796

GEOLOGICAL AND OTHER INVESTIGATIONS

of the

LEAD QUEEN GROUP

27½ miles N.W. Invermere;
50° 116° N.W.

by

H. C. B. LEITCH, P. Eng.

for

SILVERTON EXPLORATIONS, LTD.

May - Sept., 1965

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MAPS & ILLUSTRATIONS

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GENERAL

The investigations leading to this report were initiated on the request of Silverton Explorations Ltd., through Mr. Lorne Dempster of Toronto, Ontario. The project had been discussed to some extent in the year previous to the start of the investigations. The objectives of the investigation were, chiefly, to locate the old mining area and workings, to note the condition of the workings, to examine the workings, if possible, to examine the surrounding area, to size up the regional and areal possibilities, to stake ground to protect any potential area, and to make a comprehensive report on findings.

The initial investigations and work to be done on the ground by the writer were carried out in May of 1965. This first visit was in the nature of a reconnaissance as the location of the mine was known only very roughly and the snow conditions in the locality were unknown and had to be assessed. A party of two, the writer and prospector-assistant, reached the approximate area on May 23rd. After many minor difficulties, the road was opened up and the general area of the mine located. Snow conditions at the time were such that the southern exposures were clear, generally, to only about 5500' and although the party reached an elevation of 7300', the previously described upper workings could not be seen. Two workings were found at this time, one at about 5500' and one at about 6700'. Only part of the dump and a small amount of track could be seen above the snow at the higher working. The balance of time in this period was spent in prospecting and checking the ground surrounding the Crown Grants and in staking any desired ground in the immediate vicinity of the ground.

Subsequent to the May visit, two other lengthy visits were made to the mine area. The second visit was made in the middle of June while on the return trip from the Pend Oreille area. Although elevations of 7500'-8200' were reached, the uppermost workings were still buried in snow. The positions of two at 7300'-7500' could be ascertained in small basins filled with snow. The working at 6700' was

exposed to some extent, enough to ascertain that it was badly caved at the entrance and would probably require much digging. The party of this period explored other areas, such as McLean Creek, the area of the Steele Group, and Isaac Creek in a limited way. Areas to the north, east and west of the Lead Queen were checked to some extent and additional staking carried out.

The writer returned with another party at the beginning of August, passing over July in view of the depth of snow seen on upper workings in June and because of weather conditions generally, with the main objective of opening the tunnels or adits and assessing these. The working party was successful in opening up all workings except #2 adit, but only after a prolonged and often frustrating struggle. Mapping of the workings and the geology of surrounding area, some sampling and testing of the main workings where possible, and some additional reconnaissance of more difficult areas at higher elevations, was carried out in the last visit which terminated in mid-August.

LOCATION AND ACCESS

The Lead Queen property is situated in the East Kootenay region some 74 airline miles east and a little south of Revelstoke, 42 miles south-southeast of Golden, and 90 miles northwest of Cranbrook. It can be reached by car from the main Rocky Mountain Trench road between Golden and Cranbrook by way of Brisco or by way of Invermere Junction. Brisco is some 48 miles southeast of Golden on the Trans-Canada Highway. The route from Brisco into Frances Creek is long and very devious and one to be avoided.

The main access route is from Invermere, some 80 miles by road southeast of Golden and 100 miles northwest of Cranbrook. From Invermere, a fair to good road, mostly gravel, which leads behind Steamboat Mountain, is followed northwest into Frances Creek valley. At point 26 miles from Invermere and within Hidden Valley Ranch, a small road leading to the west is picked up. This road leads northwest until a crossing of Frances Creek is made at Rennickes old lumber camp (actually this is believed to be the old Camp I of the Lead Queen). From this point, the road carries due west into the mountain valley section of Frances Creek. Two miles in on the north side of the creek, an old and extensive lumber camp is located. One cabin is still habitable and this was the base camp of the investigating party.

Six to seven miles farther west after 4 crossings of the creek, the area at the base of Lead Queen Mountain is to be found, opposite McLean Creek. No good definite direct

route straight up the mountain from Frances Creek now exists. Portions of trails can be found there. The best route to the upper portions of the ground, located after much hunting, is the old cart road which leaves the Frances Creek road at the top of a hill some 5-5½ miles from the base camp. The road is overgrown with alder brush and even trees, but a trail winds along it such that it is quite feasible to reach the lower or bottom cable station at 6100' in 3/4 of an hour after leaving the road. From the 6100' station, the trail turns sharply north and steepens very considerably to reach 6600' where an upland valley is entered. This part of the route follows a strong mountain stream descending from the Lead Queen cirques. At 6600'-6700', an old upper camp is located some 700'-800' to the west of the trail. The trail carries northward through the valley of the stream until a scarp is encountered which fronts the Lead Queen cirque. An additional rise of 300' or so brings one into the cirque containing a small lake or pond. The workings occur on the east side of the cirque.

Material, in the past, has been brought up to the lower cable station by means of the cart road and either conveyed upwards to the cirque by cable or taken up the steep trail by backpacking or by horse. Except for the very highest portions, the trails are distinct with fairly good surfacing and reasonable grades.

A car route could be cleared along the old cart road fairly quickly and readily to a height of 6100' and possibly to 6300'-6400' by bulldozer, provided some bridging is done at 2 stream crossings en route. To go beyond this point with a road would involve considerable switch-backing and steeper grades.

Total distance by road to McLean Creek from Invermere varied, according to type of vehicle and tires used, from 35 to 40 miles. Thirty-nine miles is taken as standard. The scaled map distance is 33 miles. A scaled map distance to Brisco by road suggests 23 miles, but on the occasion that this road was used to drive out, it appeared to be very much longer. This is chiefly because a fair proportion of it had to be driven at 5-10 miles per hour because of rough surface and its tortuous route. Time consumed on driving this route is twice to three times that called for on a similar distance on the other, which can be driven largely at 30-40 m.p.h.

Rail connections, C.P.R. connecting north and south, can be found at both Invermere and Brisco.

Bus and large transport connections are found at Invermere.

It is roughly 234 miles by road to Trail via Cranbrook and Creston cut-off, and this route is well used by big transports.

TOPOGRAPHY, WATER, TIMBER AND CLIMATIC CONDITIONS

The area of the property varies from a level of 5000' at Frances Creek to at least 8200' at the top of Lead Queen cirque. The terrain intervening is generally steep, rough and tree-covered. At the top, where recent glacial action is evident, the terrain could be termed rugged. There are several large slides on the property and the writer found that snow slides occur at frequent intervals in late Spring in the western cirque basins. Snow slides in Lead Queen cirque appear to be of the slow moving and quite minor type, generally.

The uppermost areas of the property are devoid of timber and contain only weathered outcrops and blocky talus. Timberline is roughly at 7200'-7300'. Timber found at elevations of 6500' up are stunted and generally unsuitable for other than temporary stulls or supports in mining work. At 6100' some fair to good timber is still available for mine work.

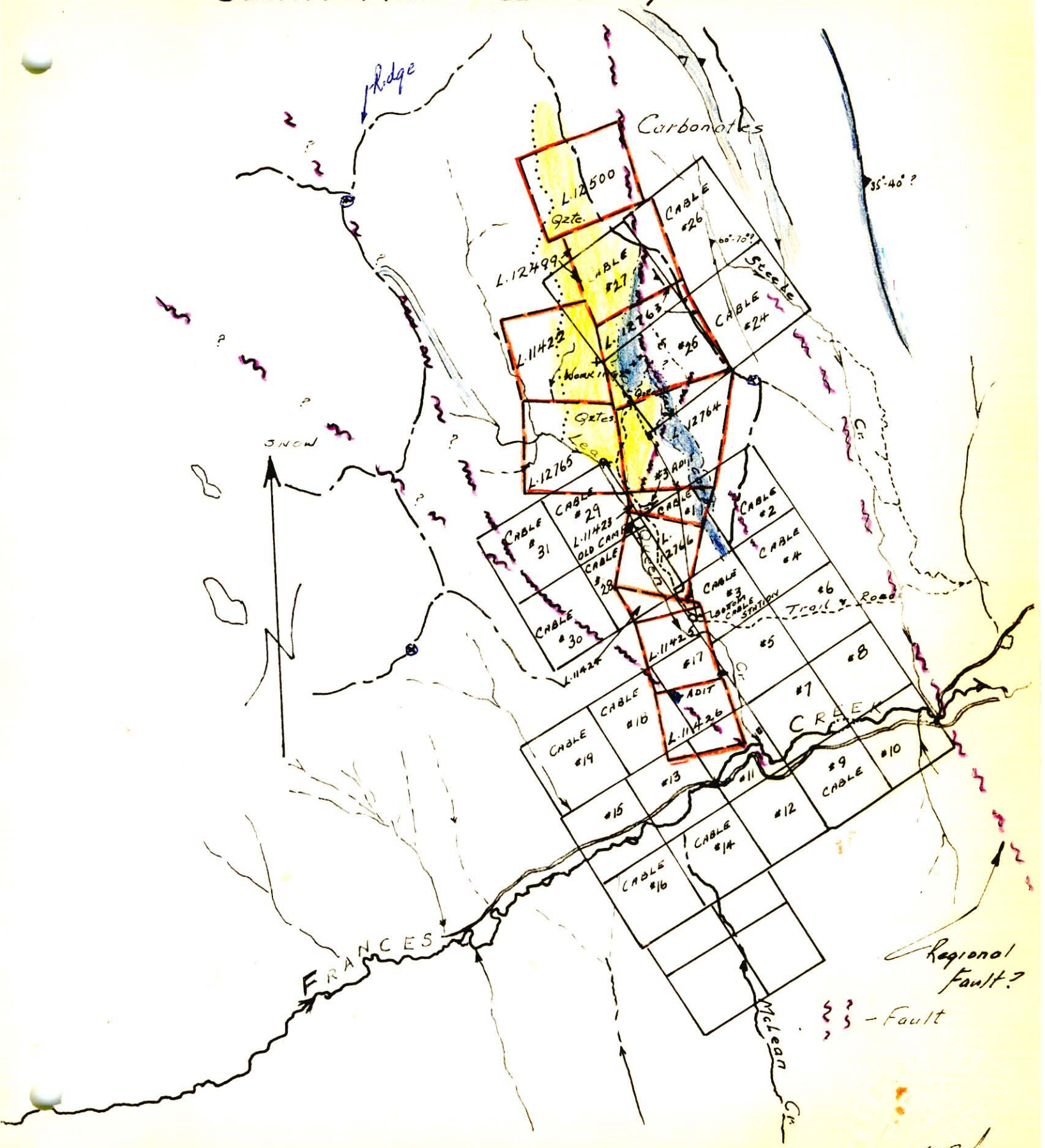
Water is adequate in the valley and cirque bottoms generally. A strong stream, dubbed Lead Queen Creek, with many small head streams from the cirques, passes through the entire property. However, in late summer there are a number of dry sectors at higher elevations, above the cirque bottoms. To get water to these points in the dry periods may require pumps and lengthy hose lines.

Climatic conditions vary considerably and rapidly at the higher altitudes. Cool fronts, even in summer, can bring sudden changes from hot to cool weather with possibly some snow. Such fronts are heralded by thunderstorms which are vigorous and cause considerable discomfort if working under exposed conditions. The period of May to October is generally good for development activity at upper levels when working from permanent camps. Snow conditions vary with the year but except for pockets in sheltered places, snow is largely gone by the middle of June - beginning of July. At levels below 6200', movement should not be hampered by snow for at least 6-7 months of the year.

Snow depths are not excessive except where wind piles drifts in the eastern lee of mountain ridges. It is estimated that a general depth of 5'-8' of snow or slightly more can be expected over the winter. The region is cold from the end of December to March generally, but strong thaws do occur from February into April.

It should be possible to operate most of the winter if bulldozer ploughs are used regularly to keep trails open. June seems a bad month for slide activity.

CLAIM MAP LEAD-QUEEN



Scale = variable
1" = 2400' at Creek level

from aerial photography

PROPERTY

At the time of writing of this report, the Lead Queen Group consists of 9 Crown-granted claims and fractions and some 31 mineral claims staked at the time of the investigations. The location and relationship of the mineral claims and Crown Grants are displayed on the accompanying map. An area along the southern boundary involving 2-3 claims is considered in dispute because of overstaking.

The Crown Grants are the residual claims of a much larger property held in earlier days. These grants cover all the significant known silver-lead-zinc mineralization located in earlier days on the north side of Frances Creek. The staked claims were intended to make a protective barrier to cover dip and to cover possible extensions.

Two additional Crown Grants, known as the Steele Group, L.12499 and L.12500, adjoin the Lead Queen Crown Grants as a northern extension. They do not form part of the present Lead Queen property.

The Crown Grants under option to Silverton Explorations Ltd. are listed below:

L.11422	Lead King	L.12763	Lead Queen
L.11423	Colum Chief Fr.	L.12764	Columbia
L.11424	Lucky Chief	L.12765	? Lead Jack
L.11425	Lucky Strike	L.12766	Big Chief
L.11426	First Effort		

The staked mineral claims are known as the Cable Claims, numbers 1 to 31. These were all staked on June 19th, 1965. The claims stretch for 2 miles in a generally northwest-southeast direction and have a maximum width of 7200'.

There are the remains of two old camps on the property. The lower is at an elevation of 6100' and the higher is approximately at an elevation of 6600'-6700'. These elevations were established by simple aneroid barometer. The best available map suggests elevations of 6300' and 6900' for these camps. The upper camp is still 600' at least below the lowest of main workings but at the same time is in a much more sheltered spot with regard to winds, snow and the possibility of slides. Most of the camp is derelict with the buildings tilted and roofs caved by snow. One building might be rehabilitated. Most of its roof still remains.

At the lower camp, the two buildings are almost completely caved or their roofs have collapsed. This is the site of the lowest cable and hoist station.

A cableway which was apparently in use after 1926 still extends up the mountain from the lower camp to the 7300'+ level and terminates at a point south of the upper workings. The lower station consists of a handmade timber hoist-like construction which held the large sheave wheel and power unit to operate the tramway. Some kind of a bin was operated from here for loading purposes. There appears to be still some usable cable lying on the ground from the sheave and extending on up the slope. At higher levels it appears to be broken and lies twisted on the mountain slope. Drums and some ancilliary cable equipment are to be found around the bottom cable station.

An intermediate station consisting of a tripod affair still exists below the carbonate cliffs at about 7000'. The uppermost station at 7300'-7400' (?) is of a sheave support nature but is back-braced and still holds sheaves and guide equipment for the return of the small ore skips.

A thin cable still extends from the upper camp to the main cable line some 1500' or more. This appears to have been used for transferring the men to the upper workings. This cable is almost invisible unless viewed in the right light and constitutes a definite hazard to aircraft, particularly helicopters.

Aside from the cable equipment which might be rehabilitated, there is an assortment of miscellaneous mining equipment, much of which is broken or very badly rusted. A scaling bar, various lengths of handsteel, a number of broken shovels, picks, etc. Some special tools for handling handsteel, such as tongs, cleaners, spoons, etc., and ore car bodies (one complete car is on the track in good shape in #3 adit) were noted at the upper levels.

Two drys or shelters containing old rusty equipment such as blacksmithing material, forge and anvil, are located at the #1 and #2 adit portals. These buildings have been stoutly made but have collapsed from the snow and the equipment has long been exposed to weather.

Another such collapsed building is located at the entrance to #3 adit. This was the location of air pumping equipment and a large ? 10"-1' diameter air pipe runs along the #3 tunnel for the length explored. Most of this appears to be in fair to good condition. The log building holding the air pump has been crushed by weight of snow, but the rusting motor and possibly a pump can still be seen under the timbers. The machinery must have been a good reliable type originally.

Mine track is still down and usable in #2 adit (not opened) and in #3 tunnel throughout. #1 adit has had the track lifted.

An early report indicates that a camp halfway between Brisco and the lower cable station did exist on 40 acres of land held by the owners of the property in 1925. This camp is believed to be the one still in existence, and in which one or two buildings could be used after cleaning, at the Frances Creek crossing just at the entrance into the mountain valley proper containing the upper portion of Frances Creek.

The solicitor-attorney who is responsible for keeping the taxes paid on the Crown Grants and for attending to other legal matters, informs the writer that taxes have been kept up on an area for use as a millsite. The location of the site was unknown to him, but it appears that it was separate from the Crown Grants.

HISTORY

Mention is first made of the Lead Queen (Windermere) in 1901 Minister of Mines Reports and from then until 1909 mention is made practically yearly in these same reports. There is no comment made on the Lead Queen in the years 1910 to 1914, inclusive, but the years 1915 to 1920 were active ones for the property. It is not known how many claims made up the property up to 1914, but in 1915 a statement is made that the group consists of 5 claims. Some 12 miles of wagon road were built then. The claims had not been Crown granted up to that date but were owned by a Tom Brown of Wilmer and C. Cartwright of Vancouver. In that year they were acquired under lease and bond for a price of $10,000 by Burgess & Barry of Althalmer. By 1916 the lower tunnel (elevation 6700'+) was well under way. It had "been run in 300' with some drifting". It had been driven as a crosscut in an attempt to catch the extension of the upper ore vein "but no ore was encountered".

In 1918 the property was taken over by a Seattle group who shipped 80 tons that year.

In 1925 the property "was acquired by New York interests". New camps and a telephone line were erected and a tramway was contemplated.

This group appear to have worked the property until 1929 and to be effectively the same from whom the property was optioned by Silverton Explorations. Considerable attention was placed on the lower tunnel (6700') and 150' of additional drifting was accomplished in it by the end of 1927.

There is no record of when the tramway was operating but it presumably operated by 1929. Records show that 8 of the claims were Crown granted January 5, 1928. The group holding the property at that time and in 1929 were still driving on the lowest tunnel.

No further reference is made to the Lead Queen in subsequent Minister of Mines reports. The only later reference seen is that of "Report of Frank Eichelberger who was consulting engineer and directed policy of development 1928-1931". Date of this report was May 12, 1931.

Snow and rock slides must have closed the portals of the upper workings some time in the late '30's, and it does not appear that they have been opened again until the writer's arrival in August, 1965.

GENERAL OR REGIONAL GEOLOGY

The region lying between the Rocky Mountain Trench on the east and watershed of the Purcells to the west is occupied largely by rocks of Cambrian to PreCambrian age. The sediments range downwards from Middle and Upper Cambrian formations such as the Jubilee and Ottertail, to the PreCambrian Aldridge formation. The southern end of the region which reaches southwards to Findlay Creek and beyond towards Kimberley area, contains the older rocks. The region is part of a larger territory known as the Eastern Kootenays or the Purcells (Purcell Mountain Range). The eastern drainage of this range of mountains extending to the Columbia River and beginning just north of Bugaboo Creek, resembles a long finger with the base to the south in the Kimberley area and the tip in the north in the Spillacheen area. The region trends north-northwest and incorporates such creek basins as Skookumchuck, Findlay, Dutch, Toby, Horsethief, Forster, Frances, Dunbar, Templeton and part of Bugaboo. Within it, the sedimentary rocks or metasediments have the same general trend and appear to "toe" or "finger" out to the north, suggestive of a controlling giant anticlinal structure.

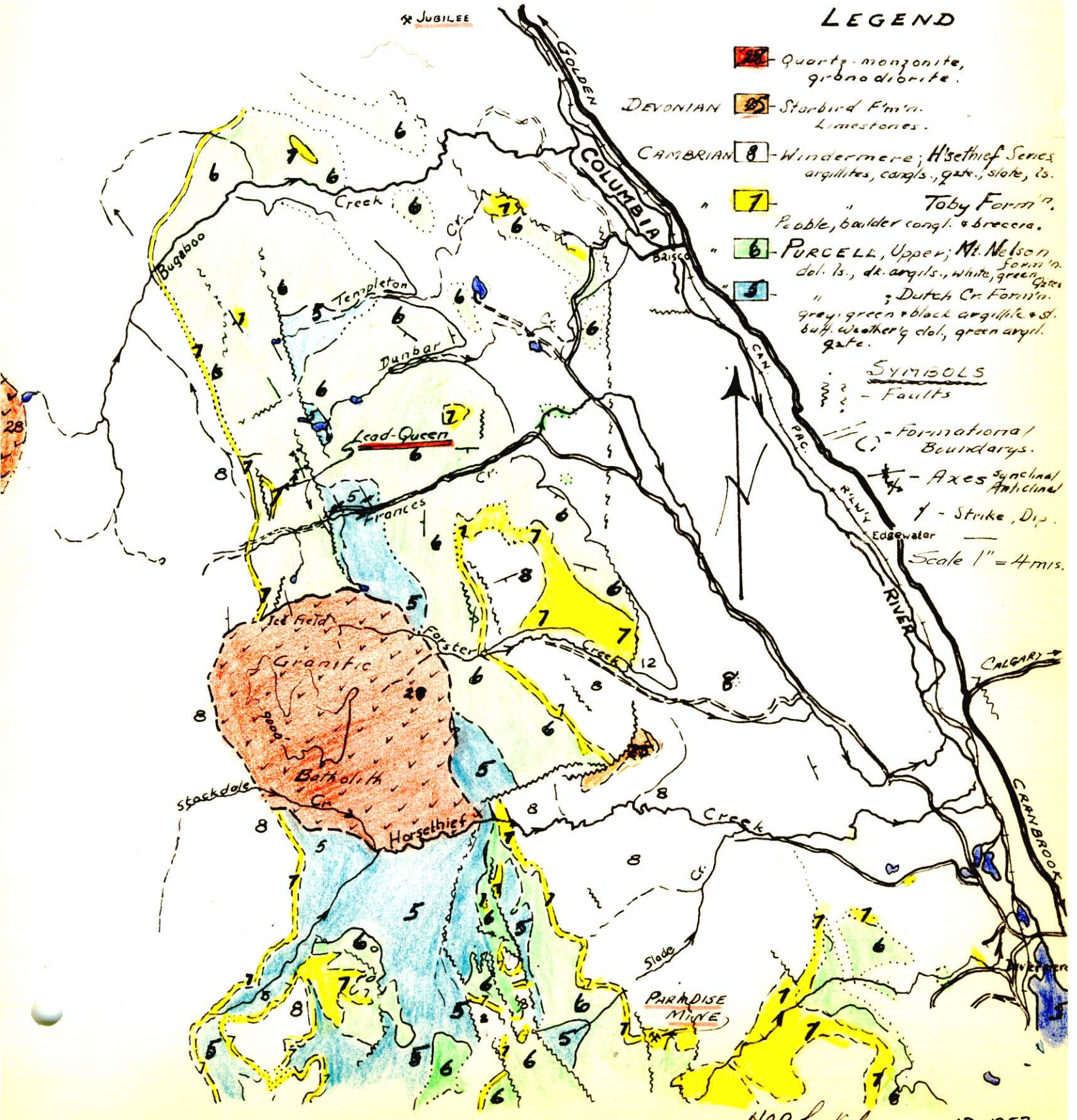
The rocks found in the defined region consist of quartzites, argillites, slates in the lower division, grading upwards into dolomites, some quartzites, argillites, some slates, some limestones and a conglomerate-breccia formation.

This overall regional structure has a north-northwest orientation and plunges in that direction. It contains many smaller anticline and synclinal structures and is, in effect, an anticlinorium.

There appears to be a general overall arching (see Geological Map) along the axis of the trend which in the upper part can be defined by the Toby pebble-boulder conglomerate and breccia of quartzite, argillite and limestone. Though much faulted and thrown laterally, this formation traces out the anticlinorium.

REGIONAL GEOLOGY

AREA SOUTH OF SPILLAMACHEEN TO INVERMERE
COLUMBIA RIVER TO PURCELL DIVIDE



H.C.B. Leitch 12-1957
AFTER E. REESOR G.S.C.

Within this larger structure are a few intrusive granitic stocks and probably a larger number of small dikes. These represent late post-tectonic intrusions. They are considered to be Mesozoic or later in age. The granitic rocks are considered to consist largely of quartz monzonite and grano-diorites. Later dikes are apparently of a diabasic nature, diorite or, as indicated in some reports, possibly of porphyritic material. Within the region defined, there is one large known intrusive stock with approximate dimensions of 7 by 10 miles. This is located a few miles south of Frances Cr. and is the main watershed of Forster, Howser and Horsethief Creeks. The smaller stocks are farther south, near Jumbo Mountain and on Frying Pan Creek. Larger stocks are found on Bugaboo Cr. to the northwest of the region outlined and to the south at Doctor Creek. The White Creek batholith occurs at Fry Creek and extends along or just back of the east shore of Kootenay Lake.

A line of large elongated diorite bodies in the manner of sills or dikes occurs just west of the outlined region. These are supposedly related to the Purcell sills.

A feature of the geanticlinal structure are the numerous faults. These are chiefly oriented north-northwest but there are also many with a northeasterly orientation. A few are noted with a north-south trend. The latter are less easily observed and defined. Many additional faults than those mapped undoubtedly exist. Government observors have noted that normal faulting with the west side down is common. The writer has also observed this and that faulting is most evident along or near the axial planes of somewhat tight and slightly overturned folds.

Metallic mineralization is commonly located along the minor folds and faults where these are contained in carbonate rocks. The observation has been made by Dr. Reesor of the G.S.C. that most mineralized zones are associated with dolomitic limestones of the Mount Nelson formation or in crystalline limestone of the Lardeau series. Metallic mineralization in the region has been noted to be commonly associated with barite gangue and to consist usually of galena-sphalerite with silver minerals closely related to galena concentration or occurring as argentiferous tetrahedrite. Copper mineralization is not uncommon in the form of chalcopyrite.

Placer claims are held in a number of areas, it is believed chiefly for gold, but it is known that black sand concentrates with columbium minerals, euxenite, uraninite, ilmenite, rutile, apatite, etc., were covered by some placer leases by Quebec Metallurgical Industries 1957.

At the time of writing and within the region outlined, there is considerable exploration activity being carried out. This is taking place chiefly along Toby, Doctor, Skookumchuck, Frances and Horsethief Creeks for silver, lead-zinc and copper mineralization.

Besides the famous Kimberley Mine of the C. M. & S. Company, there have been other mining operations in the region, notably Paradise Mine, Mineral King, Jubilee Mt., and the Lead Queen. Of these lesser mines, Paradise Mine is the most important. It is situated at a higher elevation than the Lead Queen and began its history slightly earlier than that property.

Many of the observations made above are derived from J. E. Reesor's Compilation of reports and field work on the region from 1953 to 1956 for the Geological Survey of Canada.

GEOLOGY OF LEAD QUEEN AREA & SURROUNDINGS

The area to be discussed in detail is some 2 miles wide by 4 to 5 miles long and is oriented approximately North 35° West. This is the general orientation of the entire claim group also.

This area contains prominent quartzite formations, argillites, carbonate formations (limestones, silicified limestones and probably dolomites) and a possible breccia formation. The carbonates predominate from the standpoint of thickness and prevalence of exposed strata, but the most prominent lithological features in the area are the massive quartzite formations which show on the tops of the mountains to the north. All the rocks mentioned, with the possible exception of the breccia which is not found in place, belong to the Mt. Nelson formation, Upper Purcell member of the Purcell system or Age in the Proterozoic Era. The Toby formation (Lower Cambrian) separates Purcell system from the Cambrian. This conglomerate and breccia formation is a marker which not only defines the large anticlinorium structure but also helps to define minor structures and indicate top from bottom. The only indication seen by the writer of its presence in the Lead Queen area is large breccia boulders in the Western Cirque of the Lead Queen property. With this, the Toby Formation, as the top formation of the smaller area under study, the immediately underlying rocks would seem to be either a grey limestone or a dark grey-green quartzite member of the Mt. Nelson formation. The structures on the north side of Frances Creek are outlined by the quartzite members. The quartzites are not evident along most of the southern side of Frances Creek. On the south side, an area which was only sketchily

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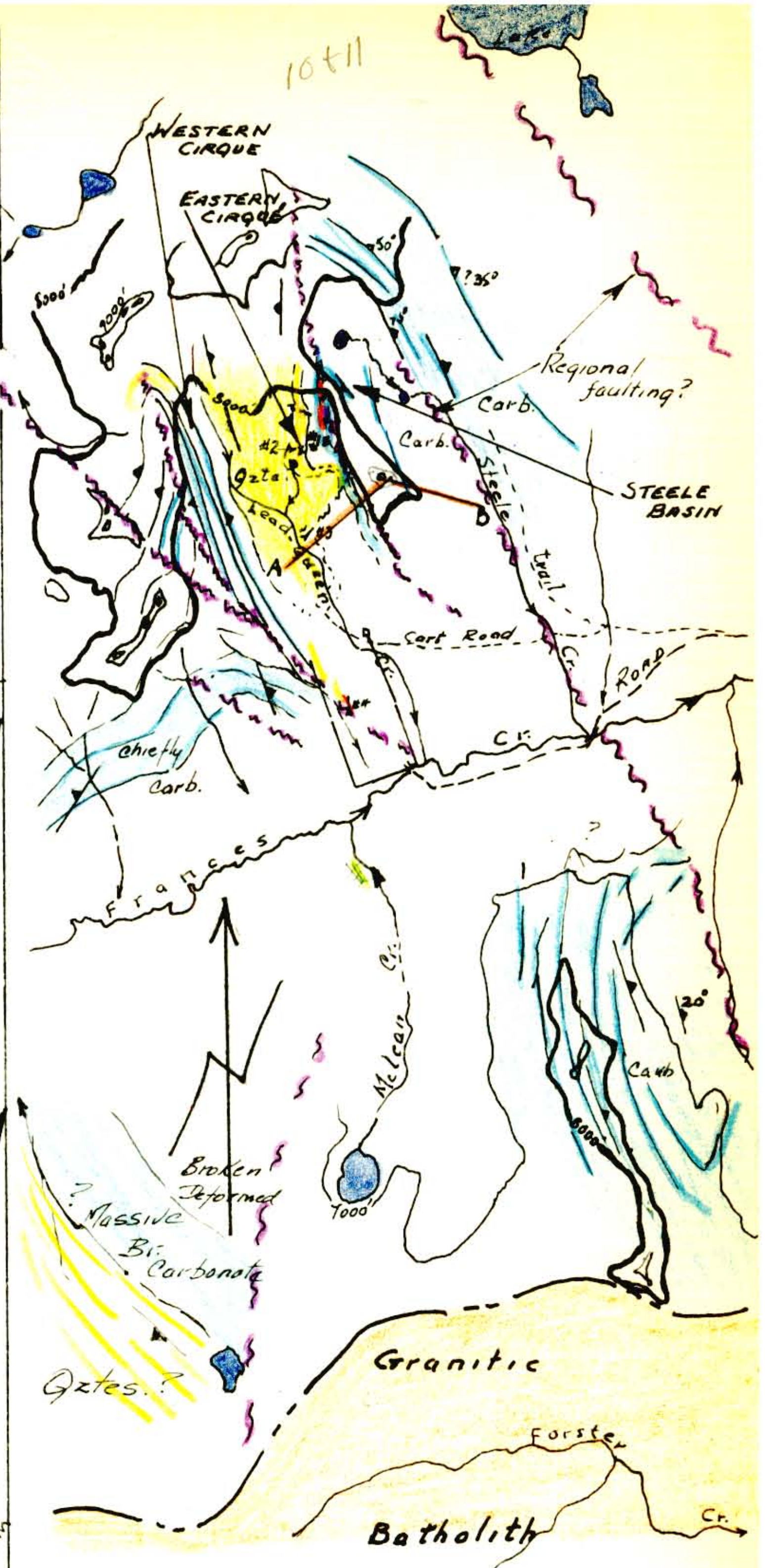


LOCAL GEOLOGY OF LEAD-QUEEN AREA SHOWING FAULT SYSTEM

Scale 1:50,000

H.B. Leitch, P.Eng.
Sept. 1965

explored, only carbonate rocks were observed from a first-hand reconnaissance of lower McLean Creek. At higher altitudes, the rocks studied by means of binoculars appear to be of a carbonate nature also.

Immediately below the dark grey-green argillaceous massive quartzite in the Lead Queen area, there appears to be a relatively narrow bed of white, very siliceous quartzite. This is succeeded downwards, by a dark argillite which in places appears to be a very impure argillaceous quartzite and in others to be dark grey to black argillite with a tendency to some liminess. In the Lead Queen cirque, this horizon is occupied by a blackish argillite or argillaceous quartzite. Below this level, in this locality, there is uncertainty as to the sequence because of the prevalence of faulting, minor folding, shearing and metamorphosis. It is believed that the dark "argillite" (or argillites) is followed by either a brown weathering carbonate or a grey silty carbonate. The area in which these were closely studied appears to be a faulted and possibly somewhat overturned anticlinal structure and the order of deposition could likely be reversed. This latter positioning is suggested from distant observation of another nearby anticlinal structure. Below the two members, mentioned immediately above and which presumably are of the Mt. Nelson Formation, there appears to be a series of chiefly carbonate rocks with some calcareous argillite members and possibly some slate. The carbonates which consist of both limestones and dolomites should be those assigned to the Dutch Creek formation. There is a considerable thickness of these displayed to the west of Lead Queen Creek at elevations from 5300' to 6500' (about $\frac{1}{4}$ to $\frac{1}{2}$ mile west) in a mildly folded, arching or anticlinal structure. In this structure, the rock seems to consist of a considerable amount of dolomitic carbonates which weather buff, cream or pinkish. Some slabby beds might be closer to argillites. There are also some fragments of a black cherty rock in the talus.

Structurally, this entire area is interesting. When the outcrops on the upper parts of the mountains are viewed from the road along Frances Creek at 5000', there is not a great deal to suggest the deep complex structures which are found to exist when one studies the top elevations. A sketch was made of a section of the mountain tops to the north of Frances Cr. and east of Lead Queen Crown Grants and Lead Queen Creek (? #3 Creek). The beds of carbonate and ?quartzite or argillite which can be seen there reveal or suggest, for the most part, an undulating, anticlinal, folded structure plunging towards the observer. There is a suggestion of an included synclinal section. Only on the west side of this section is there a suggestion of large disturbance. Farther west across the valley of the little Lead Queen creek and of the fault and slide area, in the Western cirque, another sectioned mountain face reveals an open anticlinal arch of carbonate rocks at elevations

of 5000' to 6500'. The area between is wooded and contains considerable slide rock. When, however, one reaches the upper elevations (6500' to 8000') and the bed rock is exposed by the deeply gouged cirques there, quite a different picture is obtained of the structural framework. The only mild structural form is that of a syncline of quartzite which occupies the area between the two cirques. Even this structure is not symmetrical.

The western and eastern mountain walls enclosing the two cirques are formed of complex anticlinal structures, tightly folded, highly stressed, and apparently somewhat overturned to the east. Because of the force or stress directed from the west, the eastern limbs of the anticlinal structures are very steeply dipping, with both limbs dipping to some degree to the west in the crown portions of the visible fold. The eastern anticlinal structure is the more complex and the eastern limb of this structure seems to have been not only folded over to the extent of producing an almost isoclinal fold, but also to have faulted. Both anticlinal structures have yielded to pressure by failing or faulting along their axial planes and this has produced minor drag-folds, brecciation, vertical sheeting (a general shear pattern) and metamorphosis. The openings resulting from faulting, brecciation and shearing have permitted the entrance of the metallic mineralization found in the Lead Queen.

The fault line and brecciation produced in the western anticlinal structure have not been studied closely, but there does not appear to be as distinct a line of displacement as in the eastern structure. There the displacement (vertical or rotational) seems to be illustrated by the absence of the quartzite along the crown (except possibly well to the north). The distinctly synclinal structure between the cirques plunges (or dives) to the southeast but the closure of the anticlinal structures (if it can be described as such) suggests a northwesterly plunge. There is, therefore, some discordance which has to be accounted for. One possible explanation is that the synclinal trough has dropped with respect to the anticline and been rotated downwards to the south. The normal pattern within the anticlinorium region is for the subsidiary anticlines and synclines to plunge northerly (north-northwest).

It has not been possible to trace out the anticline-syncline structures southeastwards across Frances Creek, but the central synclinal structure appears to reach downwards (and southwards) to a level at least of 6500' before being lost in soil and bush cover. The white quartzite is observed below the upper camp and in the area of the pass.

On the south side of Frances Creek in the area between McLean Creek and the next main creek east, an 8500' mountain shows on its upper areas, 7200' to 8500', a great pile of strata regularly dipping to the east-northeast. This dip and strike appear to hold to the west towards the valley of McLean Creek. However, at lower levels, 7000' to 6000', there are distinct suggestions of discordance and even structural unconformity with the upper sections. It is only where one or two recent slides have torn away the cover on the Frances Creek face that this can be seen and the slope must be viewed in the right light. Some drag-folding and possible minor faulting are indicated.

The faulting observed in the 2 cirques of the Lead Queen area has been projected southwards by the writer after a study of air photographs and from knowledge gained from early ground reconnaissance. The western fault seems to hook (? from an easterly dip) towards the mouth of Lead Queen Creek. The line of the fault is a suggestion, but the location of it is based in part on observations around the lowest adit, where there are signs of drag-folding, shearing, fracture cleavage and discordance, headed up the draw made by the stream cutting the slide. This fault structure should pass just west of the lowest adit.

The eastern fault or fault system is one of the main controls for the deposition of the Lead Queen lodes or veins. Discordance of the strata is displayed at the northern end of the fault where it crosses through the cirque wall (Steele Group) but the plane of the same fault, when traced southwards, can only be placed somewhere within the buff or rusty weathering carbonates and its course there is obscure. It seems highly likely that it is thrown to the southwest or bends in that direction, as shown in the detailed map.

In the eastern cirque, there are signs that stress has been taken up by a number of minor cross faults, by shear and by drag-folding. As the mineralization lies in the brown or rusty carbonate horizon and apparently follows the disturbed faulted zone there, the idea that the mineral lode will follow the bedding and will therefore be adversely affected when the fault and the lode zone supposedly intersect the flattening strata as they approach through dip the base of the synclinal structure, is not necessarily the correct one. It is entirely possible and even probable that if the fissure fault is the main control of the deposition of metallic mineralization, the fault and lode will continue to carry at a steep angle downwards, accompanied by steeply dipping, faulted strata, keeping to the east of the synclinal structure. To the west of the fault system, the synclinal strata could be expected to more or less abut discordantly at a low angle against the steeper strata. This has to be considered a possibility

at depth, if the faulting is strong enough.

On the surface, it would appear that the massive quartzites are bent around a synclinal axis with a gradual change from eastward dips to westward dips as one comes from west to east crossing most of the outcrop, then as one nears the lowest adit #2, one observes a sudden upturning of the quartzite beds, as these trend something around North to N. 10° E. on the steeper sections which pass over the cirque wall.

Close to the Lead Queen fault, the underlying white quartzite member along with a dark slaty argillite can be seen to dip at about 45° to the west. These horizons seem to be rolling back somewhat on the syncline as the fault zone is approached. In an area just southeast of the little lake where the quartzites change from regular, flat dips to much steeper ones, there are abundant signs of brecciation, fracturing and even metamorphosis in the green quartzites. As one crosses the brown zone of carbonate, particularly in the area of the cirque rim, the strike apparently swings to N. 60° E. and dip steepens to 60°-70°. This is very evident when the grey muddy carbonate zone is encountered at the east along the rim. This shows a distinct discordance in strike, if not so much in dip, and the idea of discordance due to faulting is strengthened. A study of air photos enables one to carry the eastern fault line to the north, but it would appear that the fault stress is largely absorbed or taken up in the flexible brown or buff carbonate to the south and southeast. The only evidence for the continuation of the fault in this direction after the workings are passed is the closely spaced vertical adjustment planes - ? sheeting - the siliceous stockwork and general disturbance in the brown carbonate. The brown carbonate, as such, continues in a rather indefinite way to a southward facing scarp in Claims Cable 1 and 2, where to all appearances it seems to emerge in part as a relatively flat to rolling bed underneath a much darker -?quartzite - member and part as a "chewed" faulted section with no apparent dip. This rolling structure is completely at variance with the somewhat overturned or very steeply dipping eastern limb of an anticline which lies back or north of it.

All the rock on the western side of the Steele Basin and well to the west, with the possible exception of that on the top of the Lead Queen ridge, is apparently carbonate rock. Dips appear to be uniformly to the east until close to the west wall of Steele Creek cirque, then there appears to be steep upturning of strata and discordance. This change could come about from additional faulting. In fact, Reesor's geological map shows a regional fault which would be very close to this locality. The observations on Steele Basin were not obtained by on-the-spot study, as time did not permit, but rather by means of

binoculars and close study of aerial photographs.

Some 2-2½ miles to the south over the dividing wall at the end of McLean Creek, a large granitic stock or small batholith can be seen plainly from the Lead Queen. It is an area of high and rugged terrain covered by ice and snow fields for a large part throughout the year. The intrusive rocks are reported to be granodiorite or quartz monzonites. The head of Forster Creek rises on the northern rim of the batholith. A north-northwest oriented fault is shown on the regional geological map as carried from Steele Basin area southwards right to the granite contact where it stops. This has thrown up an anticlinal section of the older Dutch Creek formation discordantly against the younger Mt. Nelson formation. Other faults come up to but do not penetrate this granite in other localities. The assumption is that the granite is post- the ?east-westerly, northeasterly and northwesterly faulting, or in general is post-tectonic. It would appear that the granite moved upwards along the structurally weakened tectonic zone stretching southeastwards along the east flank of the Purcell range. Several smaller stocks are in this line and it is reported that diking also follows the trend.

One might expect connections between the granitic intrusions and mineralizing fluids which produced the veins, lodes and other deposits of the area such as the Lead Queen, but there appears to be no direct association. The faulting seems to have long preceded the intrusion of the granite. The mapping suggests that some of the faulting at least is post-Devonian and probably pre-Carboniferous. There is a big geological time gap between this age and the accepted age of the granites -- Jurassic to Cretaceous.

It is not unlikely that the mineralizing fluids which produced the Lead Queen deposits originated from the same deep source that the granite stocks and batholiths came from, but there is no sign of underlying granite in the immediate Lead Queen area. There are scattered indications of a general mineralizing influence in the area west of the Western cirque and fault, but this has not been studied long enough to draw any conclusions as to its character, prevalence and origin.

DESCRIPTION OF WORKINGS

The main workings are those located around 7300' to 7600' in the Lead Queen or Eastern cirque, and are apparently all within Crown Grant #12763. The cirque has been produced by the action of ice movement in the past. There is no true ice permanent or transient in this cirque during summer months. The main ore mining operations have been carried out at 3

separate sites which permit underground access. These are more or less situated in a vertical line on a talus slope below an outcropping scarp of buff to brown weathering carbonate. A number of subsidiary pits are strung out from the topmost working, elevation 7700', southeastward for 300' to 350'. A map on the scale of 100'=1" accompanies this report and illustrates the relationship between the main workings and also shows some of the geology that could be readily picked up from the immediate surroundings of the workings.

The brown carbonate is the most important geological feature of this small area since it has been the rock unit which, lying between very competent massive quartzite units and a moderately competent argillite-carbonate unit, has yielded by buckling, drag-folding, sheeting, shearing, recrystallization (metamorphism) and faulting. Because of this incompetency, there appear to have been openings available for the mineralizing fluids from beneath. The fluids appear to have selected one main path and then spread out from this, but this appearance is probably deceiving and there is a good probability of more than one path or conduit within the favourable carbonate zone. The character or lithology of the limy rocks makes them favourable for dissemination of metallic minerals, in comparison to the quartzites, in which no metallic mineralization has been observed as yet. However, since the investigations have not been as detailed or intense as they should be, much of the above must be treated as surmise.

The original find must have been made and earliest work done, as suggested in the early reports, at the top level or working just at the foot of the carbonate scarp. This working is taken as 115' above #1 cut. The exact elevation cannot be stated. The aneroid repeatedly indicated about 7300'-7400' but the time taken to reach this elevation from the base camp was enough to bring about a substantial error; as much as 200'-250' had to be considered at times. Thus the elevation of the top working is taken as 7700', to agree with topographical map indications. From this level, there should be a further 500' to the top of the ridge separating the Steele and Lead Queen basins.

The uppermost or top working (major one) consists of a cut driven on an azimuth of about 72° to 77° for some 22'-25'. From this point, the cut curves quickly to the right (southeast) for some 7'-10' and then becomes a non-descript adit which is driven under cover for a further 40-50 feet.

At the bend in the cut there are some large and very dangerous loose slabs. It is debatable whether any person should enter the adit before these are removed, as one has to pass under these, turn one's back on them, and crawl over the already fallen slabs. These would weigh several tons at

least. They might be scaled or barred down if one could get in a favourable position over them. The writer decided to make one entrance without attempting to scale, as it was realized that the scaling might not be successful and would then make matters worse.

Inside the adit portion, the writer observed from the slope of slabs and muck that they had either slumped naturally or been pulled from below. It appeared likely that there had been a stope since there was no normal floor and the level of the slabs and muck sloped well down into the hanging wall. The back had been stoped upwards and the opening narrowed after 15'-20' to a point where outside light seemed to be coming through loose boulders. The angle of the stope would be about 60° or steeper, but the actual vein followed could have been anywhere from 50°-70°. The writer did not attempt to go too far in the stope, although there appears to be a narrow, pinched section at the southeast end where a vein had been followed. There is no visible indication of the vein in the stoped sector. The continuation of the vein out of the stope carries back into the cut wall to the sector where the large loose slabs hang. This could not be examined, but a glance in that direction suggested that ribbons of lead-zinc mineralization might lie there.

A hurried grab sample was gathered from loose material in the base of the stoped sector. This did not seem to be impressive in the outside light, as it was apparently all buff-weathering carbonate. Nevertheless the sample did yield lead and silver as follows:-

J.R. Williams & Son, #31521:

Au	Ag	Pb	Zn
tr.	6.00 ozs/ton	9.95%	4.65%

This would at least represent 2½-3" width of material and probably much more as it was apparent that the hanging wall had slabbed off to give a stope width of 6'-7' at the base. The hanging wall was stepped, but seemed to be formed partly of a slip face. It is possible that a seam of ore lay behind the wall and slabbed to this depth. At the entrance to the "drift" or stope, the writer noted a loose fitted section of broken wall which would be behind the hanging wall of the stope. This chunk was picked up quickly and without further observation, as it was directly in front of the dangerous "loose". It proved to be solid steel galena 3"-4" thick, weighing about 5 lbs. or better.

In the cut before the entrance to the drift and back about 7' from the turn, a chip-channel sample was taken on the northern side across approximately 6' through carbonate

rock laced with stringers, lenticles and pods of essentially galena ore with some sphalerite. There was also some disseminated metallic in the rock between the main stringers. There was no distinct vein but rather an indefinite pattern or zone of mineralization running in lenticular fashion generally parallel to the original fissure vein. This pattern of lenses followed by small blank areas with displacement of the generally lenticular zone to one or both sides is evident to the east of the working for a distance of 60' to 100'. Laterally to the southeast there appears to be one extension over some length along an average line but depths of mineralized zone back of the end of the extension are not observed to be of very great depth, i.e., they have narrowed.

The results of assaying the 6'.2 sample in the cut wall were as follows:

J.R. Williams & Son, #31522

Au	Ag	Pb	Zn
tr.	3.10 ozs/ton	7.84%	0.83%

A sample of the dump taken by grabbing handfuls indiscriminately over all the surface of the pile yielded the following by assay:

J. R. Williams & Son, #4989

Au	Ag	Pb
tr.	12.10 ozs/ton	14.75%

There was no assay for zinc, but undoubtedly some small percentage would be zinc. This would represent the upper portions of this small dump. There is little question but that the high grade material has been removed and bagged. There may be some 180 to 200 tons of this material at very rough estimate, in this particular dump.

South from the uppermost main workings, along the line of the drift, are a number of small workings or pits. The first noticeable pit lies some 237' southeasterly from the cut and at foot of the small cliff. It is about 23' in length but is buried under talus. A small dump containing some metallic minerals projects from the talus. Farther south another 35' on the same line, there is a 22' long pit with dump which shows much better mineralization. High grade specimens can be picked up here. At 10' farther south, another pit and dump, the largest of the three, appears. It is 15' in length and though smaller, is definitely the richest. Piles of high grade ore are to be found in broken, rotted sacks at the farther side of the pit. All these pits would go unnoticed unless an investigating party passed very close to their location. Only the last pit gives a suggestion

of ore in place. It is assumed that the main mineralization vein was several feet in front of the small cliff wall and is now completely buried in loose talus.

The strike length of this main zone is believed to be of the order of at least 350' to 400' long. A long section of 237' shows little outcrop and is largely covered with slide rock.

Pods and shoots of mineralized rock occurring in a disseminated or stockwork-like manner are found to the rear of the upper cut.

The #1 Adit which the exploration crew were successful in opening in August, is located approximately 115' vertically beneath the top main working. This working shows a large dump of basically carbonate ore material. There is one section in which there is more of the dark ore showing. The portal was caved and covered with 6'-10' of hard snow-ice when the party arrived in August. An attempt to find the portal was made straight down through the snow to the site of frozen caved muck and boulders. Exploratory holes placed in this found a standing set of timber under which a hole was punched into the drift. Several sets of timber leading back to the original portal as well as the adjacent dry-blacksmith shop have been flattened. The timbering which formed the crosscut and drift is in good shape. It is evident that the timbering had been done carefully and with choice logs, probably of fir, in the earliest period of mining. The only caving noted is related to the stope lagging in the northwestern drift.

At a measured 135'-137' from the effected entrance, a drift on the lode is encountered. This has been carried to the northwest and to the southeast. The crosscut continues beyond the drift for another 135' approximately, making a total length under cover of 270'. The crosscut has been driven through talus for some 60' to 75'. The lode or fissure vein, cut at 135' from the portal, has been drifted on for more than 80' to the northwest and for at least 60' to the southeast, according to what the writer can see. The drift to the northwest is timbered, beginning from the southeast side of the crosscut. An ore chute is encountered on the west side, perhaps 10' from the x-cut. At 35' to 40' from the x-cut, a winze or 2-compartment sloping shaft has been sunk downwards on the lode. It is timbered with platforms on which ladders can still be seen. Perhaps 35'-40' of the manway can be seen but it cannot be entered as it is filled with crystal-clear water from a point a few feet below the drift. The entrapped water suggests either that the manway may not have been carried down to the #2 adit drift or that it is so plugged that very little water is escaping. At the top of the northwest compartment, a windlass is still standing erect

and ready for use.

The northwest drift ends in a great pile of muck reaching from floor to lagged and timbered roof at a point approximately 80'-85' from the x-cut. A small gap between top of muck pile and timbers permits a slight glimpse beyond. There is a suggestion that the drift either continues a little farther or turns. The muck material seems to come from the hanging wall side where the timbers are broken and to consist of rock derived from the stope above in addition to some slabs from the wall. The portion of the hanging wall visible beyond the winze suggests a slip face dipping at 60°-70° with the heavy plaster of muck on it being derived from gouge material. This may represent the true hanging wall of the lode or fissure vein. If this were so, the true width of mined material in the stope would exceed 6' in places.

The muck pile blocking the northwest drift seems to contain considerable waste, to judge from some large pieces which were broken open. Above the lagging or stope floor which does not seem as strong as it should be and which is cracked and open in places, broken rock can be seen completely filling across the base of the stope. Small openings enabled the examiner to draw off some of the rock material up to a 3"-4" size. Much of it, 2'-3' back of the drift muck pile, is observed to be good grade ore. Several pieces 3" across are found to be solid steel galena. A sample consisting of pieces from the stope, about 50% of which would be siliceous or silicified carbonate rock (carbonate ore) was derived from along the lagging. An assay of this returned:

J. R. Williams & Son #31524	Au	Ag	Pb	Zn
	tr.	21.30 ozs.	33.27%	tr.

One additional chute is located northwest of the winze in the northwest drift, but there is no manway or access path upwards into the stope in this drift.

The southeast drift is not visible at the present time as a drift proper, but buried track shows where the drift has, in the past, been turned off the x-cut. There is a timbered barrier along the x-cut wall and across the drift stretching up beyond the roof. A large opening in the timber leads from the x-cut over muck into the open stope. The stope roof is now probably some 25'-30' over the original drift floor. Blasted muck and large slabs of fallen rock from the hanging wall form a slope of fill for the bottom 5'-10' of the stope. The lode or fissure vein is visible on the back of the stope over about 50'-60'. There is quite a narrow portion of stope at the southeast end but a thinner lode apparently continues onwards into the face there. Because of the overhang of the hanging wall side, because of slabbing which makes the stope 12'-15' wide at the base,

and because there are only 3 stull supports concentrated in one small area, the working does not impress one as safe. The 1925 report of Grant states that a winze was sunk "in the southerly (southeast) drift". This "Winze B" was filled with water in that time and today it must be buried under muck. It is also reported that the "ore shoot is stoped to a depth of 24' from Winze B to the southerly end of the ore shoot, approximately 80', leaving only a floor pillar." With regard to the length of the southeastern drift, Grant reports that it was 125' long in 1925.

A sample was taken at one point on the back of the southeasterly drift or open stope by climbing up two stulls and using a hole cut into the foot wall slip face as a stand. It was just possible to balance below the back and chip channel a small sample through 3"-4" of mud or gouge on the foot wall slip, through 9"-10" of solid high grade steel galena overlying the muck, and through 8"-10" of siliceous carbonate rock with a quartz stockwork. The sample location would be about 35' or slightly more from the x-cut timbers and was 20"-22" in cut length. The results of the sample were as follows:

J. R. Williams & Son #31523	Au	Ag	Pb	Zn
	.005 ozs.	25.10 ozs.	36.95%	3.50%

Additional sampling should have been carried out along this channel but the situation did not permit. No other point along the back of the open stope could be reached without making and erecting ladders and other supports. It was observed from the sampling point that if one could climb the crib wall above the x-cut at the northerly end of the southeastern stope, it might be possible to get on top of the muck-filled stope on the north side of the x-cut. There may be some 12'-15' of broken muck of good grade stored there. The total length of the stoping should be more than 145'. Grant states that "the vein has been stoped above the drift for 170' at an average height of 20' ", and that "the mineralization has practically pinched out in both directions". The vein is observed to be narrowing in the southeasterly direction. It might well swell out again.

It should be mentioned that #1 x-cut ends in what appears to be a greenish, argillaceous rock with a slaty character which dips at better than 45° to the southwest. Strike is perhaps a little more northwesterly than the lode strike. This latter strikes on an azimuth of 332° or N.28° W., based on Brunton compass readings of the line of the stope in the northwest drift.

Back of the x-cut face are two noteworthy seams or possible fault lines. The first is about 5' from the face

and is a break containing mud and brecciated siliceous rock. Some dark, fairly soft rock material was extracted from between breccia fragments. Although fairly rotten and hard to distinguish, it could be classed as a lamprophyre. The other cross break is 20'-25' from the face, is much narrower and seems to contain only mud. Between the two breaks the rock is noticeably lighter coloured, hard and very siliceous. The intersection may represent an infaulted quartzite block. The rock to the west of the second seam is green-grey and slatey. Rock, creamy in colour and containing a quartzy stockwork, appears to occur some 30' towards the face from the x-cut drift intersection.

The #2 Adit was not entered. Although many man-days were spent in trying to gain entrance and a great pile of frozen debris consisting of crushed timbers, iron rods, canvas, boulders and muck, even grating, were removed by the exploring crew from the caved portal, only one set of upright timbers was found. It was not possible to work under any upright supports to effect an entrance, no matter how small. The adit gives the appearance of being down for 30' or more beyond the farthest point excavated. Large boulders seem to have flattened the timbers and these could not be moved by hand methods. Blasting would break these, but undoubtedly would bring a heavy flow of slide rock from the steep trough which overhangs the farthest point reached. This would refill the section already dug. Sand blasting of the larger boulders is the only dynamiting considered. The frozen muck and timbers blocking the access would have to be handsteeled like rock. Blasting such material is most difficult because of tendency to "springing" or "capping".

The entrance area of #2 Adit which was uncovered shows that the most serious ore mining effort was made from this point. A large log building housing blacksmith shop, dry and possibly air or water pumping equipment, is located on the north side, but the roof of this has been almost completely demolished by weight of snow. Rails with switches still remain down across the relatively large dumps and lead under the debris into caved tunnel. The direction of the track and entry portion cut out are roughly of the same orientation as #1 Adit. The #2 Adit, from various checks by the aneroid, seems to be between 103' to 135' lower in elevation than #1 Adit. The lesser figure is probably much closer to the true value and a difference of 107' will be used until a proper survey is made.

For details of this working, reference must be made to Grant's report, as his observations in general appear to be comparatively accurate. He states (1925 report) that the adit was "driven 360' from portal to vein with a drift 30' southeasterly and a raise 10' from the southeasterly

end". There is an intersection of 150' of talus before country rock is encountered. It would appear from the size and condition of the dumps that the working must be far more extensive now than indicated by the 1925 report. The dumps checked by the writer are, as illustrated, quite extensive and moreover are separated into ore dumps and, presumably, waste dumps. The "ore" dumps are on either side of the large central "waste" dump. The ore dump on the north side is underlain by an earlier carbonate waste and carbonate ore dump. The "ore" on this dump has definitely been screened to remove all the high grade possible and it would appear that similar work, to some extent, has been done on the southern "ore" dump also, although there are large lumps of steel galena still lying on the surface there. The amount of ore material still available in the dumps suggests a much larger operation than was carried out at #1 Adit. A later report dated May 12, 1931, by a Frank Eichelberger gives information re #2 Adit to support the above idea. He states that "the vein has been driven upon for about 300' with ore in both faces. A raise connects these two levels (#1 and #2) and shows continuity of ore throughout its length, some being very high grade. A shipment of a carload taken from this raise showed 40% Pb and 40 ozs. Ag." This observer was certainly not as careful or precise by any means as the engineer Grant, and the writer cannot in any case check his statements. He would, however, be inclined to accept his statement on the length of drift and the fact that ore is in both faces.

Samples were taken of the "waste" dump and of the screened material in the "ore" dump on the north side of the waste. The "waste" dump was sampled by grab methods completely around the circumference at two separate contour levels. The results of this test were:

J. R. Williams & Son, #31525

Au	Ag	Pb	Zn
tr.	2.25 ozs.	3.25%	tr.

The grab sample taken over the screened material yielded the following results:

J. R. Williams & Son, #31526

Au	Ag	Pb	Zn
tr.	6.65 ozs.	9.80%	0.03%

The results signify to the writer that there must be considerable low grade carbonate ore as well as the high grade fissure vein present in the heading. The low grade material must come from mineralized carbonate wall rocks of the lode proper in the form of stockwork and dissemination. It may

represent substantial widths of mineralized rock and no doubt is the cause of the earlier references to widths of 4'-10' of vein material.

The dump on the southern side of the waste dump contains apparently richer material and grades there would be appreciably higher.

The ores from #2 were taken, after screening, along a track cut in the slide rock in a stoneboat, presumably by horse, to the top cable station for transport by cable down to the bottom station and thence by cart to railhead at Brisco. This type of operation must have been under way in the period 1928-1931. One gathers from other sources that some activity was taking place in 1931-1934, but aside from dates on buildings, etc., there is no confirmation to bear this out.

West of the main workings ½ mile lies the western cirque, separated from the eastern cirque by a sloping synclinal basin of quartzites. There are footpaths leading into the lower end of this area from the Lead Queen Creek at 7000' but, except for isolated sections, these appear to have been obliterated by slides and their ultimate destination is not known, though it does appear to have been at a level higher than 7200'. No indications of such workings were obtained by the examining party, but large, tightly folded (?slightly overfolded) anticlinal structure from which coarse breccia and blocks containing hematite seem to be derived can be observed in the western wall of this area. The hematite, and to some extent brecciation, are generally associates of ore structures of the Lead Queen area.

At a level of 6700', approximately some 500'-600' below the base of the eastern cirque, another adit exists. This adit, known as #3, is easily spotted by its large dump, which is visible on the east side of the valley about 150' from the Lead Queen creek. The adit starts at a point about 100' above the creek.

This adit has been blocked by rock and mud which had caved from above the portal. It appeared that there would be a large amount of material to move out from a rather tight spot, since the trackway and portal are wedged between a talus slope and heavy timbers of a collapsed building to the south. The examining crew were fortunate in striking a spot just in front of an erect set of timbers on their first attempt and in gaining reasonably quick access by digging down in front of this. On the first sortie into the tunnel, the writer was struck with the poor and dangerous condition of the timbering. It would seem that smaller and poor grade timber such as hemlock or balsam had been used. There is a fair quantity of water being discharged from the interior.

On the whole the crosscut, for it essentially is that, is found to be exceptionally long, meandering, and in its deeper sections, quite dangerous. There are a number of caved sections after the first 300'. The first section of timbering ends at approximately 154' and this timber is quite rotten near the portal. At 188' a good ore car is found standing on the track. Some 50' beyond this, timber begins again and sections of this timber are found to be partially caved from the south side between 290' and 400' where the direction of the tunnel actually runs north. In the next 80' the tunnel intersects a cross tunnel (drift?) which appears to be driven on a mud seam or fault. The "drift" is driven some 250-275' to the northwest and, after following along the x-cut for an interval, for an additional 30'-60' at least to the southeast. In the latter direction, the entire stope or drift appears caved.

The northwest section of this "drift" is timbered for a short distance and then is carried through bare rock. Most of this rock seems to be slaty or argillaceous. At the face the rock is a dark greenish argillite with a strike approximately N.65° West and dip about 20°-30° northerly. There is no track in this "drift". Its main use is for storage. The section where the x-cut intersects the drift is of bad ground and seems to be caving along the fault or seam. This bad ground continues beyond the "drift" as the x-cut makes several bends. There are crushed timbers and several bad spots until one reaches a place where the timbering is all down due to crushing pressure from the south, except for a $1\frac{1}{2}$' triangle through which it is just possible to drag oneself. In the next 120' there is more bad ground and finally a pile of muck which is coming in from the north through broken lagging. It is possible to move over this carefully to continue another 100' to 200' in 1' or so of water and reach another large pile of muck from a caving roof which blocks the tunnel almost to the roof. From the top of this pile, one can peer through to observe quite deep water, perhaps $2\frac{1}{2}$'-3' deep, held by the muck pile, and a continuation of the x-cut for another 100' or so to a point where the light is insufficient to define any feature for certain, but where there may be a bend.

The writer estimates he was some 800'-900' in the tunnel before turning back. It is probable that the tunnel carries considerably farther, possibly 500'-600'. At the last point reached, a large slab of iron-stained rock was noted in the muck pile. A portion of this, when taken outside to the light, proved to consist of a very siliceous carbonate, very similar to quartzite in appearance, with much finely disseminated pyrite throughout. This would be called a silicified carbonate rock.

zone is in the area into which the #3 tunnel would penetrate or has penetrated and such zones are associated with the ore metallics, it would appear that there might be a fair chance of picking up a lode within the general vicinity of this zone. Without being able to complete a trip through the entire length of the tunnel it is impossible to state whether this working actually reaches a lode or lode formation. There is no question that the tunnel runs through a great section of the brown carbonate since the dump appears to be composed of this. It is thought that the tunnel is driven below much of the quartzites and into argillites and carbonates.

The investigator noted, when studying aerial photographs, that there is a distinct indication of trails leading west and southwestward from the upper main mining camp opposite #3 adit, but he did not encounter any such trails while on reconnaissance in this area. Little intense prospecting was done in this sector during the last visit and there is a possibility that undocumented exploration with some attendant workings have been carried out in that sector. During the May visit, when snow covered the high ground, a lower sector was crossed and a natural cave or possibly an adit was reported in a cliff face approximately in the area where the indistinct trail seems to lead. Small indefinite indications of copper mineralization in the form of bornite and chalcopyrite were obtained from above the cave by a prospector at the time.

The investigating party found one more working at quite a low elevation compared to those discussed above. This working is located at the edge of the main large slide which has originated from the western cirque area, chiefly from its steep western walls. The slide has removed any dump from the front of the workings. This working, called #4 Adit by the writer, is certainly 400' or better above the parking spot on Frances Creek (near bridge at 5100'). Elevation of the working appears to be somewhere in the neighbourhood of 5400' to 5700'; an elevation of 5620' is chosen to conform to the most agreeable position on the topographic map.

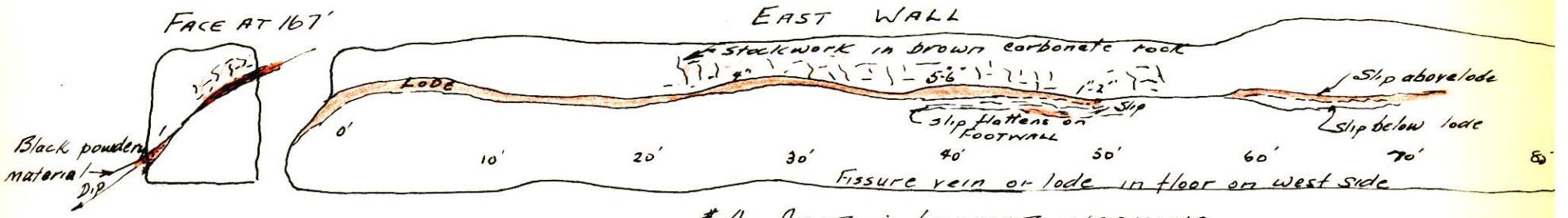
The working is situated on the east side of a draw down which the main stream draining the western cirque tumbles. This slope has been cleaned of overburden and bush to a large degree by slide action. Slides of muck and snow down the stream bed are a common occurrence in the spring, particularly in June.

The adit is cut into a slope of chiefly brown carbonate rock without benefit of timbering. It measures a total of 167' in length and has a slight bend to the west near the halfway point. The lode consists of a fissure vein of solid silver lead-zinc ore resting on a clay gouge attached to a slip face which has a variable thickness.

Above the solid ore there is normally a siliceous brown carbonate rock with a stockwork of quartzy material shot through it. There may be as much as 2' of this. The seam or fissure vein of ore is plainly visible in the face on both walls. On the east wall it is at shoulder height and on the west wall at foot level. The solid material - steel galena - varies from 1"-2" width to as much as 9". At some 80' from the face, the fissure vein appears to thin out somewhat. Near this point there is a distinct slip above and below the silver lead ore band. A fault or slip appears on the western wall and brings about attenuation and dislocation of the ore seam.

The 20' cut leading to the portal of the adit shows ore mineralization on either side. Mineralization on the western side occurs in a lumpy, altered, siliceous brown carbonate (limy) rock as pods, small lenses and in disseminated fashion. The more highly mineralized section is 6" to 1' wide and is entrapped in a small roll or drag. There is a strong indication that this is connected with mineralization in a continuation of dragging on the eastern side above the portal. Here the mineralization is of much the same nature, being apparently controlled in its deposition by small drag or crenulated structures. It can be seen to follow the form of the drag. The conclusion reached from study of the working and its immediate environs is that the ore shoot is associated with drag folding on the limb of some large fold structure or more likely, due to faulting of such a structure because of overfolding. The impression is that there is a rupture along the attendant drag and ore mineralization of the lode type is confined largely to the crown and immediate sides of the drag-fold-fault structure. There is also an impression that the fold plays into the slip fault and that the dip of this steepens to the north. Strike of the whole is somewhat north of northwest and dip variable but at the face is approximately 45°. There is still a suggestion of flattening in the vein in mid-face. The fissure vein seam gives good evidence of persisting strongly beyond the face to the northwest. At the entrance, although the mineralization can be traced above the tunnel for 20'-30', it cannot be traced beyond this point definitely and it would appear from the shearing present that the ore structure is chopped off by a vertical shear band. Neither can the mineralization be traced southeastwards down the slope, though there is some dissemination in that direction. It probably pinches in that direction, but might be picked up by sample testing.

Shearing and crumpling persist as shown by carbonate and schistose sections (almost a paper schist) southeasterly for 100'-150' before being covered by slide material and bush. If the strike of this generally disturbed area is projected, it will pass somewhere near or just east of the chute or falls on Frances Creek and will traverse Crown Grant 11426. Sections of sheared rock and evidence of



#4 ADIT - LOWEST WORKING
Scale 10' = 1"

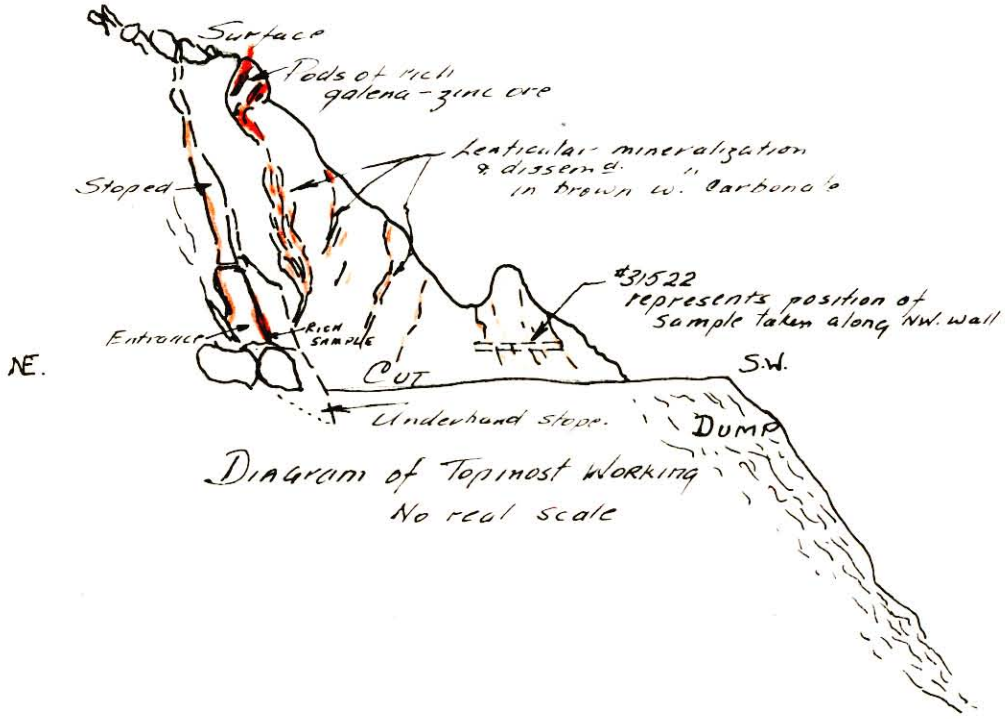
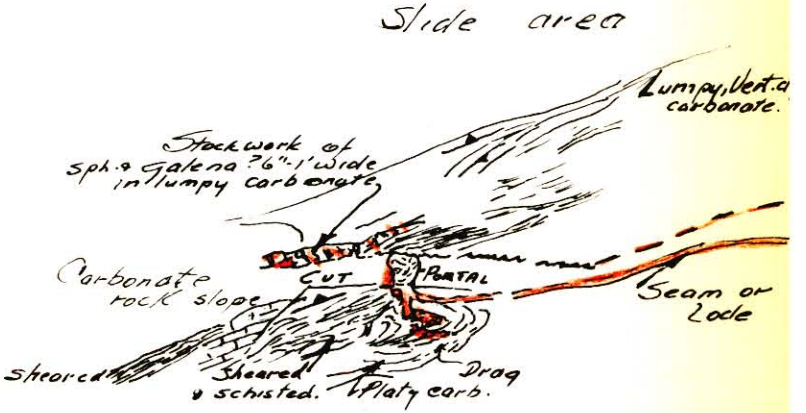


DIAGRAM of Topmost WORKING
No real scale



#4 ADIT - PORTAL AREA

LEAD QUEEN

DETAILS OF TOPMOST WORKING AND #4 ADIT

August 1965

WINDERMERE M. D.

Aug 1965

dragging and some faulting can be observed on a north-northwest trend which leads back to the area of the western cirque.

A number of assays were taken in and around #4 adit in May, 1965. The locations and results are given below:-

J. R. Williams & Son, #4975. Face of drift footwall side. Vein 4"-5". Lower portion. 2'.3 wide cut

Au	Ag	Cu	Pb	Zn
0.005 ozs.	3.80 ozs.	0.20%	6.23%	5.33%

J. R. Williams & Son, #4976. Upper portion of sample 4975. Siliceous ls. with quartz stockwork. 1' cut.

Au	Ag	Pb
	0.35 ozs	0.40%

J. R. Williams & Son, #4977. Chip across vein or seam of black soft material in hanging wall side at base of face (6" seam). 17" cut.

Au	Ag	Pb	Zn
0.01 ozs.	10.00 ozs.	18.47%	4.25%

J. R. Williams & Son, #4978. Chip across 1'10". East wall at pt. 43' back from face. 6"-7" of vein solid.

Au	Ag	Pb	Zn
0.005 ozs.	8.40 ozs.	13.75%	9.60%

There is either some error in the old reports with regard to the statements that this tunnel is at the level of Frances Creek, or there is still another tunnel or working actually at the level of the Creek which has not been turned up. If such a working did exist at the level of Frances Creek, it could be completely covered by the slide at this date. No indication was obtained of such a working. An old cabin exists at the base of Lead Queen Creek near where it enters Frances Creek, but no workings and no trails leading to workings were found in that area.

Grant, in his report, states he did not visit the above working and so quotes from C. B. North's report for C. M. & S. regarding the lowest working in which it states

that there "is a 150' drive on the vein from the most south-easterly claim at an elevation of 5000'. This tunnel shows ore varying from 3" to 6" wide along its whole length. A sample across 6" near the face assayed 36.9% Pb and 21.6 oz. Ag." As the sample was probably cut on the solid steel galena ore only, the values would be about right. The balance of data except the elevation would seem to describe the above #4 working.

Eichelberger report indicates the #4 tunnel or working to be at the level of Frances Cr. (He does not appear to have visited the working personally) but then states that "this tunnel is 2000' vertically below the #1 tunnel", and this would place #4 at 5500', which is approximately correct for the tunnel seen by the writer.

MINERALIZATION

The general area investigated contains lead-silver and zinc mineralization chiefly, but during the writer's first visit some copper and barium mineralization was noted in the western area. Gold, in very small quantities, also reports in assays from the western side of the property but appears to be lacking, from tests made, in the eastern cirque area. The gold may have some association with barite, an injected mineral observed to occur in veinlets or fracture fillings along the western fault or faulted zone. Copper in the form of chalcopyrite and bornite was also noted in small scattered amounts in company with a silica (quartz) introduction. There is also some tenuous dissemination of chalcopyrite and pyrite in a few places. Neither copper or barium mineralization is noted in the eastern cirque area. Zinc mineralization in the form of sphalerite is more prevalent in the western area and seems to occur in only small amounts in the eastern cirque, even where there is a concentration of lead-silver. More detailed study may show that the sphalerite found in the area, which is the dark, high-iron type, covers a different mineral period and is more closely associated with the hematite.

Silver is closely associated with galena or lead since in the high grade material such as the "steel galena" the proportion of lead to silver remains roughly the same. Tetrahedrite is very likely present in the richer ores but it seems to be intimately mixed with the galena.

Two samples of high grade consisting of steel galena (very fine-grained and dense ore) and a coarser ore with the typical distinct granular appearance of galena were assayed by Mr. L. Dempster when these were sent to him from the Lead Queen by the writer. They were assayed only

for silver. The coarser material yielded 26.7 ozs. Ag. in comparison to the fine-grained material yielding 77.9% ozs. Ag. The greater percentage of solid lode ore, when found along a fissure, appears to be of the steel galena type. The coarser and much brighter ore, distinctly galena, is found in pockets, in small shoots, in lenses and in disseminated or streaky fashion. The proportion of silver to lead in lode ores works out at between .6 to .7 ozs. of silver per percent of lead. This holds quite well if the samples consist largely of high grade, but if there is a substantial proportion of carbonate ore in the material being assayed or checked, the lead content rises.

It was observed that in the dumps and on the talus slopes surrounding the main workings there is a great deal of black to dark brown material mixed with carbonate. It is, in most places, made up of a boxwork with powdery limonitic material entrapped and it seems to fill fractures or surround carbonate breccia. This material in the eastern cirque is sideritic with some hematite and seems closely related to the ore structures. It has been seen in large blocks of float which have been derived from what appears to be a highly stressed, sheared and faulted brown carbonate zone in the western cirque. It was noted again near the lowest adit and it has been observed by others at more distant points in relationship to or in proximity to ores.

Similarly, the siliceous brown carbonate with the quartz or siliceous stockwork is noted to be directly associated with ore mineralization at different and fairly widely separated points. At two of these points the stockwork overlies the high grade ore. In two other areas, quartzy stockwork material is noted. One area lies about 1500' east of the #3 working, close to the cliffs of brown carbonate. This sector is significant in that it is an area into which a logical prolongation of the fissure vein or veins and adjoining disseminated ore zone of the main workings could be projected. The indications are that structures similar to those found around the ore veins might be turned up in thisssector also.

A second area where quartz stockwork could be observed was found in the western cirque, though only float was found there. This cirque contains structures similar to those found around the main workings.

A quartz veining or fracture filling accompanying introductions of iron in the form of ?specular hematite also in fractures was found east of the eastern cirque area in the vicinity of Steele Creek.

Barite gangue is noted as a common associate of ore minerals in several other mining areas of the region.

PRODUCTION AND ORE

There are few, if any, real details as to production before 1918. It would appear that ore had been shipped before that time. In 1918 the Minister of Mines report states that there was a force of 8-10 men on the property and that some 80 tons of ore were hauled to Brisco for shipment. Nothing is said about shipments in the 1925-1927 period, but Grant reports that by 1925 Mr. North of C. M. & S. claimed that 800 tons had been produced from the Lead Queen by all previous operators and that this ore averaged 65% lead and 40 ozs. per ton silver. A Mr. Watson of a later date claimed the average grade was lower, i.e., 45% Pb and Ag. 36 ozs. The higher grade is much closer to the average proportion of lead to silver noted by the writer and in view of the fact that considerable effort was made by the operators to remove the carbonate ore by screening and picking, the writer would accept those figures for the average higher grade lode ores.

Eichelberger, in his report at the later date of 1931, gives no production figures.

The 1925 Minister of Mines report lists no tonnage shipped from the Lead Queen but there is a statement that a tramway was being contemplated for 1926 and that a survey had been made for this purpose. In the 1927 report, 45 tons of silver lead zinc ore is listed as being shipped from Brisco from the Lead Queen, and this is probably due to the use of the aerial tramway. No shipping was apparently done in 1928 but 14 tons of silver lead are listed as being shipped in 1929.

No further mention is made of the Lead Queen in the Minister of Mines reports other than in the Index 1937-1958 where production 1916 to 1929 is listed as 429 tons, yielding 1 oz. Au, 14,120 ozs. Ag., 321,582 lbs. Lead and 2,630 lbs. of zinc.

Actual ore in place lies chiefly between the #1 adit and the top or uppermost working, between the #2 and#1 adits, and to a limited extent in the downward extensions of the lode below the #2 adit. Widths of greater than 4' have been mentioned for the lode and it is believed that such widths must include the lower grade carbonate ores which have been observed chiefly on the hanging wall side of the high grade. These may also occur in the footwall. The dense, high grade, steel galena or the granular type galena has been observed to vary from 4" to 1' in width in the lodes. In the eastern cirque, good general grades across 3'-4' inclusive of the lower grade carbonate ores, should run from 10 ozs. Ag, 18% Pb, to 20 to 25 ozs. Ag, 30-36% Pb, with zinc showing to some degree, possibly $\frac{1}{2}$ to $1\frac{1}{2}$% on the average. A rough estimate based on an exemplary block with a fairly steep dip of 3' thickness and variable lateral extent which, if

carried from surface to 25' below the #2 adit and subject to deduction of ore already extracted, suggests something like 13,000 tons of ore. The grades for this block could be in the order suggested above, if about ⅓ of the ore were of the more solid higher grades and the balance of carbonate ore, but this must be considered something of a "guestimate" until sufficient close sampling is done along the backs, etc., of the workings.

There is little question in the mind of the writer but that the present known vein or lode system can be expected to extend to greater depth. The present lode may increase in lateral length with depth. There are indications that a zone of mineralization of 100' or better width containing lower grades of ore exists in the vicinity of the uppermost workings. There are also indications that the mineralized zone at the uppermost working extends 300' to 400' at least or that another shoot is building up somewhat more southeast of the main lode.

DISCUSSION AND CONCLUSIONS

The Lead Queen property, located as it is at elevations between 5000'-8000', has posed some problems in carrying out an investigation. In spite of the high elevation, weather conditions were never severe during the visits except on one occasion and the discomforts brought about were due to the lightness of the shelter. Permanent log or metalled shelters at the levels up to 6900' should permit limited underground work even in winter, provided roads and paths are kept open. Even the buildings at the adit entrances have withstood very well the climatic conditions over a long period of 35 years, only collapsing as all such structures do by reason of disuse and accumulation of snow. If operations can be conducted from levels below 6700', particularly if these are underground operations connecting to the upper levels, the situation would be much easier generally. A good road to the lower cable station or some 200' above it - 6300' level - can be relatively easily reconstructed along an excellent grade. There has been no serious slide over this route in the years since the mine closed. Some minor bridging over steep streams will have to be done.

The property, as it now stands, has good potential for the discovery of new ore bodies as well as for the extension of the present lode. The investigations show that there are not one but two structural zones in which lodes could be found. The structural zones are based on sharply folded strata, chiefly in the form of anticlines which have yielded somewhat along north to northwest trends by faulting and dragging. These are favourable sites for

ore mineralization. The zone cutting the eastern cirque traces out over a long distance. The apparent visible trace of this zone is about 1⅔ miles when studied by means of aerial photographs. Its southern end disappears under talus and other overburden. Only lengths of 300'-400' in the case of the upper Lead Queen workings, 200' in the Steele Group, plus an indefinite and questionable thousand feet in the case of the #3 working have been explored in this zone.

The writer sees no good evidence to connect the #4 working with the eastern zone. Rather, it is concluded that this working confirms the presence of ore and ore structures in the newly established western structural zone. This latter zone was not established until the last day or so of the investigations. Very little study has been made of the high ground in it except by means of binoculars. Recent study of this sector by means of aerial photographs confirmed a line of disturbed faulted strata cutting through a sharply folded (?overfolded) anticlinal structure which leads down a gully to the lowest #2 working and apparently beyond. This line of faulting is roughly parallel to that in the eastern cirque. It contains several indications, other than the #4 working, of being a mineralized zone. Copper minerals, pyrite, hematite and barite were noticed along the strike of disturbed strata in the lower parts of the zone. The higher elevations of the zone are in a dangerous area of slides which can only be approached with caution in summer.

It is concluded that both of the zones of faulting and of mineralization are related to the regional faulting which seemingly has displaced large blocks of strata. The mineralized zones are related, probably as subsidiary faults, to the regional faulting. The regional faulting and structural pattern of this area are part of a very long and complex tectonic regional zone extending possibly as far as the Kimberley. Granitic batholiths and stocks along with sills occur along this great zone. It contains several mines and could be dubbed a mineral belt or zone.

The granitic bodies are considered post-tectonic and it is highly probable that their emplacement is therefore post ore. The age of the ore minerals is obscure but all signs point to its being telethermal and from a deeply seated source. It is probable that the granitic intrusives and the ore mineralization have been derived from a mother source with granitic intrusives arriving considerably later than the ores. Proximity to the granites does not appear to produce any concentration of metallic minerals similar to those found on the Lead Queen.

Ore controls are of the fold-fault-shear type basically, but one other factor may have played a considerable part in concentrating the solutions and in precipitating

them. The competent massive quartzite beds which overlay the carbonates throughout this area before erosion may have acted as a dam on the fluids. It would appear, however, that substantial folding and fissuring took place before the introduction of the mineralizing fluids. It is concluded that the most favourable situations for mineral deposition in this locality have been in the vicinity of the crown or certain sections of the limbs of the asymmetrical or slightly overturned anticlinal structure, possibly under the cap of quartzite. Dilation, fracturing, shearing and eventual failure by faulting have affected the carbonate rocks in response and accommodation to the thrusting force from the west or southwest. In the western cirque, it appears the breakage, shear and faulting are on the eastern side of the anticlinal structure. The opening into which ore material has been deposited in the instance of #4 working is connected with drag folding probably along a fault zone. The axis of the small fold would appear to dip to the west. In the eastern cirque, ore mineralization occupies a fissure and a hazy zone of metamorphosed carbonate, which presumably dips westward. The dip of the quartzites, which should have overlain the carbonate as the eastern limb of a syncline, appears the same as the carbonate. However, the brecciation of a portion of quartzite at the point of flexure and the shearing, dilation and metamorphosis apparent in the carbonate suggest that faulting has caused caused the carbonate to be out of its normal fold position. The thick quartzites of the syncline seem to have disappeared to the east, leaving carbonates in prominence. The true nature of the fault movement here is still quite obscure but the synclinal trough of quartzites seems to be of considerable depth extending well down Lead Queen Creek below the #3 working and probably well below the pass there, a drop of 1600'-1800' along the plunging axis. The rather "chewed up" quartzite seen just south of the main workings as a south-westerly dipping limb is comparatively thin. It has been mentioned by Grant and apparently others that there could be a blank section of the ore body where the carbonate rocks flattened to pass in their normal sequence under the syncline but, if, as is suspected, the faulting movement is parallel to the steeply upturned carbonates, this fault plane and its allied mineralized fissure (which might form part of the fault plane) with the associate brown carbonate horizon are very probably going to descend quite steeply to a considerable depth. In other words, the faulting with associated mineralization may have placed a steeply dipping limb of carbonate against the broken, flatter dipping quartzite beds of the syncline. The inclination of the axes of the folds to the west would help this to take place. Thus the mineralized zone could be carried downwards for a very considerable depth. To the writer, this appears a good avenue of exploration, but it must be remembered that he has only second-hand information on the lowest main working, #2 adit.

On the other hand, the writer does not agree with the idea that the ore zones can be projected indefinitely from the main workings to the southwest. The attempt to cut the projected ore zone from the #3 working 500'-600' below the top workings seems to be a very long shot indeed. It may be that intermediate areas were avoided because of lack of slide protection or that the expected lessening in the steep original dip of the fissure lode would bring it close enough to the #3 area to make it feasible to x-cut from there. The idea of the writer that the steeper dips of the ore zone would be maintained for a considerable depth would tend to place any lateral and downward extension well back towards the cliff area, subject of course to cross faulting or dragging. In any case, there appears to be a northeasterly striking cross fault some 800' to 1200' south of the upper workings. This fault is hypothetical as yet but the air photos suggest some break in the carbonate horizon. The #3 x-cut also appears to have encountered a broken zone or fault at about 400' to 450' from the portal and to have wandered along the southeast wall of it or, at times, in it. At any rate, the ground is bad along this trend for much of the way thereafter.

The writer did not succeed in reaching the end of #3 or in studying it to any degree, as it was too dangerous in its present state, but there is little real sign that the x-cut drive picked up a true lode. Some mineralization must have been encountered at its farthest reaches. The side drift to the northwest did suggest that a portion of it had penetrated the argillites which underlie the massive quartzite beds.

There appears little likelihood of a connection between #4 working at 5600'+ and the eastern zone. Rather, it seems that the eastern zone will bear east and south through the area near the cliffs. Additional ore concentrations are not assured there but certain indications, among them the disturbed strata and quartz stockwork of the zone, suggest faulting and thus favourable circumstances for mineralization.

The Steele workings were not observed by the writer, but since they have been described by one reliable previous observer to lie to the northwest of the Lead Queen main workings, it seems certain that there is a continuation of the lode zone in that direction, on the far side (east) of the cirque wall. Cross faulting may have thrown the Lead Queen lode zone to the northeast. Additional extensions of the fissure vein to the northwest beyond the Steele Group are considered probable, to judge from the geology displayed on the aerial photographs.

The western structural zone holds considerable potential, in view of the #4 working, establishing it as a possible

mineral zone. This zone was demonstrated by one quick, very limited reconnaissance trip to contain showings of barite, iron and copper mineralization. It will be difficult to explore in its upper reaches because of rugged, very steep terrain.

The claimed extension of the eastern zone for 6 miles on the basis that it has been observed and traced throughout (?southwestward) is taken as an overly optimistic and not too credible statement, but fault structures do appear to continue on the south side of Frances Creek more or less southward or southeastwards. Silver lead-zinc mineralization exactly like the Lead Queen has been shown the writer as from the McLean Creek area, but the writer did not succeed in finding and studying the workings reported there. From reports and other indications, the extent of mineralization at McLean Creek is about the same as in the #4 working. Extensions of this mineralization seem possible.

Another important area for prospecting lies some distance east of the Lead Queen claims.

Very few geophysical tests were made but magnetic changes were noted in the vicinity of the main workings. Magnetometric testing of the east-west areas might yield some interesting results.

The general conclusion from the investigation carried out is that this sector of the Purcells is a favourable one both regionally and locally, as in the case of the Lead Queen property, for mining exploration. The nature of the Lead Queen zones and ore bodies is such as to offer good opportunity for improvement, and warrants considerable exploration expenditure. The present ore bodies are, so far, not large tonnage-wise, but are fairly rich and hold good promise for downward extension, parallel development, and additional lateral extensions. The character of the ore does not change appreciably in a drop of 2000'-3000'. A large body of disseminated type ore with some massive sulphide sections is a possibility if the right coincidence of tectonic conditions take place in conjunction with cap rocks.

The writer cannot, on evidence obtained, make sound statements as to tonnage and grade of ore. On the basis of logical and permissible extensions laterally and on the dip, and assuming an average width of 3' of lode, there seems a possibility of obtaining at least 13,000 or more tons of better grades of ore within the lode structure down to some point 25'-50' below #2 Adit. This would include the mining of lower grade carbonates ores as well as the high grade. Grades might range from 3 oz. Ag, 6% Pb, to 9-10 ozs. Ag, 15% Pb in lower carbonate ores and from 10 ozs. Ag, 18% Pb to 25-30 ozs. Ag, 40-48% Pb in the higher grade material. If sorting is done to obtain high grade material only, grades

of 38 ozs. Ag, 60% Pb seem likely. The tonnage would be correspondingly greatly reduced.

RECOMMENDATIONS

The recommendations put forward below are based on a full program of exploration and development. Such a program would require, as a first step, the re-opening of the cart road linking the Frances Creek access to the bottom Lead Queen cable station. The road will have to be bulldozed out again since it is overgrown with brush and in places there are a few 6"-8" trees and some large logs or down timbers. The bank will have to be recut somewhat to permit access for larger vehicles than the carts and cars of earlier days. In addition, the route will need two stream bridges to be rehabilitated, several soft spots to be "punched" (corduroy), one or two slides moved and possibly heavy logs to be pulled out by line and positioned for bridging. One bridge will cross a small but very active torrent and this has already considerable rock pushed into it such that at present the timber and rock would serve, with a little extra work, to get a big bulldozer across. The second bridge crosses the much larger Steele Creek and it is here that most work will be needed. If at all possible, subject to costs not being exhorbitant, an attempt should be made to gain at least 300' in elevation over the lower cable station. This will require the use of a large bulldozer and quite likely cutting through blocky slide talus. A D-7 is recommended as best for the work entailed, though a smaller bulldozer such as a D-6 would suffice.

It is recommended that further assessment and exploration be undertaken at an early stage. In view of the findings after late study of data and aerial photographs, it is desirable to check the extensions of the faulted zones for mineralization. Further staking should be done for protection purposes. A reliable prospector or geologist will be needed to do this work under the supervision of an engineer. The location of mineralized points, when found, must be documented and mapped. Additional detailed geological mapping, and in particular surveying by transit and/or plane table, are definitely required. This should be carried out before drilling, if possible, but could be done to some extent in conjunction with it. An accurate detailed map of the underground workings is needed to control the setting of the drill holes.

It is recommended that some magnetometric surveying be done, initially as reconnaissance checking and later, if warranted, as detailed work along surveyed lines. Most of the reconnaissance work will be sectioning of chosen sectors of the long fault and mineral zones.

It would be advisable to check some of the structural zone and areas of mineralization by means of simple E.M. work as this method is rapid and may give speedy and better direction to the search for lateral extensions of ore leads.

It is recommended that geochemical methods be used to locate anomalous mineralization in the heavy overburden areas covering the extensions of the fault zones into the Frances Creek Valley and, within limits, into certain sections of the northern extensions of the fault-lode zones along the cirque walls.

The #2 Adit should be opened, not only for mapping-assessment purposes, but also because this is the most likely place from which to drill for downward extensions of the high grade lode. Dynamiting in a mild form will have to be used to clear the entrance. A chamber of some kind would have to be cut for the drill. Mapping of the adit would be necessary in order to control the drilling.

A large amount of sampling will be necessary. It is important to systematically sample the outcrop area above the uppermost working over wide sections at probably 5' intervals. This may reveal a substantial zone of lower grade mineralization, i.e., milling ores, and indicate the need for direct drilling of this zone. Careful drilling of this zone by several flat holes into the low scarp offers an opportunity to sample its underground potential fairly rapidly.

Sampling of the #1 and if possible the #2 Adit must be carried out systematically at 5' or possibly 10' intervals in order to assess the ore grades accurately and estimate true tonnages of ore available.

Although it is recommended that exploration and assessment be concentrated on the main workings because of the obvious potential there, it would be well to make an earlier start (lesser elevation) on exploration in the vicinity of the Frances Creek.

Drilling is definitely required in the Lead Queen situation. Most of the drilling effort will be concentrated around the known lode at the top levels of 7700' to 7300' until targets are outlined at lower levels. Drilling will initially and primarily be undertaken to locate the downward and lateral extensions of the present defined lode. Prospect drilling of the extensions along the top of the zone some 300'-400' southeast of the top working will be called for. A lower set of holes may also be needed in this vicinity. To drill on the open slopes much below this area will place a thickening blanket of coarse talus and, presumably, hard quartzite rock between the surface and the lode for every foot down slope and, subject to the dip of the lode, could

necessitate substantially long holes. The writer advocates remaining near the uppermost workings in drilling for lateral extensions. One possible exception to this would be a possible site some 600' south of the main workings at a point near the supposed northeast cross fault. In this sector, the contours permit one to come in closer to the projected ore horizon while at a lower elevation.

Water may be something of a problem in the topmost drilling unless it is carried out as early as possible. The small lake or pond in the Lead Queen (eastern) cirque offers a permanent supply, but this means pumping up 200'-300' to the upper workings. A water sump exists in #1 Adit and this will serve to lessen the lift by 150'. The only other supplies are from melting snow which could give a supply of water into August, if carefully husbanded.

As a start, 5 holes at least 200' to 250' in length, 1 hole at a guess 400' in length, and 3 to 6 holes of a length dependant on angle of hole and dip angle of lode, from the #2 Adit site are put forward for consideration. This could be roughly 2500' to 3000' of drilling.

Additionally, drilling at lower levels is not considered immediately unless the downward and lateral projections of the #4 Adit lode are to be sought. Geophysical and prospecting work is needed here before drilling starts.

Prospect drilling can be done from the face or along the drift of the #3 Adit if it is first retimbered in places. This working offers a deep look into the country rock, and in view of the controversy over whether or not it strikes or comes close to a mineralized zone at its termination, it seems worthwhile to make an attempt to reach the old face. If the retimbering should prove too costly, and it does not appear that it should, this effort can be left in abeyance.

A semi-permanent to permanent camp building at a high elevation should be built as early as possible ahead of the start of the program, as it is not advisable for a working crew to be required to climb up and down hundreds of feet of steep mountainside every day to reach their work. Sheet metal (aluminum?) camps similar to those used by the Forestry can be taken up to the Lead Queen cirque quite easily by helicopter, if speed is necessary. Other than this, it should be possible to rehabilitate the large cabin in the old upper camp at approximately 6700'-6900' elevation. The lower base camp is too low and too distant for travelling back and forth for a work crew, unless there is no other alternative.

Rehabilitation of the cable system to bring down mined ore and pay in part for exploration might be feasible using portions of the present equipment, but this was not

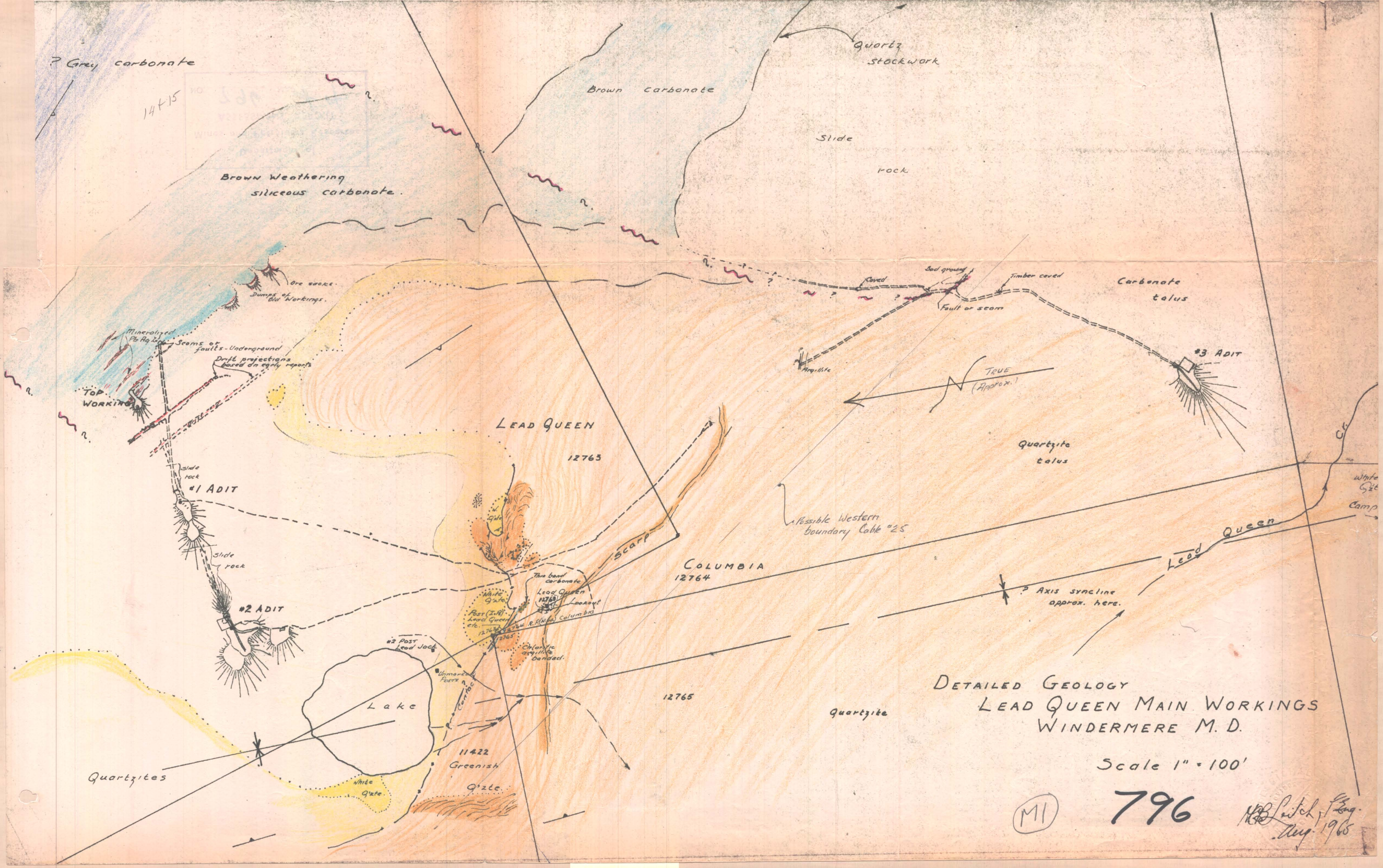
studied by the investigator. The cable stations can be re-erected in the same manner as the earlier venture, but it is an operation requiring skilled men to set up the actual cable system. Advice on this matter might be sought from the former operators. Unless much of the old equipment, such as cable wire, drums, hoist equipment, could be made workable, it is feared that costs for rehabilitation would be high.

Costs of the program can be expected to be about as follows:

Bulldozing 1½ miles of road, (this could be much less)	say	$3,000 plus
Hire of helper		150
Hire of prospector-faller, general handy man, per month $600-750, @ 2 mos.		1,500
Prospect bulldozing, if called for		2,000
Magnetic surveying, Geochemical surveying	allow, (but should be capable of expansion or contraction)	4,000
Surveying & mapping		2,000
Sampling and associated work (may require expansion)		1,000
Timbering and cleaning of tunnels		2,000
Staking, prospecting & assessment work,	allow	1,000
Helicopter work (subject to expansion if positive early results suggest increase speed of operations)		2,500
Camp building & equipment		700
Work crew wages (nominal figure)		1,200
Drilling $6 to $10/foot This is subject to many variable factors such as type drill used, whether drilling is contracted or drill rented and driller hired, and whether equipment is brought in and maintained by road or helicopter.	$15,000 to	$30,000
Engineering supervision fees, $1200 to $1500 per month, 3 months,	say	4,200
Miscellaneous expenses: food, travel, expenses, replacement equipment, etc.	allow	3,000
Transportation, 2 months, allow		1,500
Maximum cost in round figures:		$55,500

H.C.B. Leitch, P. Eng.,
Consulting Geologist.

West Vancouver, B.C.,
October, 1965.


? Grey carbonate
Brown Weathering
siliceous carbonate.
Brown carbonate
Quartz
stockwork
Slide
rock
Ore sacks
Dumps of
Old Workings.
Mineralized
Seams or
faults - Underground
Drift projections
based on early reports
TOP
WORKING
Caved
Bad ground
Timber caved
Fault or seam
Carbonate
talus
#3 ADIT
Argillite
TRUE
(Approx.)
LEAD QUEEN
12763
Quartzite
talus
Slide
rock
#1 ADIT
Possible Western
boundary Cable #25
Slide
rock
Scarp
COLUMBIA
12764
Thin band
carbonate
Lead Queen
Lookout
White
Q'zte
#2 ADIT
Axis syncline
approx. here.
Lead
Queen
White
Q'zte
Camp
#3 Post
Lead Jack
Unmarked
Posts
Contact
Chloritic
argillite
banded.
Lake
12765
Quartzite
11422
Greenish
Q'zte.
Quartzites
White
Q'zte.
DETAILED GEOLOGY
LEAD QUEEN MAIN WORKINGS
WINDERMERE M.D.
Scale 1" = 100'
796
M1
Aug. 1965

Punch along here

Top

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MINES, IMPORTANT PROPERTY AND SOME STAKING ZONES OF THE PURCELL MTS.-COLUMBIA R. REGION IN RELATION TO LEAD-QUEEN

LEGEND & SYMBOLS

28 - Granitic batholiths

Main fault zones

PARSON - - - Bush roads

Main highways

Mountain Range

796

Scale 1" = 4 mi.

N. B. Leitch P. Eng.
Traced & Compiled Feb. '66