralization containing in aggregate perhaps 1/2 million tons. From 1940 to 1947 work was confined to office and field research which resulted in 180,000 feet of diamond drilling and some underground development prior to 1955. This programme outlined 5 million tons of 11% combined Zn-Pb in several ore bodies having an

ECONOMIC CONSIDERATIONS (cont'd)

average thickness of 16 feet. By 1961 reserves had been increased to 8 million tons (?) of about 11% combined Zn-Pb, a contract was let to build a railway and mine development started. When the mill was operational in 1965 the ore reserves were 21.5 million tons of 11.2% combined Zn-Pb contained in 26 bodies.

Two obvious detrimental factors appear to exist at Robb Lake that do not occur at Pine Point: (1) the probable underground mining situation, although potential exists for open pits in the relatively unexplored valley of the Halfway River and (2) the depth of drill holes required to explore for deposits. However, proximity to transportation, indicated grade and possible dimensions, the success of the 1972 drilling programme (26% of the holes completed had significant intersections), and undrilled showings dictates that further exploration expenditures are warranted.

FIGURE "C"

	TRENCH OR DRILL HOLE #	DEPTH FROM - TO	EST. OF TRUE THICKNESS	COMBINED Zn-Pb %
1.	LOWER SHOWING			
	A-4	56.0' - 71.0'	13'	7.1
	72-1	270.0' - 290.0'	15'	6.1
	72-2	470.0' - 510.0'	15'	8.1
	72-9	334.0' - 344.2'	9'	26.1
		Average:	13'	10.4%
		Estimated Width = 300'		
2.	WEBB SHOWING			
	72-26	247.2' - 260.4'	13'	6.5
	72-26	294.0' - 302.8'	8'	11.3
	Trench 1	Surface	9'	18.9
	Trench 2	Surface	11'	20.7
		Average:	10.2'	14.0%
		Estimated Width = 200'		
3.	CASCADE SHOWING			
	72-19	577.5' - 587.5'	10'	15.0
	72-28	443.8' - 453.1'	9'	8.5
		Average:	9.5'	11.9%
		Estimated Width = 150'		
4.	NORTH FACE SHOWING			
	Trench 1	Surface	24'	6.9
	Trench 2	Surface	12'	10.9
		Average:	18'	8.2%
		Estimated Width = 270'		
5.	UPPER SHOWING			
	Trench 1	Surface	28'	11.7%
		Estimated Width = 180'		
6.	WATERFALL SHOWING			
	Trench 1	Surface	22'	8.5%
		Estimated Width = 200'		
7.	CAMP SHOWING			
	Trench 1	Surface	9'	9.8%
		Estimated Width = 30'		
8.	ED SHOWING			
	Trench 1	Surface	12'	15.4%
		Estimated Width = 100'		

SUMMARY AND CONCLUSIONS

A block of more than 900 claims located at Robb Lake, (56°55'N latitude, 123°40'W longitude) 110 miles north of MacKenzie, was explored by prospecting, geological mapping, geochemistry, geophysics, trenching and diamond drilling from May to October of 1972.

The property covers 28 square miles of rugged alpine terrain underlain by a thick sequence of Middle and Lower Paleozoic rocks having predominantly northwest-trending fold axes and low-angle thrust faults. Widespread zinc-lead mineralization in Middle Devonian carbonate rocks is exposed along a 5.5 mile outcrop trend on the flanks of a broad anticline. Regional and stratigraphic mapping and drilling have demonstrated that the Middle Devonian section, underlying 10.5 square miles of the property, is 2,300 feet thick and is divisible into three units A, B and C.

Sphalerite and galena mineralization occurs in irregular zones in crudely strataform solution-collapse breccia

SUMMARY AND CONCLUSIONS (cont'd)

of variable thickness. These deposits are genetically similar to those at Pine Point, N.W.T., and are believed to be the result of precipitation from metal-bearing connate fluids expelled from nearby shale beds during compaction.

Chaotic and local breccias occur in the upper 1,800 feet of the Middle Devonian section, but, the major mineralized breccias appear to be restricted to the middle 500 feet of Unit B and the top 400 feet of Unit C. A minimum of 1,200 feet of section must be penetrated to explore these favoured stratigraphic intervals.

There are 16 known Zn-Pb showings on the property containing significant mineralization. Limited data from surface rock-chip sampling and drilling in the 8 best areas indicates an average grade of 11% combined Zn-Pb with 0.04% Cd over an average thickness of 15 feet; however, the potential for much higher grade deposits is recognized. The mineralized bodies appear to be trending east northeast with widths ranging from 30 to 300 feet and are possibly over 3,000 feet in length.

A total of 14,922 feet of AQ diamond drilling was completed in twenty-nine holes. Seven of these holes gave intersections of mineralization greater than 8 feet in thickness

SUMMARY AND CONCLUSIONS (cont'd)

and 4% combined Zn-Pb. Six of these seven holes produced continuously mineralized low-grade intersections 65 to 300 feet in length.

Three of the remaining twenty-two holes were lost prior to reaching their objectives; twelve were essentially barren and seven gave sections of low-grade zinc-lead mineralization.

Prospecting of the property is incomplete, however, the little that was done succeeded in locating nine new zinc-lead sulphide showings.

A soil sample survey of the heavily forested Mississippi-Halfway Valley detected zinc-lead anomalies and established near-surface target areas for further exploration.

The induced polarization survey responded to near surface zones of pyrite and marcasite which are associated with zinc-lead mineralization.

Since a thick stratigraphic section (1,200 feet) must be penetrated to explore both favoured horizons and because of the marginal utility of further geochemical and

SUMMARY AND CONCLUSIONS (cont'd)

geophysical surveys it is concluded that drilling is the best approach to further explore the property.

RECOMMENDATIONS

The Robb Lake property has, in our opinion, been demonstrated to have considerable potential. Further investigation is recommended as follows:

STRUCTURAL STUDIES

A fracture orientation study covering all known showings should be undertaken to determine the influence of structure on the trend of the mineralized zones.

FEASIBILITY PROJECTION

An independent feasibility projection based on present data, should be undertaken to determine the tonnage and grade required for an economic operation.

GEOLOGICAL MAPPING

Additional 100' scale mapping of the Ed Showing is recommended to define possible drill targets.

RECOMMENDATIONS (cont'd)

PROSPECTING:

General areas recommended for prospecting are:

1. South and northeast slopes of Talis Mountain.
2. North side of Texas Ridge opposite the TGS Showing.
3. Around and between the Jed and Ed Showings.
4. Eastern end of Texas Ridge.
5. All geochemical anomalies.

CHIP SAMPLING

Further chip sampling of the TGS Showing is recommended.

DIAMOND DRILLING

Recommended drilling has two objectives: to define the length and trend of known mineralization and prospect for additional zones. Some of the suggested targets require considerable site preparation and heavy equipment capable of drilling to 1,600 feet.

1. Define the length and trend of the mineralization in the best zinc-lead showings by drilling holes at 500 to 700 foot intervals along their suspected trends. This would hopefully confirm the orientation of the long axis of the

RECOMMENDATIONS (cont'd)

bodies and lay the foundation for closely spaced grid-drilling which will ultimately be required to prove tonnage and grade.

Six showings recommended for follow-up drilling are listed below in their order of priority along with the proposed number of holes and total footage to be expended on each. Other possible drill targets are indicated but have been excluded because of extremely difficult drill sites and insufficient data to direct drilling. Expected trends of the mineralization in these showings are illustrated on Plate 13, Volume IV.

Showing	Number of Holes		Approx. Depth in feet		Total Footage	
#5 Webb	2	x	400'	=	800'	
(DDH #26)	1	x	450'	=	450'	
	3 holes			=		1,250'
#8 Cascade	1	x	500'	=	500'	
(DDH #19	1	x	600'	=	600'	
#28)	1	x	1,000'	=	1,000'	
	3 holes			=		2,100'
#2 Upper	1	x	750'	=	750'	
	1	x	850'	=	850'	
	2 holes			=		1,600'
#3 Waterfall	1	x	500'	=	500'	
	1	x	900'	=	900'	
	2 holes			=		1,400'
#1 Lower	1	x	600'	=	600'	
Showing	1	x	900'	=	900'	
(DDH #1,2,	1	x	1,200'	=	1,200'	
9)	3 holes			=		2,700'
#4 Northface	1	x	1,350'	=	1,350'	1,350'
TOTAL:	14 Holes			=		10,400'

RECOMMENDATIONS (cont'd)

It is understood that final location and distribution of proposed drilling will be heavily dependent upon decisions made on the property. In the Webb, Cascade and Lower Showing areas the position of each hole will be contingent upon results of previous drilling. These holes will be designed to give an indication of the length and trend of the zones. In the cases of the Upper, Waterfall, and Northface Showings drill sites are limited by steep topography but should serve to determine the trend of the mineralization and aid in locating exploratory holes on Tennessee Mountain.

2. Prospect for new mineralized zones by testing the 1,200 feet of section hosting the favourable horizons (A) in areas of selected geochemical anomalies and (B) in known locations of mineralized breccia. At a later stage (C) a broad widely spaced pattern of exploratory drill holes could be used to investigate the Mississippi-Halfway Valley and the Tennessee Mountain anticline. Prospect drilling as outlined below is shown on Plate 13, Volume IV.

(A) Geochemical Anomalies Selected for Prospect Drilling

Field checks of the selected anomalies should be completed prior to drilling. Other anomalies warrant further investigation, however, at this time those listed below are considered to have the best potential. (Areas referred to appear on the Zn-Pb distribution maps, Plates 10 and 11).

A-1 The zinc-lead anomaly east of the Cascade Showing (Area 3, Line 604 + 00E) may be reflecting the continuation of mineralization encountered in DDH 19 and 28. A 500 foot drill hole would be sufficient to test this anomaly.

RECOMMENDATIONS (cont'd)

A-2 A zinc anomaly southwest of DDH 19 (Area 8, line 584 + 00E at 720 + 00N) is believed to have shallow overburden and may indicate mineralization related to that encountered in DDH 19. This anomaly should be examined by a 900 foot drill hole.

A-3 North of the Halfway River, a zinc-lead anomaly (Area 10, line 688 + 00E) was selected for the site of a 500 foot drill hole, primarily because of its proximity to the thick breccia section in DDH 24.

(B) Prospect Drilling in Areas of Mineralized Breccia

B-1 West of DDH 13	-	One 500' hole
B-2 West of DDH 16	-	One 500' hole
B-3 Sheep Creek Showing	-	One 1600' hole
		3 holes 2,600'

The recommended drill holes around DDH 13 and 16 are within the indicated trends of the Waterfall and Camp Showings and it is possible that thicker breccia units with higher grade mineralization may be encountered. One hole is recommended near the Sheep Creek Showing to determine if mineralization in the thin breccia in Unit A reflects the presence of mineralized zones lower in the section.

(C) Broad Pattern Prospect Drilling

C-1 Tennessee Mountain	3 holes @ 1,000'	= 3,000'
C-2 Mississippi-Halfway Valley	5 holes @ 1,500'	= 7,500'
	8 holes	10,500'

The drilling of these areas is recommended to explore both favoured stratigraphic intervals. This drilling is contingent upon and should be influenced by the results of the previously proposed drill holes.

RECOMMENDATIONS (cont'd)

SUMMARY OF RECOMMENDED DRILLING

		Number of Holes	Total Footage
1.	Define length and trend	14	10,400'
2.	Prospecting for New Mineralized Zones		
	A Geochemical Anomalies	3	1,900'
	B Areas of Mineralized Breccia	3	2,600'
	C Broad Pattern Drilling	8	10,500'
	TOTAL:	28 Holes	25,400'

Respectfully submitted

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