CANADA
DEPARTMENT OF MINES AND RESOURCES
HON. T. A. CRERAR, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

MINES AND GEOLOGY BRANCH
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BUREAU OF GEOLOGY AND TOPOGRAPHY
F. C. C. LYNCH, CHIEF

GEOLOGICAL SURVEY

MEMOIR 212

MINERAL RESOURCES, USK TO CEDARVALE, TERRACE AREA, COAST DISTRICT, BRITISH COLUMBIA

BY

E. D. Kindle

OTTAWA
J. O. PATENAUDE, I.S.O.
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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Price, 25 cents

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Mineral Resources, Usk to Cedarvale, Terrace Area, Coast District, British Columbia

INTRODUCTION

This publication contains descriptions of mineral deposits examined by the writer during the 1936 field season in the area tributary to the Canadian National railway in the vicinity of Usk and north as far as Cedarvale, Terrace area, British Columbia. The work is a continuation of that begun in 1935, on which a report entitled "Mineral Resources of Terrace Area" (Memoir 205) has been published.

Usk is approximately 80 miles in a straight line east-northeast of Prince Rupert, and is about 12 miles northeast of Terrace. Cedarvale is 26 miles north of Usk. The intervening towns, Pacific and Dorreen, are 10 and 14 miles, respectively, northeast of Usk. The towns are situated on gravel benches, which extend along both sides of Skeena river. Skeena river flows in a south to southwest direction across the area, and the Canadian National railway which follows the northwest side of its valley gives excellent train service to the district. A good motor road extends from Terrace to Usk and is being continued northeast along the southeast side of Skeena river to connect with the Hazelton highway at Cedarvale. The Skeena is spanned by a steel highway bridge at Terrace and Government ferry boats are operated at Remo, Usk, and Cedarvale.

On the east side of Skeena river trails suitable for pack-horses extend up Zymoetz river and Kleanza, Chimdemash, St. Croix, and Legate creeks. On the west side of the river trails lead part way up Phillips, Nicholson, Hardscrabble, Sand, Fiddler, Lorne, and Porcupine creeks. A rough trail 15 miles long leads west from Ritchie station to the headwaters of the north fork of Lorne creek. Seven Sisters mountain is reached by excellent trails from both Dorreen and Cedarvale.

The area is noted for the number and variety of its mineral deposits. More than one hundred groups of mineral claims have been staked from time to time on deposits containing gold, copper, lead, zinc, silver, molybdenum, and iron. Initial mineral discoveries on the Emma, Four Aces, and Madden claims in 1893 attracted prospectors to the area and by 1910 about two hundred claims were staked in the vicinity of Usk. By 1914 prospectors had spread farther afield and discoveries were made on Zymoetz river, Kleanza creek, St. Croix creek, Fiddler creek, and Legate creek, also on Thornhill mountain and at Kitsumgallum lake. Development work was done during the next fifteen years on several of the more promising prospects and some high-grade ores were shipped from the Fiddler, M. and K., Frisco, Diorite, Lucky Luke, Globe, Bear, and Black Wolf groups of mining claims. As most of the high-grade ore shoots were found to be small many of the operators became discouraged and soon left the district. Since 1930 only three companies have been active in the area; Columario Consolidated Gold Mines, Limited, operated its gold mine near Usk between

1933 and 1935, Omineca Gold Quartz Mines, Limited, is developing a gold prospect on Zymoetz river, and Nicholson Creek Mining Corporation is doing some development work on a molybdenum prospect on Hardscrabble creek. During the last few years several new prospects have been discovered and a new interest is being shown in the area.

Although outside of the placer belt the district has produced considerable placer gold. Gold placer deposits were discovered as early as 1884 on Lorne, Chimdemash, Fiddler, and Kleanza creeks and some placer gold is still being taken from Lorne, Kleanza, Phillips, and Douglas creeks.

Most of the deposits in this area have been described from time to time in the Annual Reports of the Minister of Mines of British Columbia. Reconnaissance geological work has been done by Leach, McConnell, Hanson, Marshall, and Kerr for the Geological Survey, Canada, and their reports are listed in the bibliography. It has been the writer's endeavour to supplement the work already done by detailed examination of the deposits and of the geology in their immediate vicinity. Geological maps of those properties on which considerable development work has been done are presented in this report. A number of assay returns from samples collected by the writer at the individual deposits are given as a guide to the grade of ores. The report is designed to assist the prospector and investor and to attract the attention of mining companies to the economic possibilities of the area.

Compass readings given in this report refer to true or astronomic north. The average magnetic declination in the area is 30 degrees east of true north. Assays of ore samples mentioned in the report unless otherwise designated are assays made by the Ore Dressing Division, Department of Mines and Resources, Ottawa.

The author was given efficient assistance in the field by J. H. Radcliffe, A. F. Killin, and J. W. Hoadley. Acknowledgment is also made to the officers of the Canadian National Railways and to the Forest Branch at Terrace for assistance given in transporting equipment and supplies via gasoline speeder from Terrace to Usk during the period when railway service had been suspended by the floods on Skeena river.

The area is commended as worthy of careful prospecting. Of those properties examined during the 1936 season the Fiddler, Victor, Grotto, and Bermaline prospects are recommended as warranting development work.

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Map 2098: Zymoetz River area; issued by Geol. Surv., Canada, 1926.
Map 278A: Prince Rupert sheet; issued by Geol. Surv., Canada, 1933.

PHYSICAL FEATURES

The area lies along the eastern border of the Coast Range mountains and is characterized by high mountain peaks and deeply incised valleys. At Usk, Kitsalas mountain rises abruptly on the west side of Skeena river to an elevation of about 5,000 feet, and on the east side of the river Bornite mountain rises to about 5,500 feet. The relief is marked, as the town of Usk is only 300 feet above sea-level. North from Usk as far as Dorreen a continuous succession of unnamed mountains rise on either side of the Skeena to comparable heights. East of Cedarvale the Seven Sisters range towers to elevations exceeding 9,000 feet. As a rule the mountain slopes are steep below 4,000 feet elevation, as a result of glacial erosion and the rapid erosion by youthful streams. Between 4,000 and 5,000 feet the mountains are smooth and rounded, and gently sloping, and apparently represent a Tertiary erosion surface that has been modified by continental glaciation. Above 5,000 feet the slopes are steep, as a consequence of late alpine glaciation. Glaciers still persist on the north sides of most of the mountain peaks above 5,000 feet.

Skeena river flows in a general southerly direction for 26 miles between Cedarvale and Usk. Two miles south of Usk on passing through Kitsalas canyon it swings southwest towards Terrace. The river is swift and ranges between 300 and 1,000 feet in width along its course from Cedarvale to Usk, but at Kitsalas canyon it is confined to a deep, narrow, rock-walled channel about 100 feet wide. Zymoetz river, the largest tributary stream in the area, flows westerly to join the Skeena 7 miles southwest of Usk. Kleanza, Chimdemash, St. Croix, and Legate creeks are smaller streams which also flow west into the Skeena. Phillips, Lowrie, Nicholson, Hardscrabble, and Sand creeks flow east to Skeena river, in the same neighbourhood. Farther north, Fiddler, Lorne, and Porcupine creeks are other east-flowing tributaries of the Skeena. Whiskey, Coyote, Flint, and Big Oliver creeks are westward-flowing streams whose headwaters are on Seven Sisters mountain.

The tributary streams are fed throughout the year by melting snow and ice from the tops of the mountains. During periods of heavy rainfall they swell to many times their normal size. During the period of prolonged and heavy rainfall (9·2 inches in 96 hours) that commenced on October 21, 1935, it is stated that the Skeena rose 25 feet in 24 hours as a result of the tremendous volume of water that poured in from the tributary streams.

The scouring action of the streams is tremendous at such times and great quantities of coarse gravel and boulders are carried downstream annually in this way.

During the last week in May 1936 exceptionally warm weather caused very rapid melting of the snow on the mountains throughout the district and resulted in the most serious flood ever known along Skeena river. The big river rose 15 feet above its normal high-water mark and swept down through all the towns and villages located along the water front from Hazelton to tide-water. Many homes were destroyed, bridges were damaged, and over fifty washouts along the railway enforced cessation of train service for one and a half months.

The main valleys and lower mountain slopes are heavily forested with a fine growth of hemlock, spruce, balsam, cedar, and poplar. The area is well known for its cedar pole industry, some of the poles shipped from Terrace being over 100 feet long. Timber-line extends to an elevation of 4,500 feet.

GENERAL GEOLOGY

Terrace area lies along the eastern contact zone of the Coast Range batholith, which occupies a belt 90 miles wide running in a northwest direction along the Pacific coast. The east border of the batholith intrudes a wide belt of Mesozoic volcanic and sedimentary rocks ranging in age from Triassic to Cretaceous. The batholithic, volcanic, and sedimentary rocks are intruded by a wide variety of dykes, including quartz albite, aplite, diorite, gabbro, and lamprophyre dykes.

Table of Formations

Period	Formation	Lithology
Recent and Pleistocene	.....	Gravel, sand, silt, talus, boulder clay, glacial drift.
Middle Cretaceous or Later		Dykes.
	Coast Range intrusives.....	Granite, granodiorite, quartz diorite, diorite, gabbro, etc.
Lower Cretaceous.....	Skeena.....	Shale, sandstone, conglomerate, coal.
Upper Jurassic to Lower Jurassic	Hazelton group....	Sedimentary division: Sandstone, argillite, quartzite, greywacke, slate, tuff, conglomerate. Volcanic division: Andesite, breccia, tuff, rarely limestone, argillite, and chert.
Triassic.....	.....	Cherty quartzite, argillite, crystalline limestone, conglomerate.

TRIASSIC SEDIMENTS

Small areas of crystalline limestone believed to be of Triassic age outcrop on Thornhill mountain, along Zymoetz river and Williams creek, and along Skeena river 3 miles west of Amsbury. The limestone is usually white and occurs as both thinly laminated and thick beds. It is commonly associated with beds of cherty quartzite, slate, argillite, chert pebble conglomerate, and limestone boulder conglomerate. Five miles up Zymoetz river limestone outcrops along the main trail and appears to be overlain by andesite flows of the Hazelton group. Fossils collected by Hanson in 1925 from a limestone boulder conglomerate were identified as probably of Permian age and fossils (*Daonella* sp.) from an argillite of the series were stated to be of Triassic age.[1] Considerable detailed work must yet be done before the age, thickness, and position of the formation can be stated with accuracy.

HAZELTON GROUP

In Terrace area the Hazelton group comprises a thick assemblage of volcanic rocks of Lower Jurassic age and a thick upper sedimentary division of probable Middle and Upper Jurassic age. The group forms the country rock of most of the mineral deposits of the district.

The lower volcanic division consists of a thick series of andesite and andesite porphyry flows with local areas of tuff and volcanic breccia. There are occasional interbedded argillite and chert beds. The formation outcrops along Skeena river between Kitsalas and Pitman and extends east over the area drained by Zyometz river, Kleanza creek, Chimdemash creek, St. Croix creek, and Legate creek. The mountains comprised of these rocks rise to heights exceeding 6,000 feet, so that the original thickness of the formation must have been very great. The volcanics are usually massive and in most places the structure is difficult to determine. In those places where strike and dip could be reliably measured, the flows and tuff beds were found to strike a little north of west, parallel to the orientation of the tributary streams. Their dips ranged from 50 degrees north to 50 degrees south. The folding is believed to have occurred during the period of mountain building that accompanied the intrusion of the Coast Range batholith. Long tongues and small stocks from the batholith cut the volcanic rocks throughout the area.

The upper sedimentary division of the Hazelton group is believed on the basis of fossil evidence to pass imperceptibly into overlying conformable sedimentary rocks of Lower Cretaceous age as described under Skeena formation. This division consists of well-bedded tuffs, sandstones, argillite, quartzite, greywacke, slate, and conglomerate. The beds are commonly thick and extend for great distances. The formation crosses the northern part of the area north of Dorreen, from Kitsumgallum lake east to Seven Sisters mountain and beyond. Its passage into the underlying volcanic division in the vicinity of Dorreen has not been studied, but the transition is believed to be abrupt. The rocks have been gently folded and are intruded in the neighbourhood of Kitsumgallum lake by large apophyses of the Coast Range intrusives. Small isolated stocks of granodiorite and quartz

[1] Hanson; G.: Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 103.

diorite cut the sediments here and there from Kitsumgallum lake east to Seven Sisters mountain. On Maroon mountain the axial planes of the major folds strike east and the sediments have local dips as high as 70 degrees, but the average dip is only 30 or 40 degrees. For 15 miles between mount Couture at Kitsumgallum lake and Ritchie station on Skeena river the sediments are only slightly disturbed, with dips seldom greater than 10 or 15 degrees. On Seven Sisters mountain the sediments dip away in all directions from a central granitic core, the dips ranging from 30 to 55 degrees.

CRETACEOUS SEDIMENTS

The name Skeena formation was given by earlier writers to a series of sedimentary rocks comprised of argillite, sandstone, and conglomerate, with occasional interbedded coal seams. The distribution of these rocks in the vicinity of Telkwa and Smithers and north of Kitsumgallum lake is shown on the Prince Rupert map-sheet (Map 278A). The formation was assigned to the Cretaceous age on a basis of fossil evidence. As these coal-bearing rocks were usually found in valleys, they were described as remnants of an extensive formation largely removed by late Cretaceous and Tertiary erosion.

During the 1936 season some well-preserved fossil plants of Lower Cretaceous age were secured on the farm of E.S. Tordiffe about 1 mile northeast of Cedarvale. The fossils occur at an elevation of 1,000 feet in a bed of argillite 1 foot thick between massive beds of sandstone striking north 75 degrees east and dipping 55 degrees northwest. W. A. Bell of the Palæontological section of the Geological Survey identified the following plants from the collection:

Coniopteris sp.
Cladophlebis sp.
Sagenopteris mantelli (Dunker)
Ptilophyllum sp. cf. *Pterophyllum aequale* Ward (non Brongniart)
Ptilophyllum (*Dioonites*) *dunkerianum* (Goeppert)
Elatides curvifolia (Dunker) Nathorst

He states: "This flora regardless of certain Jurassic elements is inferred to be probably Lower Cretaceous in age and to be homotaxial with that from the Luscar formation or from the lower part of the Blairmore formation in Alberta."

The strata are northwest of and at the foot of Seven Sisters mountain, and as the sediments all strike northeast and dip from 40 to 55 degrees northwest on this side of Seven Sisters mountain it follows that the fossil horizon stands very high in the stratigraphic succession. The fossiliferous strata if projected upward along the angle of dip pass well above the top of the nearest mountain.

On the southwest side of Seven Sisters mountain about 6 miles southeast of Cedarvale a second fossil collection was made at an elevation of 4,800 feet, where fossiliferous argillite beds from 1 to 2 feet thick occur about 100 feet below a prominent conglomerate horizon about 50 feet in thickness. The strata in the vicinity strike north and dip from 30 to 35 degrees west. W. A. Bell submits the following report on the collection:

"Plants identified:

Cladophlebis virginiensis (Fontaine)
Cladophlebis fischeri? Knowlton
Nilssonia shaumbergensis (Dunker)
Nilssonia cf. *orientalis* Heer
Ptilophyllum arcticum (Heer)
Pterophyllum concinnum Heer
Czekanowskia sp.
Ctenis? sp.

This flora denotes a Lower Cretaceous age and is considered to be homotaxial with that from the Kootenay formation."

The evidence suggests that sediments of Cretaceous age (Skeena formation) overlie conformably the Hazelton sediments. As the formations are much alike lithologically the presence of the younger strata can be determined only by its higher stratigraphic position, by fossil evidence, or through the presence of coal seams. The Skeena formation would be expected on the higher parts of the mountain or in any valleys where it is preserved through synclinal folding.

COAST RANGE INTRUSIVES

The contact zone of the Hazelton sedimentary and volcanic rocks with the Coast Range intrusives is wide and very irregular in this area. A large body of granodiorite and quartz diorite, considered to be part of the main batholith, extends from Lakelse lake east to Zymoetz river, north to Terrace, and northwest from Terrace in a wide band east of Kitsumgallum river to Kitsumgallum lake. From this main body long tongues of diorite and quartz diorite extend eastward, cutting the volcanic rocks in the vicinity of Pacific, on Kleanza mountain, and on Bornite mountain. A large stock of granodiorite and quartz porphyry intrudes the volcanics at the head of Kleanza creek, and diorite and gabbro stocks cut similar rocks near the heads of Chimdemash and Legate creeks. Small intrusive stocks of granodiorite and quartz diorite cut the sediments on Goat and Maroon mountains, and the core of Seven Sisters mountain is a stock of quartz diorite. The granitic rocks are cut by a variety of later dykes. Mineral deposits are present, but are not as numerous nor as rich as are the deposits in the Hazelton series.

The age of the Coast Range intrusives is not definitely known. As they cut Hazelton sediments of Jurassic age they have always been considered as of Upper Jurassic age or later. On Seven Sisters mountain Lower Cretaceous rocks were folded at the same time as underlying Hazelton sediments. Presumably the folding and batholithic invasion took place at about the same time, and if so the batholithic intrusion is of Middle Cretaceous age or later.

DYKES

Dykes of granodiorite, quartz diorite, diorite, gabbro, quartz-albite, and lamprophyre with their various porphyritic phases intrude the Hazelton group rocks and the Coast Range intrusives. These dykes usually have vertical attitudes, average between 2 and 20 feet in width, and seldom exceed half a mile in length.

An andesine diorite porphyry dyke 12 feet wide, on the Grotto group, has a gold-quartz vein along one side. Nearby is a small tongue of andesine quartz diorite. Small dykes of albite quartz diorite occur about 1,000 feet farther west. A 6-foot dyke of the andesine diorite porphyry occurs in the workings on the Toulon group. An oligoclase diorite porphyry dyke on the Diorite property is intrusive into a mineralized quartz-albite dyke. On the Singlehurst claim an 8-foot dyke of andesine diorite was intruded and faulted prior to vein formation. A thick sill of oligoclase diorite porphyry on the Windfall claims outcrops about 200 feet above the mineral deposit, and an altered, fine-grained quartz diorite sill on the Patmore property contains small vein deposits. A granodiorite dyke on the Fiddler group seems to have played a part in damming vein solutions, thereby causing the widest part of the Fiddler vein to form nearest the dyke.

Quartz-albite dykes composed of about equal proportions of fine-grained quartz and albite, in some places micrographically intergrown and containing a little sericite are numerous in the area from Thornhill mountain north to Legate creek. These dykes are of economic interest as many of them have quartz veins along their walls, as on the Dardanelle and St. Paul properties. Vein deposits associated with these dykes were seen during the 1936 season on the Zona May, Diorite, Silver Mitts, Galena, Frisco, and Bornite King properties. On the Zona May claim the quartz-albite dyke is altered and cut by a younger lamprophyre dyke. Where coarsely crystalline these quartz-albite dykes are sometimes referred to as alaskite dykes.

PLEISTOCENE AND RECENT

Boulder clay and glacial erratics are seen along the valleys of the tributary streams. Recent morainal gravel deposits occur at the base of all the alpine glaciers. Skeena River valley is floored with thick gravel deposits, and recent gravel deposits are continually forming at the mouths of the tributary streams during flood periods. A marl deposit occurs on a wide gravel bench at Ritchie, 1 mile west of the river and 100 feet above present high-water mark. Between Cedarvale and Woodcock a second marl deposit occurs on an upper gravel bench one mile west of the Skeena, at an elevation of 1,000 feet or 500 feet above high-water mark. This bench may have formed during the wane of the glacial period when the Skeena valley was ice filled. An elevated rim 10 feet high along the outer edge of this upper gravel bench suggests the presence of ice during its formation.

Most of the mountain slopes have a shallow drift cover, but where steep ground is encountered prospecting is hindered by extensive rock talus slides. Rock exposures are abundant above timber-line.

ECONOMIC GEOLOGY

HISTORY OF MINING ACTIVITY

Placer gold deposits on Lorne, Chimdemash, Fiddler, and Kleanza creeks were worked as early as 1884. Chimdemash and Fiddler creeks were worked for only a short time, but individual operators still carry on small-scale sluicing operations on Lorne and Kleanza creeks. Large-scale

hydraulic operations were attempted at Lorne creek between 1900 and 1917 by the Dry Hill Hydraulic Mining Company and on Kleanza creek from 1912 until 1922 by the Cassiar Hydraulic Mining Company, Limited, but with little success. During the last few years a little placer gold has been recovered from Phillips and Porcupine creeks. Douglas creek at Kitsumgallum lake has been a steady though small producer of placer gold for over twenty years.

Mineral claims were first staked in 1893 in the vicinity of Usk, the Emma, Four Aces, and Madden being the first on which there is a record of development work. The Toulon and Ptarmigan or Singlehurst properties were staked in 1899, and the Golden Crown group two years later. By 1910 there were about two hundred claims staked in the vicinity of Usk on deposits containing gold, silver, and copper. By 1914 prospecting activity had spread farther afield. A large body of limonite iron ore was discovered 38 miles up Zymoetz river on Limonite creek and coal was reported on Kitmayakwa river nearby. Copper discoveries were made on the Avon, Wells, and Montana properties near the head of Kleanza creek, on the St. Croix and Continental claims on Chimdemash creek, and on the Diorite property near Pitman. Silver, copper, and lead ores were found on the Frisco, Zona May, M. and M., and M. and K. groups on Legate creek, and high-grade ore containing gold, lead, zinc, and copper was found on the Fiddler group. About the same time the initial mineral discoveries on Thornhill mountain 7 miles southeast of Terrace, and at Kitsumgallum lake 20 miles north of Terrace, were made. During the next fifteen years small-scale mining and development operations were carried on at a number of mining properties throughout the area and prospectors continued to make new discoveries.

In 1916 M. Orr of Pacific shipped 10 tons of hand-picked silver-copper ore from the Frisco property, which is said to have returned 33·5 ounces of silver a ton and 42·2 per cent copper. During the same year Stanley Ross and Sons shipped 10½ tons of hand-sorted copper ore from the Diorite group to the Anyox smelter, which returned 65 cents in gold and silver a ton and 5·2 per cent copper. In 1917 J. J. Price shipped 130 tons of float ore from the M. and K. group, which returned 25 per cent lead, 20 per cent copper, and 25 ounces of silver a ton. In 1923 J. F. Duthie shipped 80 tons of ore from the Fiddler property, and a further shipment of 100 tons was made in 1926. The first carload of the second shipment is recorded as having returned: gold, 1·28 ounces a ton; silver, 5·3 ounces a ton; lead, 6·1 per cent; zinc, 3·8 per cent.

The Consolidated Mining and Smelting Company of Canada, Limited, became interested in this area in 1928 and some development work was done on the Lucky Jim copper prospect on Kleanza creek, on the M. and M. and M. and K. silver-lead-copper prospects on Legate creek, and on the Seven Sisters group near Cedarvale. The widespread economic depression, which began in the autumn of 1929, brought about almost complete cessation of mining activity throughout the area for several years.

Between 1933 and 1935 Columario Consolidated Gold Mines, Limited, made an effort to develop their mining property near Usk into a paying mine. Quartz veins containing gold-bearing pyrite were explored and a number of ore shoots averaging half an ounce of gold a ton were mined.

Omineca Gold Quartz Mines, Limited, is at present developing a gold-quartz property known as the Dardanelle group, situated 12 miles up Zymoetz river. Nicholson Creek Mining Corporation is doing some work on Hardscrabble creek on the Phoenix group, where some molybdenum occurs in quartz veins associated with pyrite.

Very little prospecting was done in the area during the 1936 season as all available local men were employed throughout the summer in reconstruction work following the flood in May.

Late in the season T. Turner located a wide shear zone containing low gold values on the Excelsior claim and W. Hagen found a vein containing silver, lead, and zinc on the Black Bull claim. Both properties are on Kleanza mountain not far from the Zymoetz River bridge. E. M. Angell spent some time prospecting the Silver Mitts group on the north fork of Chimdemash creek. D. Wilson reported new vein discoveries on Little Beaver river west of Kitsumgallum lake. The face of the main adit drift on the Globe claim was advanced several feet.

TYPES OF MINERAL DEPOSITS

Mineral deposits containing gold, silver, copper, lead, and zinc are numerous in the area, and molybdenum and tungsten are also found. Most of the deposits are small, but there are a considerable number of ore occurrences of economic importance. The deposits occur in the volcanic and sedimentary rocks of the Hazelton group, and in the intrusive tongues and stocks of the Coast Range batholith that cut these rocks. The minerals are usually contained in quartz veins that occur along faults of small displacement or along sheared zones. Some of the quartz veins occur along the walls of quartz-albite (alaskite) dykes. One vein occurs along one wall of an andesine diorite porphyry dyke, and in another place veins occupy cross fractures in a highly altered albite diorite dyke. There are in addition a few vein occurrences of massive sulphides.

The ore deposits may be divided into the following types:

(1) Gold-quartz veins containing chiefly pyrite. Veins of this type occur on the Victor, Grotto, and Golden Crown properties.
(2) Gold-quartz veins containing pyrite, chalcopyrite, galena, and sphalerite. The Fiddler, Patmore, Bermaline, and Zona May veins are good examples.
(3) Gold-quartz veins containing pyrrhotite, arsenopyrite, and pyrite, with small amounts of galena and sphalerite. Small veins of this type occur on Whiskey creek.
(4) Quartz veins containing galena, sphalerite, and chalcopyrite, with a low silver content. The veins on the Windfall, M. and M., and Galena properties are examples.
(5) Quartz veins containing bornite and chalcocite, with an appreciable silver content. The Silver Basin, Silver Crown, and Singlehurst veins are of this type.
(6) Quartz veins containing chalcopyrite. The United St. Croix, Shenandoah, and Continental veins are examples.
(7) Sulphide veins and replacements of bornite and chalcocite, some with chalcopyrite and galena and some with an appreciable silver content. Examples of these are found on the Silver Mitts, M. and K., Lucky Jim, and Diorite properties.

No evidence was found to alter the accepted view that the ore deposits have been derived from a common source, the Coast Range batholith. The

mineralizing solutions are believed to have been given off during the consolidation of the underlying batholithic rocks and to have arisen along fractures in the folded and faulted volcanic and sedimentary rocks and along fractures formed in or along the local igneous bodies on their consolidation. There is a gradual change in the type of deposit found in a direction at right angles to the main contact zone between the Hazelton group and the batholithic rocks. High-temperature minerals such as scheelite and molybdenite were deposited close to their point of origin in the igneous rocks. Gold-pyrite deposits came next in a slightly cooler zone, followed by the copper and arsenic zone minerals, and finally the silver, lead, and zinc minerals were deposited in the zone of lowest temperature. The high-temperature minerals were deposited in the Coast Range batholith and the low-temperature minerals were deposited farthest from its edge in the rocks of the Hazelton group. The gradation from gold through copper to silver-lead-zinc deposits shows no change in relation to individual intrusive stocks. It is probable that the metals rose from a source directly below them and that the horizontal gradation from high- to low-temperature metals is due to the increasing depth from southwest to northeast of the source rock, the Coast Range batholith[1].

Samples taken by the writer during the 1936 season and assayed by the Ore Dressing Division, Department of Mines and Resources, indicate the presence of commercial grades of gold or gold-lead-zinc ores on six properties. These properties are, the Fiddler, Victor, Bermaline, Grotto, Patmore, and Zona May. Of these the first named probably has a sufficient ore tonnage to warrant erection of a mill and the others may be expected to furnish varying amounts of a shipping grade of ore. The occurrence of commercial grades of gold ore on the Bear, Black Wolf, Lucky Luke, Columario, Dardanelle, and Globe properties in Terrace area was previously pointed out (Memoir 205). As there are over a dozen properties in Terrace area on which shipping grades of gold ore are found, the area is recommended as one warranting development work and further prospecting.

LODE DEPOSITS

Providence Group (1)[2]

The Providence group, owned by G. Bissonette of Terrace, is on the south slope of Kleanza mountain about 10 miles east of Terrace. The claims are reached by following the tractor road on the north side of Zymoetz river for 4 miles east from the highway, to where a foot trail leads half a mile north to the workings.

Several pits expose narrow shear zones traversing silicified limestone at elevation 1,100 feet. Samples taken here by the writer showed only traces of gold and silver.

About a quarter mile farther northeast, at elevation 1,250 feet, four pits have been cut at 50-foot intervals on a band of highly altered and silicified limestone. The altered and silicified rock ranges from 10 to 30

[1] Hanson, George: Zoning of Mineral Deposits in B.C.; Trans. Roy. Soc., Canada, sec. IV, pp. 119-126 (1927).

[2] This number appears on Figure 10 and indicates the approximate location of the property.

feet in width and has been traced for over 1,500 feet in a northeast direction. The writer collected half a dozen samples along the zone between elevations of 1,250 and 1,450 feet, which assayed only traces of gold and silver.

At elevation 1,200 feet, a short distance east of the four pits, a small quartz lens containing galena and tetrahedrite is exposed in the bed of a creek.

Excelsior Claim (2)

The Excelsior claim, owned by T. Turner of Terrace, is about 1 mile northeast of the highway bridge across Zymoetz river, 7 miles northeast of Terrace. A truck road follows along the north side of the river from the bridge for half a mile to a cabin, from where a winter road leads to the discovery. The vein was discovered in September 1936.

A moss-covered rock knoll about 40 feet in diameter protrudes through the drift cover on a flat-lying part of the mountain-side at elevation 1,300 feet. The west side of the outcrop has been stripped over a width of 10 feet, and the fresh rock broken to reveal sheared and silicified granodiorite cut by numerous anastomosing quartz stringers. The vein carries approximately 1 per cent chalcopyrite and 1 per cent pyrite, evenly distributed. Similarly sheared and silicified granodiorite was seen near the centre of and on the east side of the outcrop, where the moss had been stripped back a few feet, so that this sheared zone is probably more than 40 feet wide. The direction of schistosity is north and south and search should be made in these directions for the continuation of the shear zone.

The writer collected two samples from the trench on the west side of the outcrop. A chip sample taken across 4 feet assayed: gold, 0·04 ounce a ton; silver, 0·40 ounce a ton; copper, 0·3 per cent. The second sample, consisting of several fragments of the vein picked at random in the rock cut, assayed: gold, 0·04 ounce a ton; silver, 0·32 ounce a ton; copper, 0·3 per cent.

As the two assays indicate the presence of gold in the shear zone, further development work and bulk sampling are advised in view of a possibility of finding a large low-grade ore-body.

Victor Group (3)

The Victor group is about 5 miles southeast of Usk on the west slope of Kleanza mountain. The claims are a mile south of the Columario mine and a pack-horse trail 2 miles in length leads south from the mine to the workings. Captain Willman of Usk was the late owner.

Fine-grained, green and grey, andesitic rocks in the vicinity are intruded by small stocks of medium-grained, grey diorite. A series of quartz veins striking southeast and dipping steeply northeast occur along faults in both andesite and diorite, or along faulted contacts between the two rock types.

No. 1 vein is a quartz vein, ranging from 15 to 36 inches in width, that outcrops for over 500 feet up a 33-degree slope between elevations of 3,750 and 4,050 feet. The vein strikes south 35 degrees east and dips 55 degrees northeast. It is enclosed in andesite with a small mass of diorite along the hanging-wall at the upper end. The vein quartz is

ribboned by small fault movements, which sliced the quartz parallel to the plane of the vein. Mineralizing solutions working along these fissures impregnated the quartz with coarse pyrite, and assays show that the pyrite carries gold.

In a rock cut at elevation 3,750 feet a 20-inch channel sample taken across the vein where it contains about 3 per cent of pyrite assayed: gold, 0·61 ounce a ton; silver, 0·19 ounce a ton. At elevation 3,850 feet a 16-inch channel sample taken across the vein where it carries 1 per cent of pyrite in narrow seams ½ to 1 inch apart, assayed: gold, 0·20 ounce a ton; silver, 0·04 ounce a ton. A third channel sample taken across 15 inches of vein quartz carrying about 2 per cent of pyrite, in a rock cut at elevation 4,000 feet, assayed: gold, 0·24 ounce a ton; silver, 0·42 ounce a ton.

A second parallel quartz vein averaging about 12 inches in width occurs 200 feet to the south between elevations of 3,850 and 3,950 feet in a small ravine. The vein is enclosed by diorite wall-rock and the quartz carries no sulphide. An assay from a 14-inch channel sample taken across the vein at elevation 3,850 feet gave: gold, a trace; silver, a trace.

Approximately 100 feet farther south a third parallel quartz vein is exposed in a cut at elevation 4,050 feet. It consists of 12 inches of white quartz enclosed in andesite, and its continuation beyond the cut is drift covered in both directions. A channel sample across the vein assayed: gold, a trace; silver, a trace.

A fourth vein not seen by the writer, but described by Mr. Willman as better mineralized than the first described vein, is said to occur in a creek bed 1,000 feet south of the No. 1 vein and at a little lower elevation.

The grade and tonnage of probable ore indicated in the No. 1 vein mark the property as of especial merit, particularly in view of the proximity of the Columario mine and mill. Development work and further prospecting are warranted.

Golden Crown Group (4)

References: Ann. Repts., Minister of Mines, B.C.: 1901, p. 997; 1904, p. 101; 1907, p. 74; 1908, p. 65; 1909, p. 84; 1914, p. 118; 1921, p. 96.

The property is 3 miles southeast of Usk on the south side of Kleanza creek, at the base of Kleanza mountain. A trail half a mile in length leaves the highway at the bridge across Kleanza creek and leads southeast to the workings. Active development work was done on these claims at intervals between 1901 and 1921, and a small Ross mill was operated for a short time in 1921.

Three parallel faults from 100 to 150 feet apart occur in massive, pink granodiorite between elevations of 600 and 900 feet. The faults are marked by 6 to 12 inches of gouge and contain short, narrow, quartz lenses. Their strike is south 50 to 60 degrees east and they dip 45 degrees northeast. They have been prospected by four adits and several open-cuts.

The lower adit, at elevation 600 feet, is 115 feet long. A short quartz vein 8 inches wide occurs along the fault near the portal, and a second

vein 10 inches wide comes in near the face. An assay from a 10-inch channel sample taken across the vein at the face gave: gold, a trace; silver, a trace.

The No. 2 adit, driven 95 feet along the second fault, is 250 feet farther south at elevation 645 feet. There are a number of short quartz lenses along it, ranging from 2 to 6 inches in width. A channel sample taken across a 5-inch quartz vein at the face assayed: gold, 0·08 ounce a ton; silver, 0·14 ounce a ton.

No. 3 adit, at elevation 700 feet and about 250 feet farther south, was driven 40 feet along the third fault. The vein along the fault is fairly persistent in the adit and ranges from 2 to 18 inches in width. About 20 feet from the portal the vein contains abundant coarse pyrite for a number of feet. A 16-inch channel sample taken here on the south wall assayed: gold, 0·36 ounce a ton; silver, 2·28 ounces a ton. At the face, where the vein quartz contained no pyrite, a 16-inch channel sample across it assayed: gold, a trace; silver, a trace.

No. 4 adit was driven 110 feet along the same fault at 90 feet higher elevation. For 60 feet a quartz vein filling along the fault averages about 6 inches in width, but farther from the portal the fault is barren. Twenty feet from the portal the vein is 4 inches wide and carries about 2 per cent of chalcopyrite. Nearer the portal a 12-inch lens on the opposite wall contains coarse pyrite. A 4-inch channel sample of the vein quartz containing the chalcopyrite assayed: gold, 0·18 ounce a ton; silver, 2·25 ounces a ton; copper, 0·76 per cent.

A 6-inch quartz vein containing a little coarse pyrite is exposed in an open-cut at elevation 890 feet. It also strikes southeast and dips 45 degrees northeast, and evidently occurs along the same fault as the vein in No. 4 adit.

Montana Group (5)

References: Ann. Repts., Minister of Mines, B.C.: 1914, p. 121; 1917, p. 96. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 114.

The Montana claims are about 2 miles south of Kleanza lake on the Zymoetz River side of the divide near the head of Salmon creek. The location is about 17 miles southeast of Usk or 21 miles due east of Terrace. The trail that follows the south fork of Kleanza creek to the pass at elevation 4,200 feet leads westerly on the south side of the pass beyond the Wells group to the Montana claims. Another trail, which branches off from the Zymoetz River trail at Salmon creek, also leads to the workings. The claims have been open for a number of years.

At the top of a long talus slide between elevations of 4,800 and 5,000 feet, a quartz vein 6 to 36 inches in width is exposed for a length of 250 feet in andesitic volcanic rocks. It occurs along a fault fissure striking a little north of west and dipping steeply southwest. At the lower end the vein splits and three small quartz calcite veins occur about 6 feet apart, roughly parallel to the main vein. Below an elevation of 4,800 feet these veins are covered by the talus slide. The main vein carries about 2 per cent of chalcocite and bornite. A 28-inch channel sample taken across the vein in a cut near its upper end assayed: gold, a trace; silver, 0·58 ounce a ton; copper 1·18 per cent.

A second showing, reported in 1917 to be 30 to 40 feet wide with small fractures containing copper sulphide and calcite, and on which a 50-foot tunnel had been driven, was not visited.

Wells Group (6)

References: Ann. Repts., Minister of Mines, B.C.: 1924, p. 120; 1927, p. 96. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 114.

The Wells group comprises about fifteen claims staked in 1913 and 1914 on the mountain south of Kleanza lake, about 17 miles southeast of Usk. A well-graded branch trail from the Kleanza Creek trail leaves the west end of Kleanza lake and follows the south fork of Kleanza creek to a pass at an elevation of 4,200 feet. The summit of the mountain on which some of the mineral occurrences are found rises west of the saddle to an elevation of 4,800 feet. A foot trail descends 300 feet on the south side of the pass and follows a bench westerly to connect with branching trails to the various workings. The claims have been open many years.

West of the pass, at elevation 4,500 feet, a cut 10 feet by 10 feet in andesitic volcanic rock exposes a 3-foot sheared zone bordering a fault. The shear planes and the fault strike west and dip steeply. The fault contains a 4-inch vein of calcite and epidote, and the andesite is epidote stained and traversed by numerous calcite veinlets with traces of sulphide. A chip sample taken across the 3-foot width assayed: gold, a trace; silver, 0·06 ounce a ton; copper, 0·08 per cent.

About 1,000 feet farther west, at elevation 4,750 feet, a pit was sunk on a shear zone 4 feet wide in reddish andesite. The sheared rock contains many calcite stringers but very little sulphide. A channel sample taken across 3 feet of the best material assayed: gold, none; silver, none; copper, 0·02 per cent.

A third vein occurs in a deep pit at 100 feet lower elevation and 250 feet farther northwest. The vein consists of 7 inches of altered, epidotized andesite mineralized with bornite and chalcocite along a vertical fracture striking north. Beyond the pit the vein is covered by talus. An assay from a representative sample of the ore gave: gold, a trace; silver, 0·50 ounce a ton; copper, 3·48 per cent.

Copper sulphides are reported to occur at several other places in the volcanic rocks on these claims.

Avon Group (7)

References: Ann. Repts., Minister of Mines, B.C.: 1908, p. 65; 1909, p. 84; 1914, p. 122; 1917, p 95. Geol. Surv., Canada, Sum, Rept. 1925, pt. A, p. 114.

The Avon group of three claims is about 1 mile south of the west end of Kleanza lake on a small creek that feeds the south fork of Kleanza creek. The claims are on the north side of the Kleanza range and approximately 16 miles southeast of Usk. The foot trail to the claims connects with the Kleanza Creek pack-horse trail at the north fork of Kleanza creek. No work has been done on these claims for about twenty years.

In a steep-walled gulch, at elevation 3,350 feet, a wide band of limestone striking north and dipping 45 degrees east has been altered and sili-

cified into a green, siliceous, banded rock containing occasional small garnets. The altered rock is cut by a number of parallel, vertical faults striking north. One of these in the bed of the creek is marked by a brecciated zone 2 to 6 feet wide cemented by calcite. It is exposed for several hundred feet up the steep, sloping stream bed. A 24-inch channel sample taken across the brecciated zone in the creek bed assayed: gold, 0·06 ounce a ton; silver, 0·04 ounce a ton.

Thirty feet west of the creek bottom an adit was driven 26 feet west into the side of the gulch. At the face of the adit a 10-inch quartz vein sparsely mineralized with chalcopyrite occurs along a fault striking north. A channel sample across the vein assayed: gold, none; silver, none; copper, 0·04 per cent.

Lucky Jim Group (8)

References: Ann. Repts., Minister of Mines, B.C.: 1908, p. 65; 1909, p. 84; 1914, p. 126; 1920, p. 84; 1923, p. 103; 1924, p. 88; 1928, p. 146; 1929, p. 152; 1930, p. 137. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 114.

The Lucky Jim copper claims are on the main trail on the north side of Kleanza creek, about 12 miles southeast of Usk. These claims have been prospected from time to time since the initial discovery of copper on them in 1908. The early work was done by the present owner, Fred Forrest of Usk. In 1924 the Federal Mining and Smelting Company drove a short adit and in 1929 the Consolidated Mining and Smelting Company continued this work and drove a second adit. Work stopped on failure to find substantial ore-bodies.

On the Lucky Jim claim a 7- by 7-foot inclined shaft, 20 feet deep, was sunk beside the Kleanza Creek trail about 200 feet west of the Fred Forrest cabin (elevation 1,650 feet). The shaft is on a fault along a contact between two flows, which strike south 60 degrees west and dip 55 degrees northwest. The hanging-wall is fine-grained, grey andesite, and the footwall is a pink, fine-grained, chilled andesite. The rock on both sides of the fault is altered and brecciated over a width of several inches and contains small veinlets of chalcocite. A 12-inch channel sample taken across this mineralized zone at the bottom of the inclined shaft assayed: gold, a trace; silver, 0·12 ounce a ton; copper, 0·28 per cent.

On the Idaho claim, about 1,000 feet farther northwest, two adits were driven to explore a mineralized fault zone in porphyritic andesite. The fault outcrops for about 50 feet up and down a steep rock slope immediately above the upper adit, which was driven for 90 feet to explore it at elevation 2,100 feet. Within the adit the fault strikes north and dips 75 degrees west. For the most part it is marked by 4 to 6 inches of gouge mineralized with bornite and chalcocite. Fractures and joint planes in the wall-rock are stained with epidote and traversed by small veinlets of bornite. A channel sample taken across the face of the adit to include 6 inches of fault gouge and 18 inches of mineralized wall-rock assayed: gold, a trace; silver, 1·04 ounces a ton; copper, 3·76 per cent. Near the entrance to the adit a more plentifully mineralized vein section has formed where the fault splits and spreads. Ten feet above the adit the section enclosed by the two arms of the fault is 4 feet wide and the brecciated andesite is replaced by innumer-

able fine veinlets of bornite. Assays from this zone quoted in the Annual Report of the Minister of Mines for 1923 show that it contains from 5 to 7 per cent of copper with negligible amounts of gold or silver.

The main adit, driven north 160 feet to explore the same fault, is 50 feet lower. Near the portal the fault has been followed for about 30 feet, but for the next 80 feet the adit lies a few feet east of the fault. A crosscut to the west 120 feet from the portal again intersects the fault and the adit follows it for an additional 35 feet. A channel sample taken across the face to include 3 inches of mineralized fault gouge and 33 inches of slightly mineralized wall-rock assayed: gold, none; silver, 0·20 ounce a ton; copper, 0·26 per cent. About 80 feet from the portal a short crosscut to the east follows a strong shear zone 1 foot wide along the north side of a 6-foot dyke of altered and disintegrated diorite. The sheared andesite is mineralized with bornite and a little chalcocite. A channel sample across it assayed: gold, 0·02 ounce a ton; silver, 1·08 ounces a ton; copper, 2·42 per cent. There are a number of mineralized cross faults in the adit striking northeast, one of which, 10 feet from the portal, is younger than the main vein, and shifts it several feet. A 6-foot diorite dyke that outcrops in the rock cut on the east side of the portal may be the same one that crosses the adit 80 feet from the portal, but in the cut it is fresh and unaltered. If it is the same dyke, then both faulting and mineralization followed the intrusion of the diorite.

Banner Homestake Group (9)

References: Ann. Rept., Minister of Mines, B.C., 1925, p. 128. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 113.

This group of claims, staked by L. E. Moody in 1925, is 9 miles east of Usk on the north side of Bornite mountain. A branch trail crosses Chimdemash creek at elevation 2,500 feet and leads south up the mountain to the camp at 4,000 feet elevation.

The claims are underlain by andesite, volcanic tuffs, and breccia. Along the face of a steep bluff, at elevation 4,250 feet, these rocks are traversed by a 4-foot dyke of quartz porphyry. A rusty, altered zone extends for 2 or 3 feet on both sides of the dyke and at intervals there are short quartz veins along the dyke. Veins and dyke strike south 60 degrees east and dip 75 degrees southwest. They are exposed for several hundreds of feet along the precipitous rock slope. Both veins and altered zone contain a little chalcopyrite and bornite, altered on the surface exposures to green carbonates. A typical sample of quartz and mineralized tuff assayed: silver, 0·26 ounce a ton; gold, none; copper, 0·20 per cent.

Silver Basin Group (10)

References: Ann. Repts., Minister of Mines, B.C.: 1923, p. 103; 1924, p. 90. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 113.

The Silver Basin claims at the head of Chimdemash creek, 12 miles east of Usk, were staked by J. D. Wells in 1923. The claims are mostly above timber-line and cover the floor of a mountain valley hemmed in on

three sides by steep slopes rising to over 5,000 feet. A little surface prospecting was done here in 1923 and 1924, but no large deposits were found and the claims were soon dropped.

The floor of the Silver Basin valley is comprised of a succession of volcanics of which andesite, dacite, and tuff are predominant. They strike south 70 degrees east and dip 60 degrees south. Several, small, quartz-albite dykes and lamprophyre dykes were seen along the creek at elevation 4,100 feet. On the steep slope north of the valley floor the eastern end of a large diorite stock outcrops between elevations 4,500 and 5,000 feet and is cut by similar dykes.

A short distance below a 50-foot waterfall, at elevation 4,150 feet, a quartz vein averaging 12 inches in width outcrops for about 200 feet along the south bank of Chimdemash creek. The vein strikes north 60 degrees west and dips 45 degrees south. At its west end the vein gradually narrows and is then drift covered. A 10-foot adit was driven across the east end of the vein along a cross fault that strikes north 65 degrees east and dips 50 degrees southeast. At the point of faulting the vein is 3 feet wide, but it narrows to 1 foot only 15 feet west. The vein quartz carries a sparse dissemination of pyrite and tetrahedrite, with which a little calcite is associated. Similar vein matter 3 inches wide occurs along the cross fault. A 3-foot channel sample taken across the vein at the adit assayed: gold, none; silver, 1·58 ounces a ton.

About 1,700 feet farther east, at elevation 4,450 feet, a 12-inch vein of quartz and calcite in the stream bed of Chimdemash creek occupies a fault fracture for a length of about 100 feet. The fault strikes north 60 degrees east and dips 70 degrees northwest. It strikes at a small angle diagonally across the stream and its continuation a few feet beyond the vein is drift covered in both directions. The vein contains narrow seams of tetrahedrite and bornite. A 13-inch channel sample taken across the vein at the water's edge assayed: gold, none; silver, 9·70 ounces a ton; copper, 1·0 per cent. At a cut on the vein a representative sample from a pile of hand-sorted ore assayed: gold, 0·02 ounce a ton; silver, 71·88 ounces a ton; copper, 6·62 per cent.

Silver Crown Group (11)

References: Ann. Repts., Minister of Mines, B.C.: 1923, p. 103; 1924, p. 90. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 113.

The Silver Crown claims, staked by J. D. Wells in 1923, are on the summit of the mountain immediately east of the head of Chimdemash creek, about 14 miles east of Usk. A foot trail from the Chimdemash Creek trail leads up to the claims through a pass at the east or upper end of the Silver Basin valley. Several small cuts were made on narrow, silver-copper veins.

The rocks in the vicinity of the Silver Crown claim post, at elevation 4,900 feet, comprise a series of grey and purple andesite flows, which strike southeast and dip steeply. An altered dyke of light-coloured quartz diorite outcrops 70 feet west of the claim post. The dyke is about 25 feet thick, strikes northeast, and dips 40 degrees northwest. Two parallel quartz veins occur on the east side of the dyke and strike at right angles to it. One of

these veins, 7 inches in width, is exposed in a rock pit 50 feet west of the claim post. It is exposed again in a second pit 90 feet southeast of the claim post, where its width is 3 inches. The vein strikes south 45 degrees east and dips 75 degrees southwest and has a total length of about 150 feet. The vein quartz is mineralized with about 3 per cent of sulphide, chiefly pyrite, chalcopyrite, and tetrahedrite. A 7-inch channel sample taken across the vein in the first-mentioned pit assayed: gold, 0·02 ounce a ton; silver, 4·38 ounces a ton; copper, 1·24 per cent.

The second vein outcrops in a pit 150 feet northeast of the claim post. It is exposed for only 20 feet, beyond which it is covered by light drift. The vein is only 5 inches wide, but the quartz is well mineralized with chalcocite and tetrahedrite. A 5-inch channel sample across it assayed: gold, 0·02 ounce a ton; silver, 38·18 ounces a ton; copper, 7·66 per cent.

The foot-wall of the altered quartz diorite dyke is everywhere drift covered in the vicinity of the veins, so that the possible occurrence of a vein along it has not been ascertained.

M. and M. Group (12)

(*See* Figure 1)

References: Ann. Repts., Minister of Mines, B.C.: 1917, p. 100; 1925, p. 129; 1928, p. 149; 1929, p. 153. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 111.

The group comprises three claims staked by R. Moore 20 years ago on the mountain on the south side of the east fork of Legate creek, about 15 miles by trail southeast of Pacific. The Legate Creek pack-horse trail follows along the south side of the east fork for a mile and then climbs by a series of switchbacks to the workings, which are between elevations of 4,300 and 4,650 feet. The Consolidated Mining and Smelting Company of Canada did a little work on the claims in 1928 and 1929, but nothing has been done since.

A series of approximately parallel quartz veins occur near the top of the mountain in coarsely crystalline albite diorite. The veins occupy faults or shear zones that strike southeast and dip steeply south.

The upper vein has been traced by a series of test pits for about 600 feet along the north slope of the mountain, at an elevation of 4,600 feet. It ranges in width from 55 inches at the west end to 6 inches at the east end, and averages about 2 feet. The strike is north 60 degrees west and the dip 60 degrees southwest. The vein quartz is bordered on both sides by several feet of brown, altered diorite. Pyrite, galena, tetrahedrite, and chalcopyrite are sparsely disseminated throughout the vein quartz, with occasional rich sections containing up to 5 per cent of sulphide. The writer collected a 30-inch channel sample across the vein at one of the richer sections, 100 feet from the west end of the vein, which assayed: gold, 0·02 ounce a ton; silver, 39·28 ounces a ton; copper, 0·36 per cent; lead, 0·82 per cent.

Other veins outcrop on the steep west side (46-degree slope) of the mountain overlooking the middle fork of Legate creek. Their upward extension is terminated by a cross fault striking north and dipping 45 degrees east at elevation 4,550 feet. One of these veins is best exposed in a ravine

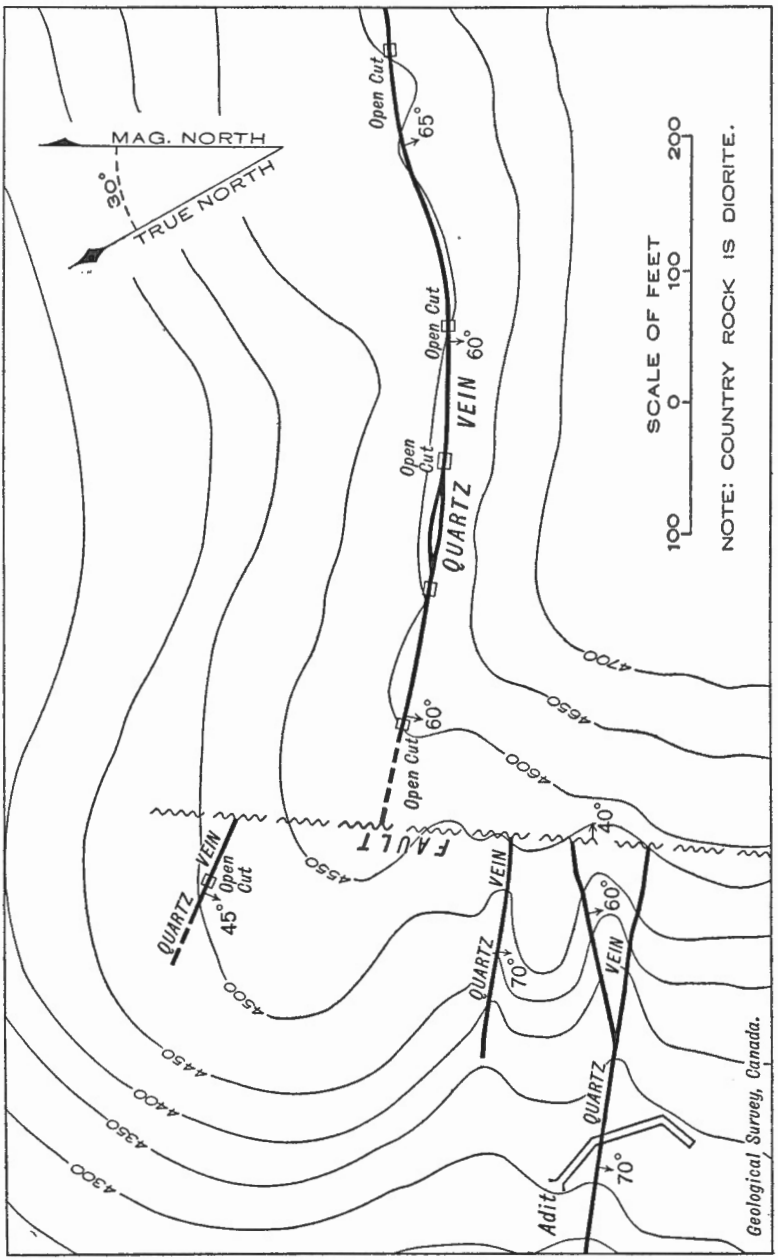

Figure 1. Plan showing veins on the M. and M. claims.

at elevation 4,500 feet, about 200 feet west of the most westerly pit on the upper vein. Two other veins occur at the same elevation, 60 and 120 feet farther south, respectively. All three are quartz veins that occupy faults in the diorite. They strike from south 30 to south 50 degrees east and dip 70 degrees southwest. Each vein ranges from 6 to 12 inches in width, with 2 to 3 feet of altered wall-rock. The vein quartz is sparsely mineralized with galena and occasionally with tetrahedrite and a little chalcopyrite. A typical 8-inch channel sample taken across the second vein assayed: gold, none; silver, none; lead, 0·22 per cent.

The two latter veins converge and join about 100 feet farther down the slope, and at their junction increase to 10 feet in width. At elevation 4,300 feet this vein has decreased to 6 inches of vein quartz. Here, an adit 125 feet in length was driven to crosscut the vein about 100 feet east of the portal. Ten feet from the face there is a 6-inch quartz vein with sparsely distributed tetrahedrite. The writer collected a channel sample across it that assayed: gold, none; silver, 0·20 ounce a ton; copper, none; lead, none.

M. and K. Group (13)

(*See* Figure 2)

References: Ann. Repts., Minister of Mines, B.C.: 1916, p. 100; 1917, p. 99; 1919, p. 99; 1921, p. 96; 1925, p. 128; 1928, p. 148; 1929, p. 153. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 111.

The M. and K. group is on the mountain on the north side of the east fork of Legate creek, about 15 miles by trail southeast of Pacific. The claims are reached by a switchback trail, now badly overgrown, which leaves the east fork trail half a mile east of the middle fork. The original stakers, Whitmore and Orr, bonded the property to J. J. Price in 1916. The following year he shipped 130 tons of float ore, which returned about 25 per cent lead, 20 per cent copper, and 25 ounces of silver a ton. The Consolidated Mining and Smelting Company of Canada, Limited, carried out a little exploration work on the claims in 1928 and 1929, but failed to locate a further source of the rich sulphide ore.

The upper part of the mountain is comprised of andesitic flows with interbedded volcanic breccia and tuff. Intrusive diorite outcrops below an elevation of 3,800 feet. The diorite is part of a granitic stock that extends for about 2 miles west and south.

The original discovery consisted in finding blocks and fragments of solid sulphide for a distance of 500 feet on a talus slide between elevations of 4,600 and 4,850 feet. The ore occurred in pieces up to 2 feet in diameter and was scattered over a width of about 200 feet. Most of the ore has since been sacked and packed away, but some still remains. The sulphides consist of an intergrowth of chalcopyrite, galena, bornite, and sphalerite, with small amounts of tetrahedrite and specularite. A typical sample picked from the slide assayed: gold, a trace; platinum, none; silver, 3·10 ounces a ton; copper, 10·98 per cent; lead, 26·51 per cent. There was in addition zinc, for which a test was not made.

About 80 feet east of the talus slide, at elevation 4,675 feet, an adit was driven north 50 degrees east for 79 feet and then south 60 degrees east

for 35 feet. At 79 feet from the portal a crosscut adit was run north, but no other veins were located. The main adit follows a 12-inch sheared zone in the andesite for 114 feet. The sheared zone contains sparsely disseminated sulphides with occasional enriched zones containing up to 3 or

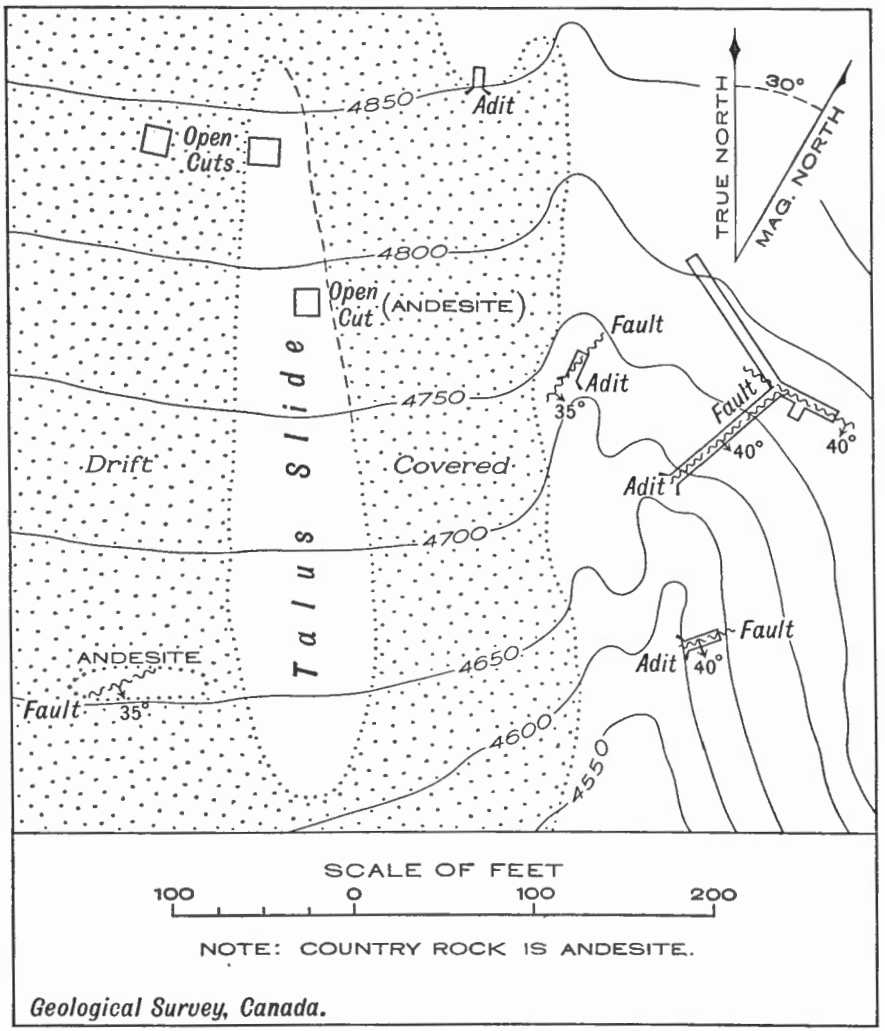

Figure 2. Plan of part of M. and K. group.

4 per cent of chalcopyrite. An 8-inch channel sample taken across the vein 20 feet from the portal assayed: gold, 0·02 ounce a ton; silver, 0·50 ounce a ton; copper, 2·16 per cent. It is probable that the westerly extension of this sheared zone contained much of the rich sulphide ore found on the talus slide.

A second adit, 100 feet farther south and at 50 feet lower elevation, was driven for 20 feet along the same shear zone. The andesite wall-rock in the adit is impregnated with about 1 per cent of disseminated chalcopyrite over a width of 2 feet on both sides of the sheared zone.

Other exploration work includes the sinking of numerous test pits on the talus slope and the driving of several short adits.

At elevation 3,500 feet a 12-inch quartz vein on the trail has been trenched for about 50 feet in the diorite. The vein contains less than 1 per cent of pyrite and chalcopyrite. A typical sample of the vein quartz gave on assay: gold, none; silver, 0·30 ounce a ton; copper, 0·1 per cent.

Frisco Group (14)

References: Ann. Repts., Minister of Mines, B.C.: 1916, p. 90; 1925, p. 130; 1928, p. 149. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 111.

The Frisco claims are above timber-line on the south side of Frisco creek about 14 miles by trail southeast of Pacific. At the junction of Frisco with Legate creek a well-graded branch trail from the Legate Creek trail leads up the mountain to the workings. In 1917 M. Orr of Pacific shipped 10 tons of hand-picked silver-copper ore from this property, which is said to have assayed: gold, a trace; silver, 33·5 ounces a ton; copper, 42·2 per cent. No work has been done in recent years.

On a steep slope, at elevation 4,700 feet, andesitic, volcanic rocks are intruded by a sill-like body of quartz porphyry. A bed about 12 inches thick lies several feet above the intrusive and contains an abundance of bornite oxidized on the surface to malachite and azurite. The mineralized bed strikes east and dips 30 degrees south, but has been traced for less than 100 feet. A grab sample taken from a small pile of hand-sorted ore assayed: gold, a trace; silver, 11·60 ounces a ton; copper, 11·62 per cent.

About 1,000 feet farther east, at elevation 4,650 feet, a quartz vein 6 to 24 inches wide is exposed for about 100 feet along the hanging-wall side of another quartz porphyry dyke intruding the andesite. The vein is sparsely mineralized with chalcocite. An 8-inch channel sample taken across the vein assayed: gold, 0·02 ounce a ton; silver, 17·38 ounces a ton.

Other occurrences of the silver-copper minerals in andesite associated with intrusive dykes and sills of quartz porphyry are reported to occur farther east towards the head of Frisco creek.

Zona May Group (15)

References: Ann. Rept., Minister of Mines, B.C., 1928, p. 147. Geol. Surv., Canada, Sum. Rept. 1925, pt. A, p. 112.

This property is on the east side of the south fork of Legate creek about 14 miles by trail southeast of Pacific. A branch trail from the Legate Creek trail follows along the east side of the south fork to the foot of a glacier about half a mile wide. The Zona May vein, reached by climbing to the top of the glacier, is exposed in several places between elevations of 3,900 and 4,200 feet along the south side of the glacial cirque.

At elevation 4,000 feet at the eastern edge of the glacier the quartz vein is exposed for about 125 feet along a bench before it follows up the

steep eastern wall of the cirque. The vein occupies a fault along the north wall of a quartz porphyry dyke about 15 feet wide. The dyke cuts a coarsely crystalline diorite boss that intrudes the country rock of andesites and volcanic breccia. In hand specimens the quartz porphyry dyke resembles the white quartz-albite dykes described in other parts of the area, but in thin section the rock was found to consist entirely of quartz, sericite, and calcite, the secondary minerals evidently having formed through complete alteration of the albite. Alteration of the adjoining diorite over a width of 10 feet on each side of the dyke indicates a marked circulation of heated waters along the walls of the dyke.

Along the bench the vein strikes south 60 degrees east and dips steeply south. It ranges from 2 to 10 feet in width and contains a sparse dissemination of pyrite, chalcopyrite, and galena throughout, with several short, rich ore shoots. Fifty feet from the edge of the glacier there is an ore shoot in the vein approximately 1 foot wide and 25 feet long, comprised of about 80 per cent of sulphide, chiefly galena, sphalerite, and tetrahedrite, cut by narrow chalcopyrite veinlets. A channel sample taken across this ore shoot by the writer assayed: gold, 0·16 ounce a ton; silver, 92·00 ounces a ton; zinc, 17·28 per cent; lead, 6·10 per cent; copper, 1·42 per cent. Forty feet farther west at a small test pit a 36-inch channel sample taken across a sparsely mineralized part of the vein assayed: gold, a trace; silver, 1·80 ounces a ton.

The vein was seen to outcrop along its strike about 1,000 feet farther west, near the base of a steep rock face that juts out into the glacier. Honeycombed, steeply sloping ice prevented an examination of the vein at this point, but it was seen from a distance to range from 2 to 3 feet in width and to dip steeply to the south. Farther west its continuation is covered by glacial ice.

As the vein is mostly concealed by steep, ice-covered slopes, development would necessitate the driving of a long crosscut adit.

United St. Croix Group (16)

(*See* Figure 3)

Reference: Ann. Rept., Minister of Mines, B.C., 1914, p. 136.

The United St. Croix claims are on the summit of the mountain that forms the divide between the headwaters of the north fork of Chimdemash creek, the south fork of Legate creek, and St. Croix creek. The claims are 12 miles east of Usk and are reached by a branch pack-horse trail from the Chimdemash Creek trail. The trail leads along the north side of the north fork of Chimdemash creek to a grassy basin at elevation 3,100 feet. From here a switchback trail leads up the steep slope to the summit (elevation 5,100 feet).

Many varieties of volcanic flows comprise the bedrock of the mountain. The flows range from reddish to green and grey. Some are fine grained, others coarse grained, amygdaloidal, and porphyritic. The volcanics are cut by numerous granite and quartz-albite dykes.

At an elevation of 4,950 feet on the north fork slope a trench is cut across a 12-foot zone of volcanic breccia that is impregnated with narrow

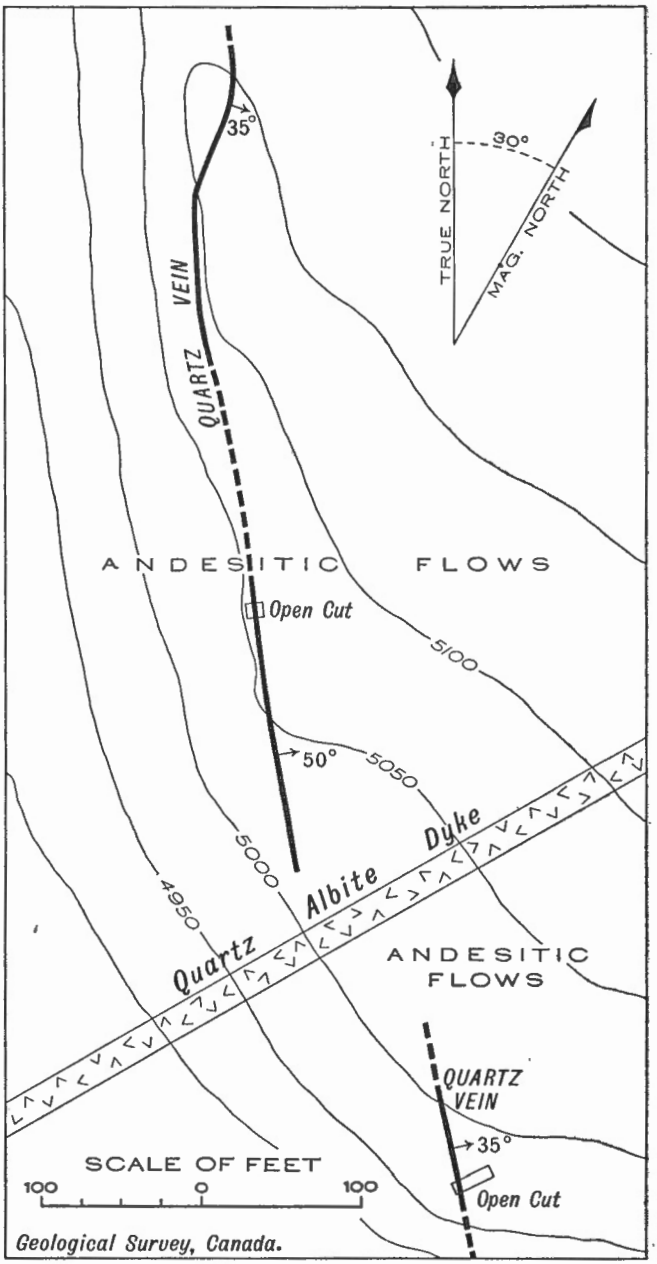

Figure 3. Plan of part of United St. Croix group.

quartz veinlets and replaced by chalcopyrite. The breccia zone contains up to 10 per cent chalcopyrite. The foot-wall is amygdaloidal and porphyritic andesite, the hanging-wall a fine-grained, grey andesite. The flows and ore zone strike north 45 degrees west and dip 40 degrees north. Farther northwest the continuation of the deposit is concealed by a talus cover, and is probably interrupted by a granite dyke that cuts across its strike 100 feet to the northwest. About 225 feet to the southeast there is a second pit 8 feet wide across the same zone, but there sulphides are less plentiful, there being less than 3 per cent of chalcopyrite. Fifty feet northeast of the latter pit a second brecciated zone 8 inches wide follows a flow contact striking south 45 degrees east and dipping 35 degrees northeast. The breccia is replaced by a little chalcopyrite. This vein is exposed in another pit 150 feet southeast, where it is 2 feet wide and contains up to 10 per cent chalcopyrite. The deposits may be related to a stock of granodiorite that lies 60 feet southeast of the last-mentioned pit on the strike of the ore zone.

A representative sample taken from the pit near the stock assayed: gold, a trace; silver, 0·46 ounce a ton; copper, 7·30 per cent. At the first-mentioned trench, where the mineral zone is 12 feet wide, a representative sample assayed: gold, a trace; silver, 0·20 ounce a ton; copper, 5·96 per cent.

About 500 feet east of the granodiorite stock mentioned above, an 18-inch quartz vein outcrops on the mountain top. This vein strikes south 10 degrees east and dips 35 to 50 degrees east. It has been traced by a half dozen pits for over 750 feet in a southeast direction down the north fork slope of the mountain between elevations of 5,100 and 4,900 feet. At 525 feet southeast along the vein a 15-foot, vertical dyke of quartz albite cuts across it, and south of the dyke the vein appears to be offset 40 feet to the north. A small talus slide hides the vein from view in the neighbourhood of the dyke. In a wide open-cut on the vein 170 feet southeast of the dyke the vein quartz is 14 inches wide and carries up to 5 per cent chalcopyrite. The hanging-wall is sheared and altered over a width of 15 feet, and the altered andesite carries a sparse distribution of chalcopyrite. Farther southeast the ground is very precipitous, but the vein appears to continue down the steep slope.

A 14-inch channel sample taken across the quartz vein at the wide open-cut assayed: gold, a trace; silver, 0·30 ounce a ton; copper, 3·12 per cent. At the same place a chip sample taken across 12 feet of the altered and mineralized hanging-wall assayed: gold, a trace; silver, 0·16 ounce a ton; copper, 0·78 per cent. Another channel sample across 12 inches of mineralized vein quartz 100 feet northwest of the quartz-albite dyke assayed: gold, a trace; silver, 0·16 ounce a ton; copper, 1·06 per cent. A representative sample taken at the northwest end of the vein on the summit assayed: gold, a trace; silver, 0·16 ounce a ton; copper, 0·88 per cent.

Galena Group (17)

The galena group of three claims is on the south side of the north fork of Chimdemash creek and adjoins the east boundary of the Silver Mitts group. It is part of the consolidated group of twenty claims, the Butte

Angell group owned by E. M. Angell (*See* Silver Mitts group). A good trail leads along the north side of the creek, crossing it about half a mile above the Mitts cabin, from where a steep switchback trail leads up the mountain to the workings at 4,000 feet.

Above timber-line a series of andesite and basalt flows, ranging from 20 to 50 feet in thickness, stand out as steep rock bluffs. The flows strike from east to southeast and dip 50 degrees south. At elevation 4,000 feet a white, quartz-albite dyke striking south and dipping 45 degrees east runs up the steep face of the mountain. An open-cut on the dyke shows from 2 to 6 inches of altered andesite porphyry wall-rock on the upper side of the dyke, but there are no sulphides. One hundred feet west a 35-foot adit has been driven along the foot-wall of a parallel quartz-albite dyke, but again no ore was found. The adit was driven because of the occurrence of galena and chalcopyrite in an altered zone along the foot-wall of the dyke at 100 feet higher elevation. The ore lens is from 2 to 3 feet wide and possibly 30 feet long, and is localized along the foot-wall side of the dyke at a point where the dyke makes a sharp turn to the east and connects in a short distance with the main body of the dyke, which continues up the steep mountain slope. A 24-inch channel sample taken across the vein assayed: gold, a trace; silver, 0·68 ounce a ton; lead, 1·09 per cent. The vein contains in addition a little copper for which a test was not made.

At elevation 3,780 feet, directly below the workings mentioned above, there is a 2-foot quartz vein exposed on the short, steep, rock slide, above which the vein is drift covered. The vein strikes south 70 degrees east and dips north 55 degrees. It is in a fine-grained andesite or basalt. The vein quartz is well mineralized with chalcopyrite and bornite and contains a little very fine-grained galena. A selected sample across the best part of the vein assayed: gold, 0·02 ounce a ton; silver, 6·68 ounces a ton; lead, 0·96 per cent; copper, 6·98 per cent.

Silver Mitts Group (18)

References: Ann. Repts., Minister of Mines, B.C.: 1929, p. 150; 1930, p. 135.

This group consists of the Blue Jack Nos. 1, 2, 3, 4, 5, and 6 claims, which together with the Galena, Angell View, and Butte Angell groups comprise a consolidated group of twenty claims named the Butte Angell group by the owner, E. M. Angell of Prince Rupert. The Silver Mitts group is 9 miles as the crow flies east from Usk on the south side of the north fork of Chimdemash creek about a mile above the forks. The claims are reached by a branch pack-horse trail from the Chimdemash Creek trail, which follows the north side of the north fork to the Silver Mitts cabin at elevation 1,840 feet.

On the mountain, on the southeast side of the creek, a trail leads to an adit (elevation 2,050 feet) driven south 15 degrees east in the andesite country rock for 35 feet. One hundred feet above the adit there is a fine-grained, quartz-albite dyke altered and silicified and impregnated with about 2 per cent of pyrite. The dyke is about 10 feet wide, strikes north 75 degrees east, and dips southeast into the mountain at 70 degrees. The

adit would have to be continued somewhat over 100 feet to intersect the downward continuation of the dyke. A grab sample of the silicified dyke rock carried neither gold nor silver.

At elevation 2,280 feet, on a steep, rocky slope cleaned by annual snow slides, a large open-cut in andesite discloses numerous, small, intersecting faults and joint planes. Chalcopyrite with pyrite and a little galena occurs in narrow seams along the faults and joints, and the bordering andesite is replaced by small veinlets of the sulphides. The ore zone is about 4 feet wide, but gives no promise of continuity along its strike as it passes gradually into almost barren andesite a short distance above and below the cut. A selected sample assayed: gold, a trace; silver, 0·84 ounce a ton; copper, 2·16 per cent. A very similar occurrence of chalcopyrite and pyrite along fault slips and joint planes in the andesite is exposed in a second open-cut about 100 feet farther northeast along the mountain side. Again the ore zone has indefinite boundaries and lacks continuity.

The trail continues to an elevation of 3,000 feet where there is a dyke-like body of fine-grained, brownish purple albite andesite, which strikes east and dips 65 to 70 degrees north. The north contact of this dyke or flow has been stripped for about 60 feet and a trench 14 feet long blasted into it to expose six or seven parallel fractures, about 15 inches apart, which contain vein fillings of quartz, calcite, and bornite, with a little chalcocite. The bornite veins range from 1 to 8 inches in width with an average width of 4 inches, but they do not appear to continue along their strike for over 50 feet. The mountain slope in the neighbourhood is mostly drift covered and unprospected. A typical sample collected from the ore dumps assayed: gold, a trace; silver, 9·64 ounces a ton; copper, 19·10 per cent.

About 1,000 feet northeast along the mountain from the two cuts mentioned above an adit at elevation 2,300 feet, which is reached by a separate trail from the creek below, has been driven 270 feet in a southeast direction in andesitic lavas. Several intersecting and steeply dipping fault slips were drifted along and several inches of quartz calcite gangue occurs at intervals in the fault gouge, but no ore was found. The adit was driven with the intention of intersecting the downward continuation of a quartz-albite dyke that outcrops on the east side of a steep-walled ravine cut by a small mountain stream at elevation 2,700 feet. The dyke is 12 feet thick, strikes south 10 degrees east, and dips east at 45 degrees. The hanging-wall side of the dyke is bordered by a 14-inch quartz vein, containing about 2 per cent of chalcopyrite and bornite. At about 2,500 feet elevation the dyke crosses to the west side of the creek and pinches out. Where the dyke narrows before pinching it is altered and impregnated with a little chalcopyrite. A 14-inch channel sample across the vein assayed: gold, 0·02 ounce a ton; silver, 5·98 ounces a ton; copper, 1·16 per cent.

Shenandoah Group (19)

References: Ann. Repts., Minister of Mines, B.C.: 1927, p. 126; 1928, p. 147; 1929, p. 150.

The Shenandoah claims are on the north side of the north fork of Chimdemash creek, approximately 12 miles east by road and pack-horse

trail from Usk. A switchback trail leads up to the workings from the north fork trail at a point 1½ miles above the forks. Two adits were driven in 1928 and 1929, by R. W. Seeley of Seattle, to explore silver-copper deposits. No work has been done since.

The mountain is comprised of a thick assemblage of andesites and basalts, which strike southeast and dip 50 to 60 degrees south. The flows are intruded by several small stocks and tongues of porphyritic granodiorite.

At elevation 4,800 feet on the summit of the mountain, a sulphide vein of chalcocite and bornite occurs along the contact of two flows striking southeast and dipping 55 degrees southwest. The foot-wall is greyish brown andesite and the hanging-wall very fine-grained, purplish brown albite andesite, both flows being about 50 feet thick. On the south side of the knife-edge summit, which trends north 80 degrees east, the vein pinches out in less than 30 feet, and on the north side it is hidden 20 feet down the slope by glacial snow and ice. One hundred feet below the summit an adit was driven north 30 degrees east for 220 feet in an endeavour to locate a downward continuation of the vein, but without success. A 6-inch sample taken across the vein in a cut, 10 feet below the summit, assayed: gold, a trace; silver, 74·50 ounces a ton; copper, 24·90 per cent.

About 1,000 feet farther east, at elevation 4,600 feet, an adit drift was run easterly along a sheared zone and quartz vein for about 170 feet. The sheared zone has been traced by test pits along the steep south slope of the mountain for over 1,000 feet. It contains a narrow quartz vein, averaging one foot in width over most of its length. The vein strikes south 80 degrees east and dips 40 degrees north into the mountain. It contains up to 6 per cent of chalcopyrite as irregular impregnations in the quartz and as small lenses. In several pits lenses of chalcopyrite 2 inches wide and 4 feet long were seen in the quartz. An average sample of the mineralized vein quartz from the ore dump assayed: gold, 0·02 ounce a ton; silver, 2·62 ounces a ton; copper, 2·94 per cent.

Continental Group (20)

Reference: Ann. Rept., Minister of Mines, B.C., 1914, p. 134.

This group of claims is 5 miles east of Usk, on the north side of Bornite mountain south of Chimdemash creek. The mineral showing is in the Continental basin and is reached from the Chimdemash Creek trail by a well-graded pack-horse trail. No work has been done on the claims since 1914.

At an elevation of 3,900 feet on the west side of Continental basin a strong quartz vein in andesite strikes north and dips west into the mountain slope at 30 degrees. It outcrops close to Continental creek, and from there is exposed in a northerly direction along a steep slope for about 250 feet. In this distance it ranges in width from 8 inches at its southern exposure to 24 inches at its northern exposure. Farther north its continuation is hidden by a talus slope about 1,000 feet wide.

A 45-foot adit has been driven west on the vein near its southern end. The vein narrows from 15 inches at the portal to 5 inches at the face. One

hundred feet north a deep, 20-foot cut driven on the vein shows a 24-inch width of quartz at the face. The vein carries up to 3 per cent of sulphide, chiefly chalcopyrite, but with a little bornite and pyrite. The chalcopyrite occurs in irregular blebs throughout the quartz and also in short, parallel seams, some of which are half an inch thick and extend for 3 or 4 feet.

Two channel samples were collected for assay. The first, taken across 9 inches, about 30 feet south of the 45-foot tunnel, assayed: gold, none; silver, 0·10 ounce a ton; copper, 0·76 per cent. The second, taken across 16 inches, 20 feet from the talus slide at the north end of the vein, assayed: gold, a trace; silver, 0·60 ounce a ton; copper, 0·18 per cent. An average sample collected by W. M. Brewer, M.E., at the 45-foot adit in 1914, assayed: gold, 0·08 ounce a ton; silver, 1·6 ounces a ton; copper, 1·9 per cent. This average sample from the 20-foot open-cut assayed: gold, 0·04 ounce a ton; silver, 1·4 ounces a ton; copper, 4·1 per cent.

No intrusives were seen in the andesite in the immediate vicinity of the vein, but small stocks of granodiorite are present in the neighbourhood, judging by large blocks of granodiorite seen on the talus slide over which the trail to the vein passes.

Singlehurst or Ptarmigan Group (21)

(*See* Figure 4)

References: Ann. Repts., Minister of Mines, B.C.: 1899, p. 655; 1900, p. 786; 1901, pp. 990 and 997; 1902, p. 46; 1914, p. 131.

The Singlehurst or Ptarmigan property is about 5 miles east of Usk, at an elevation of 4,700 feet, near the summit of Bornite mountain. The claims are reached by a branch from the Kleanza Creek trail.

The Ptarmigan vein was one of the first in the area on which serious work was done. Active development commenced in 1899 and by 1901 a vertical shaft had been sunk to 130 feet, with crosscuts to the vein on the 60- and 100-foot levels. At a depth of 30 feet there was a 20-foot drift north and a 25-foot drift south, at the 60-foot level a drift 16 feet south, and on the 100-foot level 60 feet of drifting north and south. There is no record of work done following the shipping of 5 tons of ore to a smelter in the autumn of 1902.

The claims are underlain by thick, massive, andesitic flows. A small area of bedded cherts, with an observed thickness of 20 feet, outcrops about 350 feet northeast of the shaft. The chert strikes northeast and dips 40 degrees northwest. The andesite flows probably have the same dip and strike. About 30 feet east of the shaft the andesites are cut by a diorite dyke, which strikes in a northerly direction. The dyke ranges from 5 to 10 feet in width and has occasional small, branching dykelets, which strike at right angles to it. At a pit on the vein 225 feet south of the shaft a 14-inch branch dyke of diorite is offset for 6 feet by the fault along which the vein occurs. It is presumed that the main diorite dyke is also offset 6 feet where it crosses the line of the vein and fault, beneath a drift cover 100 feet north of the shaft.

At the shaft the vein consists of 8 inches of vein quartz with several inches of altered wall-rock. The quartz is rusty in several places through

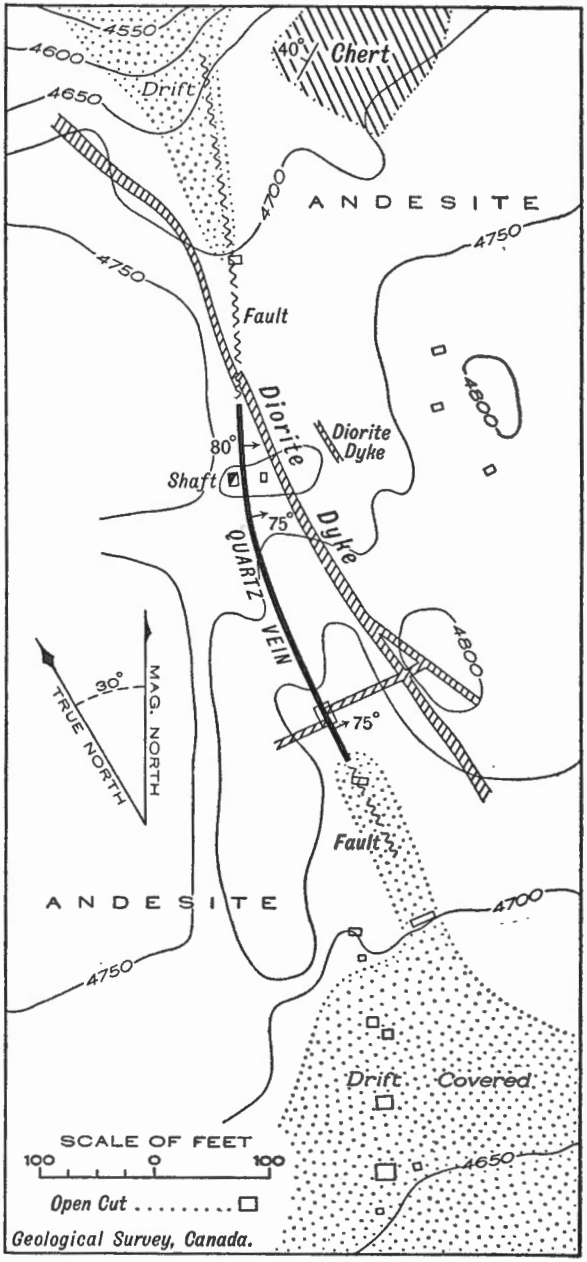

Figure 4. Plan of part of Singlehurst claim.

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oxidation of a small sulphide content. North of the shaft the vein is exposed for about 50 feet, and for this distance strikes north 20 degrees east and dips 75 degrees east. The fault along which the vein occurs contains no vein quartz where it is exposed 150 and 275 feet farther northeast. South of the shaft the vein has been followed by stripping and trenching for 225 feet, and may extend farther beneath the drift cover. Where exposed the vein quartz ranges from 6 to 10 inches in thickness and contains occasional pockets of honeycombed, limonite-stained quartz. At its southern end the strike changes to a few degrees west of south and the dip remains 75 degrees east.

An 8-inch channel sample taken across the vein 40 feet north of the shaft assayed: silver, 0·14 ounce a ton; gold, 0·06 ounce a ton. A picked sample was collected from the dump at the shaft by selecting a dozen pieces of quartz containing about 2 per cent of a silvery grey mineral, evidently argentite. The argentite was present as small veinlets in the quartz, and a little chalcopyrite accompanied it. The sample weighed about 2 pounds and assayed: silver, 122·78 ounces a ton; gold, 0·02 ounce a ton. A representative sample taken from an old ore bin containing the remains of 50 bags of crushed ore assayed: silver, 35·64 ounces a ton; gold, 0·02 ounce a ton; copper, 0·20 per cent. A fourth sample taken across the vein 30 feet south of the shaft where there were no visible sulphides assayed: silver, 0·10 ounce a ton; gold, none. The assays seem to indicate the presence of ore shoots rich in silver in this old mine.

Bornite King Group (22)

References: Ann. Repts., Minister of Mines, B.C.: 1919, p. 99; 1931, p. 70.

The Bornite King group, owned by Andrew Pete of Usk, is on the west slope of Bornite mountain, about 3 miles east of Usk. The camp at an elevation of 3,900 feet is reached by a 5-mile trail, which goes up by way of the Four Aces group.

The claims are underlain by massive, volcanic flow rocks intruded by occasional quartz-albite dykes and granodiorite tongues.

Small quartz veins are associated with the intrusives, but none of them appears to carry attractive mineral values.

At an elevation of 3,950 feet, about 200 feet southeast of the campsite, an adit has been driven south 25 degrees east for 22 feet into barren andesite on the face of a precipitous slope.

Considerable prospecting has been done on the steep rock sides of a glacial cirque, particularly on the southeast side. Here, at an elevation of 4,150 feet, an adit was driven south 10 degrees east for 86 feet in porphyritic and fine-grained andesites. The flows strike south 60 degrees east and dip 45 degrees southwest. One hundred feet above the adit a trench exposes closely spaced joint planes in andesite. These strike south and dip 70 degrees west, but contain no sulphides. At elevation 4,350 feet two other trenches about 30 feet apart have been made in barren andesite. A small cut exposes a vertical fault fissure striking east at 4,500 feet elevation. The fault contains up to 2 inches of gouge and the wall-rock is stained green for several inches on either side. At 4,650 feet there is a 6-inch quartz vein exposed for 100 feet along the contact between two flows. The vein strikes

south 60 degrees east and dips 30 degrees southwest. A channel sample taken here gave negative values in gold and silver. Another quartz vein is exposed 600 feet north along the steep edge of the cirque, but is inaccessible due to the steep slope.

A 6-foot quartz-albite dyke with a 12-inch quartz vein lying along its upper contact is exposed on the north side of the cirque at elevation 4,500 feet. Vein and dyke strike south 20 degrees west and dip 30 degrees northwest into the hill-side. They are exposed on the east side of a narrow draw, southwest of which their projection is covered by a talus slope. To the northeast the dyke pinches out in about 100 feet, but the vein continues beyond the dyke an additional 100 feet before pinching. The andesite above the vein is rusty brown over a width of several feet, particularly where the vein rests on the dyke, and where alteration is most pronounced the andesite is cut by a stockwork of small 2-inch quartz veinlets. The vein quartz contains up to 1 per cent of chalcocite irregularly distributed. No work has been done on this showing.

There are several other small quartz veins at a higher elevation north of the cirque.

Toulon Group (23)

(*See* Figure 5)

References: Ann. Repts., Minister of Mines, B.C.: 1899, p. 656; 1900, p. 787; 1901, p. 999; 1914, p. 133; 1929, p. 149.

The Toulon group of Crown-granted mineral claims is 3 miles east of Usk on the mountain slope on the south side of Chimdemash creek, and is reached by a branch from the Chimdemash Creek trail. These claims were first located in May 1899, and three short exploratory adits were driven between 1900 and 1910 by the Bornite Mining Company of Portland, Oregon.

At an elevation of 1,200 feet an adit (No. 1 adit) has been driven 80 feet along a quartz vein (No. 1 vein) in schistose andesite. The vein occurs along a fault of small displacement that lies parallel to the schistosity of the andesite. Its strike is approximately south 60 degrees west and the dip is 40 degrees northwest. The vein has an average width of 3 feet, but a lens-like nature is apparent at the portal where an initial vein width of 5 feet pinches to 5 inches only 20 feet above the portal. The quartz carries about 1 per cent of sulphide, chiefly chalcocite and chalcopyrite. The vein is cut by two faults, one 40 feet and the other 80 feet from the portal. The first shifts the vein a few feet northwest, and at the second one the vein disappears. It appears to have been downfaulted. The adit was continued beyond this second fault an additional 60 feet in a direction south 15 degrees west, but did not locate the faulted part of the vein. There is a 6- or 8-foot dyke of andesine diorite porphyry at the face of the adit and a 5-foot dyke of fine-grained diorite 35 feet from the face. Both dykes strike north.

A 31-inch channel sample taken across the vein 70 feet from the portal assayed: silver, 2·16 ounces a ton; gold, 0·02 ounce a ton; copper, 1·32 per cent. A sample of quartz containing bornite and chalcopyrite was picked from the dump at the portal and assayed: silver, 17·52 ounces a ton; gold,

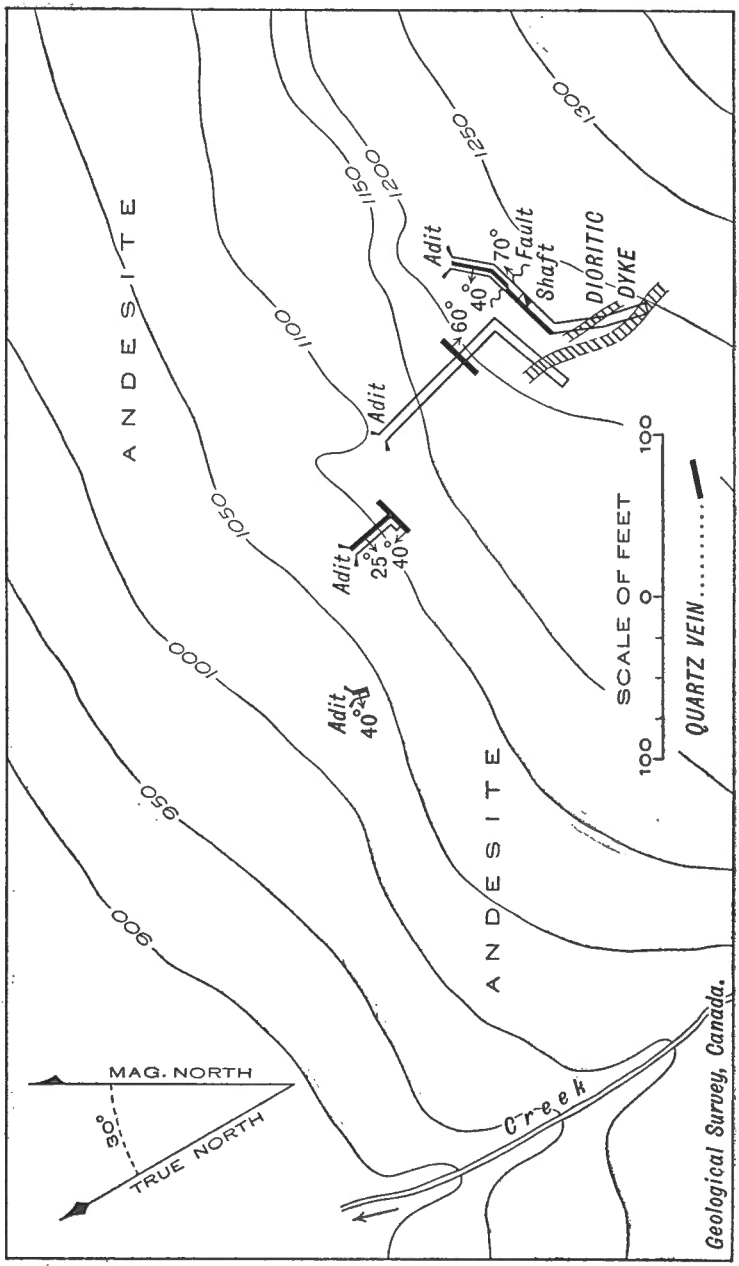

Figure 5. Plan of part of Toulon group.

0·08 ounce a ton; copper, 13·38 per cent. In 1914, W. M. Brewer collected a sample here that assayed: "gold, 0·84 ounce; silver, 11·0 ounces; copper, 8·0 per cent."

No. 2 adit was driven for 130 feet in a direction south 16 degrees east to intersect the downward extension of the No. 1 vein at an elevation of 1,100 feet. About 70 feet from the portal a 12-inch shear zone with a few quartz stringers was encountered, but it dips 60 degrees southeast rather than 40 degrees northwest. At 130 feet from the portal the adit turns at right angles and continues an additional 60 feet southwest. Fifteen feet from the face the andesite is cut by a 6-foot dyke of andesine diorite porphyry striking north.

No. 3 adit is 75 feet distant from and 25 feet below No. 2 adit. It follows a quartz vein that strikes south 12 degrees east and dips 25 degrees west. The vein carries a little chalcopyrite and bornite, but is narrow, ranging from 12 inches at the portal to 3 inches at the face. There it meets a cross vein that strikes at right angles and dips 40 degrees north. This vein consists of 8 inches of barren-looking quartz, for the few feet exposed in a 5-foot cross drift.

A 10-inch channel sample taken 11 feet from the portal assayed: silver, 0·50 ounce a ton; gold, a trace; copper, 0·26 per cent. A sample taken from the 8-inch vein at the face showed neither gold nor silver.

No. 4 adit, 90 feet to the northwest and at 50 feet lower elevation, follows a quartz vein which may connect with the vein in No. 3 adit. The vein strikes south and dips 35 degrees west. The adit is only 12 feet long and the vein ranges from 14 inches in width at the portal to a few inches at the face. Neither vein nor schistose andesite wall-rock shows sign of mineralization.

Half a mile farther east, at an elevation of 2,100 feet, a quartz-albite dyke cutting massive andesitic lavas strikes southeast across the bed of a small mountain stream. West of the dyke the andesite is mineralized with sparsely distributed chalcocite and chalcopyrite over a width of 100 feet. The sulphides occur along fine joint fissures and as replacements of the andesite near the joints. Stripping and trenching done here eight years ago failed to reveal commercial grades of copper ore.

Madden Claim (24)

Reference: Ann. Rept., Minister of Mines, B.C.: 1914, p. 135.

This claim is on Chimdemash creek 2 miles east of Skeena river. It was first staked in 1894 by Captain Madden, pioneer placer miner, who drove a 20-foot adit, at elevation 500 feet, into the south bank of the creek along a quartz vein. The vein outcrops at the water's edge in andesitic volcanics and is exposed by natural agencies for 75 feet in a southeast direction up a steep bank, above which bedrock is drift covered. The vein is very sparsely mineralized, containing only a little chalcocite and specularite. A 16-inch channel sample taken across the vein at the entrance to the adit assayed: gold, a trace; silver, 0·02 ounce a ton. Another 16-inch channel sample taken across the vein at 50 feet higher elevation assayed: gold, a trace; silver, 0·15 ounce a ton.

St. Elmo Claim (25)

Reference: Ann. Rept., Minister of Mines, B.C., 1929, p. 151.

The St. Elmo claim, about 4 miles northeast of Usk, is reached from the trail along the east side of the Skeena by a short, steep trail that branches east about 1½ miles north of Chimdemash creek.

The claim is underlain by thick beds of very fine-grained tuff striking north 70 degrees east and dipping 40 degrees south. On the east bank of a small stream at elevation 1,000 feet a 25-foot adit was driven across a sheared and altered zone in the tuff. The altered rock contains a sparse impregnation of bornite and a little hematite, but not in economic amounts. A typical sample assayed: gold, none; silver, 0·36 ounce a ton; copper, 0·04 per cent.

Bradle Bane Group (26)

The Bradle Bane group of eight claims was staked in 1935 by A. A. MacDonald of Usk, and Reid L. Maclennan and J. Preece of Prince Rupert. The claims are about one mile east of Skeena river and 5 miles northeast of Usk. A fair pack-horse trail turns off from Skeena river a mile below the mouth of St. Croix creek and leads to the Bradle Bane camp at 2,600 feet elevation.

The claims are underlain by very fine-grained, grey tuffs which strike east and dip 50 degrees south. Intrusive rocks, if present, are hidden by an abundant drift cover.

At elevation 2,850 feet the tuffs are cut by a fault that strikes south up the steep mountain slope in the bed of a small stream. A subsidiary fault which branches northwest encloses with the main fault a brecciated and altered zone of pinkish white tuff mineralized along minute fractures with fine veinlets of pyrite with a little galena and molybdenite. The mineralized zone is about 15 feet wide at the base of a 30-foot cliff where trenching has been done and here the tuff contains 2 per cent of sulphides, chiefly pyrite. Farther north as the zone widens on the west side of the creek the mineralization progressively weakens. A typical sample of the mineralized tuff selected from the dumps assayed: gold, none; silver, 0·46 ounce a ton; lead, 0·72 per cent; molybdenum, 0·11 per cent. A 5-foot channel sample taken across the face of the rock cut at the foot of the cliff assayed: gold, none; silver, 0·02 ounce a ton; lead, none.

Approximately 150 feet farther north and 50 feet lower a parallel, vertical fault 12 feet east of the main fault has been exposed by stripping on the east bank of the creek. The tuff is sheared and altered for 6 feet on either side of this fault and contains small amounts of pyrite, galena, and sphalerite, in about equal proportions. The extent of mineralization along the strike of the sheared zone is unknown, as it is drift covered.

Algoma Group (27)

Reference: Ann. Rept., Minister of Mines, B.C., 1931, p. 71.

The Algoma claims are on the mountain on the north side of St. Croix creek, about 2 miles east of Pitman flag station. A steep branch trail leaves the St. Croix trail 2 miles east of Skeena river and leads to an old

shack at elevation 3,250 feet. The claims have been restaked several times during the past twenty years, but very little work has been done aside from the building of a trail.

The country rock comprises a thick series of andesitic flows. Between elevations of 3,500 and 3,700 feet a granodiorite dyke about 200 feet wide intrudes the volcanics. The mountain rises abruptly in an easterly direction along the strike of the dyke and falls steeply on the west. A pit sunk on a 3-foot lamprophyre dyke, which cuts the granodiorite at elevation 3,650 feet, failed to reveal any minerals.

Diorite Group (28)

References: Ann. Repts., Minister of Mines, B.C.: 1916, p. 98; 1929, p. 152; 1931, p. 71.

The Diorite claims are less than half a mile west of Skeena river on Hardscrabble creek, and are reached by way of a wagon road about one mile long from Pitman flag station. In 1916 Stanley Ross and Sons did some surface work and shipped 10½ tons of hand-sorted copper ore to the Anyox smelter, which gave returns of 65 cents in gold and silver to the ton and 5·2 per cent copper. Some years later the property was acquired by J. M. Dechene, who carried on a little prospecting prior to his death in 1930.

The predominant rocks on the claims, fine-grained, andesitic volcanics, are cut by fine-grained, pinkish white, quartz-albite dykes. The dykes are composed of about 50 per cent quartz and 50 per cent albite phenocrysts, both microscopically crystalline. Small dykes and stocks of oligoclase diorite porphyry intrude the andesites and cut the quartz-albite dykes.

Half a mile west of the railway Hardscrabble creek flows through a narrow canyon with vertical rock walls 150 feet high. Near the top of the rock bluffs, at an elevation of 640 feet on the north side of the creek, a 20- by 20-foot open-cut and a 15-foot adit explore a quartz-albite dyke mineralized along minor faults and small fracture planes by narrow seams of chalcopyrite with minor amounts of bornite. The sulphides also occur along the contacts of several small 6-inch dykes of oligoclase diorite porphyry that traverse the quartz-albite dyke in irregular fashion.

Twenty-five feet down the face of the bluff a 20-foot adit was driven north into the dyke. It is reached from the upper working by a ladder that runs down the vertical rock face. Some good ore in this adit came from along a small fault striking north.

In the 15-foot adit ½ inch of solid chalcopyrite occurs along a small fault striking northwest. A picked sample taken from the partly replaced wall-rock, a few inches on both sides of the fault plane, assayed: gold, a trace; silver, 0·30 ounce a ton; copper, 2·50 per cent. From a nearby 10-ton ore dump a representative sample was collected which assayed: gold, a trace; silver, 0·20 ounce a ton; copper, 1·84 per cent. As the sulphides in the dyke comprise less than 1 per cent by volume of the whole rock mass, there is insufficient copper present to make a large low-grade ore-body.

About 300 feet farther west a third short adit was driven on the opposite side of the creek to explore volcanic rocks mineralized along jointing planes with chalcopyrite and bornite.

At the location of the open-cut and two adits the strike and dip of the quartz-albite dyke are indeterminable, due to faulting and a drift cover. Farther east, where exposed on the side of a steep hill, the dyke has a width of 40 feet and strikes south 80 degrees west. An adit was driven at the foot of the hill at an elevation of 550 feet for 40 feet in a northwest direction to intersect the dyke. The adit is heavily timbered and wholly in drift, with andesite showing at the face.

Grotto Group (29)

(*See* Figure 6)

References: Ann. Repts., Minister of Mines, B.C.: 1929, p. 152; 1931, p. 71. B.C. Dept. of Mines, Bull. No. 1, 1932, p. 56.

The Grotto group, owned by G. Alger, J. Bell, and Lee Bethurem of Usk, is on Hardscrabble creek about one mile west of the Canadian National railway and about 1½ miles from Pitman flag station. The workings are on both sides of the stream at an elevation of approximately 650 feet, and are reached by a good trail which runs along the north side of the creek across the Diorite property.

Thirty-five feet from the water's edge on the north side of Hardscrabble creek an adit has been driven for 96 feet to explore a quartz vein that occurs along the contact of a 12-foot andesine diorite porphyry dyke intrusive into andesite. Vein and dyke strike northeast and the dip of the vein ranges from vertical to 60 degrees northwest. The vein maintains an average width of 12 inches for over 100 feet, and the quartz is heavily mineralized with pyrite and a little specularite. Twenty-five feet from the portal of the adit the vein branches, one part crosses the dyke and the other part follows the west side of the dyke. The main adit follows the west side for 65 feet, but no vein quartz is present for the last 20 feet of this distance. There is, however, a shear zone along the line of contact along which the vein might be expected to reappear. At 65 feet from the portal the adit swings across to the east side of the dyke and follows the main vein for a few feet until it likewise pinches.

A small, stock-like body of andesine granodiorite is exposed on the stream bank 30 feet east of the portal, but whether it is older or younger than the andesine diorite porphyry dyke is not known. The andesine granodiorite is cut by a 2-foot dyke of lamprophyre.

The writer took a 12-inch channel sample across the vein from the roof of the adit which assayed: gold, 0·26 ounce a ton; silver, 5·30 ounces a ton; copper, 2 per cent. A hand specimen picked from the dump assayed: gold, 0·06 ounce a ton; silver, 17·44 ounces a ton; copper, 0·82 per cent. Both samples were well mineralized with pyrite and contained a little bornite and specularite.

About 300 feet farther upstream a quartz vein of similar appearance, which outcrops on the south shore of the creek, has been traced in a southwest direction for 40 feet. The vein pinches out near the face of a 26-foot adit where the fault along which it occurs turns southeastward to join a cross fault. Its continuation to the north is hidden by water and boulders. The vein has an initial width of 6 inches at the water's edge, but widens to 9 inches in the adit. The enclosing andesite country rock is cut by a 6-foot

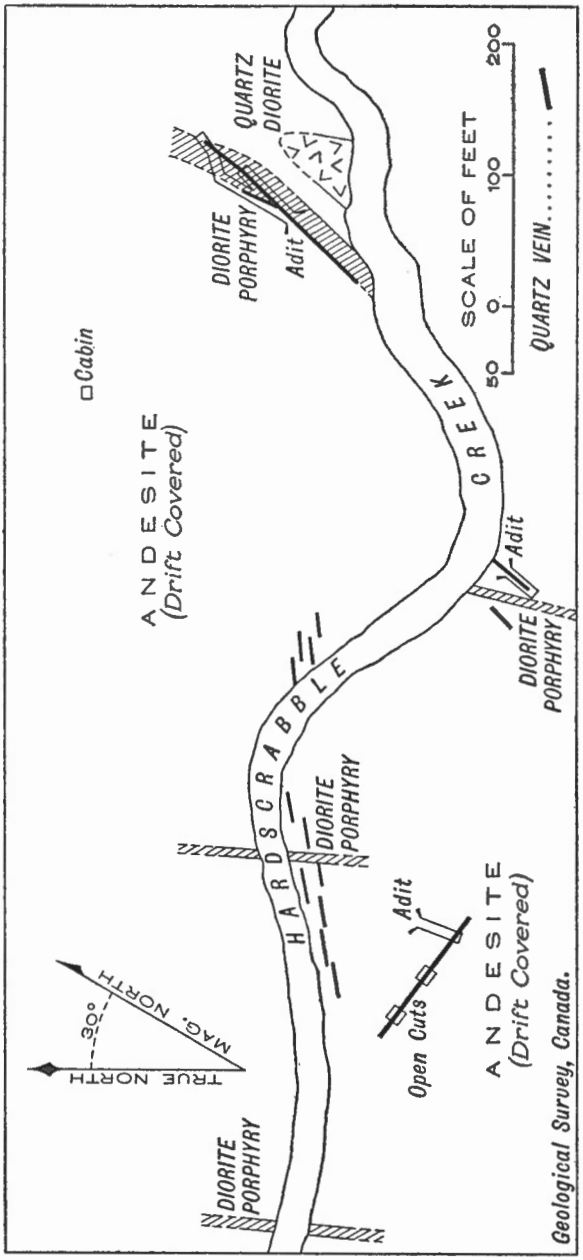

Figure 6. Plan of part of Grotto group.

dyke of andesine diorite porphyry exposed 12 feet west of the portal, but the dyke does not come in contact with the vein. A typical 9-inch channel sample of vein quartz, well mineralized with pyrite and chalcopyrite, taken in the adit near the portal, assayed: gold, 0·70 ounce a ton; silver, 14·40 ounces a ton; platinum, none; copper, 3·76 per cent.

Several hundred feet upstream from the vein just described there is a series of small, parallel quartz veins in the andesite on the south side of the creek. The veins mostly range from 1 to 12 inches in width, with lengths seldom exceeding 50 feet. They strike a little north of east with a vertical dip and may be followed along the shore for 400 or 500 feet to where they cross to the north side at the bend in the stream. The quartz carries up to 10 per cent of chalcopyrite present in irregular masses. The andesite in the vicinity of the quartz veinlets is cut by occasional narrow dykes of quartz diorite porphyry which strike north and dip 65 degrees west. The quartz veins do not traverse these dykes. Two channel samples taken across a combined vein width of 19 inches at a place 100 feet west of the bend in the creek, or about 50 feet west of one of the quartz diorite porphyry dykes, gave on assay: gold, 0·30 ounce a ton; silver, 2·50 ounces a ton; copper, 3·08 per cent. The combined quartz samples contained about 10 per cent chalcopyrite by volume.

One hundred feet to the south an adit has been driven 30 feet through andesitic lavas to a sheared zone of chloritic schist containing quartz stringers. The shear zone strikes south 60 degrees east and dips 65 degrees south. A 24-inch channel sample taken across the shear zone in a nearby open-cut assayed: gold, 0·02 ounce a ton; silver, 1·58 ounces a ton; copper, 0·32 per cent.

At an elevation of 1,400 feet, or 750 feet above the adit just mentioned, some surface work has been done on an 8-inch pyritized quartz vein in andesite. A channel sample across the vein gave on assay only a trace of gold and 0·08 ounce a ton of silver. About 800 feet farther east, at an elevation of 1,000 feet, a trench has been blasted on a grey, fine-grained, andesitic rock containing a fine dissemination of chalcopyrite veinlets.

The occurrence of a milling grade of gold-quartz ore in the veins along the creek marks this property as one of sufficient merit to warrant further development and exploration.

Helen Group (30)

References: Ann. Repts., Minister of Mines, B.C.: 1931, p. 71; 1932, p. 84.

The Helen group, staked by George Alger of Usk in 1931, is about 3 miles northwest of Pitman station on the north side of Sand creek. A foot trail follows the south side of Sand creek for about 2 miles, then crosses and leads by a series of switchbacks to the workings.

A thick flow of fine-grained black basalt outcrops on the west side of a small mountain stream at elevation 2,600 feet, and on the east side are numerous outcrops of grey andesite. Along the bed of the stream a shear zone occurs near the contact between the two flows. The shear zone is conspicuously marked by a 2-foot dyke of fine-grained, altered quartz diorite that follows along it. Dyke and shear zone strike a little west of north and dip 35 degrees west. On the foot-wall side of the dyke the basalt

is sheared and altered over a width of 4 feet, and is traversed by a network of quartz stringers carrying small amounts of pyrite, chalcopyrite, and sphalerite. There is a similar alteration and mineralization of the basalt along the upper side of the dyke over a width of 2 feet.

The quartz diorite dyke contains a sparse impregnation of pyrite with associated carbonate alteration. Five test pits have been sunk on the shear zone in a distance of about 300 feet along the creek bed. A large mass of light grey, porphyritic quartz diorite outcrops on the west side of the stream near the upper end of the shear zone.

Three channel samples taken across the sheared zone by the writer showed very low assays for copper, silver, and zinc, and no gold.

At elevation 2,650 feet a cut about 100 feet northeast of the creek exposes a brecciated zone in andesite with ramifying quartz veinlets carrying a little pyrite. A 3-foot chip sample across it gave a negative assay for both gold and silver.

Fiddler Group (31)

(*See* Figure 7)

References: Ann. Repts., Minister of Mines, B.C.: 1914, p. 139; 1916, p. 101; 1923, p. 105; 1924, p. 93; 1925, p. 131; 1926, p. 125.

The Fiddler group is on Knauss creek, a short, north-flowing tributary of Fiddler creek, about 4 miles west by wagon road from Dorreen station. A quartz vein containing gold, silver, lead, zinc, and copper attracted attention to this property as early as 1914, when Martin Welsh of Spokane first bonded the property from L. C. Knauss and drove an adit 140 feet along the vein. In 1916 the Fiddler Creek Gold Mining Company of Edmonton drove a prospect adit 183 feet through gravel at a point 450 feet lower along the dip of the vein, but work stopped soon after striking bedrock. This adit has since completely caved in. In 1923 J. F. Duthie acquired the property and continued the main adit along the vein. The following year 80 tons of ore were taken out to the railway. An average of all samples taken during the sacking of the ore is said to have given: gold, 1·67 ounces a ton; silver, 6 ounces a ton; lead, 6·2 per cent; copper, 1·3 per cent; zinc, 5·8 per cent. Further development work was done during the summers of 1925 and 1926. In 1926 J. W. Treadway with three men shipped 100 tons of ore to the smelter. The first carload (35 tons dry weight) is recorded as having returned: gold, 1·28 ounces a ton; silver, 5·3 ounces a ton; lead, 6·1 per cent; zinc, 3·8 per cent. The claims have lain idle during the past ten years. Mr. Patmore of Prince Rupert is the owner.

The claims are underlain by rocks of the Hazelton group, comprised of laminated argillites, bedded tuffs, and massive interbedded flows of andesite, which strike north 60 degrees west and dip from 20 to 30 degrees northeast. They are intruded by dykes of pink, porphyritic quartz diorite and by small, grey, feldspar porphyry dykes. The Fiddler vein or veins occur in the argillite along slip planes parallel to the bedding a short distance below a massive andesite bed. Although the vein abuts against a dyke of the pink quartz diorite at the portal of the No. 1 adit, it is younger than the intrusive. The dyke is about 100 feet wide, strikes approximately

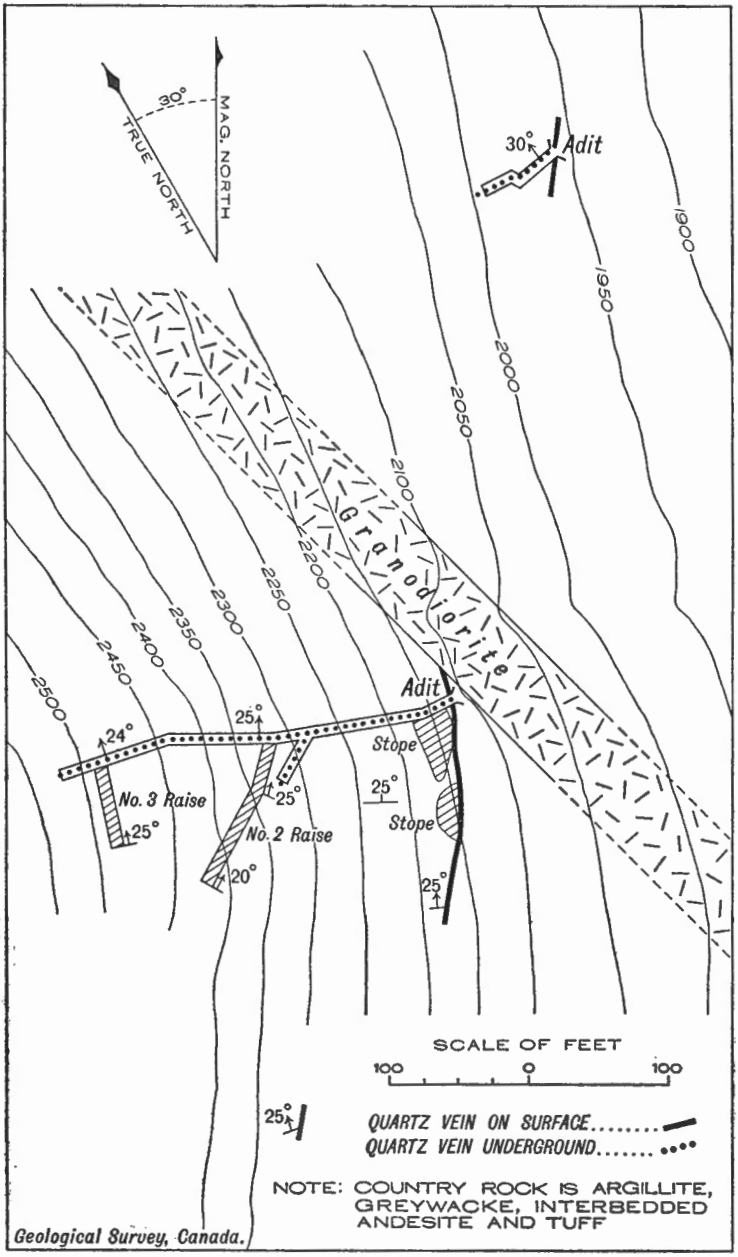

Figure 7. Plan of part of Fiddler group.

north 15 degrees west, and is vertical. The fault slip on passing from the argillite into the brittle granitic rock turns up sharply and splits into a number of small fissures in which no quartz was deposited. The dyke rock is believed to have impounded the mineralizing solutions, as development work shows the vein to be widest near the dyke.

The main vein outcrop is continuously exposed along the surface for about 200 feet between elevations of 2,100 and 2,200 feet on the west slope of Knauss Creek valley, 600 feet above the creek bed. The No. 1 adit is driven westerly along the vein from a point at the lower exposure of the vein at elevation 2,100 feet, a few feet from where it abuts against the dyke of pink quartz diorite.

The No. 1 adit was driven north 60 degrees west along the vein for 296 feet. For the first 60 feet the vein averages 3 feet in width, then for 180 feet its average width is 15 inches, and farther west towards the face it is 6 or 7 inches wide. A narrow branch vein that diverges from the main vein 120 feet from the portal has also been followed for 30 feet. Close to the portal the vein is stoped out for about 30 feet along the strike and 50 feet up the dip. At 140 feet from the portal a raise was put up for 125 feet along the dip of the vein. The slope ranges from 26 degrees for the first 50 feet to 20 degrees in the upper 75 feet. The vein is persistent in the raise, but narrows gradually from 12 inches in the main adit to 6 inches at the top of the raise. A third raise 265 feet from the portal follows the vein for 65 feet up a 23-degree slope. The vein is 7 inches wide at the adit, and this width persists to the top of the raise.

The vein quartz carries 1 to 2 per cent of pyrite, galena, sphalerite, and chalcopyrite throughout, with many rich ore shoots containing up to 30 per cent of these sulphides.

At 120 feet from the portal a 12-inch channel sample taken across the vein assayed: gold, 0·98 ounce a ton; silver, 4·72 ounces a ton; lead, 6·73 per cent; zinc, 3·00 per cent; copper, 1·04 per cent. At the foot of the No. 2 raise a second 12-inch channel sample taken across the vein assayed: gold, 2·18 ounces a ton; silver, 2·46 ounces a ton; lead, 3·68 per cent; zinc, 1·25 per cent; copper, 0·26 per cent. A 6-inch channel sample taken across the vein 6 feet from the face of the No. 2 raise assayed: gold, 0·28 ounce a ton; silver, 0·76 ounce a ton; lead, 1·31 per cent; copper, 0·36 per cent. Twenty feet from the face of the main adit a 6-inch channel sample taken across the vein assayed: gold, 0·86 ounce a ton; silver, 0·72 ounce a ton; lead, 1·35 per cent; copper, 0·24 per cent. At the face of the No. 3 raise a 7-inch channel sample taken across the vein assayed: gold, 0·70 ounce a ton; silver, 2·38 ounces a ton; lead, 1·55 per cent; copper, 0·34 per cent. These samples were collected by the writer.

No. 2 adit, 400 feet northeast of the main adit and 150 feet lower, was driven 60 feet along a vein similar in every respect to the one described above. The vein outcrops along the surface for 50 feet, beyond which it is concealed by an alder-covered talus slide. In the adit the vein ranges from 6 to 12 inches in width and is well mineralized with pyrite, galena, and chalcopyrite. An 8-inch channel sample taken across this vein 12 feet from the face assayed: gold, 0·94 ounce a ton; silver, 0·56 ounce a ton; lead, 1·28 per cent; copper, 0·24 per cent.

What is believed to be a different vein outcrops at elevation 2,300 feet, about 400 feet southwest of the main adit. It is about 20 inches wide and is exposed for less than 30 feet along the contact between argillite and overlying andesite. Structurally it lies 70 feet above the main vein outcrop. No effort has been made to trace this vein by trenching, but other vein exposures are reported to outcrop farther southwest along the mountain side.

Patmore Group (32)

This property is on the south side of Fiddler creek about 6 miles west by wagon road and foot trail from Dorreen station. The wagon road to the Fiddler property is followed as far as Knauss creek, from where a foot trail 2 miles in length leads westerly to the showings. The property was first prospected over twenty years ago, at which time a short adit was driven and surface stripping and trenching done. The claims were relocated in 1934 by Mr. Patmore of Prince Rupert. Premier Gold Mining Company, Limited, did a little surface work that year.

No. 1 showing is at elevation 2,550 feet. A number of small quartz veins in altered, fine-grained quartz diorite have been exposed by trenching and stripping in an area roughly 100 feet long and 40 feet wide. The quartz stringers average about 6 inches in width and 50 feet in length and are well mineralized with galena and sphalerite, with lesser amounts of pyrite and chalcopyrite. The longer veins, which trend south up the mountain slope, are intersected by cross veins, but the total amount of vein quartz does not exceed 10 per cent of the rock mass. The estimate includes numerous fine quartz veinlets less than ½ an inch in width which traverse the altered quartz diorite. The intrusive is brown stained on weathered surfaces through oxidation of a small pyrite content.

A representative sample of the mineralized vein quartz taken from a small pile of hand-sorted ore assayed: gold, 0·12 ounce a ton; silver, 2·28 ounces a ton; lead, 1·00 per cent; zinc, 1·05 per cent.

Other exposures of the altered quartz diorite with quartz stringers were seen 150 feet west of the No. 1 showing and again 125 feet south up the mountain side.

No. 2 showing is at the same elevation, 1,200 feet farther west along the mountain side. The intervening area is drift covered. Mineralized quartz stringers striking south to southwest occur in altered quartz diorite in a manner analogous to the occurrence at the No. 1 showing. The veins and intrusive are exposed by cuts in a stripped area about 50 feet wide and 60 feet long. There are a number of smaller exposures 200 feet north down the mountain side. At elevation 2,500 feet a 37-foot adit was run south at a point just below the stripped zone. The adit is in altered quartz diorite for 35 feet, with 2 feet of argillite at the face. The argillites strike easterly and dip 40 degrees north. Argillites are exposed again about 25 feet above the stripped zone, and strike easterly with a dip of 40 degrees north. The evidence indicates that the altered quartz diorite occurs as a sill and that its strike and dip correspond approximately with the strike and dip of the mountain slope. This being so, other occurrences of the altered diorite cut by mineralized quartz stringers might be found by digging test pits through the overburden in the area between the two main showings.

In the adit a 6-inch channel sample taken across a quartz vein 20 feet from the portal assayed: gold, 0·14 ounce a ton; silver, 2·68 ounces a ton; lead, 2·92 per cent. A representative sample taken from an ore pile at the foot of the stripped zone assayed: gold, 0·20 ounce a ton; silver, 0·78 ounce a ton; lead, 1·15 per cent. An assay made on a typical specimen of altered quartz diorite gave a negative test for both gold and silver.

Bermaline Group (34)

References: Ann. Rept., Minister of Mines, B.C., 1930, p. 137. B.C. Dept. of Mines, Bull. No. 2, 1932, p. 56.

The Bermaline group of five claims is on the northwest slope of Goat mountain overlooking the divide between the headwaters of Douglas creek and the north fork of Lorne creek, approximately 12 miles west of Ritchie flag station. The owner, August Johnson of Dorreen, has constructed a 15-mile pack-horse trail to the claims from the station.

The claims are underlain by a thick series of sediments comprised largely of laminated argillites and thick, massive beds of volcanic tuffs. The sediments are gently folded, with dips up to 15 degrees, and are intruded by a few dykes and small stocks of granodiorite.

A quartz vein has been traced by trenches for about 425 feet between elevations of 4,750 and 4,900 feet. The vein strikes north 65 degrees west down a 15-degree slope towards the canyon at the head of Douglas creek. The dip ranges from vertical to 45 degrees northeast. The vein occupies a fissure in argillaceous sediments and tuffs that strike north 50 degrees east and dip 15 degrees northwest. A body of granodiorite outcrops on the mountain slope a short distance above the highest vein outcrop. Where the vein has been stripped for 30 feet at its upper end it is 4 feet wide, dips vertically, and the quartz carries about 15 per cent of sulphide, roughly 10 per cent of which is galena and 5 per cent is pyrite and chalcopyrite with a little sphalerite. A representative chip sample taken here across the vein assayed: gold, 0·06 ounce a ton; silver, 6·06 ounces a ton; lead, 9·06 per cent; zinc, 0·40 per cent; copper, 4·44 per cent. In a trench about 100 feet farther northwest the vein is 3 feet wide and the dip has changed from vertical to 45 degrees northeast. The quartz contains much less sulphide, but a representative chip sample across the vein assayed: gold, 0·04 ounce a ton; silver, 2·00 ounces a ton; lead, 4·04 per cent; zinc, 0·80 per cent; copper, 0·12 per cent. About 300 feet farther northwest where the vein is exposed in a creek bed it is only 6 inches wide and carries a little pyrite. A channel sample taken across it here showed neither gold nor silver.

About 1,500 feet farther southeast, at elevation 4,950 feet, a quartz vein ranging from 18 to 24 inches in width is exposed at intervals across a knoll for about 300 feet. The vein has a north-south strike and dips vertically. It traverses sedimentary rocks that strike south 60 degrees east and dip 15 degrees south. The vein quartz carries very little sulphide, probably less than 1 per cent of pyrite and chalcopyrite. A representative sample gave on assay: gold, a trace; silver, 1·03 ounces a ton. At the north end of the vein exposure a number of vugs or open spaces in the vein contain large, clear crystals of quartz.

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A third quartz vein is exposed in the face of a 60-foot bluff of interbedded, gently dipping argillite and tuff about 300 feet east of the last-mentioned vein. The vein is 10 inches wide, strikes easterly, and has a vertical dip. It contains from 1 to 2 per cent of a galena and pyrite. An assay of a tpyical sample of the vein quartz gave: gold, a trace; silver, 0·30 ounce a ton. What may be a continuation of this same vein was seen several hundred feet farther east at elevation 5,100 feet, where a quartz vein of 15 inches average width is exposed for 30 feet near a group of claim posts. The vein carries a little pyrite and galena. A chip sample across the vein assayed: gold, a trace; silver, 0·40 ounce a ton.

Farther southeast, at elevation 5,200 feet on the Bingo claim, a quartz vein 6 feet wide has been stripped for about 40 feet. Its continuation is heavily drift covered. A typical sample of the vein quartz, carrying 1 per cent of pyrite, gave on assay: gold, none; silver, a trace.

Another quartz vein occurs at an elevation of 5,650 feet on the divide looking down into the valley of the middle fork of Lorne creek. The vein is exposed for less than 100 feet, its continuation down the steep middle fork slope being ice covered. It occurs in argillites and interbedded tuffs which strike south 50 degrees east and dip 27 degrees southwest. The sediments are intruded immediately northwest of the divide by a stock-like body of granodiorite, several hundred feet in diameter. A representative sample of the vein quartz gave on assay: gold, a trace; silver, 0·32 ounce a ton.

The owner reports that another vein not seen by the writer occurs wholly in granodiorite some distance above the first-described occurrence. It is said to be covered by snow most of the year.

September and July Groups (35, 36)

The July group of two claims and September group of four claims occupy the wide valley between Goat mountain and mount Couture, at the headwaters of the north fork of Lorne creek. August Johnson, the owner, has constructed a 15-mile pack-horse trail west from Ritchie station to a cabin on the south side of the valley which acts as base camp for work on the Bermaline, July, and September groups.

On the September claim three quartz veins are exposed in the bed of a small mountain stream at elevation 4,000 feet, near the junction of the stream with Lorne creek. The veins range from 6 inches to 3 feet in width, lie roughly 50 feet apart, strike north, and dip from 50 to 70 degrees east. The country rock is comprised of thick beds of volcanic tuffs which dip gently. There is much drift cover and the veins are exposed for less than 100 feet along their strike. The vein quartz carries about 1 per cent of pyrite. Two channel samples collected by the writer gave on assay less than half an ounce of silver a ton and no gold.

On the July claim, on the Goat Mountain slope of the valley, three narrow quartz veins lying 15 feet apart have been stripped over an area 50 feet in diameter. The veins occur in massive tuff beds which strike south 60 degrees east and dip 10 degrees north. The individual veins range from 3 to 6 inches in width and carry pyrite and chalcopyrite in small

pockets. They are intersected by a cross vein 6 inches wide which contains small stringers of pyrrhotite up to 1 inch in width. A representative sample collected from the mineralized parts of these veins assayed: gold, none; silver, a trace.

Canadian Swede Group (37)

References: Ann. Repts., Minister of Mines, B.C.: 1928, p. 149; 1930, p. 138.

The Canadian Swede group, owned by August Johnson of Dorreen, is about 2 miles west of Ritchie station. It is reached by way of a truck road that leads west as far as Johnson's marl deposit.

At elevation 650 feet an open-cut and a 90-foot adit were driven along a quartz vein in gently dipping argillites. The vein occurs along a fault fissure of small displacement, and is not strong or continuous. It ranges in width from 6 inches of quartz to 4 feet of sheared argillite veined with quartz stringers. The quartz carries about 1 per cent of sulphide. A channel sample taken across 9 inches of vein quartz 10 feet from the face of the adit assayed: gold, a trace; silver, a trace.

About 500 feet farther northwest a 12-inch quartz vein runs diagonally across a small creek bed at elevation 750 feet. The country rock is argillite and coarse-grained sandstone dipping gently. The vein strikes north and dips vertically. A channel sample taken across the vein assayed: gold, a trace; silver, a trace. Ten feet lower a quartz vein lies along the bedding of the gently dipping argillite. It evidently connects with the upper vein. The vein ranges from 18 to 24 inches in width and the quartz carries about 1 per cent of fine pyrite. A 20-inch channel sample taken across it assayed: gold, none; silver, a trace.

Windfall Group (39)

(*See* Figure 8)

Reference: Ann. Rept., Minister of Mines, B.C., 1931, p. 71.

This property, owned by E. S. Tordiffe, M. F. Burke, and F. McLean of Cedarvale, is on the north bank of Porcupine creek which enters Skeena river one mile north of Ritchie station. An excellent trail 2 miles in length leads from the railway along the north side of the creek to the property.

At elevation 1,000 feet, about 100 feet above Porcupine creek, a quartz lens occurs in argillaceous sediments at the top of a small, sharp, anticlinal fold. The vein has been stripped for about 20 feet along its strike. In a test pit on the south limb of the fold the vein ranges from 3 to 5 feet in width, strikes easterly, and dips 45 degrees south. The vein flattens a few feet to the north and is cut off 15 feet north of the test pit by a small fault that strikes easterly parallel to the axis of the fold and dips 45 degrees north. The vein quartz is well mineralized with sphalerite, galena, and chalcopyrite, containing up to 10 per cent of these sulphides. A representative sample of the ore assayed: gold, a trace; silver, 4·03 ounces a ton; lead, 4·92 per cent; zinc, 11·60 per cent; copper, 0·66 per cent.

42993—4½

About 125 feet west along the strike of the fault a quartz lens is exposed in the bed of Porcupine creek. This vein ranges from 1 to 3 feet in width and is about 50 feet long. It is localized along a vertical fracture and contains very little sulphide. In this vicinity the argillites on the north side of the creek dip 5 degrees north, and on the south side of the creek dip 5 degrees south.

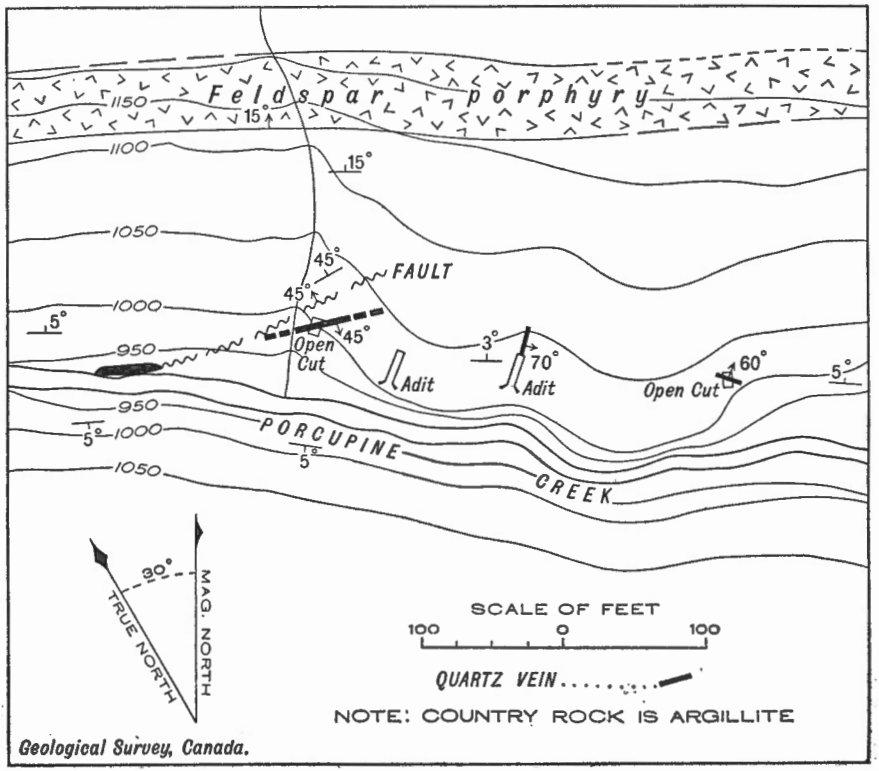


Figure 8. Plan of part of Windfall group.

Seventy feet southeast of the main vein outcrop an adit 24 feet long was driven to intersect the vein on the south limb of the anticlinal fold. The face of the adit is 30 or 40 feet short of its objective. A representative sample taken from quartz veins at the face of the adit showed neither gold nor silver on assay.

Ninety feet farther southeast a second exploratory adit was driven 23 feet in a northeast direction, and a number of small, parallel, quartz stringers were found. These stringers strike north 45 degrees east and dip 67 degrees southeast.

The sediments in the vicinity of the two adits are flat lying and a little farther east they dip 5 degrees north. About 125 feet above the main vein showing the sediments strike easterly and dip 15 degrees north.

They are intruded by a sill of feldspar porphyry exposed in a vertical bluff about 75 feet high. The intrusive is comprised of about 80 per cent of prominent white oligoclase phenocrysts. It contains about 1 per cent of pyrite. Where this sill crosses Porcupine creek about 800 feet to the northwest it is only 10 feet thick and the sediments overlying it are brown stained over a width of 50 feet and contain numerous, small, quartz, vein stringers.

Seven Sisters Group (40)

(*See* Figure 9)

References: Ann. Repts., Minister of Mines, B.C.: 1925, p. 130; 1926, p. 125; 1927, p. 126; 1928, p. 150; 1929, p. 153; 1930, p. 138.

The Seven Sisters group is on the southwest slope of Seven Sisters mountain about 8 miles by pack-horse trail from Cedarvale. Sulphide veins containing silver, lead, and zinc were prospected on these claims by D. W. Mines, Limited, from 1926 until 1928, and by the Consolidated Mining and Smelting Company of Canada, Limited, in 1929. There is a well-built camp at elevation 4,100 feet close to the main workings.

The veins occur in folded sedimentary rocks for 4,000 feet along the west slope of the mountain between elevations of 4,200 and 4,600 feet. The sediments include conglomerate, sandstone, greywacke, argillite, and arkose, with interbedded volcanic tuffs. In the vicinity of the main workings these rocks strike north and dip 28 degrees east into the mountain, and the veins are found along faults that have the same strike and dip. Several hundred feet farther west down the mountain slope the rocks strike north, but dip 30 degrees west. This indicates that the veins occur at the main workings on the east limb of an anticlinal fold, the axis of which strikes north. About 900 feet north of the inclined shaft at Chisholm creek a number of rock trenches were cut on pyrrhotite veins that occur along faults of small displacement striking north and dipping 40 to 45 degrees east. In several of the pits and along the creek the argillites were seen to strike easterly and to dip 35 degrees north. Here again the veins occur along the north-plunging nose of the anticline, along faults that strike parallel to the axis of the anticline. About 1,800 feet north of the creek, in the vicinity of the Chisholm tunnel, pyrrhotite veins and lenses are found on the crest of a second anticline, the axis of which also strikes north. Again the faults and fissures along which the veins were formed lie roughly parallel to the axis of the fold.

Small dykes of quartz diorite porphyry intrude the sediments and are older than the veins. A body of diorite is reported some distance north of the claims.

Where the vein appears strongest, at elevation 4,325 feet, a shaft inclined at 28 degrees was sunk for about 175 feet and levels were run at points 50 and 112 feet, respectively, down the shaft. On No. 1 level a drift run south 110 feet follows much of the way a fault gouge zone 6 inches wide. In several places the gouge gives place to brecciated argillite up to 2 feet in width containing a little quartz, calcite, and pyrite. The north drift on this level is 78 feet long with a crosscut east for 23 feet at a point 28 feet north of the shaft, and a 15-foot crosscut east at the north

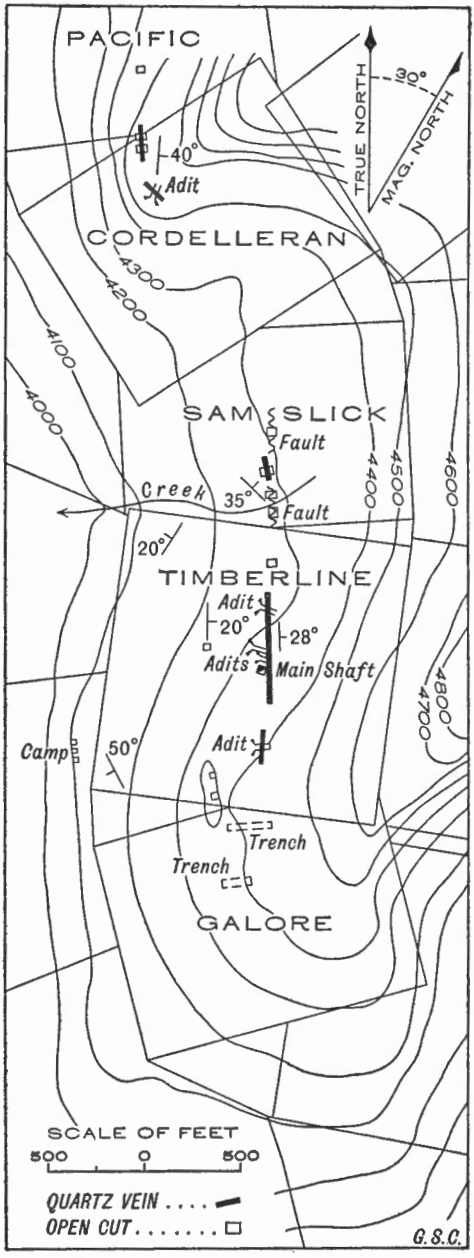


Figure 9. Plan of Seven Sisters group. Country rock is sandstone, argillite, conglomerate, and tuff.

face. An adit 120 feet in length connects with the north drift 21 feet north of the shaft. Immediately north of the shaft the vein consists of 6 inches of quartz containing up to 50 per cent of pyrite. A channel sample taken across this part of the vein assayed: gold, 0·08 ounce a ton; silver, 0·36 ounce a ton. On the north wall of the east crosscut the vein is 24 inches wide, consisting of 12 inches of calcite well mineralized with galena and sphalerite and 12 inches of brecciated argillite containing up to 10 per cent of pyrite. Fifteen feet farther north the vein pinches and gouge about 4 inches thick continues to the end of the drift except for one small 3-inch calcite lens. A 24-inch channel sample taken across the vein at the east crosscut assayed: gold, a trace; silver, 0·24 ounce a ton; zinc, 1·95 per cent; lead, undetermined.

On No. 2 level a drift was run north for 105 feet, with crosscuts running east and west for 25 feet at a point 68 feet north of the shaft. In the north half of the drift the vein averages about 4 inches in width, but elsewhere there is 4 to 6 inches of fault gouge with no vein filling. A channel sample taken across the vein at the crosscuts assayed; gold, none; silver, a trace.

In the shaft the vein persists from the surface down as far as the first level, but there is very little vein filling between the first and second levels. Commencing several feet below the No. 2 level, a 50-foot continuation of the inclined shaft is water filled.

The Chisholm adit, 75 feet in length, is at elevation 4,560 feet, about 2,500 feet north of the inclined shaft. The adit is driven in almost flat-lying, tuffaceous beds impregnated with a little pyrite and chalcopyrite. Forty feet from the portal a branch drift runs 31 feet northwest along a 6-inch quartz calcite vein dipping 50 degrees northeast. The vein contains up to 20 per cent of pyrite. A channel sample taken across the vein on the east wall of the adit assayed: gold, a trace; silver, 0·36 ounce a ton. Near the face of the main adit a number of small vertical fissures contain seams of solid pyrrhotite with little chalcopyrite up to 1 inch in thickness. An assay of a representative sample of this sulphide gave: gold, a trace; silver, 0·41 ounce a ton; copper, 0·32 per cent.

About 200 feet north of the Chisholm adit a lens of massive pyrrhotite containing a little chalcopyrite is exposed in a deep trench. The sulphide body strikes north and dips 65 degrees east. At the trench its width is 15 feet, but along the surface the lens pinches out at points 60 feet north and 50 feet south. A typical sample of the solid sulphide assayed: gold, a trace; silver, 0·16 ounce a ton; platinum, none; nickel, none; copper, 0·08 per cent.

In summary it might be said that several small lenses of galena and sphalerite occur on the property, but that the pyrrhotite and pyrite deposits are too low in gold and silver to be of economic importance.

Hughie Group (41)

References: Ann. Repts., Minister of Mines, B.C.: 1925, p. 130; 1927, p. 129; 1928, p. 150; 1929, p. 153.

The claims are on the west slope of Seven Sisters mountain about 3 miles by trail south of Cedarvale. The workings are a short distance from the Seven Sisters pack-horse trail.

At elevation 1,800 feet two 10-foot shafts are sunk on a vein that occurs along a fault in fine-grained, grey argillite. The sediments strike north 75 degrees east and dip 20 degrees north, and the vein strikes north and dips 65 degrees west. The vein ranges from 3 to 7 feet in width and consists of brecciated argillite veined and replaced by quartz and calcite mineralized with pyrite, sphalerite, galena, and chalcopyrite. Small, rich pockets of the sulphides occur along the vein where it has been stripped for 60 feet, but mineralization is sparse for the most part. An adit 42 feet in length was driven east at elevation 1,770 feet to intersect the fault and vein. Near the face of the adit a 7-foot drift exposes a vein 6 feet wide comprised of about 50 per cent brecciated argillite and 50 per cent quartz and calcite gangue containing sparsely disseminated sulphides. A 24-inch channel sample taken across the best part of the vein assayed: gold, a trace; silver, 1·13 ounces a ton; zinc, 3·80 per cent. At the entrance to the adit a 12-inch channel sample taken across a small parallel vein assayed: gold, a trace; silver, a trace. Farther south two old adits driven years ago to intersect the vein have caved in.

Whiskey Creek Claims (42)

Several mining claims were held on Whiskey creek a number of years ago by A. Gray of Cedarvale. Whiskey creek enters Skeena river from the east about 3 miles northeast of Cedarvale. Six or seven short adits were driven in the banks of the creek, but nothing of importance was found.

At elevation 600 feet, about 100 feet east of the highway bridge across Whiskey creek, a 12-foot adit was driven along a small sulphide vein that occurs along a fault slip in fine-grained, sericitic quartzite. The vein averages 6 inches in width and is heavily mineralized with pyrite and arsenopyrite, with a little galena and sphalerite. It strikes north at a small angle across the creek and dips 20 degrees east. A channel sample taken across the vein at the adit assayed: gold, 0·12 ounce a ton; silver, 6·08 ounces a ton; arsenic, 1·55 per cent. About 70 feet south of the adit a sample taken where the vein outcrops on the south shore of the creek assayed: gold, 0·12 ounce a ton; silver, 15·16 ounces a ton; lead, 2·27 per cent; zinc, 2·15 per cent; arsenic, 3·68 per cent.

Several hundred feet farther up the creek the sediments are intruded by small stocks of quartz diorite. Several small veins in or near these intrusives were prospected by short adits.

About a mile above the bridge a considerable area is underlain by black shales and argillites intruded by large dykes of quartz diorite. The sediments strike north 80 degrees east and dip 40 degrees north. At elevation 1,100 feet, on the north bank of the creek, a 56-foot adit was driven into one of the dykes of quartz diorite without striking any sulphides. Fifty feet above the adit the intrusive is altered and impregnated with a little pyrite and arsenopyrite. A sample of the altered rock assayed: gold, a trace; silver, a trace.

PLACER MINING

Placer gold was discovered on Lorne creek in 1884 by Harry McDame, and since that time individual operators have been carrying on small-scale placer operations along the creek almost continuously. The placer activity

is centred along the main creek from the mouth as far west as the junction with the north fork. Fairly coarse gold is recovered from the low-lying gravel benches on or close to bedrock. Much gold has also been recovered from the outlet end of an ancient channel of Lorne creek known as the "Dry Hill." The total production from Lorne creek is estimated at more than $70,000. Placer gold also occurs on Porcupine and Kleanza creeks, and operators were working their leases on these creeks during the past summer. Some sluicing for placer gold has been done along the low-lying bars along Skeena river, principally between Pacific and Hazelton.

Dry Hill Placer Group (33)

References: Ann. Repts., Minister of Mines, B.C.: 1898, p. 1152; 1899, p. 657; 1900, p. 790; 1901, p. 991; 1902, p. H47; 1903, p. H52; 1904, p. 101; 1905, p. 82; 1906, p. 109; 1914, pp. 137, 175; 1930, p. 154; 1931, p. 77; 1932, p. 86.

The Dry Hill placer group, owned by Stewart A. Corley of Prince Rupert, is on the north side of Lorne creek a short distance west of Skeena river. The claims cover an ancient channel of Lorne creek about 2,000 feet in length. The channel is a gravel-filled depression which joins Lorne creek a mile above its mouth and enters the Skeena valley half a mile west of Skeena river at a point three-eighths of a mile north of Lorne creek. The outlet end of the stream known as the Dry Hill pit has been worked from time to time by various operators for almost fifty years. Large-scale hydraulic operations were carried out here between 1901 and 1917 by the Dry Hill Hydraulic Mining Company, but without the success anticipated. In 1905 it is recorded that the clean-up amounted to $12,800, but that mining expenses were $20,000. In 1916 the clean-up is said to have been $10,000 and operating expenses $14,000. During this period only 350 feet of a total length of 2,000 feet of virgin ground in the buried channel was worked.

An excellent detailed description of the operations on this property is given by Douglas Lay in the Annual Report for the Minister of Mines, B.C., 1930, pages 154 to 159.

During the year 1936 S. A. Corley was engaged in driving an adit in the bedrock beneath the outlet end of the Dry Hill channel in the expectation of finding a narrow, deeper channel of the old stream. In September the adit had been driven 240 feet in a westerly direction, with a 15-foot cross-cut to the north at the face, but no deeper channel was found.

In the pit where hydraulic operations were carried out the floor of the old channel slopes downward in an upstream or westerly direction, and the walls of the ancient stream course are steep and narrow. At the outlet where the stream spilled into the Skeena valley the confining walls are spread apart fan like and the floor rises for a short distance. A slightly higher rim of bedrock might be expected at the outlet as a result of less cutting power of the water with the broadening out of the channel.

Provided the adit is low enough it might be continued westerly to break into the floor beneath the centre of the Dry Hill pit. It would then form an excellent drainage channel for sluicing operations of bedrock gravels from farther upstream.

Porcupine Creek

Reference: Ann. Rept., Minister of Mines, B.C., 1931, p. 79.

M. F. Burke, of Cedarvale, and F. McLean and J. Bulzac of Prince Rupert, did considerable work in 1936 on their placer lease 3 miles above the mouth of Porcupine creek. About 1,000 feet downstream from the shear zone on the Windfall group an adit was driven south into the south bank of Porcupine creek a few feet above water-level. The adit is about 75 feet in length and follows closely the contact between bedrock and overlying gravels. As the banks of Porcupine creek are comprised of steep bluffs of argillite and tuff about 40 feet in height elsewhere in this vicinity, there is some evidence that the adit follows an old abandoned stream channel. Some fairly coarse gold was recovered during the summer by sluicing the gravels taken from the adit. The owners estimate the gravel to carry about 10 cents a yard in gold.

During sluicing operations considerable coarse pyrite was found to collect in the riffle-boxes. A sample of this pyrite gave on assay: gold, 1·14 ounces a ton; silver, 0·80 ounce a ton.

Kleanza Creek

References: Ann. Repts., Minister of Mines, B.C.: 1912, p. 115; 1913, p. 109; 1914, p. 175; 1922, p. 97; 1932, p. 86.

Cassiar Hydraulic Mining Company installed a complete hydraulic plant on Kleanza creek in 1912 and carried on intermittent operations until 1922. There is no record of the amount of gold recovered by this company, but it is reported that much time and money were lost in replacing equipment washed away during spring and autumn floods. In recent years several persons have been engaged in small-scale sluicing operations about 2 miles above the mouth of the creek, and small amounts of placer gold are recovered yearly. The gold has apparently been concentrated since glacial times by the reworking of the creek gravels and glacial debris as creek deepening progressed. Douglas Lay (1932) believes that a pre-glacial channel segment lies buried beneath a moraine on the north side of the canyon 1½ miles above the mouth of the creek. He states that the rims of the ancient channel are exposed below the downstream end of the canyon.

MARL DEPOSITS[1]

Buccaneer of the North Claim (38)

References: Ann. Repts., Minister of Mines, B.C.: 1931, p. 72; 1932, p. 90.

The Buccaneer of the North claim, owned by August Johnson, is 1 mile west by truck road from Ritchie flag station. Several carloads of marl were shipped last summer from this claim to be used as a land dressing by farmers at Terrace.

A marl deposit 300 feet wide, 350 feet long, and of undetermined depth occurs on the gently dipping eastern shore-line of a small lake. The lake

[1] A full discussion of the use of "Lime in Agriculture" is given in Bull. 86, new ser., Dept. of Agriculture, Ottawa.

bottom is roughly 100 feet above Skeena river and occupies a small area of depression on a wide gravel bench that extends east to the river. In a trench 12 feet wide and 300 feet long, excavated across the deposit, the marl is well over 10 feet in depth. It is very white and pure and contains minute fossil shells throughout. The deposit is concealed beneath a thin layer of moss and humus, and is also covered by birch, poplar, cedar, and balsam trees up to 10 inches in diameter. The marl is laminated and dips 4 degrees west towards the present lake bottom. The lake bottom is about 400 feet across and is overgrown by marsh grasses. Test pits indicate that the marsh grass and several feet of underlying soft black muck cover a considerable depth of additional marl.

The following determinations were made by F. J. Fraser of the Geological Survey on a sample of the dried marl collected by the writer: calcium oxide, 53·4 per cent; insoluble matter after ignition, 3·0 per cent; iron and aluminium oxides, 0·4 per cent; phosphate, none. The calcium oxide as determined corresponds to 95·1 per cent of calcium carbonate.

Gee Kid Claim (43)

The Gee Kid claim, 4 miles north of Cedarvale, was staked by J. H. Reid of Woodcock during the summer of 1936. It covers a marl deposit on a gravel bench at elevation 1,000 feet, about one mile north of Wilson creek and one mile west of the highway between Cedarvale and Woodcock. The gravel bench is about 600 feet wide and follows along the base of the mountain for a considerable distance. At its outer edge the bench drops away quickly to lower ground.

Marl occurs in a shallow lake about 600 feet long and 300 feet wide on the gravel bench. The lake ranges from 1 to 3 feet in depth, and has two small streams entering it and one outlet stream.

About 400 feet farther northeast marl has completely filled what was formerly a small lake basin over an area about 300 feet in diameter. This old lake bottom is now comparatively dry although the outlet stream from the lake described above flows across it. The marl is covered by a foot of peat, but its presence is disclosed by numerous test pits. A pole shoved down through the marl in the test pits shows an average depth of about 6 feet of marl.

The deposit could be readily drained by digging a trench eastward across 200 feet of gravel to the edge of the bench.

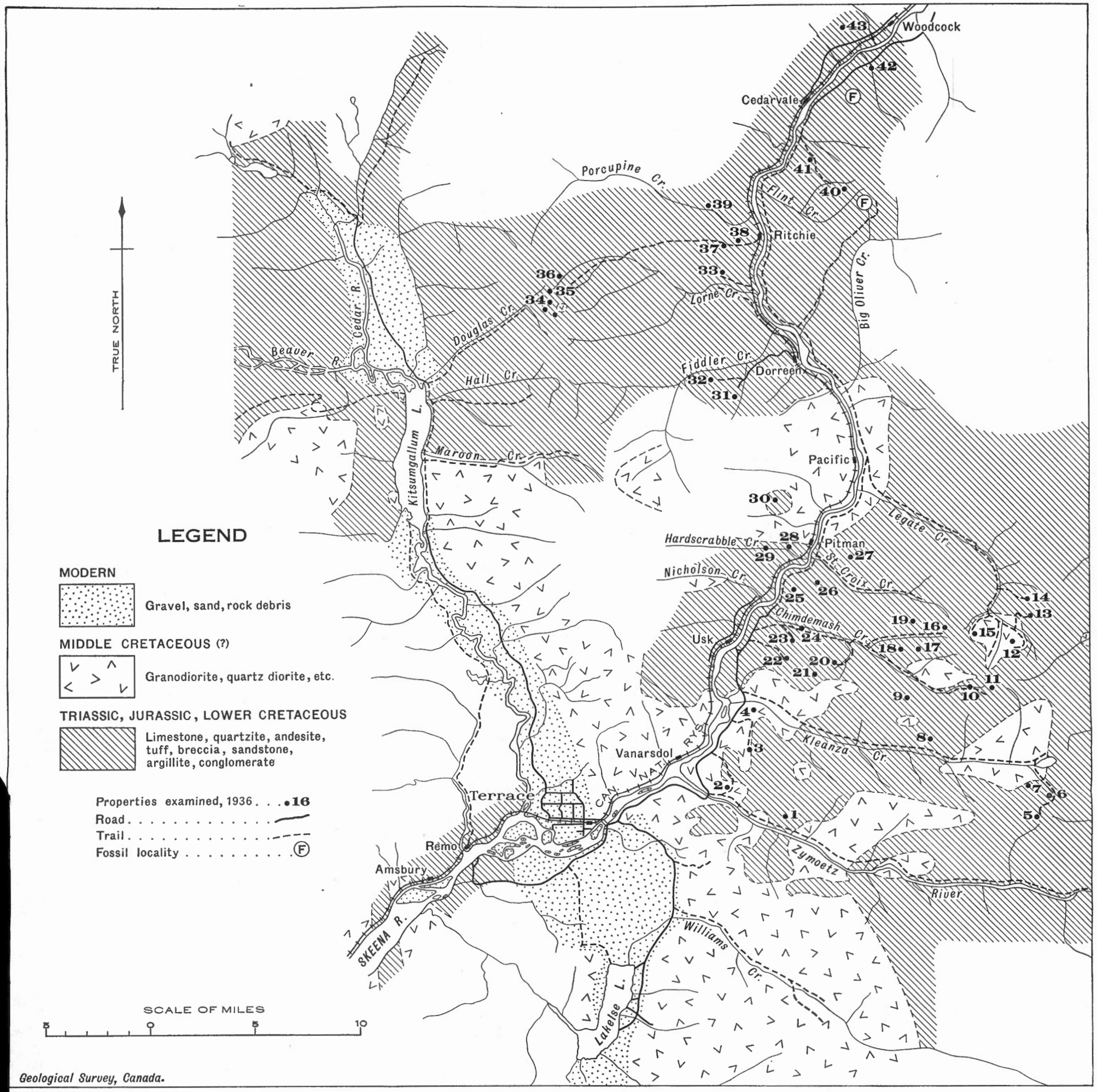
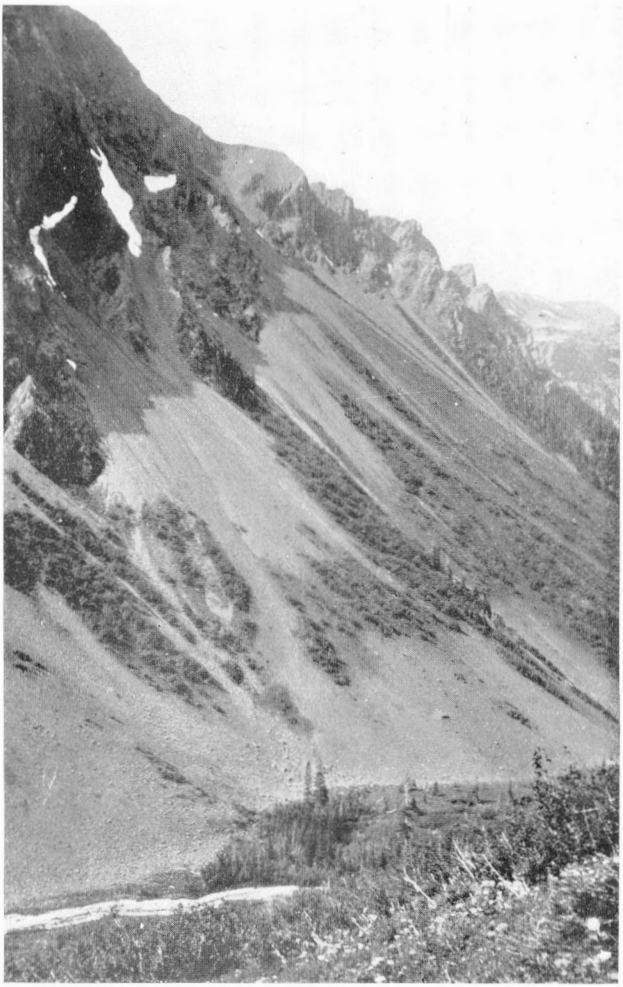


Figure 10. Index map of Terrace area, Coast district, British Columbia, showing position of properties described in memoir. 1, Providence group; 2, Excelsior group; 3, Victor group; 4, Golden Crown group; 5, Montana group; 6, Wells group; 7, Avon group; 8, Lucky Jim group; 9, Banner Homestake group; 10, Silver Basin group; 11, Silver Crown group; 12, M. and M. claims; 13, M. and K. group; 14, Frisco group; 15, Zona May group; 16, United St. Croix group; 17, Galena group; 18, Silver Mitts group; 19, Shenandoah group; 20, Continental group; 21, Singlehurst claim; 22, Bornite King group; 23, Toulon group; 24, Madden group; 25, St. Elmo group; 26, Bradle Bane group; 27, Algoma group; 28, Diorite group; 29, Grotto group; 30, Helen group; 31, Fiddler group; 32, Patmore group; 33, Dry Hill placer group; 34, Bermaline group; 35, July group; 36, September group; 37, Canadian Swede group; 38, Buccaneer of the North claim; 39, Windfall group; 40, Seven Sisters group; 41, Hughie group; 42, Whiskey Creek claims; 43, Gee Kid claim.

PLATE I

Middle fork of Legate creek showing typical rugged topography.

PLATE II



Talus slides near the head of the north fork of Chimdemash creek.

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