BRITISH COLUMBIA
DEPARTMENT OF MINES AND PETROLEUM RESOURCES

HON. DONALD L. BROTHERS, *Minister* P. J. MULCAHY, *Deputy Minister*

LODE METALS IN BRITISH COLUMBIA

1963

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(Reprinted from the Report of the Minister of Mines and Petroleum Resources for the Year Ended December 31, 1963)

LODE METALS

CONTENTS

GENERAL REVIEW

The average Canadian prices paid in 1963 for silver and lead were well up, in comparison with 1962, the price for zinc showed a moderate increase, and the prices for gold and copper were practically unchanged. The United States price for silver was $1.216 per ounce at the start of 1963 and $1.293 at the end; the average Canadian price was a record $1.37965. Lead increased 1.7 cents per pound in average Canadian price, and zinc increased three-quarters of a cent per pound. The fractional increase in the rate of exchange more than offset a very small drop in the United States price for copper.

It has been the long-standing custom in the Annual Report to group the principal metals—gold, silver, copper, lead, and zinc—and to refer to all others as miscellaneous. However, concentrated iron ore has exceeded for the fifth successive year the values of production of both gold and silver, and is currently in fourth place. In 1963 the value of iron concentrates and iron sinter was $20,746,424, the highest yet. The gold, silver, copper, lead, zinc, and concentrated iron ore produced at British Columbia lode mines had a value of $164,249,008. Other metals, including nickel, tin, and minor metals recovered as smelter by-products, had a value of $10,117,639. The total quantity of ore mined at all lode mines amounted to 11,898,408 tons and came from 65 mines, of which 36 produced 100 tons or more. The average number employed in the lode-mining industry in 1963, including mines, mills, and smelters, was approximately 8,200.

In 1963, 25 mills were operated, 19 of them throughout the year. Of the others, three were on a part-time basis, two were closed, and one operated for the first time. In addition, two small mills were built but did not operate. Two mills treated gold ore and one small one was built, nine treated silver-lead-zinc ore and one small one was built, seven treated ores of copper, six of iron, and one of nickel. The Bethlehem mill came into production early in the year, and the rated capacity of 3,500 tons per day was exceeded by the year's end. The iron-ore mill at the Nimpkish mine closed because of exhaustion of reserves. Modification was made of the Coast Copper mill to produce a magnetic iron by-product, and modification was made of the Bethlehem mill to produce a molybdenite by-product.

The Trail smelter recorded custom receipts of 13,095 tons of ore, 2,348 tons of lead concentrates, and 30,018 tons of zinc concentrates. The ore was from 34 properties, 10 of which shipped a total of 9,150 tons of siliceous ore. The lead concentrates were from five properties, one of which shipped 90 per cent of the total. The zinc concentrates came from six properties, two of which contributed 92 per cent of the total. Lead concentrates exported to American smelters totalled 14,228 tons, and zinc concentrates, 26,740 tons. Of the copper concentrates, 167,466 tons went to Japanese smelters and 44,767 tons went to the Tacoma smelter. Copper matte from the Trail smelter, amounting to 435 tons, went to the Tacoma smelter. Nickel-copper bulk concentrates amounting to 20,107 tons were shipped to Japan. All iron-ore concentrate was shipped under contract to Japan, a total of 1,998,644 tons.

Gold production was relatively unchanged. A drop in output from Bralorne was more than made up by the Coast Copper mine, which in 1963 ranked third as a producer of gold. Discovery of a gold-bearing zone on Banks Island led to the location by several companies of several hundred mineral claims. This was the first staking rush for gold ore in many years.

There was no marked change in the situation of silver, lead, and zinc. Exploration activity on old properties was slight, except near Sandon and Silverton. Two deposits diamond drilled west and north of Revelstoke are of potential interest even though neither has yet been proved economic. These are extensive bedded deposits containing chiefly zinc. One of the few new mills to be erected was at the Ottawa silver mine near Slocan City. A new source of zinc is seen in the Western Mines ore zone at Buttle Lake.

Copper production continued to increase, and established a new record of 123,401,020 pounds worth $37,817,476, a yearly value almost equal to that of lead. The Bethlehem mill started officially on February 1st at a rate of about 2,500 tons per day and treated almost 4,000 tons per day by the end of 1963. Production at Phoenix again showed an increase over the previous year. The extent of the Craigmont operation may be judged from the fact that about 1,000,000 tons of ore and waste rock was removed from the open pit per month.

The two brightest copper hopes continued to be the Granduc property, with early preparations for production almost assured, and the Galore Creek property, with more diamond drilling to be done. The growing sureness of production from the general Stikine-Unuk area greatly stimulated prospecting, and many claim groups were recorded in the region. Problems of access and the pattern and rate of growth are of great importance to the future of this rugged section of British Columbia. Several copper deposits were investigated on Vancouver Island. A shaft was sunk on the Lynx copper-zinc zone of Western Mines at Buttle Lake.

The production of iron ore showed little change from 1962. The Nimpkish operation closed late in 1963 with exhaustion of ore reserves, having produced 2,400,000 tons of ore in four years. Exploration work was done on a number of properties in the coastal area, the most significant fact to emerge being that the Tasu magnetite deposit is the largest yet known. The Tasu deposit contains considerable copper in addition to iron. Copper production from an iron mine is not new, but Coast Copper started remodelling its copper mill to make a magnetic iron concentrate.

The F.L. property closed in February, 1963, after a brief and unsuccessful period of open-pit mining. However, work recommenced in November with preparation for underground mining. The first underground mining of iron ore was done at the Kingfisher orebody at Benson Lake. The change-over from open pit to underground was well under way at Texada, and at the end of 1963 Brynnor had started to sink a shaft to develop the deeper part of its ore zone.

Molybdenite dominated the exploration scene, but in spite of several extremely interesting developments it will be the Bethlehem mine that will contribute as a by-product the first substantial production of molybdenite in the history of the Province. Careful checking of all data, plus new sampling, led to installation of a molybdenite circuit in the Bethlehem mill at the end of 1963. Decision to go into production at the rate of 1,000 tons per day was reached at Boss Mountain in November. This is the culmination of exploration at a property at which diamond drilling was first done more than 20 years ago.

The greatest interest in molybdenite was shown in the Endako area—the general region west of Prince George where Topley intrusions may occur—with a general focus south of Endako station. About 6,000 mineral claims were located in 1963, presumably to cover ground that might have a chance to contain molybdenite. Interest centred on the Endako property, at and near the old Stella molybdenite-bearing quartz vein, where extensive diamond drilling established the existence of a large tonnage of low-grade molybdenite ore, and a decision to put the property into production at the rate of 10,000 tons per day was reached early in

1964. Diamond drilling was continued at Glacier Gulch and was resumed on Lime Creek near Alice Arm. Many other new properties were under investigation for molybdenite, most, but not all, in the central and northwestern parts of the Province.

The year 1963 was a boom year in prospecting and exploration, and 25,461 mineral claims were recorded, almost as many as the peak year of 1956, in which interest centred on the Kamloops-Ashcroft-Merritt region. The interest in 1963 was more widespread, with molybdenite and copper the chief prizes, extending through almost the entire length of the western and central sections of the Province. The search is for deposits that on the whole are low in grade, and prospecting in areas with a thick cover of drift and little exposed rock is not easy. In the northern and western mountains the ruggedness of the terrain poses many problems, one of which is expense. All exploration techniques are used, embracing geology, geochemistry, and geophysics, in order to find targets for the diamond drill. Several large companies maintain staffs and laboratories of a size that, until recently, were more commonly associated with governmental organizations. The helicopter is of prime importance in this work, whether for freighting in supplies, positioning the geologist, or for moving drilling equipment from one set-up to the next.

NOTES ON METAL MINES

TAKU RIVER

Copper

Thorn (Julian Mining Co. Ltd.)*

(58° 132° N.W.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. The Thorn group of 22 recorded claims is on a tributary of Sutlahine River about 13 miles southeast of King Salmon Lake. Some hand-trenching commenced in May was completed in November by a crew of 14 men. A magnetometer survey was conducted over 11,000 feet of line and 300 soil samples were taken. Transportation was by charter aircraft. The property was not visited.

CASSIAR

Gold

Copco, Liz, Cote (Hanna Gold Mines Ltd.)†

(59° 129° S.W.) Head office, 401, 470 Granville Street, Vancouver 2; mine office, Cassiar. J. A. Hanna, president; W. C. Hood, Jr., managing director. The property, which was originally known as the Cornucopia group, is on the east slope of Quartzrock Creek valley, 2 to 3 miles north of McDame Lake. The showings have been described in previous Annual Reports.

Underground exploration work, which started in 1961, was continued in 1963. Work in 1963 commenced on May 4th and was suspended on October 31st. Development of the 3600 level continued and comprised 1,387 feet of drifting and crosscutting. Other work included surface stripping and 1,500 feet of diamond drilling from underground. An average crew of 16 men was employed under the supervision of Donald Martin. The property is serviced by the Cassiar–Stewart road.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1947, pp. 70–72.]

Silver-Lead

McDame Belle, Bar (Ventures Mining Ltd.)*

(59° 129° S.E.) Company office, 850 West Hastings Street, Vancouver 1. H. A. Briden, managing director; A. P. Fawley, consulting geologist. This property is located on McDame Creek, 23 miles east of Cassiar and 2 miles west of Centreville. A total of 54 claims is held, of which 5 are under option from John Bartle, of Lower Post, and 49 by record. Work commenced in late May and terminated in early October. A programme of geological study, trenching, and cutting of grid lines was done for a geophysical survey. An average crew of two men was employed under the direction of R. G. Hawley. The property is serviced by an all-weather gravel road which connects Cassiar to the Alaska Highway. The property was not visited.

DEASE LAKE

Copper

Joy*

(58° 129° S.E.) Kennco Explorations, (Western) Limited; company office, 1111, 1030 West Georgia Street, Vancouver 5. C. J. Sullivan, president. The company holds the

* By H. Bapty.
† By W. C. Robinson.

Joy group of 32 claims lying east of Dease Lake and from 5 to 7 miles southeast of Eaglehead Lake. Scattered showings of copper mineralization associated with a geochemical anomaly were investigated by geochemical sampling and some trenching. This work was done by an average crew of four men under the direction of C. S. Ney between July 15th and August 20th. Transportation was by helicopter. The property was not visited.

KING MOUNTAIN

Copper

TNA (Julian Mining Co. Ltd.)*

(58° 128° S.W.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. The TNA group of 40 recorded mineral claims is on Kehlechoa River near the head of the Stikine River. Work commenced in May and was completed by November by a crew of 14 men. A magnetometer survey was conducted over 20,000 feet of line, 500 soil samples were taken, and 80 feet of light diamond drilling was done. Transportation was by charter aircraft. The property was not visited.

SHESLAY RIVER

Copper-Molybdenum

FAE*

(58° 131° S.W.) Kennco Explorations, (Western) Limited, holds the FAE group of 24 recorded claims about 35 miles northwest of Telegraph Creek and 5 miles south of the junction of Samotua and Sheslay Rivers. It is reported that molybdenite and a small amount of copper mineralization are found in fractures in a stock of quartz monzonite. Work commenced in late June and was terminated in early August. An average crew of four men was employed under the direction of C. S. Ney. Work included soil-sampling, trenching, and some diamond drilling. A packsack drill cored 250 feet of rock. About 1 mile of trail was constructed. Transportation was by helicopter. The property was not visited.

STIKINE

Molybdenum

Sam*

(57° 132° N.E.) Southwest Potash Corporation; company office, 718 Granville Street, Vancouver 2. This company holds the Sam group of 59 recorded mineral claims and fractions near the headwaters of the Barrington River, 35 miles west of Telegraph Creek. Molybdenite occurs in quartz veinlets cutting argillite and volcanic rocks. Work done in 1963 consisted of a helicopter-borne magnetometer survey under the direction of W. W. Shaw. Sixty line-miles were surveyed. The work was carried out between July 29th and August 2nd, and involved a crew of three men. Transportation was by Hiller 12E helicopter. The property was not visited.

Copper

Poke*

(57° 132° N.E.) Kennco Explorations, (Western) Limited; company office, 1111, 1030 West Georgia Street, Vancouver 5. C. J. Sullivan, president. The company holds the Poke group of 24 recorded mineral claims south of Limpoke Creek, a tributary to Barrington River approximately 25 miles west of Telegraph Creek. Copper showings in fractured zones in syenite and syenitized volcanics are exposed along the bank of the creek. The overburden-covered slopes adjacent to the creek were

* By H. Bapty.

investigated by geochemical soil-sampling and by an induced polarization survey. One diamond-drill hole was attempted, but it did not reach bedrock. Work in 1963, which was carried out by an average crew of eight men, was under the direction of C. S. Ney. Work commenced in June and was suspended in mid-August. Transportation was by helicopter. The property was not visited.

Molybdenum

Ann (Julian Mining Co. Ltd.)*

(57° 131° S.W.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. This group of 92 recorded mineral claims is in the Anuk River area. Work commenced in May and was completed by November by a crew of 14 men. A magnetometer survey was conducted over 56,000 feet of line, 1,160 soil samples were taken, and 100 feet of light diamond drilling was done. Transportation was by charter aircraft. The property was not visited.

Copper

Goat*

(57° 131° S.E.) Kennco Explorations, (Western) Limited, holds the Goat group of 40 recorded mineral claims on Sphaler Creek 16 miles east of the junction of the Porcupine and Stikine Rivers. It is reported that several copper showings occur in a northerly trending belt associated with small intrusives. Work done during July and August consisted of prospecting, mapping, sampling, and trenching. Five men were employed under the direction of G. H. Rayner. Transportation was by helicopter. The property was not visited.

Molybdenum

Decker Creek*

(57° 131° S.W.) Southwest Potash Corporation; company office, 718 Granville Street, Vancouver 2. F. Coolbaugh, president, New York. The company holds the Decker Creek group at the headwaters of Decker Creek, 48 miles southwest of Telegraph Creek. The mineralization is reported to consist of molybdenite-bearing quartz veins cutting quartz monzonite. Work done between August 19th and August 31st consisted of four diamond-drill holes totalling 196 feet of EX core. This work was done by a three-man crew under the direction of G. W. Mannard. The property was serviced by helicopter. The camp was not visited.

Copper

Galore Creek (Stikine Copper Limited)*

(57° 131° S.E.) Company office, 1111, 1030 West Georgia Street, Vancouver 5. C. H. Burgess, president. This company holds 176 claims by record and 16 claims by option, all in the headwaters of Galore Creek, about 20 miles southeast of the junction of the Stikine and Scud Rivers. Chalcopyrite and bornite occur in several deposits within an area of 8 square miles. The largest deposit developed to date, the Central zone, has been traced by diamond drilling for a length of 1 mile. Work commenced on May 16th and stopped October 15th. An average crew of 70 men was employed under the direction of D. A. Barr. Work consisted of 34,894 feet of diamond drilling, geological mapping, and induced polarization and magnetometer surveys. Two core-storage sheds were constructed. Two helicopters were employed at the property. Supplies and

* By H. Bapty.

equipment were barged up the Stikine River to Anuk River at the start of the season and regular service trips were made by fixed-wing aircraft from Prince Rupert. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 7.]

ISKUT RIVER

Molybdenum

Mary*

(57° 130° S.E.) Southwest Potash Corporation; company office, 718 Granville Street, Vancouver 2. F. Coolbaugh, president, New York. The company holds the Mary group of 43 recorded claims on Ball Creek, a tributary of the Iskut River. The claims are 5 miles west of a newly completed part of the Cassiar–Stewart road, at a point 20 miles south of Kinaskan Lake. Small quantities of molybdenite occur with pyrite in quartz veinlets and on fracture surfaces in altered andesite and feldspar porphyry. Four men were employed on the property in the 1963 field season. Six diamond-drill holes totalling 199 feet were put down by packsack drill. The area was geologically mapped, and a geochemical soil survey was done under the direction of G. W. Mannard. All transportation was by helicopter. The property was not visited.

UNUK RIVER

Copper and Copper-Iron

Granduc (Granduc Mines Limited)*

(56° 130° S.E.) Company office, 604, 744 West Hastings Street, Vancouver 1. J. Drybrough, president; C. J. McLellan, mine superintendent. The Granduc mine, at the head of the Leduc River, 25 miles north-northwest of Stewart, comprises 64 Crown-granted and 180 recorded mineral claims.

Shan.—This group of 20 recorded claims is located 3.8 miles southeast of the confluence of Snippaker Creek with the Iskut River. A shallow skarn zone overlying syenite porphyry contains an erratic distribution of magnetite, chalcopyrite, pyrite, and sphalerite. A four-man crew carried out geophysical surveys on 67,000 feet of line between June 19th and July 2nd. Geological mapping of control lines and surrounding area was carried out by a two-man crew between September 10th and September 26th under the direction of G. Gutrath, engineer in charge.

Mag.—Fourteen recorded claims in the upper Forrest Kerr Creek area along a limestone-diorite contact cover a skarn zone mineralized with massive magnetite with minor pyrite and traces of chalcopyrite. A four-man crew carried out geological and geophysical surveys on 50,000 feet of control line between June 6th and 13th under the charge of G. Gutrath, engineer in charge.

Ken.—Five recorded claims are located west of the headwaters of Forrest Kerr Creek. Small outcrops of skarn occur on feldspar porphyry contacts. A heavy concentration of magnetite containing chalcopyrite was discovered. A six-man crew carried out geological and geophysical surveys on 67,000 feet of control lines between July 27th and 31st. This work was under the care of G. Gutrath, engineer in charge.

Jon.—Twelve recorded claims lying at the head of the east fork of the Inhini River cover a quartz vein from 4 to 8 feet wide erratically mineralized with tetrahedrite. The vein is along a contact of folded volcanics and limestone and in an indeterminate shatter zone sparse tetrahedrite was found in reticulated quartz

* By H. Bapty.

stringers in the limestone footwall. A two-man crew did geological mapping between August 29th and September 1st under the direction of G. Gutrath, engineer in charge.

Don.—Forty recorded claims at the headwaters of Forrest Kerr Creek are located along a contact zone between feldspar porphyry and limestone. Sparse pyrite, tetrahedrite, and chalcopyrite mineralization occur in porphyry and in the limestone. A four-man crew carried out geological and geophysical surveys on 77,050 feet of control line between June 15th and 30th under G. Gutrath, engineer in charge.

In.—Four recorded claims on the upper Inhini River were trenched by a two-man crew between August 26th and 30th, directed by G. Gutrath, engineer in charge. This work was done on a narrow quartz vein mineralized with galena, sphalerite, and chalcopyrite. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, p. 8.]

Gold-Silver-Lead-Zinc

Kay (Western Resources Limited)* (56° 130° N.E.) Company office, 425 Howe Street, Vancouver 1. T. J. McQuillan, president. This company holds the Kay group of 40 mineral claims located 3 miles east of Tom MacKay Lake on the headwaters of the Unuk River. Work commenced August 5th and was suspended on October 15th. Three hundred and sixty-five feet of adit driving and crosscutting was done. Other work consisted of building a 4-mile tractor-road from the lake to the property. An average crew of seven men was employed under the supervision of T. F. Tomlinson. Transportation to the property was by aircraft. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1953, pp. 87–89.]

PORTLAND CANAL

Salmon River (56° 130° S.E.)

Gold-Silver-Lead-Zinc

Silbak Premier Mines Limited* Company office, 844 West Hastings Street, Vancouver 1. A. E. Bryant, president; H. Hill & L. Stark & Associates Ltd., consulting engineers. The property has been described in previous Annual Reports. Work in 1963, which was carried out by a crew of 11 men under the supervision of D. McLeod, commenced in April and was suspended on November 9th. During the summer two mucking-machine draw points involving 97 feet of drifting and crosscutting were driven into the glory-hole. Construction was commenced on a loading-trestle and ore-bin. A crusher-site was excavated. The camp now consists of two 8-man bunk trailers, one 18-man kitchen-diner trailer, a mine dry, repair-shop, oil-shed, and the warehouse-office. The camp was not visited.

Silver-Lead-Zinc

New Indian Mines Ltd.* (56° 130° S.E.) Company office, 789 West Pender Street, Vancouver 1. T. E. Blossom, president; F. J. Hemsworth, field engineer. This company holds 82 Mammoth-Indian mineral claims, of which 54 are Crown-granted, 7 are recorded, and 21 are held by lease. The claims are on the Salmon River, 15 miles from Stewart, and adjoin the Silbak Premier on the west and north. The showings consist of silicified fracture zones in altered volcanics, mineralized with sphalerite,

* By H. Bapty.

galena, and chalcopyrite and containing variable values in gold and silver. Work, between May and September, was done by a crew of 11 men, and included trenching, soil-sampling, and geological mapping. Four diamond-drill holes recovered 2,000 feet of core on the Payroll showing. The Payroll zone is located on the west side of the Big Missouri Ridge at the 2,200-foot elevation. Lead, copper, zinc, and silver mineralization occur intermittently along a strike length of 800 feet. The mineralized zone is contained in a northerly trending in echelon fracture system which is in part filled by quartz breccia containing argillite and greenstone fragments. Transportation of men and equipment was by helicopter from Stewart. The property was not visited.

SUMMIT LAKE (56° 130° S.E.)

Gold-Silver

East Gold and East Gold Extension*

Utica Mines Ltd.; company office, 1030 West Georgia Street, Vancouver 5. A. Robertson, president. This group of 14 claims was under option to Utica Mines Ltd. The claims are 24 miles north of Stewart and 11 miles north of the Big Missouri mine. An adit 494 feet long was driven under the ore zone, and 746 feet of EX diamond drilling completed. A 2,000-foot landing-strip suitable for an Otter-type aircraft was cleared on the Tide Lake flats. An average crew of seven men was employed under the direction of R. C. Coutts. Access to the property was by helicopter. The option was relinquished on June 26th. The property was not visited.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1927, p. 106; 1946, pp. 68–72.]

BEAR RIVER (55° 129° N.W.)

Silver-Lead-Zinc

Prosperity, Porter Idaho (Cassiar Consolidated Mines Limited)*

Company office, 1519 Marine Building, 355 Burrard Street, Vancouver 1. W. R. Wheeler, president; A. C. Skerl, consulting geologist. This property consists of 91 Crown-granted claims, 46 claims south of Stewart, and 45 claims on Glacier Creek northwest of Stewart. Work on the property commenced on July 27th and continued until December 2nd. Drifts and caved areas in the Prosperity tunnel were rehabilitated and retimbered. The crew consisted of four men under the direction of H. Fahle. Access to the property was by helicopter. The property was not visited.

[Reference: *Geol. Surv., Canada*, Mem. 175, 1935, p. 135.]

Bayview and United Empire*

Bayshore Silver Mines Ltd. is a private company. Capital: 100,000 shares, $1 par value. Company office, 556 Howe Street, Vancouver 1. F. J. Hemsworth, president; C. C. Buckland, geological engineer in charge at the property. Twenty Crown-granted claims are held by mineral lease, covering claims formerly held by Bayview Mining Company and United Empire Mines. The property is situated on the eastern slopes of Mount Dolly, on the Bear River Ridge, 3 miles north of Stewart. Work, which was started in June and terminated in August, consisted of cutting 3½ miles of trail and geological mapping. The property is served by the Bear River road and trail. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 53.]

* By H. Bapty.

ALICE ARM

Silver-Lead

Ace and Galena (Silver Butte Mines Ltd.)*

(55° 129° N.W.) Company office, 581 Hornby Street, Vancouver 1. B. Brynelsen, president. The company holds the Ace and Galena claims located on the east side of the Kitsault River, 23 miles north from the village of Alice Arm. Work in 1963 commenced in August and continued until October. Work consisted of clearing old trails, clearing a heliport, erecting two " paneloc " buildings, and diamond drilling. Five holes were drilled, totalling 772 feet. An average crew of six men was employed under the supervision of S. J. O. McClay. The camp was serviced by a jeep-road within 2 miles of the camp and by helicopter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 91–93.]

Silver

Victory (Sirmac Mines Limited)*

(55° 129° N.W.) Registered offi, Suite 1326, 67 Yonge Street, Toronto. D. H. Baird, president. This property of 1 leased claim and 11 recorded claims is on the east side of the Kitsault River and 22 miles north of Alice Arm. Work on the property commenced in June and continued until October 26th. An average crew of four men was employed under the direction of G. B. Tribble. Twelve diamond-drill holes were drilled, with a combined footage of 2,021 feet. The property is served by a jeep-road from Alice Arm to within 2 miles of the camp and then by trail. Transportation of freight is by helicopter.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 93–94.]

Molybdenum

Alice (British Columbia Molybdenum Limited)*

(55° 129° N.W.) Company office, 1030 West Georgia Street, Vancouver 5. C. H. Burgess, president. The property is on Patsy Creek, the east fork of Lime Creek, and is 5 miles south of Alice Arm. It consists of 72 full and fractional claims held by record. An elliptical stock, about half a mile in diameter, intrudes greywacke of the Hazelton Group. The molybdenite mineralization is in a quartz vein stockwork in the northern half of the stock. Work during 1963 started on July 15th and terminated on November 22nd. Twenty-seven diamond-drill holes totalling 21,378 feet were drilled from the surface with NW wire-line. An average crew of 22 men was employed under the direction of B. A. Bradshaw. The camp was supplied mainly by helicopter. The camp was not visited.

Silver-Lead-Zinc

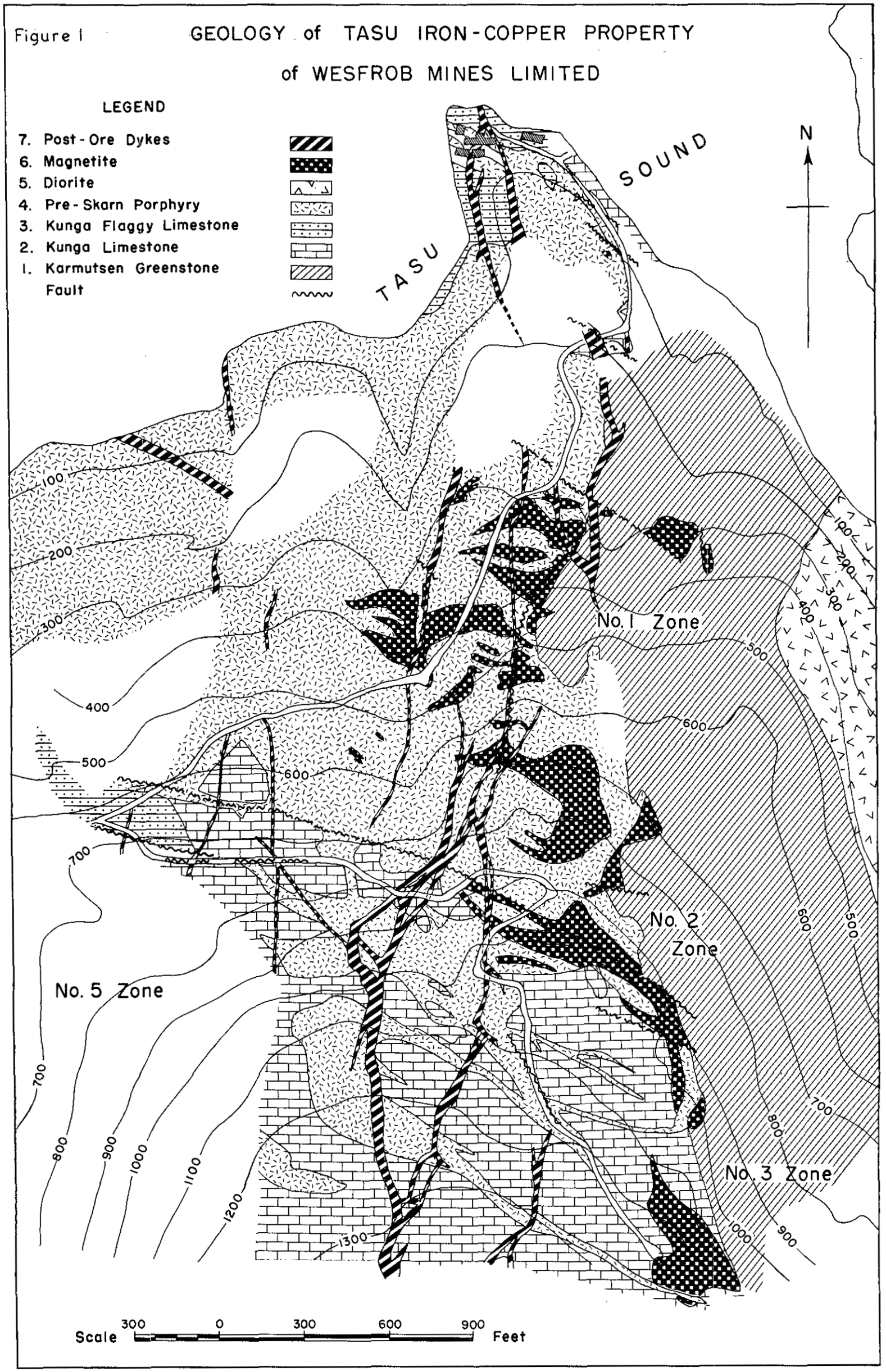
Dolly Varden Mines Ltd.*

(55° 129° N.W.) Company office, 837 West Hastings Street, Vancouver 1. F. C. Buckland, president; T. E. Swanson, of J. A. C. Ross & Associates, manager. The company holds 21 Crown-granted claims, 7 recorded claims, and 21 optioned claims. Nineteen surface diamond-drill holes were collared and 3,026 feet drilled. On the North Star claim 62 feet of raising was done, and on the Wolf claim three adits were driven a total of 627 feet with 164 feet of cross-cutting. All the work was under the direction of J. C. S. Moore. Other work consisted of extending the road from the Dolly Varden camp to a new bridge across the Kitsault River and the widening of the mining-trail 2.5 miles to the

* By H. Bapty.

Figure I

GEOLOGY of TASU IRON-COPPER PROPERTY of WESFROB MINES LIMITED



Wolf property. On the Wolf, access roads were built to the portals of the 1500, 1450, and 1350 levels from the 1200 main adit level. The number of men employed for this work averaged 40. Transportation to the camp is by a good truck-road from Alice Arm.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, pp. 9–10.]

OBSERVATORY INLET

Copper

Anyox (The Consolidated Mining and Smelting Company of Canada, Limited)*

(55° 129° S.W.) Company office, Tadanac. J. B. Murphy, geologist in charge. The property is on the west side of Observatory Inlet and comprises 73 Crown-granted claims and 7 recorded claims. In the period from late July to late September, one diamond-drill hole was cored a length of 2,898 feet from the surface of the Kenneth mineral claim. The drilling and minor road maintenance was done by an average crew of eight men. The property was serviced by barge and helicopter. The camp was not visited.

Red Wing (Magnum Consolidated Mining Co. Ltd.)*

(55° 129° S.W.) Company office, 700 Burrard Building, Vancouver 1. J. D. Little, president; E. T. Lonergan, engineer in charge of property. This company is working three Crown-granted claims, at the head of Glacier (Tauw) Creek, approximately 4 miles south of the old village of Anyox. Work in 1963, which was carried out by an average crew of 10 men, commenced in September and was suspended on October 3rd. Two miles of trail was built to the claims from Granby Bay. A heliport and compressor-site was blasted out of the steep mountain-side. A helicopter was used to transport men and equipment from the beach to the mine-site. Equipment and supplies were shipped from Prince Rupert by barge. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1932, p. A 53.]

QUEEN CHARLOTTE ISLANDS

Moresby Island

Iron-Copper

Tasu (Wesfrob Mines Limited)†

(52° 132° N.E.) Wesfrob Mines Limited is a wholly owned subsidiary of Falconbridge Nickel Mines Limited, 7 King Street East, Toronto 1. P. N. Pitcher, president. Vancouver office, 504, 1112 West Pender Street, Vancouver 1. G. K. Polk, resident geologist. The property is in Tasu Sound near the entrance of Fairfax Inlet, and it consists of 21 Crown-granted claims and 50 recorded claims. It is the largest metasomatic iron-copper deposit explored so far in coastal British Columbia. Reserves are of the order of 40 million tons of magnetite ore (about 37 per cent iron), of which between a quarter and a third is also copper ore.

The geology of the western part of Tasu Sound was described and illustrated in the Annual Report for 1961 (pp. 11–13). The geology in the vicinity of the Tasu orebodies is shown on Figure 1. The stratified succession consists of three units. The upper part of the Karmutsen Formation, which is here composed of massive, slightly amygdaloidal chloritized sodic basalts, is the oldest unit present. Overlying it successively are massive grey limestone and flaggy black limestone, which form respectively the lower and middle members of the Kunga Formation. The lower

* By H. Bapty.
† By A. Sutherland Brown and H. Bapty.

member is about 500 to possibly 600 feet thick at Tasu and is Middle Karnian (Early Upper Triassic) in age. Only a small part of the middle member shows on the figure. This member is commonly 600 to 1,000 feet thick and is of Late Karnian and Norian age (Late Upper Triassic). The stratified succession is cut by a series of intrusive rocks, of which the San Cristoval batholith of foliated hornblende diorite and quartz diorite is the largest body. The batholith is exposed to the east of the showings and is believed to be penetrated below the limestone in the deepest drill-holes in the southwestern part of Figure 1. Of greater importance within the ore zones is a laccolith-like body of feldspar-hornblende porphyry, which splits Kunga limestone from Karmutsen greenstone. The relative age of porphyry and diorite is not certainly known, but the porphyry may have been emplaced first. All the foregoing rocks may contain skarn and magnetite, with the possible exception of the diorite. Younger than the mineralization are two groups of dykes, of which the oldest are andesites and porphyritic andesites not very different from the pre-skarn porphyries but which clearly cut ore and skarn and are unreplaced themselves. Still younger is a group of undeformed dykes and minor sills of basalt, diabase, fine gabbro, and porphyritic gabbro, which are probably Early Tertiary and are related to Masset volcanism.

The pre-ore porphyry is highly variable, partly because of differences in original texture but mainly because of great variation in metasomatism and alteration. The original rock was composed of about 45 per cent plagioclase phenocrysts ($An_{30}\pm$) with prominent oscillatory zoning, 5 to 10 per cent hornblende phenocrysts, and rare quartz and pigeonite phenocrysts in a finely lathy quartzofeldspathic matrix. Much of the variation in appearance of unaltered specimens results from differing colour contrast between phenocrysts and matrix, both of which vary from dark green to white, but in even the least altered specimens the feldspars are almost completely sericitized and the rock contains variable amounts of carbonate, chlorite, epidote, tremolite, and pyrite. Quite commonly the porphyry is converted to skarn, with progressive development of epidote, actinolite, and finally garnet.

The post-ore dyke rocks are also variable, but they fall into two chief suites, the earlier of which contains rocks dominantly of greenish cast, including sugary to stony green andesite, porphyritic andesite, and glomeroporphyritic andesite. Plagioclase phenocrysts form a variable proportion of the rock (3 to 20 per cent of $An_{30}\pm$ composition). There are no other phenocryst minerals. The matrix is a lathy mixture of plagioclase, quartz, pyroxene, and alteration minerals: Plagioclase ($An_{28}\pm$), 45 per cent; quartz, 8–10 per cent; pyroxene, 2–8 per cent; iron ores, 2–3 per cent, with carbonate, sericite, chlorite, and some epidote in all specimens examined. Some porphyritic dykes resemble the main porphyry but are not similarly altered. The later suite of dykes includes diabase, gabbro, and basalt and slightly porphyritic varieties. These rocks cut all others and are completely undeformed, cross most faults without offset, and are essentially unaltered. Their crystallinity depends mainly on the size of the dyke. Multiple dykes formed of representatives of the two suites are not rare. The quantity of dykes throughout the ore zone is large, in places approaching 30 per cent of the volume. The figure shows only some of the largest dykes and does not distinguish the two suites. The dominant strike of the first suite is northwesterly with steep, southwesterly dips; of the later, basalt suite, the strike is more northerly with dips steeply to east or west.

Structurally the Tasu ore zone is at the northern termination of the San Cristoval batholith, within a folded panel that plunges northwestward at about 20 degrees. The property is on the east limb of a moderate-sized syncline with bedding striking northward and dipping 25 to 65 degrees westward. The shape of the porphyry

mass resembles that of a Christmas-tree laccolith with a base along the greenstone-limestone contact, which folding and erosion have left in partial plan. If symmetrical, at least half of the body is covered by Tasu Sound. However, the roof or hangingwall cuts up section to the middle member of the Kunga Formation and is found along Horn Island, 700 feet west of the map, so that the massive limestone member is entirely missing in the area of the northern orebodies (No. 1 zone). The apparent bodily removal of the limestone indicates a mode of intrusion less concordant than that of a laccolith.

Faults are numerous and important, although none is large. At least two ages of faults are known. The older have pre- and probable post-ore movements, whereas the younger are entirely post-ore. Most faults of both kinds strike in the northwest quadrant. The two most important faults are nearly normal to one another; one strikes about north 70 degrees west and dips 60 degrees south and the other strikes about north 20 degrees east and dips 60 degrees west. Both are mainly normal faults with maximum vertical displacement of about 200 feet. Both seem to exercise considerable control over the position and development of the thickest ore sections. Post-ore faults which offset the gabbro diabase suite of dykes are relatively unimportant on the property.

Skarn occurs over a much wider zone than does significant magnetite, a zone that may be taken to include in some degree most of the pre-ore rocks of Figure 1. The skarn is somewhat selective, affecting massive limestone less than greenstone or flaggy limestone, and these less than porphyry. This is well illustrated in the vicinity of No. 3 ore zone, where porphyry dykes or sills cutting limestone may be quite highly skarnified, but the limestone is only bleached and recrystallized or is apparently unaffected. The flaggy limestone near the hairpin turn on the road is converted to a banded garnet-tremolite rock that on weathering resembles a garnet sandstone. With porphyry and greenstone, the less intense and earliest stage of metasomatism is thorough chloritization, followed by growth of epidote and actinolite-tremolite, and less commonly anthophyllite; the latter minerals are particularly common to the Karmutsen alterations. Garnet replaces the earlier minerals, and magnetite is apparently still younger but more local.

The orebodies are lenticular and digitating, but they are crudely planar and occur in a general layer parallel to the contact between the Karmutsen Formation and either porphyry or limestone. Some ore occurs below the Karmutsen-porphyry contact, but it is thought to be of relatively minor amount. The main layer containing ore is 200 feet or more thick, becoming thicker with a higher percentage of ore of higher grade on approach to the pre-ore faults. The individual orebodies are separated by skarn bands or rarely by less altered porphyry or limestone and are cut by a large number of post-ore dykes. The orebodies are divided for convenience into five zones as shown. The orebodies of Zone 3 replace limestone with little associated skarn, are copper rich, and are concentrated at the contact with the Karmutsen Formation. The orebodies of Zone 1 replace porphyry, are copper poor, and form a flat ramifying network. The orebodies of Zone 2 have something of the characteristics of each zone. Zone 4, as far as is known, is a small zone south of Zone 3. Zone 5 in the west, currently being explored, has characteristics like Zone 3.

Exploration continued throughout the year by surface diamond drilling and detailed geological mapping. One hundred and nine AX surface diamond-drill holes cored a total of 33,727 feet. Total footage drilled to date is 109,255 feet. An access road commenced in 1962 was completed in February, 1963. The work was done by an average crew of 32 men under the supervision of G. Davis. The camp

is serviced by a weekly aircraft flight from Sandspit and periodically by an oil tanker and barge.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1913, pp. 96–97; 1956, pp. 125–127; 1961, pp. 11–13; 1962, p. 11; *Western Miner*, Oct., 1959, pp. 38–44.]

Iron

Harriet Harbour (Jedway Iron Ore Limited)*

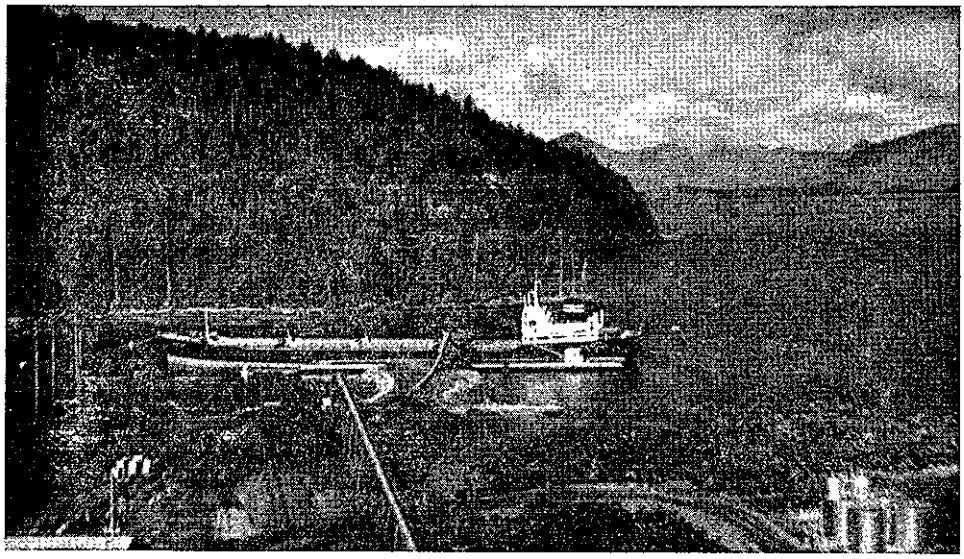
(52° 131° S.E.) Head office, 1111 West Georgia Street, Vancouver 5; mine office, Jedway. L. T. Postle, president; A. J. McDougall, manager; G. M. Cornish, mine superintendent; F. Irwin, mill superintendent. Harriet Harbour is on Skincuttle Inlet, on the southeastern coast of Moresby Island, and is 70 miles south of Sandspit. The company is a subsidiary of The Granby Mining Company Limited and was formed in April, 1961, to take over and mine the Harriet Harbour property of Silver Standard Mines Limited. Jedway Iron Ore Limited has a contract with Sumitomo Shoji Kaisha Ltd., of Tokyo, to supply 2,000,000 long tons of iron-ore concentrates over five years. The first shipment was on October 27, 1962. In 1963, 724,273 tons of ore averaging 35.5 per cent iron was trucked from the open pit, 2,623,080 tons of waste was removed, and 339,008 tons of concentrate shipped. During the year a new 9- by 9-foot adit was driven at 475 feet above sea-level for a distance of 1,526 feet. From this adit 14,902 feet of diamond drilling developed proven reserves of 2,750,000 tons of 35 per cent iron ore between the level and the bottom of the pit, most of which will be mineable by open pit. Ore below the adit was not further investigated.

The geology of Harriet Harbour was described in the Annual Reports for 1959 and 1961 as it was known from surface mapping and diamond-drill holes. Minor modification of these reports is needed as a result of the complete exposure resulting from mining. The main modification is that moderate-sized faults are far more important than was realized in the early stages of exploration. At Jedway the ore occurs in two zones which, with the enclosing Karmutsen Formation greenstones, strike about east-west and dip about 35 degrees northward. The upper and main ore zone is about 100 feet below the base of the Upper Triassic Kunga Formation limestone. The zone is about 100 to 140 feet thick, including ore, skarn, and chloritized greenstone. The lower, footwall ore zone is about 100 feet below the main zone, is about 20 feet thick, and is largely ore. The pit area is cut by four faults which trend north to northwestward (north 30 degrees west to north 15 degrees east) and dip 45 to 65 degrees eastward. In plan they form a reversed letter "N." Separations are of the order of 200 feet. The ore is associated with the faults—not only does some ore occur parallel to the fault planes, but better ore sections plunge north 25 degrees east at about 30 degrees along the intersections of beds and faults.

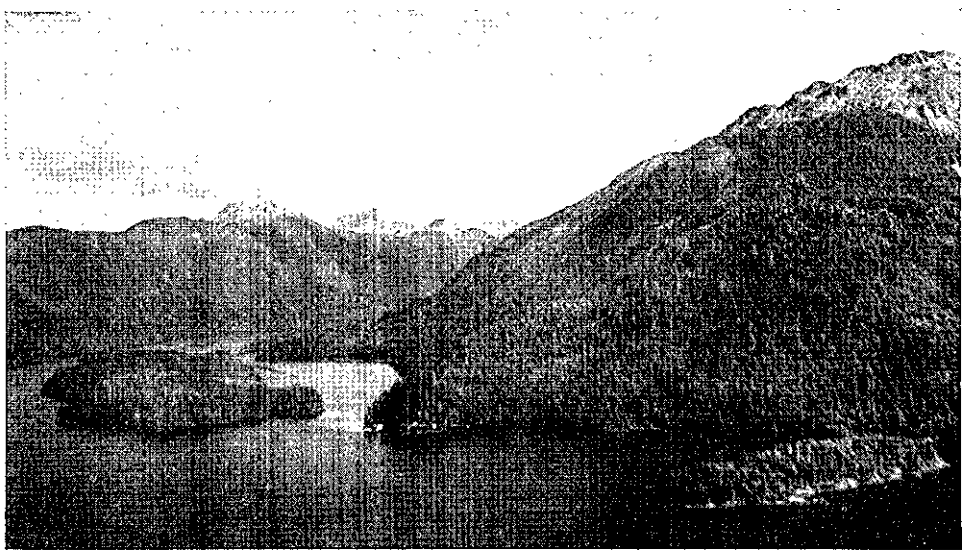
New installations at Jedway include a 60-man bunk-house, a dry, and a core-shack. An Atlas Copco D-T-4 air compressor was installed in a new building to supply air for adit-driving. Two oil hydraulic-powered fast-acting chute gates were installed in order to provide more positive fine-ore control from the mill fine-ore bins to the feeders. A new manager's house was built to accommodate the mine manager and his family. Other new work consisted of two water-storage areas. The "Fish Creek" dam was completed. The "Mill Pond," a reclaiming-pond for mill effluent, is still under construction. The working force was 142 men working for Jedway Iron Ore Limited, 20 men for the trucking contractor, and 13 men for the catering company.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1959, pp. 11–14; 1960, pp. 11–12; 1961, pp. 13–15; 1962, pp. 11–13.]

* By H. Bapty and A. Sutherland Brown.



M.V. " Harriet Maru " loading concentrates at Jedway.



Tasu camp at junction of Tasu Sound and Fairfax Inlet (*see* Fig. 1).

Burnaby Island

Nickel

Johnson Nickel (Silver Standard Mines Limited)*

(52° 131° S.E.) Company office, 808, 602 West Hastings Street, Vancouver 2. R. W. Wilson, president; W. St. C. Dunn, engineer in charge. The property was explored jointly with Jedway Iron Ore Limited. The Johnson Nickel claims lie on the northwest corner of Burnaby Island and includes 138 claims held by record and 2 claims held under option. The option was dropped in October.

The area is geologically complex because it is within a belt of braided faults which form the Louscombe Inlet-Rennell Sound fault zone. Argillites of the Kunga Formation have been intruded by small heterogeneous diorite stocks and later gabbro dykes and plugs and cut by the north-northwesterly faults. The initial showing is in the bottom of the westernmost north-flowing creek about 600 feet from the shore. An outcrop about 18 feet in diameter consists of gabbro mineralized with pyrrhotite, chalcopyrite, and bravoite with minor nickeliferous minerals. The showing contained about 1 per cent nickel and 1 per cent copper. The area is heavily drift covered, and the mineralization is very local, although another mineralized gabbro body was found several hundred feet south.

Work commenced January 3rd and finished June 5th and consisted of 30 packsack diamond-drill holes with a total length of 1,857 feet, geological mapping, and magnetometer, E.M., and soil surveys. Five trenches were dug for a total of 100 feet by an average crew of three men. Transportation was by small boat from Jedway.

Iron

Mac (Merrican International Mines Limited)†

(52° 131° S.E.) Company office, 202, 114 West 15th Street, North Vancouver. W. R. Bandeen, president; A. J. McClellan, manager. A group of 87 claims is held by record on Burnaby Island. Work commenced on June 27th and continued until the year-end. A crew of six men under the direction of W. E. Selnes, engineer in charge, drilled nine diamond-drill holes totalling 685 feet. Trenching was done on three zones, and four pits were dug. A 2-mile tractor-road with bridges and culverts was constructed. The property is reached by boat from Jedway or direct by plane from Sandspit. The property was not visited.

Iron

Jib (Burnaby Iron Mines Limited)‡

(52° 131° S.E.) Company office, 1200 West Pender Street, Vancouver 1. K. J. Springer, president; W. R. Bacon, exploration manager. This company is owned jointly by Mastodon-Highland Bell Mines Limited and Leitch Gold Mines Limited. The property, of 57 mineral claims held by record, extends from Poole Peninsula of Burnaby Island to Skincuttle Island of the Copper Islands. A magnetic anomaly at Bluejay Cove at the southeast tip of Burnaby Island was discovered in 1961 by an aeromagnetic survey in which a fixed-wing aircraft flew northwesterly lines at quarter-mile intervals with a mean terrain clearance of 500 feet. Subsequent surface investigation confirmed the presence of magnetic anomalies and defined three of 5,000 to 10,000 gammas relief, at and just offshore in an area of Kunga Formation limestone in which no significant mineralization was

* By H. Bapty and A. Sutherland Brown.
† By H. Bapty.
‡ By A. Sutherland Brown.

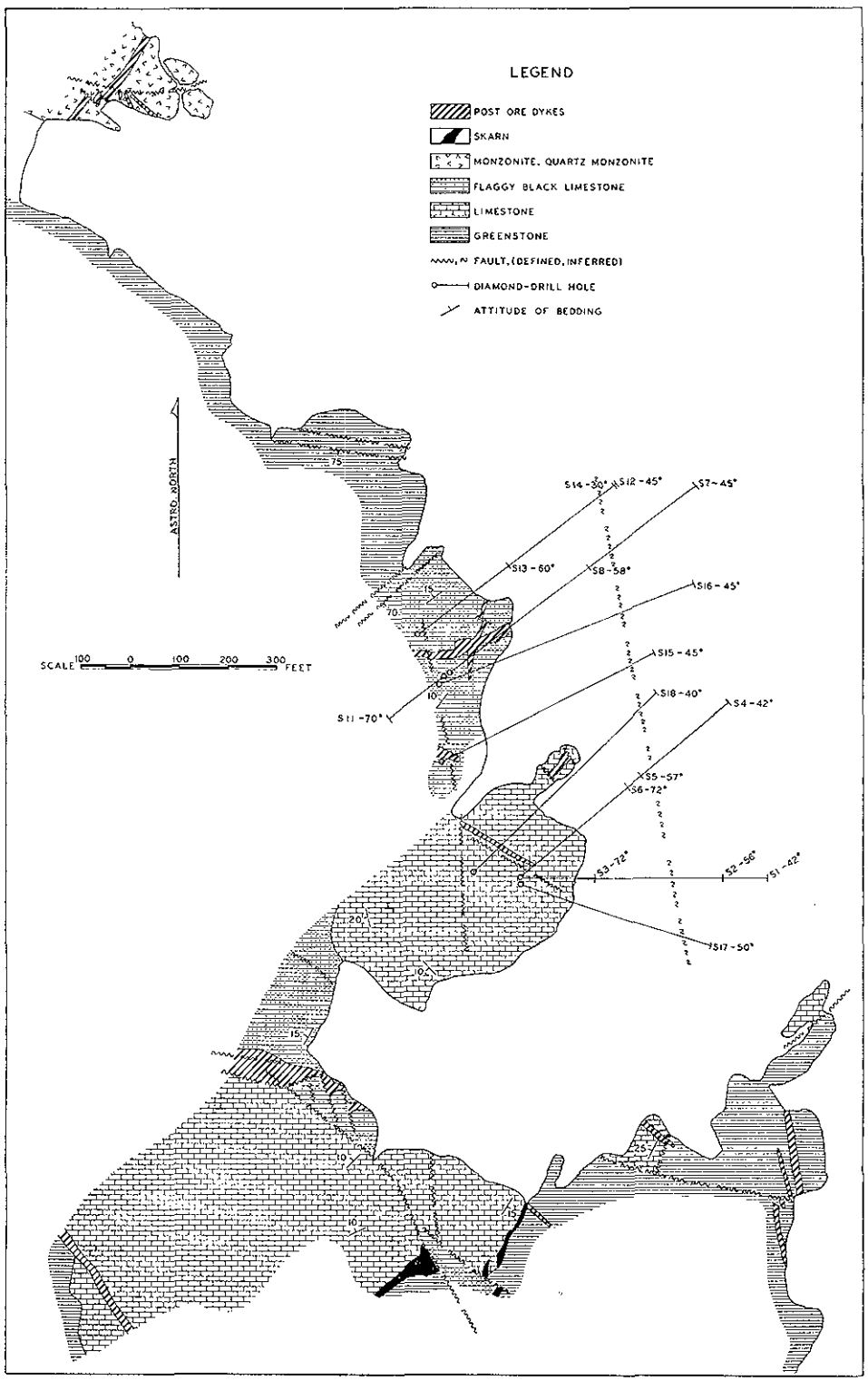


Figure 2. Geology of Jib group. Burnaby Iron Mines Limited.

exposed. The anomalies were investigated by 12,208 feet of diamond drilling from six positions along the shore over a length of 760 feet. Drilling started in January and continued with an interruption until September. This preliminary programme developed reserves of the order of 2½ million tons of ore grading 50 per cent iron and an additional 1½ million tons of probable ore. The drilling did not explore an anomaly, centred 900 feet offshore, which is the largest areally.

The geology of the shoreline is shown on Figure 2. At the property the lower part of the normal stratigraphic sequence of the Queen Charlotte Islands consists of Karmutsen Formation greenstones overlain successively by about 600 feet of the massive limestone member of the Upper Triassic Kunga Formation and about 200 feet of the black flaggy limestone member of the same formation. The remainder of the black flaggy limestone member and the overlying flaggy argillite member are exposed nearby. The limestone is apparently cut by sill-like bodies and some dykes of greenstone which are difficult to distinguish from the Karmutsen Formation. The Burnaby Island batholith, a post-Lower Cretaceous intrusion of monzonite and quartz monzonite, outcrops on the shore about 1,200 feet northwest of the ore zone and is penetrated at 875 feet in Hole S-7 drilled at 45 degrees. Dykes probably from this body are intersected in Hole S-12. Feldspar porphyry dykes found in other holes may also be related. Some minor post-ore basalt dykes also occur on the surface and in the drill-holes. Southwestern Burnaby Island and the Copper and Bolkus Islands are in a monoclinal panel of gentle north-to-northwest dips, and the whole area is block faulted. The area of the anomalies is no exception; dips are mostly 10 to 20 degrees, except adjacent to some faults. Three prominent trends of steep block faults are north 50 to 60 degrees west, north 60 to 70 degrees east, and north 10 to 20 degrees east.

The drilling has revealed two ore zones, but the lower one is penetrated by only one hole. The shape and structure of the upper ore zone is uncertain, because of the enforced geometry of the drilling. The structure of the enclosing rocks indicated by the contact of the two limestone members is essentially flat. The over-all ore zone can be readily traced from section to section and is a crudely tabular body parallel or subparallel to bedding, and dipping gently northeastward. The zone starts about 180 feet below the bottom of the black flaggy limestone member and includes ore, skarn, chloritized greenstone, and some limestone. The ore zone is between 100 and 160 feet thick and may be composed almost entirely of magnetite ore in the best sections. In shape the ore zone is irregularly thickened in the centre. This shape can readily be explained by a fault striking north 50 degrees west and dipping steeply southwest with the northeast block dropped 120 to 140 feet compared to the southeast block. The trace of this hypothetical fault at sea-level is shown on the plan. The ore appears to replace a greenstone sill within the limestone. Unmineralized sections of the zone are chiefly skarn and skarny or chloritized greenstone; remnants of greenstone also occur in small amount within the ore. The somewhat irregular shape of the greenstone body and irregularly included masses of limestone suggest that it is a sill rather than a flow. Similar sills in the limestone can be demonstrated on the Copper Islands.

Below the upper ore zone is an additional 300 to 440 feet of massive limestone (depending on whether or not a fault exists). The lower ore zone was found by deepening Hole S-6 at the completion of the programme. This zone is at the contact with the Karmutsen greenstones and has a true thickness of about 60 feet and a grade of about 45 per cent iron. A nominal allowance of 62,500 tons is made for it in the probable reserves.

The ore in both zones varies from dense magnetite, in which little impurity other than flecks of calcite and occasional chlorite and quartz are present, to magnetite containing minor sporadically distributed pyrite, chalcopyrite, and hematite (maghemite?).

A crew averaging six men was employed from January 7th to September 16th in diamond drilling, sampling, and core-logging. A landing-barge was used to transport the drilling equipment from Queen Charlotte City to the property. Subsequent supplies were taken via Jedway and the Jedway fish-boat. Personnel were transported by aircraft based at Sandspit.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, pp. 13–14.]

POOLEY ISLAND

Copper

H and C (Rainbow Mines Limited)*

(52° 128° N.E.) Company office, 1557 West Broadway, Vancouver 9. W. Howden, president; J. P. Elwell, engineer in charge. The H and C property consists of 1 Crown-granted mineral claim and 37 claims held by record. The claims are on Pooley Island, adjacent to Griffin Passage and 35 miles northwest of Ocean Falls. Work done from May until December consisted of 200 feet of trenching, 600 feet of diamond drilling, and half a mile of road and trail construction. The work was done by five men. Access to the property was by boat and aircraft. The property was not visited.

BANKS ISLAND

Gold

Bank, Banker, Isle, Omi, Waller†

(53° 130° S.E.) Falconbridge Nickel Mines Limited, 1112 West Pender Street, Vancouver 1, holds about 250 claims on Banks Island, mostly in a belt about 20 miles long extending southeastward from a point 3 miles north of Banks Lake. The main belt of claims coincides with a prominent northwesterly trending lineament that runs the full length of the island.

The first claims were located in July, 1960, on Hepler Lake, midway between Banks Lake and Waller Lake, and cover an exposure of auriferous, siliceous, and pyritized skarn. It is a new discovery of important gold-bearing mineralization in the coastal area that has resulted from systematic prospecting of major lineaments.

Banks Island is largely underlain by granitic rocks of the Coast Intrusions, of which light-coloured granodiorite, quartz monzonite, and quartz diorite are common, but darker dioritic to gabbroic phases are also present. These rocks intrude older sedimentary formations, of which only remnants remain. The remnants lie in northwesterly trending belts, of which the largest and most prominent is one extending discontinuously from Calamity Bay to Kingkown Inlet. One remnant forms a fringe on the west side of the island northwestward from Waller Bay, another outcrops extensively at and west of Deadman Inlet, and several remnants occur on the east coast of the island.

The belt northwest of Calamity Bay lies at the west end of Keecha and Kooryet Lakes and passes through Waller, Hepler, and Banks Lakes. It is narrow, seldom more than 1,000 feet wide, and comprises isoclinally folded limestone, silty limestone, and agrillaceous rocks which are metamorphosed to marble, skarn, and slate. The rocks strike north 20 to 40 degrees west and dip to the northeast, and lie in an isoclinal syncline whose axis is rumpled, alternatively plunging northwest and south-

* By H. Bapty.
† By Stuart S. Holland.

east. The opposed plunges essentially cancel each other, and the over-all effect is that of a synclinal structure whose axis is horizontal. A pronounced lineament expressed topographically by the alignment of streams, lakes, ridges, and bluffs, and expressed especially by the height and the depth of colour of the tree growth, coincides with the belt of sediments. This lineament runs the full length of the island and is the topographic expression of major faulting that was localized along the belt of sediments.

Figure 3, drawn directly from aerial photographs, gives an indication of the structural complexity of the major lineament in the vicinity of Hepler Lake. The main lineament extends northwestward from Waller Lake through Hepler Lake to Banks Lake. It is interpreted to be a complex shear zone as much as 2,000 feet wide, made up of strands crossing from one side to the other. Horizontal movements along the zone have developed tensional fractures between bounding shear planes. The northwesterly trending shear is joined by branches having a westerly strike. Two of these on the west side offset a belt of sediments which extends north-northwestward from Waller Bay and which joins the main zone at Banks Lake. The granitic rocks on either side of the lineament are strongly jointed along northerly, easterly, and northeasterly directions.

At Hepler Lake two fault strands enclose a lens of marble, skarn, and metamorphosed sediments about 1,000 feet wide and 2 miles long. The gold-bearing mineralization is in these rocks.

A dominantly garnet skarn outcrops east of the south end of Hepler Lake and has been traced in outcrop and by diamond drilling to the southeast and northwest from there. The outcrop at the lake is pyritized and gold-bearing. This mineralization was explored by diamond drilling during the summer of 1963. The drilling consisted of 5 EX drill-holes totalling 1,250 feet and 18 AXWL holes totalling 5,800 feet, starting at a point about 1,000 feet southeast of the lake and of the camp. The drilling has shown that the skarn is brecciated, silicified, and mineralized with pyrite, pyrrhotite, chalcopyrite, arsenopyrite, and minor galena and sphalerite. Gold values are associated with arsenopyrite, and widths up to 50 feet in some places are mineralized. The deepest drill-hole penetrated gold-bearing silicified and pyritized skarn at a depth of 350 feet. The mineralization is localized by tension fractures which would open preferentially in skarn rather than in marble. Potential areas of mineralization within the shear may be indicated by the presence of quartz-filled tension fractures in adjoining granitic rocks.

Additional drilling consisted of two EX holes totalling 125 feet at Kingkown Lake and three EX holes totalling 214 feet at Waller Lake.

The company established a temporary camp at the south end of Hepler Lake. It was serviced by fixed-wing aircraft from Prince Rupert. From it prospecting crews operated by helicopter. It served as a camp for diamond drilling the nearby mineralization. J. J. McDougall was in charge of the work and Jack Genest was foreman.

ZYMOETZ RIVER

Copper

Northwest, Bet*

(54° 128° S.E.) Bralorne Pioneer Mines Limited, 355 Burrard Street, Vancouver 1. F. Joubin, president; D. H. James, geologist. Forty-eight claims are held by option and eight claims by record. The property lies 25 miles east of Terrace in a right-angle bend of the Zymoetz River. Work commenced June 22nd and was suspended September 2nd. An average crew of four men was employed under the direction

* By H. Bapty.

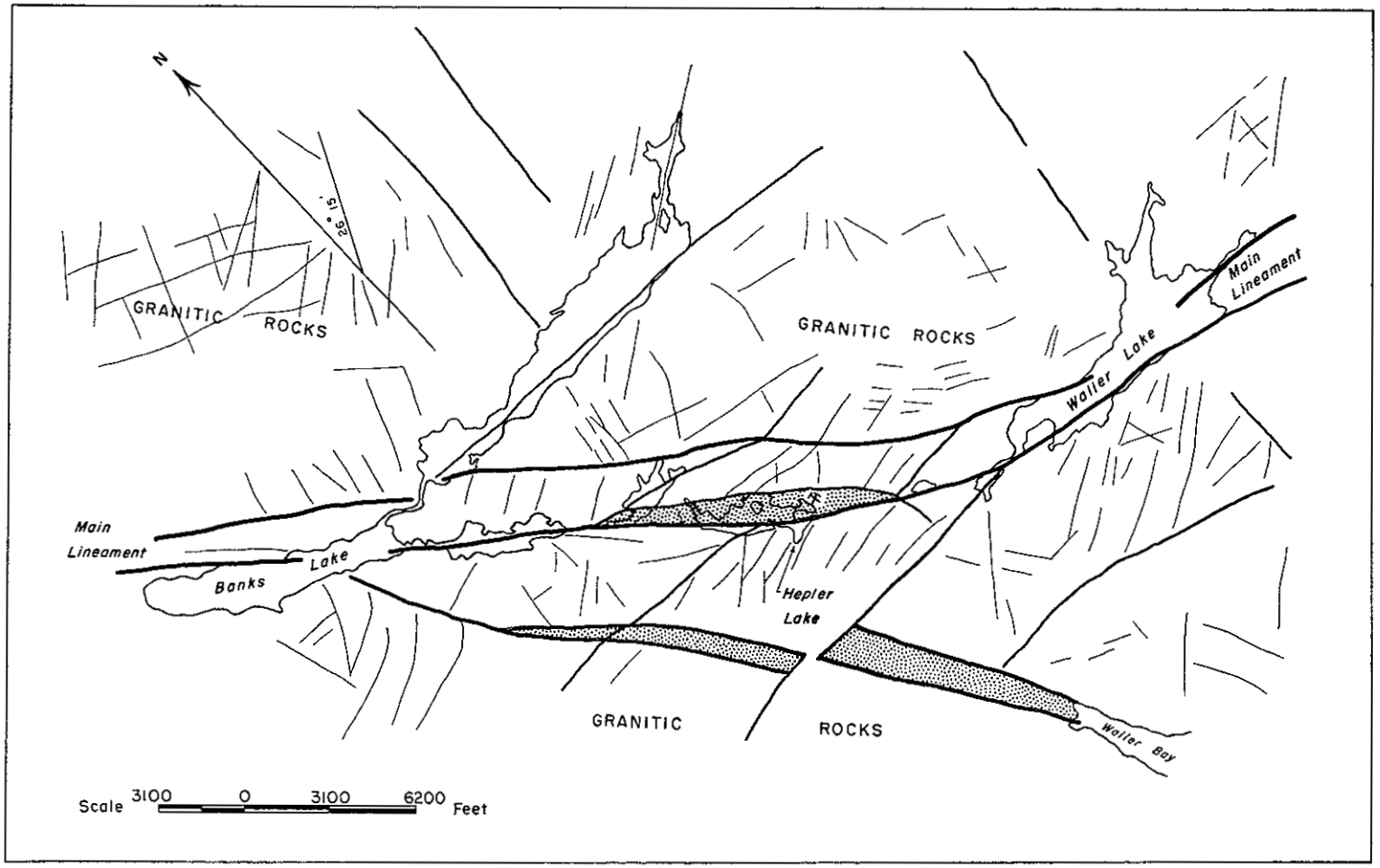


Figure 3. Lineaments on part of Banks Island. Sedimentary belts stippled.

of T. Bell. Ten trenches were excavated in overburden on the original showing. Prospecting a mile to the north turned up a new showing on the Keeler property, on which 11 trenches were excavated. Access to the property is by private logging-road to a new bridge across the Zymoetz River, thence by an old ill-defined trapper's trail to a tent camp.

Keeler*

(54° 128° S.E.) The two Keeler claims are 1 mile north 25 degrees west of the Northwest group at an elevation of 5,000 feet. Mineralization is at the top of a line of high and very steep bluffs which are covered with thick brush. The mineralization occurs in a feldspar porphyry flow within andesite flows. The porphyry flow consists of a light-grey matrix which contains phenocrysts (up to 1½ inches in diameter) of pink orthoclase feldspar. The chief copper mineral is chalcocite, but bornite, native copper, azurite, and malachite are also present. The mineralization occurs in veinlets in fractures in the rock and also disseminated throughout the groundmass. Copper occurs over a distance of 600 feet but is not continuous. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1914, pp. 118–119.]

BABINE RANGE

Molybdenum

Molly, Moly, Red Canyon, Tom, Len (The Buttle Lake Mining Company Limited)†

(55° 127° N.E.) Company office, 355 Burrard Street, Vancouver 1. H. H. Huestis, president. The company holds the Molly, Moly, Red Canyon, Tom, and Len groups on the north side of Tomlinson Mountain at the north end of the Babine Range about 25 miles north of Hazelton. The claims lie between the heads of Shegisic and Tomlinson Creeks and essentially along the crest and on the northeastern slope of a high northwesterly trending ridge.

A tent camp was established in a saddle on the ridge at an elevation of about 6,000 feet, there being just sufficient flat space for half a dozen tent frames and a helicopter pad. The camp was serviced by helicopter.

The claims are underlain by a stock of moderately coarse-grained pink porphyritic granite, containing feldspar phenocrysts as much as 2 inches long and three-quarters of an inch wide and commonly quartz grains half an inch across. This rock at its western contact is finer grained and foliated and is in contact with slate and with hornfelsed members of the Hazelton Group. The contact strikes north 25 to 30 degrees east and dips 45 to 60 degrees northwest.

Across a width of 300 feet along its western margin, the intrusive is cut by narrow dykes of rhyolite porphyry and granophyre. The whole zone is fractured and veined by narrow quartz veinlets of two or more ages. The predominant strike of the veinlets is north 30 degrees east; 10 per cent, and in places considerably more, of the rock is quartz. The quartz veinlets are accompained by pyrite and a small amount of chalcopyrite as well as some molybdenite. There is a considerable amount of oxidation and surface leaching, and fracture surfaces show films of green copper stain (malachite) or yellow molybdenum stain (molybdic ochre).

The mineralized contact zone near camp was exposed by three trenches put down through talus to bedrock. The trenches were about 300 feet long and were explored on the southwest side of the ridge through a vertical range of about 300 feet.

* By H. Bapty.
† By Stuart S. Holland.

It is estimated that the molybdenite content of the southwestern part of the contact zone is low, probably less than 0.15 per cent.

The contact zone extends northeastward along the ridge and is very largely covered by talus until, at a distance of about 3,000 feet from the tent camp, it outcrops on steep bluffs facing northeast and dropping off toward the Babine River. These northeastern exposures of the contact zone are better mineralized than that part near camp, and during late August were investigated by engineers of Southwest Potash Corporation. They were not examined by the writer.

The company reports that the results of 78 samples ranged from 0.14 to 0.67 per cent molybdenite. The higher assay values are presumably from the northeastern contact zone.

Tom Lisle was in charge of the work.

SMITHERS

Silver-Lead-Zinc

Duthie, Mamie (Sil-Van Consolidated Mining & Milling Company Ltd.)*

(54° 127° N.E.) Company office, Bank of Nova Scotia Building, 602 West Hastings Street, Vancouver 1. R. W. Wilson, president and managing director. The Sil-Van mine is on the southwest slope of Hudson Bay Mountain 16 miles by gravel road from Smithers.

Five major subparallel, complex breccia-vein systems are known to occur over an east-west distance of 1 mile on the southwest slopes of Hudson Bay Mountain. Most of the fracture systems strike about north 60 degrees east and are vertical or dip steeply to the northwest. Negligible offsets of contacts have been found along these zones. The main vein system, the Henderson, is irregularly mineralized along a strike length in excess of 1 mile. The width of mineralization is highly variable, ranging from zero to more than 10 feet. The reported ore minerals include galena, sphalerite, pyrite, arsenopyrite, pyrrhotite, chalcopyrite, tetrahedrite, pyrargyrite, and gold.

The country rock consists of spherulitic flow-banded rhyolite and massive lapilli tuff cut by numerous greenstone, diabasic, and a few fine-grained diorite dykes. The flow-banded rhyolite outcrops in the southern part of the area on the lower slopes of the mountain. It is overlain to the north, east, and west by the massive lapilli tuff. The contact dips about 20 degrees north at about the 4,000-foot level on the Henderson vein. In the vicinity of the veins the country rock is usually bleached and altered.

Work in 1963 consisted of a "Turam" geophysical survey carried out by Hunting Survey Corporation in an attempt to find extensions of the Henderson, Mamie, and Coronado veins. During July and August an average crew of about seven men was employed. A 5,000-foot base-line trending north 65 degrees east was established in the vicinity of the Mamie vein and about 12 miles of line was cut. Four diamond-drill holes totalling 250 feet were put down.

W. St. C. Dunn was in charge of the work.

Copper

Canadian Citizen, American Citizen, May, J.W.B.*

(54° 127° N.E.) The two Crown-granted mineral claims Canadian Citizen (Lot 7171) and American Citizen (Lot 7238) and the May and J. W. B. groups held by W. Yorke Hardy and associates, of Smithers, were under option to Noranda Exploration Company, Limited.

* By R. V. Kirkham.

The claims are about 1½ miles south of Smithers and surround two sets of showings, one on the north side of Dahl Creek at an elevation of 2,100 feet and about three-quarters of a mile west of the Sil-Van road, and the other at an elevation of 2,000 feet and 1,500 feet west of the north end of Seymour Lake. The showings were originally located in 1925 and 1926, and at that time were called the Smithers Copper and Canadian Citizen respectively.

Both showings are similar and consist of small veinlets of bornite and chalcopyrite in fracture zones in massive dark-purple and grey volcanic rocks of the Hazelton Group. The dominant fracturing strikes west and dips 70 degrees south.

In the early part of the summer the Noranda company made a geophysical and geochemical survey of the area. The option was relinquished in August, 1963.

Silver-Lead-Zinc

Silver Creek, Silver Lake, Trade Dollar Groups*

(54° 127° N.E.) The property consists of a number of Crown-granted claims and fractions owned by Sil-Van Consolidated Mining & Milling Company Ltd. They are at elevations between 5,000 and 7,000 feet on the northwest slopes of Hudson Bay Mountain near the divide between Silvern and Toboggan Creeks. They are reached by 6 miles of logging-road to the north side of Glacier Gulch, thence by 4 miles of steep tractor-road up the north side of Toboggan Creek.

In 1963 the steep trail up Toboggan Creek was converted into a road on which it was possible by late August to drive a four-wheel-drive vehicle to an elevation of 5,500 feet, about half a mile from Silvern Lake.

Molybdenum

Glacier Gulch (Southwest Potash Corporation)*

(54° 127° N.E.) Executive office, 1270 Avenue of the Americas, New York 20. F. Coolbaugh, president. British Columbia office, 718 Granville Street, Vancouver 2. The company holds a large number of mineral claims centred on Glacier Gulch on the east side of Hudson Bay Mountain. The main molybdenite mineralization occurs in a stockwork of narrow quartz veinlets in altered volcanic rocks near the toe of the glacier and under the glacier. Some highly altered rocks intersected at depth in drill-holes are believed to be derived from a thick sill of granodiorite. The volcanic rocks in the cirque area dip between 40 and 60 degrees to the north.

A drill camp at about 5,700 feet elevation below the ice-fall on the glacier was reoccupied. Three AX drill rigs occupied sites at about 5,700 feet elevation on bedrock on the north and south sides of the glacier. Six holes totalling 14,500 feet were put down.

The camp was completely serviced by helicopter, a large Sikorsky being used to move the drills and heavy equipment and a Hiller 12E for fuel and camp supplies.

A crew of 19 men was employed from July to October. R. E. Anderson was engineer in charge of the work.

Silver-Lead-Zinc

Cronin (New Cronin Babine Mines Limited)†

(54° 126° N.W.) Company office, 844 West Hastings Street, Vancouver 1. L. C. Creery, president; H. Hill & L. Starck & Associates Ltd., consulting mining engineers. The property is on the east slope of Cronin Mountain, about 30 miles by road from Smithers. During the summer and fall

* By R. V. Kirkham.
† By H. Bapty.

12 diamond-drill holes were aimed to intersect the downward extension of the vein. Twenty-two inches of vein were found in four drill-holes after drilling 1,007 feet. The vein averages 51 ounces of silver per ton, 14 per cent lead, and 15 per cent zinc. A winze was sunk 68 feet below No. 5 level in the hangingwall of the vein; a drift was driven on ore for 55 feet from the bottom of the winze. The development muck was milled.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1962, p. 16.]

BABINE LAKE

Copper

McDonald Island (Granisle Copper Limited)*

(54° 126° N.E.) Head office, 1111 West Georgia Street, Vancouver 5. L. T. Postle, president. This company is a wholly owned subsidiary of The Granby Mining Company Limited. The property, formerly known as the Richmond, is on McDonald Island at the entrance of Hagan Arm near the north end of Babine Lake. It is 10 miles by boat north of Topley Landing.

The original claims were located more than 50 years ago. In 1929 they were under option to The Consolidated Mining and Smelting Company of Canada, Limited, at which time some diamond drilling was done, and it was announced by the company that approximately 8,000,000 tons grading 0.01 ounce gold, 0.15 ounce silver, and 0.80 per cent copper had been indicated. The property lay idle for many years, but since 1955 has been under active exploration by the Granby company. During the past few years a considerable amount of systematic diamond drilling of vertical and inclined holes has been done, and the company has stated that 22,000,000 tons grading 0.55 per cent copper has been delimited to a depth of 500 feet. A vertical drill-hole disclosed that mineralization extends to a depth of 1,000 feet. Currently a feasibility study has been made, complete metallurgical testing of the ore has been undertaken, and detailed engineering information has been accumulated.

Andesitic volcanic rocks of the Hazelton Group striking north 70 degrees east outcrop on the shores and inland at McDonald Island. In the central part of the island, about half a mile from the south end, these rocks are intruded by a small stock of porphyritic nepheline syenite. It outcrops mainly on a low hill rising to 250 feet above lake-level and standing above the general level of its surroundings. The volcanics at the margin of the stock are metamorphosed to a granular dioritic texture that is accompanied by the development of biotite and hornblende. Some layers in the volcanics are feldspathized, carbonatized, and pyritized by the intrusion, and weather to a light-brown colour. The stock is elongated in a northeasterly direction and cuts obliquely across the trend of the volcanics.

The mineralized area is about 500 feet wide and lies within the syenite porphyry and in the adjoining volcanics along the eastern side. It is exposed on the knoll and has been completely outlined by diamond drilling. The mineralization consists of chalcopyrite, pyrite, bornite, some magnetite, and a small amount of molybdenite associated with narrow quartz veinlets which occupy unsystematic fractures. Some mineralization, unaccompanied by quartz, occupies joint surfaces. At surface there is some leaching of pyrite and copper sulphides and deposition of malachite along fracture planes. Geochemical soil-sampling on the island indicates that copper mineralization is localized only in the vicinity of the stock.

* By Stuart S. Holland.

During the summer a detailed geological survey of the island was made by two geologists under the direction of K. C. Fahrni. A crew of four men did the necessary surveying to lay out a grid preparatory to a magnetometer survey. Work was completed by November 23rd.

MORICE LAKE

Molybdenum

Lucky Ship (Southwest Potash Corporation)*

(54° 127° S.E.) Executive office, 1270 Avenue of the Americas, New York 20. F. Coolbaugh, president; J. W. Hoadley, geologist in charge, 718 Granville Street, Vancouver 2. The company holds the Lucky Ship property, consisting of 109 recorded claims and fractions. Forty-two of these claims are held under option from Plateau Metals Ltd. The property is on the east side of Morice Lake, 50 air miles west of Houston. The claims cover a stockwork of molybdenite-bearing quartz veins in quartz porphyry. Geological mapping, trenching, sampling, geochemical and magnetometer surveys, and 103 feet of EX diamond drilling were carried out by a crew of 12 men from September 15th to October 21st under the direction of G. W. Mannard and T. J. R. Godfrey. Transportation was via helicopter from Smithers. The property was not visited.

TAHTSA LAKE

Copper-Molybdenum

Berg*

(53° 127° N.E.) Kennco Explorations, (Western) Limited, 1030 West Georgia Street, Vancouver 5. The company holds the Berg group of 33 mineral claims between Nanika and Tahtsa Lakes. The mineralization consists of pyrite, chalcopyrite, malachite, azurite, and molybdenite in fractures and disseminations associated with a feldspar porphyry stock. Work commenced July 16th and terminated September 1st with an average crew of six men under the direction of P. T. Black. Water was used to ground-sluice trenches. Seventy-three chip samples for a total length of 650 feet were taken, and 1 square mile of plane-table geologic mapping was done. The property was not visited.

Copper-Molybdenum

Len*

(53° 127° N.E.) Kennco Explorations, (Western) Limited, 1030 West Georgia Street, Vancouver 5. The company holds the Len group of 44 claims on Huckleberry Mountain east of Tahtsa Lake. The mineralization consists of chalcopyrite in fractures in a small granite stock, and pyrite, chalcopyrite, and molybdenite in adjacent altered and fractured volcanics. Work started May 23rd and terminated October 2nd with an average crew of eight men under the direction of P. T. Black. A bulldozer excavated a total of 8,240 cubic yards in seven trenches. A total of 953 feet of diamond drilling was done from five drill-sites. Sampling was done on 550 feet of drill core and 250 feet of chip-sampling. The property was not visited.

WHITESAIL LAKE

Molybdenum

Cob*

(53° 127° S.E.) Kennco Explorations, (Western) Limited, 1030 West Georgia Street, Vancouver 5. The Cob group of 10 claims lying southeast of the west end of Whitesail Lake

* By H. Bapty.

was held by option from C. V. and W. H. Harrison. The mineralization consists of disseminated pyrite and molybdenite in volcanic rocks in the vicinity of a granitic intrusion. Work commenced on August 5th, and terminated September 3rd, under the direction of P. T. Black. Forty-six stream silt geochemical samples were collected, 126 feet of core was taken with a packsack diamond drill, and 14 man-days of prospecting were done. The property was not visited.

EUTSUK LAKE

Molybdenum

CAFB* (53° 127° S.E.) Phelps Dodge Corporation of Canada Limited, 404, 1112 West Pender Street, Vancouver 1, holds the CAFB claims, extending northward from Haven (Bone) Lake to the top of Red Bird Mountain. Haven Lake is 8 miles west of Pondosy Bay on Eutsuk Lake. The claims cover a stock of quartz feldspar porphyry containing molybdenite mineralization. A good trail leads from Haven Lake to a tent camp which was established near timberline at an elevation of about 4,500 feet. The camp was supplied by service flights of fixed-wing aircraft from Tchesinkut Lake.

A teardrop-shaped stock of white quartz feldspar porphyry on the south slope of Red Bird Mountain between 3,900 and 6,000 feet elevation intrudes a succession of tuffs and volcanic rocks of the Hazelton Group. The porphyry stock has dimensions of 4,000 feet in an easterly direction by 5,000 feet in a northerly direction. A central core of the stock is silicified, and the constituent feldspars are partly to thoroughly altered. On the western side of the stock and in a roof pendant within it, the Hazelton rocks have been hornfelsed and in places silicified and mineralized with pyrite and molybdenite.

On the western side of the stock, along the contact which locally strikes north, the porphyry and the adjoining hornfelsed volcanics are fractured and silicified by quartz veinlets striking east and north. The quartz is accompanied by pyrite and molybdenite, but the molybdenite content is low. At the eastern contact at about 5,000 feet elevation, quartz-filled fractures of at least two ages form a stockwork in which the dominant direction strikes north 60 degrees east. Some pyrite and molybdenite are present in surface exposures and especially in the vicinity of No. 4 drill-hole.

In March and April eight diamond-drill holes totalling about 5,000 feet were put down. They were essentially laid out to test the periphery of the porphyry stock and the enclosing hornfels. After a summer spent surveying and geological mapping, a small bulldozer was brought onto the property in order to trench in selected areas where slopes were not too steep and the overburden and talus not too deep. Trenching was started in early September, and in addition to 15,500 feet of access roads to the camp and to drill set-ups, 3,680 lineal feet of trenching was accomplished. Four additional diamond-drill holes were put down in October, making a total footage in 1963 of 6,514 feet in 12 drill-holes.

Bruce Woodsworth was in charge of the work.

TIT (Julian Mining Co. Ltd.)† (53° 126° S.W.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. This group of 32 recorded claims is on Rivers Peak, 2 miles north of Tesla Lake. Work commenced in May and was completed by November by a crew of 14 men. A magnetometer survey was conducted over 17,000 feet of line, 400 soil samples were taken, and 30

* By Stuart S. Holland.
† By H. Bapty.

feet of light diamond drilling and 500 feet of hand-trenching were done. Transportation was by charter aircraft and leased vehicles. The property was not visited.

ENDAKO*

Success in exploration by Endako Mines Ltd. in 1963 at the Stella molybdenite deposit focused attention on the molybdenite possibilities of a considerable area in the vicinity of Endako. Previously known occurrences and new discoveries indicate that numerous molybdenite occurrences lie within granites of the Topley Intrusions.

The Topley Intrusions are a group of related granites, granodiorites, diorites, and syenites of Lower Jurassic age which extend discontinuously for at least 100 miles from Babine Lake in a southeasterly direction past the west end of Fraser Lake to the West Road (Blackwater) River. The main body of granite lies between Shovel Creek, northwest of Endako, and the Nechako River. It has a length of about 36 miles and a maximum width of about 20 miles.

The granitic area in the vicinity of Endako consists very largely of pink and grey granite. Porphyritic granite with pink feldspars an inch or more long is common northwest of the Stellako River. Medium-grained pink granite is at the Endako mine, on Nithi Mountain, and elsewhere. This granite contains only a small amount of biotite and normally no hornblende. A pale-pink to white leucogranite is exposed near the summit and on the east side of Nithi Mountain.

Although it has been stated that some gradation has been observed between granite and granodiorite,† the relations between the several varieties of pink granite are not known with assurance, and no contact relationships have been observed.

The granites are intruded by a variety of dykes: white to pink quartz feldspar porphyry which is seen on surface and in drill core at the Endako mine, pale porphyritic trachyte, dense olive-coloured uranium-bearing rhyolite porphyry on Nithi Mountain, and fine-grained dark-grey andesite. The dykes of quartz-feldspar porphyry at the Endako mine are mineralized with molybdenite; no others are known to be.

Stratigraphic evidence and potassium-argon determinations date the Topley Intrusions as Lower Jurassic. It is significant, nevertheless, that one diorite body, intrusive into the Topley Intrusions, was found to be Paleocene.‡ This introduces the possibility that within the Topley Intrusions there may be others of considerably younger age. Such occurrences might be of considerable importance in localizing mineralization.

In the following property descriptions the numbers refer to the locations in Figure 4.

Molybdenum

Tor (1) (Triform Explorations (B.C.) Ltd.)§ (54° 125° S.W.) Company office, 629 Hornby Street, Vancouver 1. J. San Severino, president; J. Sullivan, engineer in charge. The property consists of 54 claims held by record, 10 miles northeast of Decker Lake Post Office and 1 to 2 miles south of Ling Lake. Work commenced July 15th and was completed by November 2nd. Two men took soil samples over the surface of 29 mineral claims, dug trenches in weak anomalous zones on the Tor Nos. 49 and 51 claims, and cut out 3½ miles of trail. The property was not visited.

* By Stuart S. Holland, except as noted
† *Geol. Surv., Canada,* Mem. 252, p. 92.
‡ *Geol. Surv., Canada,* Paper 62-17, p. 135.
§ By H. Bapty.

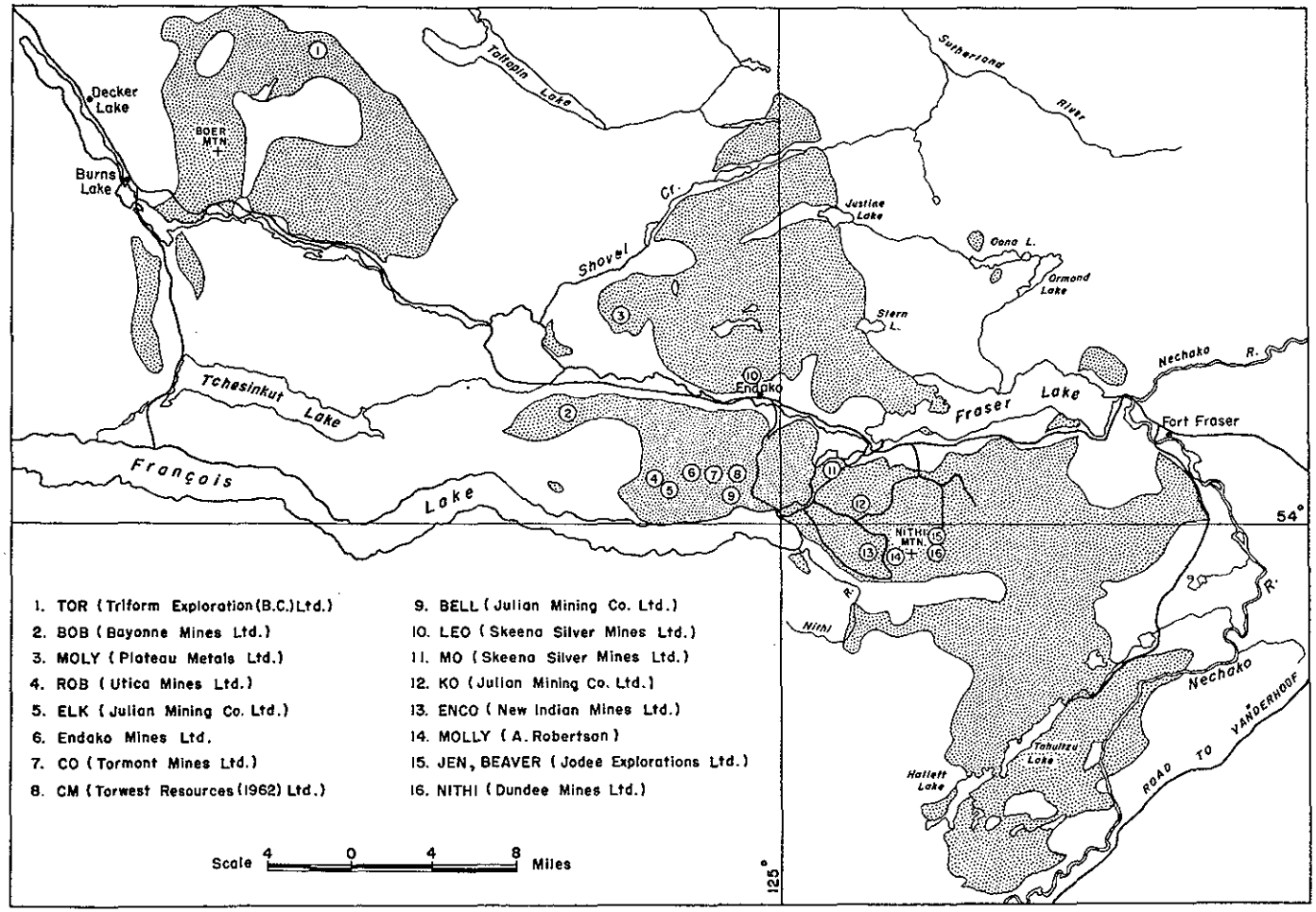


Figure 4. Locations of properties in the Endako area. Topley intrusions stippled.

Bob (2) (Bayonne Mine Ltd.)*

(54° 125° S.E.) Company office, 404, 409 Granville Street, Vancouver 2. C. F. Mackenzie, president; W. G. Hainsworth, consulting geologist. The Bob group of 40 recorded claims lies south of the Endako River 7 miles west of Endako. Work commenced in July and was completed by September with a crew of three men. An electromagnetic survey was conducted over the claims. The property was not visited.

Moly (3) (Plateau Metals Limited)*

(54° 125° S.E.) Company office, 420 West Pender Street, Vancouver 3. C. Riley, president; K. Lovang, engineer in charge. During the early summer, soil-sampling and surface prospecting was done on the Moly group of 25 recorded claims, situated 10 miles west of Endako and 4 miles north of Savory station. Two base-lines of 9,000 feet each were cut, and from these cross-lines were run at 500-foot intervals. Soil samples were taken 300 feet apart. Work was done by a two-man crew commencing in April and was completed by the end of May. Subsequently the claims were allowed to lapse. The property was not visited.

Rob (4) (Utica Mines Ltd.)*

(54° 125° S.E.) Company office, 1218 Burrard Building, Vancouver 5. A. Robertson, president. The Rob group of 28 recorded mineral claims adjoins Endako Mines Ltd. property on the west and is about 6 miles southwest of the village of Endako. Geological and geochemical surveys were carried out by Endako Mines Ltd. under an agreement with Utica Mines Ltd. The crew consisted of seven men under the supervision of C. E. Dunn and C. W. Ball. The property is reached by 1 mile of private road from Endako Mines Ltd. The property was not visited.

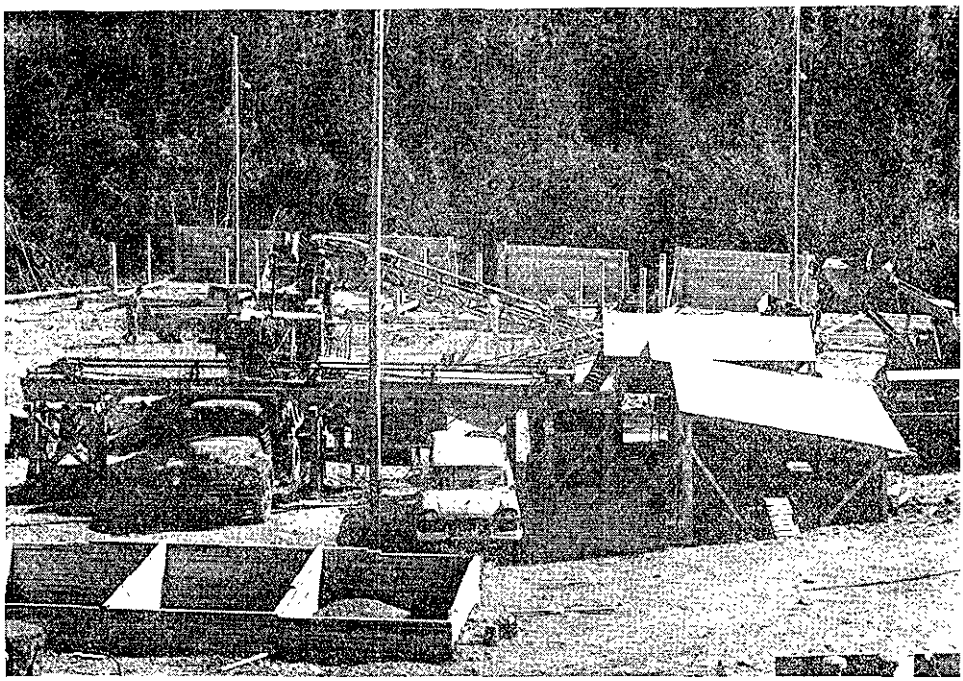
Elk (5) (Julian Mining Co. Ltd.)*

(54° 125° S.E.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. This group of 92 recorded claims is west of Endako Mines Ltd. property. Work, which began in May and finished in November, consisted of some diamond drilling, a magnetometer survey run on 56,000 feet of cut lines, and the taking of 1,150 soil samples by a crew of 14 men. The property was not visited.

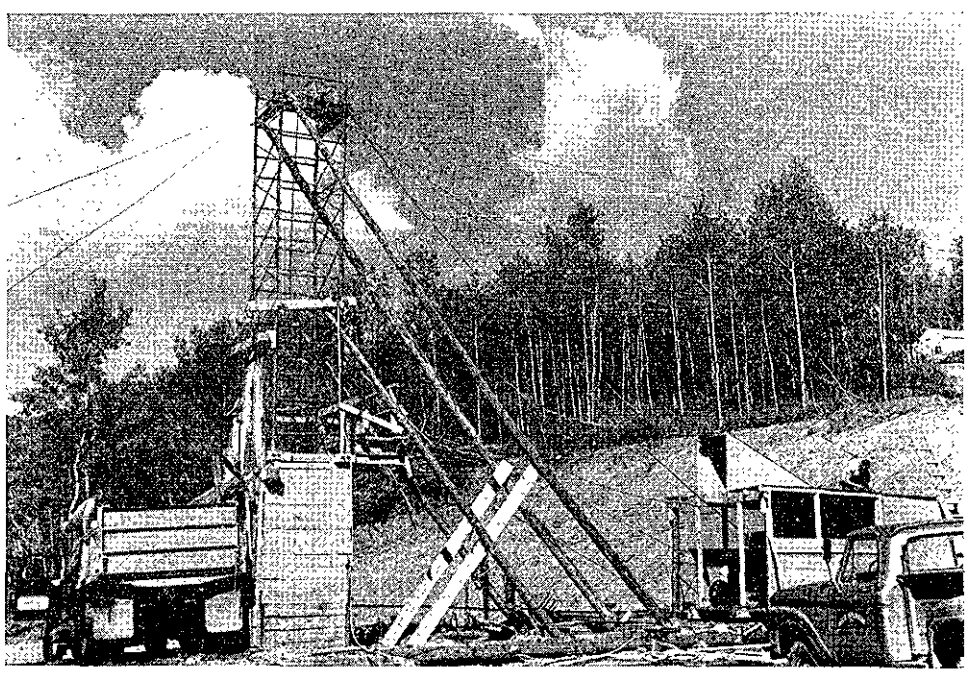
Endako Mines Ltd. (6)

(54° 125° S.E.) Company office, 1218 Burrard Building, 1030 West Georgia Street, Vancouver 5. Andrew Robertson, president; Canadian Exploration Limited continued to finance exploration, their engineer in charge at the property being C. E. Dunn. Diamond drilling began again in February, 1963, and continued until December. Wire-line equipment was used, and the core recovery, which in 1962 had been poor, was increased to about 90 per cent. A total of 119 vertical holes were put down, mostly to a depth of 500 feet, mostly at intervals of 200 feet on lines 400 feet apart. Total distance drilled was 48,257 feet. All drill core was weighed (to determine percentage of recovery), and the specific gravity of the rock was measured at 5-foot intervals. The core was then split, half being shipped to Vancouver for assay and the balance retained in the core-shed at the mine. In addition, a mechanical splitter was used to take about one-eighth of the drill return water. The sludge from this was collected and weighed for each 10-foot run, and

* By H. Bapty.



Endako Mines Ltd. sampling plant. Sample-bins in foreground and other bins under construction in background.



Endako Mines Ltd. sampling shaft.

a sample was sent in for assay. By August the drilling had outlined a mineralized zone 5,000 feet long, from 600 to 1,200 feet wide, and as much as 500 feet deep. Three holes extended to depths of 1,000 to 1,077 feet showed mineralization persisting to depths ranging between 600 and 800 feet. The general trend of the mineralized zone is south 64 degrees east.

During all of the drilling there was a discrepancy between the assay of drill core and the assay of the corresponding sludge sample, the sludge being higher but not uniformly so. It was decided, therefore, to let a contract for underground work which would supply mineralized material for bulk sampling and metallurgical testing. Work was started in early August on a crosscut adit near the western end of the mineralized zone. The crosscut, about 730 feet long, was driven along the line of drill-holes just west of the Foote inclined shaft. From it vertical raises about 80 feet high were driven on five drill-holes. Three thousand feet east a shaft was sunk 140 feet on drill-hole No. 92, and from the bottom crosscuts were driven 200 feet north and south. From them vertical raises 130 feet high were driven on four diamond-drill holes. Assays of material from the raises provided an accurate check of the earlier drill-holes' results and enabled the derivation of a factor that could be applied to all the drilling.

Each round from underground, whether crosscut, shaft, or raise, was treated as a bulk sample, and was hauled to a sampling plant and dumped into a separate bin. From the bin it was put through successive crushers and splitters to reduce its size and bulk, was dried and sacked to provide a sample for assay and material for metallurgical testing at Salmo. The results of the bulk sampling upgraded the values obtained by assay of drill core by a significant amount. The underground sampling was concluded in October.

Additional work on the property consisted of a great many thousand feet of line cutting and bulldozing of roadways for use in the intensive geochemical soil-sampling of the property and adjoining ground. Soil samples were taken at 100-foot intervals on lines 1,000 feet apart.

A new road was built from a point on the highway 5 miles west of Endako to the mine camp, a distance of 5.6 miles.

[References: *B.C. Dept. of Mines,* Bull. No. 9, 1940, pp. 11–16; *Minister of Mines, B.C.,* Ann. Rept., 1962, pp. 17–19.]

CO (7) (Tormont Mines Limited)*

(54° 125° S.E.) Company office, 405, 25 Adelaide Street West, Toronto 1, and 1218 Burrard Building, Vancouver 5. A. Robertson, president. Twenty recorded claims lie 4 miles southwest of Endako, adjoining Endako Mines Ltd. property on the east. During May and June two NX diamond-drill holes totalling 602 feet were completed and soil-sampling, stripping, and road-building were done by an average crew of eight men under the supervision of C. E. Dunn, engineer for Canadian Exploration Limited. The property is 6 miles by road from Endako or 1½ miles east of the Endako mine camp. The property was not visited.

C.M. and R.W. (8) (Torwest Resources (1962) Ltd.)

(54° 125° S.E.) Company office, 404, 409 West Hastings Street, Vancouver 1. W. E. Garnett, president; R. E. Falkins, secretary-treasurer. The company held 50 claims, comprising the C.M. and R.W. groups adjoining Endako Mines Ltd. holdings on the east and west respectively. The eastern-

* By H. Bapty.

most claims are accessible by about 1 mile of road leading west from the Francois Lake road running south from Endako.

Early in the year Scope Mining and Exploration consultants conducted an electromagnetic survey of the C.M. group. Three westerly trending conductors were discovered, which later provided targets for diamond drilling after some geochemical soil-sampling had been completed.

Very few outcrops are present on the C.M. group, and as a consequence the geophysical work was taken as the sole basis for laying out the diamond drilling.

Drilling began in June and was completed by August. Seven holes, of which the deepest was 449 feet, were put down, and the total footage drilled was 2,719 feet.

The rocks encountered in the drilling are the same pink granite that lies to the west at the Endako mine. On the average it is not so intensely altered nor are any pale quartz feldspar porphyry dykes seen in drill core. Dykes of amygdular basalt are present, and pink to grey biotitic feldspar porphyry is not uncommon. Some molybdenite mineralization was encountered, and in hole No. C.M. 3 the company announced that the core between 210 and 330 feet assayed 0.24 per cent molybdenite. On the average the amount and degree of alteration is small and the amount of molybdenite mineralization disappointingly low.

Maurice Mathieu was the engineer in charge at the property, working under W. G. Hainsworth, company geologist.

Bell (9) (Julian Mining Co. Ltd.)*

(54° 125° S.E.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. The Bell group of 19 recorded claims lies southeast of Endako Mines Ltd. property. Work commenced in May and ceased in November, and was done by a crew of 14 men. Some hand-trenches were dug, a magnetometer survey was conducted on 11,000 feet of line, and 190 soil samples were taken. The property was not visited.

Leo (10) and Mo (11) (Skeena Silver Mines Limited)*

(54° 125° S.E. and 54° 124° S.W.) Company office, 301, 744 West Hastings Street, Vancouver 1. A. F. Lungley, president; C. Rutherford, engineer in charge. The Leo group consists of 20 recorded claims northwest of Endako, and the Mo group of 20 recorded claims is 5 miles southeast of Endako and on the east side of the Stellako River. Work commenced May 1st and was completed by June 15th by an average crew of three men. Six hundred lineal feet of bulldozer trenching was done on the Leo and 800 feet of similar trenching was done on the Mo group. These claims were not visited.

Nithi Mountain.—Nithi Mountain, which is about 10 miles distant in a direction slightly south of east from the Endako mine, was the locus of exploration activity by several companies during the year. The mountain lies within the area of the Topley Intrusions, but the pink granite is unlike that west of the Stellako River, and the summit and nearby terrain is underlain by a white to pale leucogranite or alaskite.

The various claims are reached from highway No. 16 by a road that turns south a few miles east of the west end of Fraser Lake. It branches with one branch following old logging-roads and eventually leading up the west side of Nithi Mountain and another branch leading up to the east side of the mountain. It is possible with four-wheel-drive vehicles to continue down the southwest slope of the mountain and to reach the Nithi River road about 4 miles east of the east end of Francois Lake.

* By H. Bapty.

KO (12) (Julian Mining Co. Ltd.)*

(54° 124° S.W.) Company office, 1030 West Georgia Street, Vancouver 5. B. G. Gore, president; R. Macrae, engineer in charge. The KO group of 179 recorded claims lies east of the Stellako River and on the northwest slope of Nithi Mountain. It is accessible from the Stellako River road and the old " Burma " road to Nithi Mountain. Work commenced in May and was completed by November by a crew of 14 men. A magnetometer survey was conducted over 104,000 feet of line, 2,300 soil samples were taken, and 360 feet of light diamond drilling was done. The property was not visited.

Enco (13) (New Indian Mines Ltd.)

(53° 124° N.W.) Company office, 714, 789 West Pender Street, Vancouver 1. T. E. Blossom, president. The company holds the Enco group of 29 claims and 8 fractions on the west slope of Nithi Mountain. The easternmost claims are reached by the west branch of the Nithi Mountain road. From it a steep cut (used by four-wheel-drive vehicles) was bulldozed downhill to one that joins the old road to the " uranium showing." It also continues southeastward around Nithi Mountain about 500 feet below the Molly-Linda roadway. The New Indian road system eventually connects with the Nithi River road about 4 miles east of Francois Lake.

Bedrock is poorly exposed, and bulldozed trenches were used to prospect the claims. Ray Richards was in charge of the work.

The main mineralized showings are exposed by trenches on the Enco No. 1 Fraction, Enco No. 2 Fraction, and Enco No. 3 Fraction. These are rather small wedge-shaped fractions projecting into the acute angles between the Molly No. 2 and No. 4, the Molly No. 6 and No. 8, and the Molly No. 12 and No. 14 mineral claims. When the bulldozer trenching was completed, shallow cuts were blasted along altered zones and mineralized fractures were revealed in the exposed bedrock.

There were exposed several mineralized fractures on the Enco No. 1 Fraction, one of which produced an inch or more of high-grade molybdenite mineralization. The bulk of the work was done on the Enco No. 3 Fraction and Enco No. 11 claim. There, pink granite was exposed at shallow depth and rock cuts were made on narrow quartz-molybdenite veinlets in fractures striking north 20 to 40 degrees east. Some finely disseminated pyrite is present in the granite, but the degree of alteration (kaolinization and feldspathization) is slight.

No work was done on the more westerly of the Enco claims, which lie lower down the mountain slope where the depth of overburden might be expected to be significantly greater.

Molly, Pogo, Sandy (14)

(53° 124° N.W.) The Molly, Pogo, and Sandy groups are held by Andrew Robertson, of Vancouver. They lie on the western and southwestern slopes of Nithi Mountain near 4,000 feet elevation and are reached by the westerly branch of the Nithi Mountain road.

The claims are very largely underlain by a light-coloured, medium-grained, foliated granite having biotite as the sole dark mineral. The granite is cut by olive-coloured rhyolite porphyry and darker-green basaltic dykes, but in general dyke rocks are not common.

Mineralized showings are made accessible by and lie close to a road which is on the west side of Nithi Mountain, and which runs southerly through the Molly group and then swings almost due east across the Linda claims. The Molly 1 and

* By H. Bapty.

2 claims cover uranium showings described in the Minister of Mines Annual Reports for 1955, page 28, and 1956, page 28. The secondary uranium minerals are in a northerly striking westerly dipping rhyolite porphyry dyke traced on surface for more than 800 feet. Molybdenite mineralization a few inches wide occurs in the granite along the east side of the dyke in a fracture striking north 65 degrees east. On the Molly 8 mineral claim, fractures striking north 65 degrees east contain narrow quartz veinlets and fine-grained molybdenite. Farther along the road to the east two bulldozed trenches trending northwest expose an area of altered granite cut by a dark-grey fine-grained andesitic dyke. Both trenches expose small areas of disseminated molybdenite as well as quartz-filled vertical fractures striking north 60 degrees east.

Work in the early part of the season was under the supervision of R. G. Coutts and later under Sol Waisberg.

Jen, Beaver (15) (Jodee Explorations Limited)

(53° 124° N.W.) Company office, 404, 510 West Hastings Street, Vancouver 2. In 1963 the company did some exploration work on the Jen and Beaver groups of claims, adjoining the Nithi group, on the east side of Nithi Mountain. The claims extend from near the summit of Nithi Mountain down the southern slope. They are accessible from the easterly Nithi Mountain road by a roadway bulldozed west and northwest from the Dundee Mines Ltd. drill camp.

The Beaver group and Jen Nos. 1 and 2 claims near the summit of Nithi Mountain are underlain by pale-pink, fine sugary textured leucogranite or alaskite in which the feldspar has been altered to pale-green sericite. These rocks are broken by fractures striking north 65 degrees east and dipping 80 degrees north. Quartz veinlets up to half an inch wide and mineralized with specular hematite, magnetite, and rare molybdenite occupy some of the fractures. Five bulldozed and blasted trenches on these claims expose veinlets of this sort.

Six thousand feet to the south on the Jen No. 10 claim a trench in pink granite, similar to the Endako type, exposes a small showing of disseminated molybdenite associated with a northeasterly striking fracture occupied by a narrow pink aplite stringer.

Nithi (16) (Dundee Mines Limited)

(53° 124° N.W.) Company office, 19, 425 Howe Street, Vancouver 1. Ralph Sostad, president. In 1963 the company held a very large number of Nithi claims and fractions on the east side of Nithi Mountain. These claims are accessible from the more easterly of the Nithi Mountain roads, built by the company from the closest of a number of logging-roads on the north side of the mountain.

Bedrock is fairly well exposed on the highest of the Nithi claims and down on the south slope; elsewhere on the claims it is at comparatively shallow depth and the ground is amenable to bulldozer trenching.

The claims are underlain by pink sericitized granite which, at higher elevations on the Nithi No. 28 claim and to the west on the Jodee ground, is intruded(?) by a somewhat finer-grained leucogranite or alaskite. In several places grey rhyolite porphyry dykes a few feet or a few tens of feet wide intrude the granite.

Early in the season, prospecting revealed some molybdenite-bearing float on the Nithi Nos. 27 and 28 claims and others to the south. This was followed by geochemical soil-sampling over a comparatively small area. Concurrently 10,000 feet or more of bulldozer roadways and trenches were made for access and to expose bedrock. As on the western side of Nithi Mountain, the granite is fractured along a north 60 to 70 degrees east direction with the surfaces dipping 65 degrees northwest.

Fractures of this orientation are not uncommonly occupied by frozen, narrow quartz veinlets in which specular hematite is present but in which molybdenite was rarely seen.

In July diamond drilling was begun, the first hole being put down on a small showing where sparse molybdenite was disseminated through altered pink granite near a northeasterly striking fracture. A total of 2,976 feet in nine diamond-drill holes was completed. In general the core shows very little alteration and contains very little molybdenite.

Ray Richards was in charge of the work. Exploration ceased with the completion of the last hole in August.

STUART LAKE

Antimony-Gold

Snowbird (Bralorne Pioneer Mines Limited)*

(54° 124° N.W.) Company office, 320, 355 Burrard Street, Vancouver 1. F. R. Joubin, president; D. H. James, chief geologist. The Snowbird antimony property consists of 6 claims held under option and 16 recorded claims, which lie on the southwest side of Stuart Lake. Work commenced in May and was completed by August, and was done with an average crew of seven men under the direction of S. B. Fulton. A grid was cut consisting of 72,000 feet of lines at 400-foot intervals from a central base-line, and magnetometer readings were taken every 100 feet. The camp was serviced by boat and aeroplane from Fort St. James. The camp was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1929, p. C 186.]

AIKEN LAKE

Copper-Gold

Croydon*

(55° 125° S.W.) Croydon Mines Ltd.; company office, 108, 718 Granville Street, Vancouver 2. H. Hill & L. Starck & Associates Ltd., consulting engineers. This is a group of 62 recorded mineral claims under option to Rio Tinto Canadian Exploration Limited. The claims are about 8 miles west of Aiken Lake, some 50 miles north of the end of the existing highway. During 1963 some 23 miles of lines were cut, and magnetometer readings were taken every 100 feet over an area of 3,000 by 3,500 feet. This was followed by induced polarization and geochemical surveys. The work was done by a crew of 12 men under the supervision of E. Bronlund. The camp was serviced by helicopter and pack-horse from Aiken Lake.

The camp was not visited.

CARIBOO

WELLS-BARKERVILLE (53° 121° S.W.)†

Gold

Aurum (The Cariboo Gold Quartz Mining Company Limited)

Company office, 617 West Pender Street, Vancouver 2; mine office, Wells. J. Royden Morris, president; Marcel Guiget, general manager; Charles McNeil, mine superintendent; J. J. Stone, mill superintendent. Capital: increased during 1963 from 2,000,000 shares, $1 par value, to 4,000,000 shares. This company operates the Aurum mine on the east side of Island Mountain. The mine is adjacent to the community of Wells and is 51 miles by road from Quesnel.

The mine has been in production since 1934 and has been operated by the present company since 1954. It is developed from a main haulage adit at the 4,000-

* By H. Bapty.
† By W. C. Robinson.

foot level, from which a three-compartment internal shaft 1,450 feet deep is sunk. Eleven levels have been developed from the Aurum shaft.

The following is a summary of development work done during 1963:—

	Ft.
Drifting and crosscutting	5,223
Raising	595
Box-holes and sub-drifts	404
Diamond drilling	25,052
Test-holes (jackleg and ribbon steel)	13,327

A total of 34,702 tons of ore was milled, yielding 18,308 ounces of gold and 3,165 ounces of silver. An average crew of 119 men was employed.

LAC LA HACHE

TAKOMKANE MOUNTAIN (52° 120° S.W.)

Molybdenum

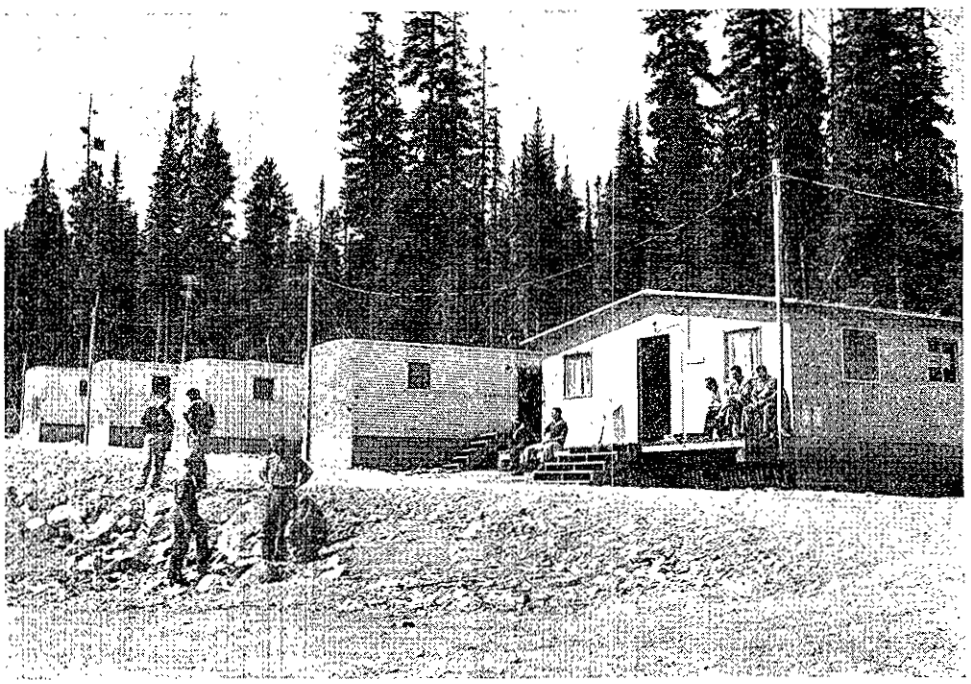
Boss Mountain (Noranda Exploration Company, Limited)*

British Columbia office, 202, 2256 West 12th Avenue, Vancouver 9; mine office, Box 247, 100 Mile House. B. O. Brynelsen, manager, Vancouver; S. G. Bruce, superintendent, Boss Mountain. The property comprises 11 Crown-granted and 135 recorded claims. The showings are at an elevation of 5,500 feet on the east side of Takomkane (Big Timothy) Mountain about 50 air miles due east of Williams Lake. The property is reached by 57 miles of road from 100 Mile House. From Eagle Creek on the north shore of Canim Lake the forest access road is followed for 22 miles to Hendryx Lake, where a permanent camp is planned, thence 6 miles to the adit site and present temporary camp.

The country rock is quartz diorite, intruded near the ore zone by a granite stock. There are felsite (quartz porphyry) and lamprophyre dykes. The ore under development is in brecciated quartz diorite. Molybdenite-bearing quartz veins which were investigated in the past are not currently receiving attention. Regional fracturing includes a dominant steep northeast set of fractures and a subsidiary northwest set. The long axis of the granite stock, which is nearly 1 mile long, trends northeast. The ore breccia and the quartz-molybdenite veins are aligned northwest. The full extent of brecciation within the quartz diorite has not been determined, largely due to the lack of exposures. The most widespread type is a rock breccia that contains no quartz. It is finely comminuted quartz diorite that is little altered.

The ore occurs in two bodies aligned about north 35 degrees west and 240 feet apart at surface. The south orebody measures about 220 feet by as much as 120 feet wide and consists of quartz breccia; that is, rock fragments cemented by quartz. The north orebody is about 500 feet long by a maximum of 140 feet wide. It consists of quartz breccia, except for the north end, which is fractured quartz diorite containing seams of molybdenite. The quartz breccia bodies are pipes, with the greatest abundance of quartz in the central parts. Alteration is marked by kaolin, sericite, and chlorite, but is not as a rule intense. There has been considerable rotation and translation within the quartz breccia pipes, as is shown by the distribution of numerous fragments of dyke rock, both felsite and lamprophyre. The southern pipe contains fragments of rock breccia and the northern one does not. The quartz-free breccia ore at the north end of the north body shows little or no rotation of the fragments.

* By M. S. Hedley.



Boss Mountain temporary camp.

Boss Mountain mine plant at adit portal. View from camp.

The breccia of the two pipes appears plainly to be explosion breccia. The more widespread quartz-free comminuted rock has no obvious pattern of occurrence, although its full extent is not known. The quartz breccia pipes are aligned northwestward, along one of the regional directions of fracturing. The plunge is steep to the northwest. The foregoing are generalizations; the distribution of molybdenite within the orebodies cannot be simply stated, and is not precisely known until underground development has progressed further.

A 10-foot lamprophyre dyke encountered underground, near the north orebody, is sheeted with quartz and molybdenite. Development was insufficient in mid-August to indicate the extent of this mineralization, but some sections were of high grade. It is understood that this occurrence is an extremely important addition to the ore reserves.

The adit driven west to the ore zone, begun in 1962, was completed, a total distance of about 6,000 feet. The southwestern end of the granite stock was crossed in this drive. The inner part of the adit passed to the northeast of the orebodies, and crosscuts were driven from it to the ore. A vertical raise was driven from the adit, elevation 5,045 feet, to surface at an elevation of 5,488 feet. No deep drilling to test the extension of ore below the adit had been done at the time of examination in mid-August.

In 1963 underground work comprised 1,980 feet of crosscutting, 1,915 feet of drifting, and 678 feet of raising. Diamond drilling from underground amounted to 23,893 feet, and from surface, 1,595 feet.

Investigations were made of a mill-site close to the adit portal. Preparations were made for a camp-site at Hendryx Lake. Geochemical investigations were carried out on surface.

During 1963 an average crew of 30 men was employed.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1956, pp. 34–35; 1957, pp. 18–22; 1961, pp. 21–22; 1962, pp. 20–21; Stevenson, J. S., *B.C. Dept. of Mines,* Bull. 9, 1940.]

LILLOOET

Bridge River (50° 122° N.W.)

Gold

Bralorne Pioneer Mines Limited*

Company office, 355 Burrard Street, Vancouver 1; mine office, Bralorne. G. H. Davenport, president; C. M. Campbell, Jr., resident manager; J. P. Weeks, mine superintendent; E. H. Hall, mill superintendent; A. J. Learmonth, plant superintendent. This company operates the Bralorne mine on Cadwallader Creek. It is reached by 51 miles of road from Shalalth or 75 miles from Lillooet, both stations on the Pacific Great Eastern Railway. Development of the surface showings began about 1898, and production has been continuous since 1931. The property was described in some detail in the 1958 Annual Report.

The workings are approached by a main haulage adit on the No. 8 level. There are three internal shafts: the Crown shaft, approximately 2,600 feet deep from No. 8 to No. 26 level; the Empire shaft, approximately 3,280 feet deep from No. 3 to No. 26 level; the Queen shaft, 2,300 feet deep from No. 26 to No. 41 level. The major portion of present production is by the cut-and-fill method. Most of the stopes are sand-filled with mill tailings, which are piped into the mine. The ore is hoisted in the Queen shaft to No. 26 level and is then hauled by battery locomotive to the Crown shaft, hoisted to No. 8 level, the main haulage level of the mine,

* By W. C. Robinson.

and hauled by trolley locomotive to the mill. The ore is treated in a 600-ton cyanide mill. In 1963, 152,601 tons of ore was milled, yielding 87,016 ounces of gold.

A summary of development work done in 1963 is given below:—

	Ft.
Drifting	5,824
Crosscutting	2,137
Raising	1,673
Diamond drilling	15,969

A major problem is created at this operation by high rock temperatures in the deeper workings of the mine. Rock temperatures reach 108 degrees, and an ample air flow is required to maintain reasonable working conditions. Insulated ventilation pipe was used, successfully, during the year to deliver relatively cool air to development headings where an acute heat problem existed.

The number of employees was 341, of whom 234 were underground.

Tyaughton Creek (51° 122° S.W.)

Mercury

Dot (Silverquick Development Co. (B.C.) Ltd.)*

Company office, 325, 1155 West Georgia Street, Vancouver 5; mine address, Gold Bridge. Robert E. Woods, president. The company holds a group of claims between Tyaughton Creek and Taylor Creek. The showings on this property contain cinnabar mineralization. Work in 1963 was carried out by a crew of five men under the direction of Bruce Buck. The work included camp construction and mining and stockpiling of material containing cinnabar. It has been reported that one load of this material was trucked approximately 23 miles to a proposed mill-site on Tyaughton Lake before work was suspended for the winter. It has been indicated that plans are to install a Gould rotary furnace capable of treating 10 to 15 tons per day. Initial plant construction began during November. Access to Tyaughton Lake is by 3 miles of road from the Bridge River road.

Anderson Lake

Gold-Silver

Barkley Valley Mines Ltd.*

(50° 122° S.E.) Office, 736 Granville Street, Vancouver 2. Thomas Barkley, president; Harvey Cohen, consulting engineer. This company holds the Gladys No. 1, Gladys No. 2, and Nita groups of located claims, totalling 14 claims, on Haylmore, Lawlawton, and Crystal Creeks, about 15 miles by road southeast of D'Arcy station on the Pacific Great Eastern Railway. Work on the property commenced on June 3rd and was suspended on September 29th. Approximately 1½ miles of trail was constructed. Four holes, averaging about 50 feet long, were diamond drilled and an adit was driven 50 feet. A crew of three men was employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1962, p. 28.]

Lytton

Copper

Rocky, Tom, Nav (Lytton Minerals Limited)†

(50° 121° S.E.) Company office, 624 Howe Street, Vancouver 1. E. Koblanski, president; D. W. Asbury, geologist in charge. This newly formed company is controlled jointly by Macacona Minerals Ltd. and The Patiño Mining Corporation Ltd. It holds 113 claims and fractional claims by record,

* By W. C. Robinson.
† By J. M. Carr.

mainly in the Rocky, Tom, and Nav groups, on the south slopes of the Scarped Range, near Pitquah on the north side of the Thompson River. The property extends westward from Shushten Creek to within about 1 mile of Botanie Creek and covers dry, rugged terrain ranging from river-level at about 500 feet to elevations of as much as 4,600 feet.

Showings in the eastern part of the property are known as the Pop zone and are best reached from a point on the Trans-Canada Highway about 8 miles east of Lytton, by means of a foot- bridge across the Thompson River to Mile 89 on the Canadian National Railway and thence westward along the railway right-of-way for a distance of 1 mile to the start of newly constructed roads at the mouth of Shushten Creek. A jeep-road about 2¼ miles in length leads to the eastern showings, which are west of Shushten Creek at an elevation of about 2,600 feet. Other showings on the property lie as much as 1 mile to the northwest of the Pop zone and include showings on the Tom group discovered earlier by Tom Curnow, of Spences Bridge. They are best reached by ascending a creek west of the railway tunnel at Mile 93 and are reported to lie at scattered locations which range in elevation from 2,500 to 3,500 feet. They were not visited by the writer.

Work in 1963 was directed by The Patiño Mining Corporation Ltd. and employed a maximum crew of 10 men from June onward. It included 4½ miles of road construction, prospecting, geological mapping of the whole property, and detailed mapping of the Pop zone, which was sampled by means of eight trenches at intervals along a length of 1,800 feet. Lesser amounts of trenching and sampling were done on other showings. Diamond drilling of the Pop zone began in December and by year-end totalled 679 feet.

The property is mostly underlain by a thick series of banded plutonic rocks which are mainly light-coloured anorthosites and dark-coloured gabbroic rocks (eucrites). These rocks dip northeastward at moderate angles and may be part of a large layered intrusion whose full extent is unknown. The banded rocks are cut by numerous dykes of andesite, some of which post-date the sulphide mineralization, as well as by a few sheets of intrusion breccia and, near Shushten Creek, by a body of quartz diorite. Near the northern limit of the property they are overlain by Lower Cretaceous volcanic rocks of the Spences Bridge Group.

Showings in the Pop zone are on a steep south-facing slope and occur in dark, fractured gabbroic rocks which underlie anorthosites. The western limit of the exposures is beneath a prominent bluff, beyond which a rockslide extends for as much as 1,700 feet along the westerly strike of the rocks. Eastward there are showings intermittently for nearly 2,000 feet along the strike, and chalcopyrite is disseminated in some of them across widths of as much as 100 feet.

MARTEL

Copper

Dora Kay (Northwest Ventures Ltd.)*

(50° 121° S.E.) Company office, 718, 355 Burrard Street, Vancouver 1. T. J. McQuillan, manager. This property consists of 64 claims, including the Dora Kay showings on the east side of the Thompson River about 7 miles northeast of Spences Bridge. Access is by a narrow road which leaves No. 8 highway just northeast of the Nicola River bridge and follows the east bank of the Thompson River. A branch road leads up Pimainus Creek valley for 2 miles and then climbs rapidly to the main camp, which is on the brow of the hill overlooking the Thompson and Spences Bridge. In 1963, 385 feet of drifting and cross-

* By David Smith.

cutting was done under contract in a mineralized zone. A crew of six men was employed under the direction of K. G. Sanders.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, p. 29.]

Copper-Iron

Spatsum (Alscope Consolidated Ltd.)*

(50° 121° N.E.) Company office, 549 Howe Street, Vancouver 1. N. Martini, president; V. M. Prescott, secretary-treasurer; Chapman, Wood and Griswold Ltd., consulting engineers. This company holds a large number of claims on either side of the Thompson River near Spatsum, including newly located groups on the west side.

Work in 1963 included completion of a vertical diamond-drill hole on the east side of the river to a depth of 564 feet. The hole ended in diorite containing occasional minor concentrations of magnetite and some gougy faults.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, p. 45.]

HIGHLAND VALLEY

Copper

Trojan (South Seas Mining Limited)*

(50° 120° N.W.) Company office, 390 West Hastings Street, Vancouver 3. R. E. Signorello, president; A. R. Allen, consulting geologist. By an agreement made early in 1963 with Trojan Consolidated Mines Ltd., this company controls 57 claims, 24 of which are Crown granted, to the north and east of the south peak of Forge Mountain, about 30 miles by road from Ashcroft. The Trojan mine, where most work on the property has been done, is about 3 miles to the north of the Bethlehem open pit and consists of a shaft completed in 1957 and workings on a level at 150 feet depth. The shaft is in the west wall of a mineralized breccia pipe that is as much as 1,500 feet long from north to south and in places nearly 900 feet wide. Work to 1962 explored chiefly a well-mineralized zone in breccia near the shaft, the rest of the breccia pipe being tested by widely spaced, inclined surface diamond-drill holes.

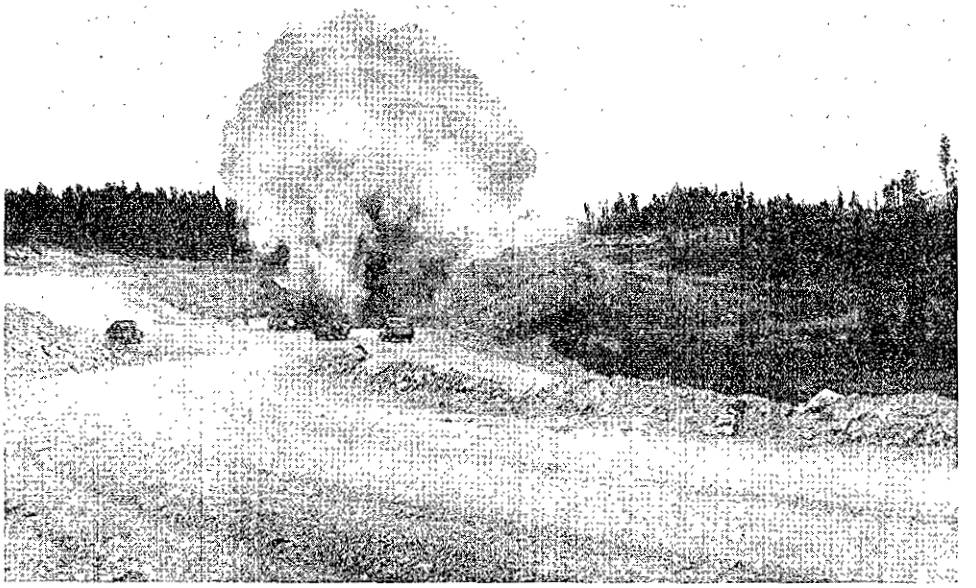
Work by the company in 1963 included 960 feet of crosscutting and 380 feet of drifting and was done by a crew of 23 supervised by Arpad Fustos. A caved east crosscut was cleaned out and extended to the east wall of the breccia pipe, and north and south drifts were made in breccia near the east wall. Muck and face samples taken for assay throughout the new workings confirmed the existence of wide sections of material containing sub-commercial amounts of copper.

[References: *Minister of Mines, B.C.*, Ann. Repts. 1956, pp. 43–44; 1957, pp. 24–26; 1958, p. 21; 1959, p. 29; 1961, p. 30; 1962, p. 47.]

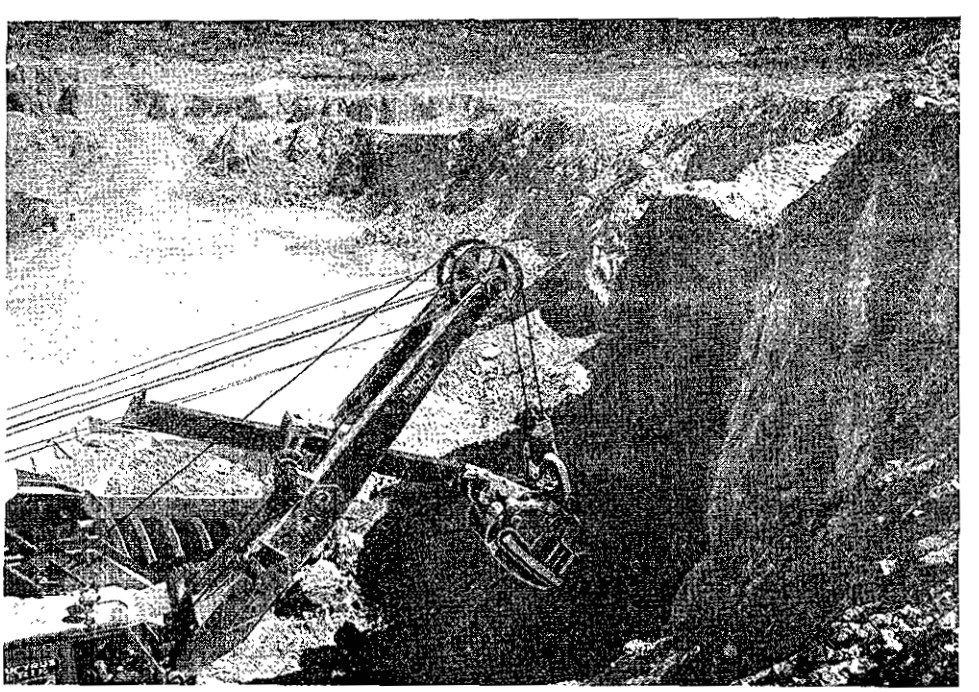
Dave (Huestis Mining Corporation Ltd.)*

(50° 120° N.W.) Company office, 1818, 355 Burrard Street, Vancouver 1. H. H. Huestis, president; P. M. Reynolds, secretary-treasurer. This company, in which The Consolidated Mining and Smelting Company of Canada, Limited, has an interest, holds about 60 claims in the Dave group north of the Bethlehem property. In 1963 work included geochemical and magnetometer surveying, an induced polarization survey by Hunting Survey Corporation, and 1,876 feet of diamond drilling in six holes, of which two did not reach bedrock. Frank Cooke was in charge of the work and B. Chaplin was geologist on the property. Hole No. 3 was drilled westward under a trench near the road

* By J. M. Carr.



Bethlehem Copper Corporation Ltd. Blast at East Jersey open pit.



East Jersey open pit. Note steepness of blasted face.

south of Bose Lake and intersected a chloritic fault exposed with northerly strike in the trench. Holes No. 1 and No. 2 were drilled toward one another under a creek about 1,000 feet farther east, and they also intersected a fault. Small amounts of bornite and chalcopyrite were exposed in the trench and were intersected in all three holes. Hole No. 6 was drilled eastward near the northwest side of Bose Lake, and its core was not seen by the writer.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, p. 47.]

Bethlehem Copper Corporation Ltd.*

(50° 120° S.W.) Company office, 1825, 355 Burrard Street, Vancouver 1; mine office, Box 520, Ashcroft. H. H. Huestis, president; D. W. Pringle, manager; C. J. Coveney, production superintendent; R. G. Blundell, mill superintendent. Access to the property is by about 30 miles of paved road from Ashcroft. This company holds 56 Crown-granted and 106 recorded claims and fractions, immediately east of Quiltanton (Divide) Lake.

Following the tune-up period of the mill, which commenced in December, 1962, the property was officially declared open on February 1, 1963. The plant, with a rated capacity of 3,500 tons per day, commenced treating about 2,500 tons of ore per day. Subsequently the tonnage was increased, and at the end of 1963 an average of between 3,900 and 4,000 tons per day was being treated. Additions to the plant in 1963 included a tertiary 4-foot cone crusher, which handles a scalped feed from the secondary crusher discharge to the fine-ore bin and returns the crushed product to the fine-ore bin. An additional circuit was being added to the mill, and when completed a molybdenum concentrate will be recovered. Concentrates are handled by truck and unloaded at the Vancouver Wharves in North Vancouver. Concentrate produced in 1963 totalled 29,631 tons.

Mining of the East Jersey open pit was under contract. In 1963 production from the East Jersey zone pit was 3,446,880 tons of waste, 882,950 tons of marginal ore, 80,410 tons of molybdenum-bearing ore, and 1,265,988 tons of ore. The Jersey zone was cleared on surface, boundaries were established, and roads were built to the new waste-dump area.

Additional equipment placed in service in the pit in 1963 included a 4½-yard shovel, four 27-ton Euclid trucks, and a rotary drill using 9-inch bits. There has been no work underground.

In 1963 the number of persons employed was 131—71 employed by the company and 60 employed by the contractors. No housing is provided at the property, employees commuting to Ashcroft.

Other work done on the property in 1963 consisted of further exploration on known ore zones. Two holes were diamond drilled on the Spud Lake zone, totalling 800 feet. An additional 1,180 feet of diamond drilling was done on the East Jersey zone.

Bethsaida, Tom (The Buttle Lake Mining Company Limited)†

(50° 121° S.E.) Company office, 1121, 355 Burrard Street, Vancouver 1. H. H. Huestis, president. This company holds a large number of recorded claims in the Tom group at Calling Lake and also holds by option the adjoining property of Bethsaida Copper Mines Limited together with the Empire claim and the Kathleen Crown-granted claim. The Tom group adjoins the western boundary of the Noranda property and is partly a

* By David Smith.
† By J. M. Carr.

relocation of the Nancy and Terry groups, on which trenching was done in 1956 by Laco Mines Limited.

Work on the Tom group was done by a small crew under T. E. Lisle and included geological mapping and magnetometer surveying. Geological mapping of the Bethsaida property was done by J. Sullivan.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1956, p. 45.]

Noranda Exploration Company, Limited*

(50° 121° S.E.) Company office, 202, 2256 West 12th Avenue, Vancouver 9. In 1963 this company acquired 342 claims, partly by option from E. H. Lorntzen, south of Highland Valley between the O.K. mine and Pimainus Lake on the west and the Gnawed Mountain area on the east. The property includes former parts of the Bethsaida, Cadamet, and Jericho properties. It is covered widely by superficial deposits and is underlain chiefly by Bethsaida granodiorite of the Guichon batholith.

Work was done by a crew of six men directed by B. Botel and D. Pegg under the supervision of A. Burton. It included rebuilding a road between Calling and Pimainus Lakes and making a new road parallel to this one and farther to the east. It also included geological, geochemical, and geophysical surveying, making pits and trenches, and diamond drilling a single hole 500 feet in length.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1958, p. 24; 1959, p. 30.]

Sheba, Highmont, Minex, B.X. (The Anaconda Company (Canada) Ltd.)*

(50° 120° S.W.) Company office, Britannia Beach. Glenn C. Waterman, assistant vice-president and chief geologist. Late in the summer this company optioned about 157 claims on the south side of Highland Valley in a single block extending southward from the Bethlehem property as far as Roscoe Lake and including, from north to south, the Sheba property, which is controlled by Peel Resources Limited (company office, 408, 580 Granville Street, Vancouver 2), the Highmont property, owned by Torwest Resources (1962) Ltd. (company office, 404, 409 West Hastings Street, Vancouver 3), and two properties owned by Minex Development Ltd. (company office, 310, 850 West Hastings Street, Vancouver 1)and B.X. Mining Company Limited (company office, 1500, 355 Burrard Street, Vancouver 1), respectively. Work by the Anaconda Company included both reconnaissance and detailed geological mapping and some induced polarization surveying. Minex Development Ltd., on its own, diamond drilled four holes totalling about 1,500 feet, partly on the A.M. No. 10 and No. 12 claims and partly on the A.M. fractional claim, where stripping was done in 1962. Core from the two holes on the fractional claim showed copper mineralization in silicified quartz diorite and granodiorite porphyry.

[References: *Minister of Mines, B.C.*, Ann. Repts. 1957, p. 27; 1962, pp. 49–50.]

Jericho Mines Ltd.†

(50° 120° S.W.) Company office, 1531 Davie Street, Vancouver 5. Hamlin B. Hatch, secretary-treasurer. This company holds 157 claims south of Witches Brook, about 7 miles east of Quiltanton (Divide) Lake. The Jericho camp lies on the Witches Brook road about 8 miles west of Guichon Creek. In 1963 magnetometer and geochemical surveys were carried out over 40 claims. Trenching and stripping were

* By J. M. Carr.
† By David Smith.

done with a bulldozer, and some diamond drilling was done. An adit, to be driven by contractors a distance of 500 feet, had been collared and was 50 feet long at the end of 1963. A crew of 12 men was employed under the direction of Mr. Hatch.

GUICHON CREEK

Copper

P.G. (Noranda Exploration Company, Limited)*

(50° 120° N.W.) Company office, 202, 2256 West 12th Avenue, Vancouver 9. This company holds 99 recorded claims in the P.G. group along and mainly west of Guichon Creek to the north of Witches Brook. The property is partly a relocation of the Fran and Giselle claims held by Deer Horne Mines Limited in 1956 and on which Rio Canadian Exploration Ltd. (now Rio Tinto Canadian Exploration Limited) then did geological and geochemical work. Much of the property is drift covered and is at least partly underlain by older and younger quartz diorites of the Guichon batholith.

In 1963 work was carried out intermittently during the summer by a small crew under A. Burton and consisted of geological, geochemical, and geophysical surveys.

WDR*

(50° 120° N.W.) This group of 68 recorded claims is held by W. D. Rorison and associates and extends north-northwestward mainly between Forge and Guichon Creeks. Access to the northern part of the property is from the Rorison ranch on the Savona–Mamit Lake road about 5½ miles north of the Highland Valley turn-off. The property is largely drift covered and is at least partly underlain by the older quartz diorite of the Guichon batholith. Work in 1963 included road-building and bulldozer trenching at a number of localities scattered at intervals throughout a distance of nearly 4 miles in a north-northwesterly direction. Chalcopyrite is reported to have been uncovered in some of the new trenches in the northern part of the property.

BROOM CREEK

Copper

Chataway (Chataway Exploration Co. Ltd.)*

(50° 120° S.W.) Company office, 1926 Ogden Avenue, Vancouver 9. S. W. Wright, president. This company holds 211 recorded claims in a large block extending from Roscoe and Antler Lakes southward nearly to Broom Creek. The property is accessible by 5 miles of jeep-road leading from the Aberdeen mine on Broom Creek to a recently constructed camp at Dot Lake and thence by branch roads to other parts of the property. Since 1956 the company and its predecessor, Chataway Mining Syndicate, have explored the property by prospecting, soil-testing, bulldozer trenching, and limited diamond drilling. In 1963 work included geological mapping of most of the property by K. C. McTaggart, trenching, and 3,047 feet of diamond drilling, as well as soil-testing, surveying, and magnetic surveying on 40 claims in the southeastern part of the property. As many as seven men were employed under the direction of S. W. Wright.

The property is largely drift covered and is underlain by rocks of the Guichon batholith, which are mainly Bethsaida-type granodiorite in the southwestern part and varieties of the older and younger quartz diorites elsewhere on the property. Quartz porphyry float is abundant between Dot and Chataway Lakes, and a differ-

* By J. M. Carr.

ent variety of quartz porphyry is exposed as dykes in the northwestern part of the property.

The main showings in the southern part of the property are east of Chataway Creek on the SHO No. 11 claim, which is about 1,000 feet north of the road to Twin Lakes. On this claim widely spaced lenses and seams of oxidized copper mineralization are exposed by stripping and occur in older quartz diorite which is partly altered to a brownish colour. Nearby the rock is cut by younger quartz diorite dykes and northerly faults, which are not conspicuously mineralized. Six holes totalling 1,835 feet were drilled near this showing.

Most of the showings in the northern part of the property are between Roscoe and Chataway Lakes and occur variously in older quartz diorite that is cut by younger quartz diorite or porphyry dykes, and in younger quartz diorite cut by porphyry dykes. The mineralized rocks are fractured and faulted, argillized, silicified, and rusty. The exposed mineralization is low grade and consists chiefly of fracture fillings and disseminations of specular hematite, chalcopyrite, and bornite, which are partly oxidized to copper carbonates and chalcocite. Extensive trenching has been done on and near the Jay No. 1 claim, which is about 1 mile west of the south end of Chataway Lake. Two inclined holes, each 75 feet long, were drilled prior to 1963 and failed to reach the altered zone exposed on the claim. In 1963 a further 854 feet of drilling was done in two or more holes at this showing and is reported partly to have intersected mineralization. One hundred and fifty-eight feet of drilling was done farther north on the Bob No. 8 claim, where there are mineralized exposures of quartz porphyry that is similar in type to porphyry found at the Bethlehem mine and at other major prospects in Highland Valley. On the WIZ No. 3 claim south of Dot Lake, a single hole 200 feet in length was drilled.

[Reference: *Minister of Mines.*, Ann. Rept., 1962, p. 50.]

Copper

Rich (R. & P. Metals Corporation Limited)*

(50° 120° S.W.) Western office, 1218 Burrard Building, Vancouver 5. A Robertson, president. This group of 12 recorded claims lies on Broom Creek to the north of the Aberdeen mine. In 1963 five AX diamond-drill holes were drilled, totalling 1,471 feet. A crew of four men was employed under the supervision of B. A. Nekrasov.

MERRITT

Copper

Laron (Tormont Mines Limited)*

(50° 120° S.W.) Western office, 1218, 1030 West Georgia Street, Vancouver 5. A Robertson, president. This company holds 30 claims in the Laron group adjoining the northeast border of the Craigmont property. Access is by the Aberdeen road and through the Craigmont property. In 1963 three holes were diamond drilled, totalling 3,744 feet. A crew of five men was employed under the direction of B. A. Nekrasov.

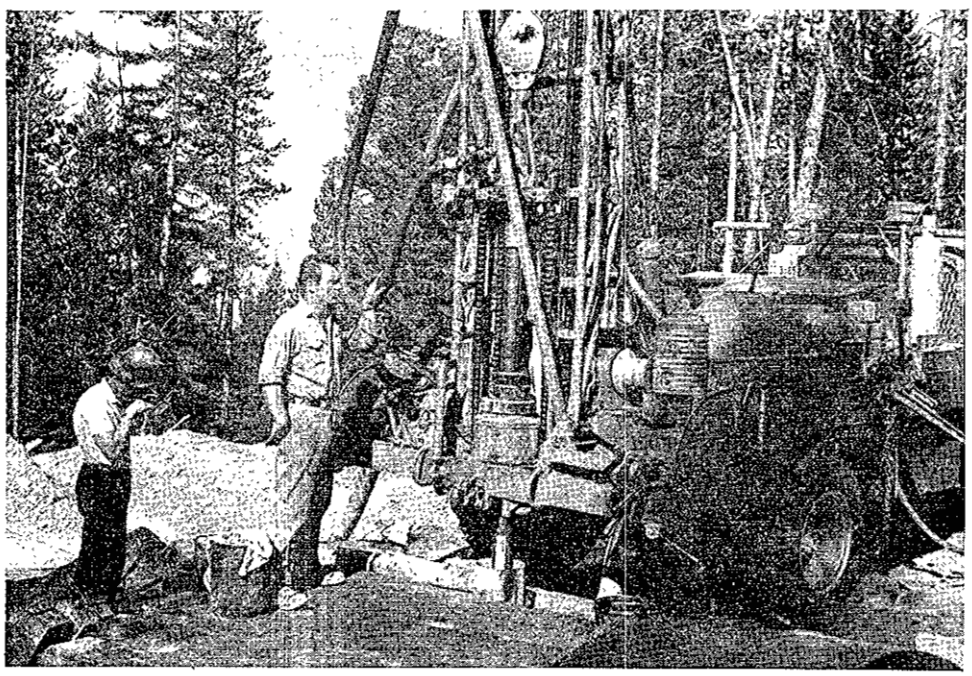
Copper-Iron

Craigmont Mines Limited*

(50° 120° S.W.) Company office, 700, 1030 West Georgia Street, Vancouver 5; mine office, Box 3000, Merritt. J. D. Simpson, president; R. G. Duthie, mine manager. This company holds 107 mineral claims and fractions, of which

* By David Smith.

Craigmont open pit, August, 1963. The final benches are 66 feet high.



Craigmont Mines Limited. Rotary drilling for geological information on Promontory Hills.

22 claims and fractions are held in 10 separate leases. The Craigmont orebodies are on the Merrell Nos. 7 and 8 claims and McLeod Nos. 5 and 6 claims and are between the forks of Birkett Creek at original surface elevations between 3,800 and 4,200 feet. Access to the property is by road north from Lower Nicola on No. 8 highway 5 miles west of Merritt.

Mining and milling was continuous throughout 1963. Production was mainly from the open pit. Underground development was speeded up, and a small tonnage of ore from underground was milled. Most of the concentrate was shipped to Japan, and the remainder was shipped to the American Smelting and Refining Co. smelter at Tacoma, Wash. The iron content of the ore was impounded with the tailings. In 1963 material moved in the open pit by contractors measured 896,100 cubic yards, including glacial till and waste rock. An additional 12,580,900 tons of material, including glacial till, waste rock, and stockpiled ore, was moved by the company which also mined 1,652,600 tons of open-pit ore. Underground work was continued on three levels and is summarized as follows:—

Development—	Ft.
Lateral development	7,142
Raising	4,575
Shaft sinking	738

Ore production—	Tons
Cut-and-fill stopes	12,700
Blast-hole stope	54,600
Development	39,000

Diamond drilling was continued underground and on the surface.

The internal service shaft connecting the 2400 level and the 3000 level was completed and equipped with friction-type hoisting. Installation of the primary crusher, of 550 tons per hour capacity, serving the underground and situated at the portal of the 2400 level, has been completed. The conveyor carrying the crushed ore from the crusher to the coarse-ore stacker was completed. Additions to the open pit included six new 27-ton trucks and a 4-yard electric shovel.

In 1963 the number of persons employed was 533. No housing is provided on the property, and the crews commute from Merritt, a distance of approximately 8 miles.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1959, pp. 31–34; 1960, pp. 35–40; 1961, pp. 31–37; 1962, pp. 52–53.]

Copper

Tom (Peel Resources Limited)*

(50° 120° S.W.) Company office, 230 West Broadway, Vancouver 10. N. H. McDiarmid, president. This company holds the Tom group of about 11 claims, which are high on the southern slope of Promontory Hills adjoining the road to the lookout. No work is reported for 1963, but in 1962 an induced polarization survey was done on contract and at least one diamond-drill hole was completed. This hole was drilled to 711 feet at minus 45 degrees northward and intersected greywacke, tuff, and rarely limestone belonging to the Nicola Group. The beds are partly strongly faulted, and the core commonly contains disseminations and fracture fillings of pyrite.

* By J. M. Carr.

Har, Mid, etc. (Mid-West Copper & Uranium Mines Ltd.)*

(50° 120° S.W.) Company office, 535 Howe Street, Vancouver 1. G. S. Shaw, president. This company holds 38 claims in four groups south of the Craigmont mine. These are the Har, Mid, AR, and ARH groups. In 1963 work done consisted of magnetic and geochemical surveys and two diamond-drill holes totalling 592 feet. A crew of six men was employed under the direction of B. R. Richards.

Wade, Sarg, Major (General Resources Ltd.)†

(50° 120° S.W.) Company office, 213, 678 Howe Street, Vancouver 1. E. M. Olts, president; R. B. Stokes, senior engineer. This company holds 96 claims in the Wade, Sarg, and Major groups on the southwestern slopes of Promontory Hills immediately north of Highway No. 8. In 1963 a vertical diamond-drill hole begun in 1962 on an induced polarization anomaly on the Wade No. 7 claim was lengthened to 1,003 feet. The hole was in overburden to bedrock at 177 feet and thence in a light-coloured Kingsvale andesite dyke to 230 feet. From 230 to 428 feet it was partly in limestone containing disseminated pyrite and minor amounts of chalcopyrite and partly in similar unmineralized andesite rock. From 428 feet to its end the hole was mostly in Nicola volcanic and tuffaceous strata containing scarce pyrite, pyrrhotite, and chalcopyrite. Between 816 and 894 feet it was in slightly mineralized limestone.

Justice (The Consolidated Mining and Smelting Company of Canada, Limited)†

(50° 120° S.W.) This group of about 55 claims is mainly north and west of Jesse Creek, about 4 miles north of Merritt, and is owned by Vanmetals Exploration Limited (company office, 213, 678 Howe Street, Vancouver 1). In 1963 the property was optioned by The Consolidated Mining and Smelting Company of Canada, Limited, which diamond drilled four holes totalling about 2,000 feet. The property is largely underlain by quartz monzonite similar to younger phases of the nearby Guichon batholith. The drilled area contains a large induced polarization anomaly and is underlain partly by dacite porphyry, intrusive breccia, and diorite bodies which intrude the quartz monzonite. Holes Nos. 1 and 2 were drilled one-quarter of a mile apart and intersected rock containing disseminated pyrite partly with small amounts of chalcopyrite. Holes Nos. 3 and 4, drilled about one-half mile south of the northernmost hole (No. 2), intersected sheared, faulted, and somewhat pyritized volcanic rocks on the south side of the quartz monzonite body. G. M. Gibson was geologist in charge of the work.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, pp. 55–56.]

Rye, Jesse, Jack (Earlcrest Resources Ltd.)†

(50° 120° S.W.) Company office, 213, 678 Howe Street, Vancouver 1. E. M. Olts, president. This company holds about 20 claims in the Rye, Jesse, and Jack groups adjoining the northern boundary of the Justice group about 5 miles north of Merritt. Access is through the Justice group by a road 5 miles long from the Mamit Lake road. Work was done by a crew of four under R. B. Stokes and included magnetometer surveying and bulldozer trenching on the Rye group near the Indian reserve boundary. In the trenches, quartz monzonite of the same type as on the Justice group is fractured and locally mineralized

* By David Smith.
† By J. M. Carr.

with chalcopyrite, malachite, specular hematite, and pyrite near a steep fault that strikes west-northwestward.

Magna Copper, Ranch*

(50° 120° S.W.) Twelve claims in the Magna Copper group and seven claims in the adjoining Ranch group are owned by H. P. Thorton and associates and J. A. Hext, of Route 2, Oliver, respectively. They adjoin the Jesse group on the east side of Jesse Creek. Seven diamond-drill holes, ranging in length from 38 to 86 feet, were drilled on the Magna Copper group, and one hole 74 feet long was drilled farther east, on the Ranch group. It is reported that copper mineralization was intersected in six of the holes drilled on the Magna Copper claims. An examination of specimens of core from the hole drilled on the Ranch group showed small amounts of partly oxidized copper mineralization in one of the specimens. The hole was drilled in Nicola tuffs showing a moderate degree of alteration accompanied generally by small amounts of pyrite.

Copper-Iron

Judy*

(50° 120° S.W.) This group of about 40 claims, owned by M. D. Merrell and associates, of Merritt, is on the southwest slopes of Iron Mountain. Stripping additional to that reported in 1961 has been done in a zone of specular hematite and chalcopyrite mineralization in Nicola tuffs, which are shattered and mineralized adjacent to inferred northeast-trending faults. In new trenches near an old inclined shaft on the lower southwestern slopes of the mountain, hematite and chalcopyrite are developed where shears cut massive limestone and adjacent tuff beds.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1961, pp. 43–45.]

CANFORD

Copper

Copper Canyon (Hurley River Mines Ltd.)†

(50° 121° S.E.) Company office, P.O. Box 335, Bralorne. P. Polischuk, president; W. A. McLelland, vice-president and secretary. The property consists of 54 recorded mineral claims and fractions in the Copper Canyon, Eagle, and P.J.H. groups situated on the east slope of Mimenuh Mountain, which is 10 miles west-northwest of the village of Canford on the Nicola River. It is reached by jeep-road from Canford.

The claims are underlain by Lower Cretaceous Kingsvale volcanic rocks. On Copper Canyon No. 2 mineral claim, at about 5,000 feet elevation, the volcanics are intruded by a stock of porphyritic diorite which limited prospecting indicates to be about 700 feet long by 300 feet wide with the longer dimension lying nearly north-south. The rock type is described in Geological Survey of Canada Memoir 262, page 85.

Mineralization consists of chalcopyrite and bornite with minor pyrite in fine fractures in the porphyritic diorite. The mineralization appears to be confined to the diorite.

In 1963 work done consisted of magnetic surveys, geochemical surveys, trenching, and road-building. A total of 4,479 feet of diamond drilling was carried out in 1963. An average crew of five men was employed under the direction of B. R. Richards and W. A. McClelland.

* By J. M. Carr.
† By N. D. McKechnie.

NICOLA

Copper

Copperado (Toluma Mining and Development Co. Ltd.)*

(50° 120° S.W.) Head office, 1040 West Georgia Street, Vancouver 5. Mine office, Box 849, Merritt. W. B. Montgomery, general manager. The property consists of 60 claims held by record and the Turlite Crown-granted claim. The property is 4½ miles by road north of Nicola at an elevation of between 3,500 and 4,500 feet. Work done in 1963 consisted of a geochemical survey and geological mapping.

Gold-Silver

Quilchena (Guichon Mines Limited)*

(50° 120° S.W.) The property is controlled by Quilchena Mining and Development Co. Ltd., 201, 901 Jervis Street, Vancouver 5. It comprises 7 Crown-granted mineral claims held by lease agreement with Quichon Mines Limited, a mineral lease covering 12 former Crown-granted claims, and 55 claims held by record, all on the west side of Quilchena Creek and south of Nicola Lake. A road leads about 1 mile from the Nicola–Kamloops highway to the workings. Work done in 1963 consisted of geological mapping and sampling. A crew of two men was employed under the direction of P. Schutz.

ASPEN GROVE

Copper

Georgi†

(50° 120° S.W.) This group of four mineral claims is held by record in the name of F. A. McGowan, Merritt, and is half a mile southwest of Garcia Lake, 8 miles southeast of Merritt. The only mineral showing consists of a shear in fine-grained Nicola volcanic rocks. The shear is 4 feet wide, strikes north 85 degrees east, and dips 55 degrees southward, and is exposed in an old shaft about 8 feet deep. The footwall of the shear is a reddish fine-grained rock which may be tuffaceous; limy tuff is exposed in outcrops south of the shaft. The hangingwall is a highly siliceous rock now composed of white and grey quartz. The grey quartz shows, in places, faint outlines, which suggest that the rock may be a silicified fragmental.

Mineralization consists of barren quartz in the shear and scattered malachite and azurite in the hangingwall. A few specks of yellow metallic mineral, too small to identify, were seen in the hangingwall. No sulphides were seen in the footwall rocks.

Neither the shear nor the wallrocks appear to cross a shallow north-south depression which lies immediately west of the shaft. To the east there are no outcrops.

Porcupine (Amalgamated Resources Ltd.)†

(50° 120° S.W.) Company office, Box 466, Lillooet. The Porcupine group comprises 36 recorded mineral claims situated on the east side of the Princeton–Merritt highway one-half mile north of Corbett Lake. The property is underlain by Upper Triassic Nicola flows and pyroclastics, and to the northeast by Miocene Coldwater sediments. The mineralization is in Nicola rocks and is exposed in and near an old inclined shaft on the Porcupine No. 1 mineral claim about 4,500 feet east of the highway. The bottom of the shaft is filled with rubble, but the depth is believed to be about 50 feet.

* By David Smith.
† By N. D. McKechnie.

The shaft is sunk on a band of dark-grey amygdaloidal basalt, extensively altered to chlorite and carbonate. The basalt strikes north 50 degrees east and dips 45 degrees southeastward. It is overlain by red tuffs.

Mineralization appears to be confined to the basalt and consists of disseminated chalcocite, chalcopyrite, bornite, and native copper, and the secondary copper minerals malachite, azurite, and cuprite. The basalt also contains finely disseminated specular hematite which in hand specimen may be mistaken for chalcocite and vice-versa. The basalt shows some fracturing, but no direct relationship was recognized between this fracturing and the mineralization.

A grab sample made up of five basalt specimens taken at random in and near the shaft assayed 1.73 per cent copper. No chalcopyrite, bornite, or native copper was recognized in these specimens.

Work done in 1963 comprised 410 feet of diamond drilling in six holes in the vicinity of the shaft, and a spontaneous polarization survey of the shaft area. Two men were employed under the direction of Sherwin F. Kelley.

Robin (Utica Mines Ltd.)*

(49° 120° N.W.) Head office, 1218, 1030 West Georgia Street, Vancouver 5. G. L. Mill, president; Boris A. Nekrasov, consulting geologist. The group consists of 50 claims held by record and is situated at the confluence of Pothole and Quilchena Creeks. The northwestern half of the group is underlain by Miocene valley basalts, the remainder of basaltic lavas of the Upper Triassic Nicola Group.

Trenches in an area south of Quilchena Creek expose a dark amygdaloidal basalt with epidote amygdules separated from tuffs by an unmineralized fault. The fault strikes north 20 degrees west and is nearly vertical. Another unmineralized fault 10 feet wide is exposed cutting the basalt, striking north 60 degrees east and dipping 88 degrees southeast.

Two mineralized faults, strike north 80 degrees east, dip 75 degrees south and strike north, dip 85 degrees west, each about 2 feet wide, are exposed in the basalt. They show malachite, specular hematite, and very minor chalcopyrite.

Work in 1963 consisted of stripping and trenching and a geological survey. A crew of three men was employed under the direction of B. A. Nekrasov.

Pay (Payco Mines Ltd.)*

(49° 120° N.W.) Head office, 2117 West Fourth Avenue, Vancouver 9. William Swanson, president; Sherwin F. Kelley, project manager. This company holds by record the Pay group of 40 claims surrounding Alleyne Lake, 3 miles southeast of Aspen Grove. The property is reached by a narrow road which turns north from the Kentucky Lake road about 2½ miles east of the Princeton–Merritt highway.

The property is underlain by Upper Triassic Nicola volcanic rocks. At the time of the writer's visit in July, rock trenching and diamond drilling were in progress near the northwest corner of the group, northwest of the north end of Alleyne Lake. Here the rocks are andesite and trachyte flows and flow breccias. The rocks are well altered to carbonate and chlorite and are more or less ablitized and epidotized; epidote-garnet skarn occurs in minor quantities.

Intraformational contacts could rarely be recognized with certainty. A strike of north 45 degrees west and a dip of 40 degrees southwest was obtained on an andesite–trachyte contact near the site of diamond-drill holes Nos. 1 and 2. A less evident contact between andesite and andesite breccia about 1,000 feet to the north-

* By N. D. McKechnie.

east had a strike of north 60 degrees east and a dip of 80 degrees northwestward. A fault marked by closely spaced shear planes but little crushing, striking north 70 degrees east and dipping 85 degrees northwestward, lies just north of the site of Nos. 1 and 2 diamond-drill holes.

The mineralization is chalcocite, bornite, pyrite, and chalcopyrite disseminated in finely brecciated andesite. Although No. 2 diamond-drill hole cut very sparse pyrite and chalcopyrite down the dip of the fault, the writer could see no surface evidence that this fault had had any appreciable influence on the distribution of sulphides. It was not possible to determine whether or not the sulphides were restricted to a single volcanic horizon.

June, Saw*

(49° 120° N.W.) These adjoining groups of recorded claims comprise the June 1 to 18 and Saw 1 to 12 mineral claims and are held in the name of John Tancowny, 4430 Albert Street, North Burnaby. They are on the east side of the Princeton–Merritt highway and west of Kentucky Lake. The road to Kentucky and Alleyne Lakes passes eastward through the Saw group and just to the north of the June group.

The claims are underlain by volcanic breccias, andesite, and amygdaloidal basalt of the Nicola Group. The beds strike north 45 degrees west and dip 35 degrees southwest. No intrusive rocks were recognized. The rocks are not well fractured.

Mineralization exposed in three places consists of chalcocite, sparsely disseminated and in scattered fine fractures in the fragmental rocks, and malachite.

On the June 8 mineral claim a 2-foot-thick bed of grey andesite flow breccia containing angular and rounded light-grey, green, and red fragments is overlain by a reddish andesite and underlain by a red andesite flow breccia. The grey flow breccia is stained with malachite and contains sparsely disseminated chalcocite. A specimen assayed 0.44 per cent copper.

At the initial posts of the June 4 and 6 mineral claims a similar grey andesite flow breccia is overlain by reddish andesite and underlain by amygdaloidal basalt. This breccia is about 30 feet thick. It contains finely disseminated chalcocite; a grab sample comprising two specimens assayed 0.34 per cent copper.

The third showing is about one-half mile westward on the Saw group. The host rock is a grey flow breccia, of finer grain than in the other showings, underlain by amygdaloidal red andesite and overlain by reddish andesite. Chalcocite occurs in the flow breccia as sparse, short, thin stringers and disseminated grains. The rocks strike northwestward and dip southwestward, but the dip was not determined. About 50 feet to the northwest a green andesite flow showed a few small grains of chalcopyrite.

MOUNT THYNNE

Copper-Iron

Dawn, B and R†

(49° 120° N.W.) About 19 claims and fractions in the adjoining Dawn and B and R groups are owned by R. E. Dale and Barbara Dale and are situated mostly between 5,500 and 6,000 feet elevation west of the summit of Mount Thynne. Access to the east limit of the group is by a newly constructed road servicing the forest lookout and microwave station, which leaves the public road about 1 mile east of Brookmere. The property is underlain by fairly steeply dipping strata of the Nicola Group which strike northward and include limestones. Magnetite, pyrite, and some chalco-

* By N. D. McKechnie.
† By J. M. Carr.

pyrite are developed in places of strong epidote alteration, principally in tuffaceous and volcanic strata which are sheared and faulted. Recent work by the owners includes road construction, bulldozer trenching, and hand-pitting at various widely scattered localities.

MISSEZULA LAKE

Copper

Shamrock (Shannon Group) (Missezula Lake Mines Ltd.)*

(49° 120° N.W.) This group of 15 claims, on the west side of Summers Creek about a mile south of Missezula Lake, is held by record in the name of Missezula Lake Mines Ltd. The country rocks are Nicola volcanics. The rocks at the mineral showing are reddish flow breccias with a texture which superficially resembles that of an intrusive rock. The flows strike nearly north and dip from 40 to 60 degrees westward.

The flows are cut by narrow shears striking north 20 to 25 degrees east and dipping 70 degrees northwestward. At one point the northeast shear passes into subsidiary shears, one striking north 2 degrees east and dipping 65 degrees west, and another striking north 35 degrees west and dipping 55 degrees southwest. In the vicinity of the shearing the flows, which elsewhere are massive, show a banding subparallel to the north-striking plane. The northeast-striking shears and the subsidiary ones are mineralized.

The flows and mineralized shears are cut by faults striking north 75 degrees east and dipping 80 to 90 degrees northward, and striking north 30 degrees west and dipping 80 degrees northeastward. The horizontal displacement of the flows across the north 75 degrees east faults appears to be about 15 feet to the right; that of the mineralized shears is about 5 feet to the left. These displacements suggest a movement on the planes of the faults of about 80 feet, with the northwest side moving left and down on a plunge of 60 degrees.

The mineralization is chiefly malachite and azurite. Minor chalcocite was seen in the flow rocks and in the shear together with a few grains of chalcopyrite. Primary sulphide is more evident in the flow rocks than in the shears.

The mineral showings are exposed by trenches for a strike length of about 350 feet. Two diamond-drill holes were completed at the end of July to depths of about 150 feet each, and a third was in progress of drilling. Some mineralization was cut, which appeared to be on the extensions of the flows exposed in the trenches. Neither of the completed holes was deep enough to have reached the shear. The shear, however, was not with certainty identifiable in the trench at a strike distance of less than 50 feet from its best exposure, and so it may not persist.

The work was being done by Consolidated Woodgreen Mines Limited under agreement with Missezula Lake Mines Ltd.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1929, p. 278; *Geol. Surv., Canada,* Mem. 243, 1947, p. 92.]

Primer*

(49° 120° N.E.) This group of 92 recorded claims is owned by Primer Group Minerals Ltd., 501, 1111 West Georgia Street, Vancouver 5. A. Murray Inch, president. It is situated southeast of the south end of Missezula Lake, 21 miles north of Princeton. A jeep-road connects the showings with the Missezula Lake road, which leaves the Princeton–Merritt highway at the sawmill 6 miles north of Princeton.

The property includes ground described as the King George group in Geological Survey of Canada Memoir 243, page 92.

* By N. D. McKechnie.

In 1962 a geophysical survey and some surface stripping were done by McIntyre Porcupine Mines, Limited. The stripping was in two areas south of Dillard Creek at elevations between 4,100 and 4,900 feet. The western area is on the Primer 8, 55, and 56 mineral claims, near their common boundaries; the eastern area is about 4,500 feet to the southeast on the Primer 21 claim, at the end of the jeep-road.

The western area, exposed by five trenches, is about 700 feet in a southwesterly direction by about 600 feet in a southeasterly direction. The underlying rocks are carbonatized and albitized andesitic lavas. A prominent fault, about 80 feet wide, striking north 5 degrees east and dipping 80 degrees westward passes across the northwest side of the area. It is well exposed only in the most southwesterly trench. Three small faults also are exposed; one near the northeast end strikes north 35 degrees east and dips 75 degrees southeastward; of the other two, in a middle trench, one strikes north 30 degrees west and dips 80 degrees northeastward, and one strikes north 65 degrees east and dips 60 degrees southeastward.

The lavas are sparsely and locally mineralized with pyrite and chalcopyrite; malachite and azurite are noticeable in parts of the trenches where fracturing is prominent. No continuous structures associated with sulphides were recognized. The large fault and the three smaller ones described above appear to be essentially post-mineral.

The eastern area is about 500 feet southwest by about 200 feet southeast and rock is exposed in five trenches. The rock is monzonite porphyry, little altered compared to the andesites and considered to be an intrusive. The monzonite is cut by a fault 15 feet wide striking north 25 degrees west and dipping 80 degrees southwestward and by minor faults striking north 60 degrees west, dipping 60 degrees northeastward and striking north 70 degrees west, dipping 80 degrees northeastward.

Chalcopyrite occurs sparsely in a small pit 75 feet northeast of the jeep-road, and malachite was seen on closely spaced joint planes in the second-last trench southwest. There seems to be no evidence that the sulphides are associated with the faults.

Magnetometer, electromagnetic, and geochemical surveys were carried out. Some stripping was done on zones of mineralization. A crew of four men was employed under the direction of A. E. Angus.

KAMLOOPS

Copper

Galaxy Minerals Ltd.*

(50° 120° N.E.) Company office, 1403, 1030 West Georgia Street, Vancouver 5. W. F. Evans, president; W. I. Nelson, consulting engineer. This company holds 6 Crown-granted and 46 recorded claims east of the road to Le Jeune Lake, about 5 miles southwest of Kamloops. Work in 1963 consisted of an induced potential survey on the Prince of India, Evening Star, and Golden Star mineral claims. Eight surface holes were diamond drilled, totalling 2,963 feet. A crew of five men was employed.

Makaoo Development Company Limited*

(50° 120° N.E.) Company office, 915, 736 Granville Street, Vancouver 2. L. G. Wood, president; W. I. Nelson, general manager. This company holds 5 Crown-granted and 67 recorded claims in the vicinity of Coal Hill, about 3 miles southwest of Kamloops. Work in 1963 consisted of

* By David Smith.

an induced potential survey and of stripping and diamond drilling under the direction of A. Poole, engineer in charge. A crew of five men was employed.

Laura, Earl (Copper Lake Explorations Ltd.)*—(50° 120° N.E.) Company office, 1288—20th Avenue, Prince George. This company holds 19 recorded claims about 6 miles south of Kamloops and lying to the northeast of Edith Lake. Access is by secondary road to Long Lake. Two men were employed doing assessment work.

NORTH THOMPSON

BARRIERE

Copper-Lead-Zinc

Harper (Barriere Lake Mines Ltd.)†—(51° 119° S.W.) Company office, 640 West Hastings Street, Vancouver 1. R. Martin, president. This company holds 36 claims on the west and north shores of North Barriere Lake. Work done in 1963 consisted of diamond drilling eight holes, totalling about 1,700 feet, and stripping. Two men were employed. Access to the property is by road from Barriere. The property was not visited.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, p. 60.]

TULAMEEN

Iron

Imperial Metals and Power Ltd.*—(49° 120° N.W.) Company office, 230 West Broadway, Vancouver 10. N. H. McDiarmid, president. The property includes a large group of claims encompassing the area of Lodestone and Olivine Mountains and Tanglewood Hill. The property lies about 15 miles due west of Princeton and is accessible by logging-roads from the community of Tulameen. Magnetite has been known to occur in the area for many years. The area has been explored, some of it in detail, by magnetic surveys. Work done in 1962 consisted of a bulk-sampling programme on a section of the Lodestone Mountain deposit. Eleven diamond-drill holes, the deepest 330 feet, were drilled. In 1963 an economic survey and tabulation of results was carried out under the direction of G. E. Leonard.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1959, pp. 39–53.]

SIMILKAMEEN RIVER

Copper

Friday Creek (Princeton Exploration Ltd.)‡—(49° 120° S.W.) Company office, 411, 850 West Hastings Street, Vancouver 1. D. V. Hawkes, managing director; D. D. Campbell, consulting geologist. This newly incorporated company holds about 30 claims in the Ilk, Elk, and Ni groups transferred from Friday Creek Development Co. Ltd. The property lies between the Hope–Princeton highway and the Similkameen River, about 17 miles by road south of Princeton. The main showings are astride Friday Creek at a distance from the river of about 1,500 feet and are reached from the north by 2 miles of dirt road which leaves the highway at a point almost opposite the Kennedy Lake turn-off. In previous years an area on the south bank was stripped, measuring about 250 feet across with about 150 feet of relief. In 1963 the present company drove an adit due south under the stripped area for 100 feet, did 195 feet of underground diamond drilling in four holes and about 300 feet of surface drilling

* By David Smith.
† By W. C. Robinson.
‡ By J. M. Carr.

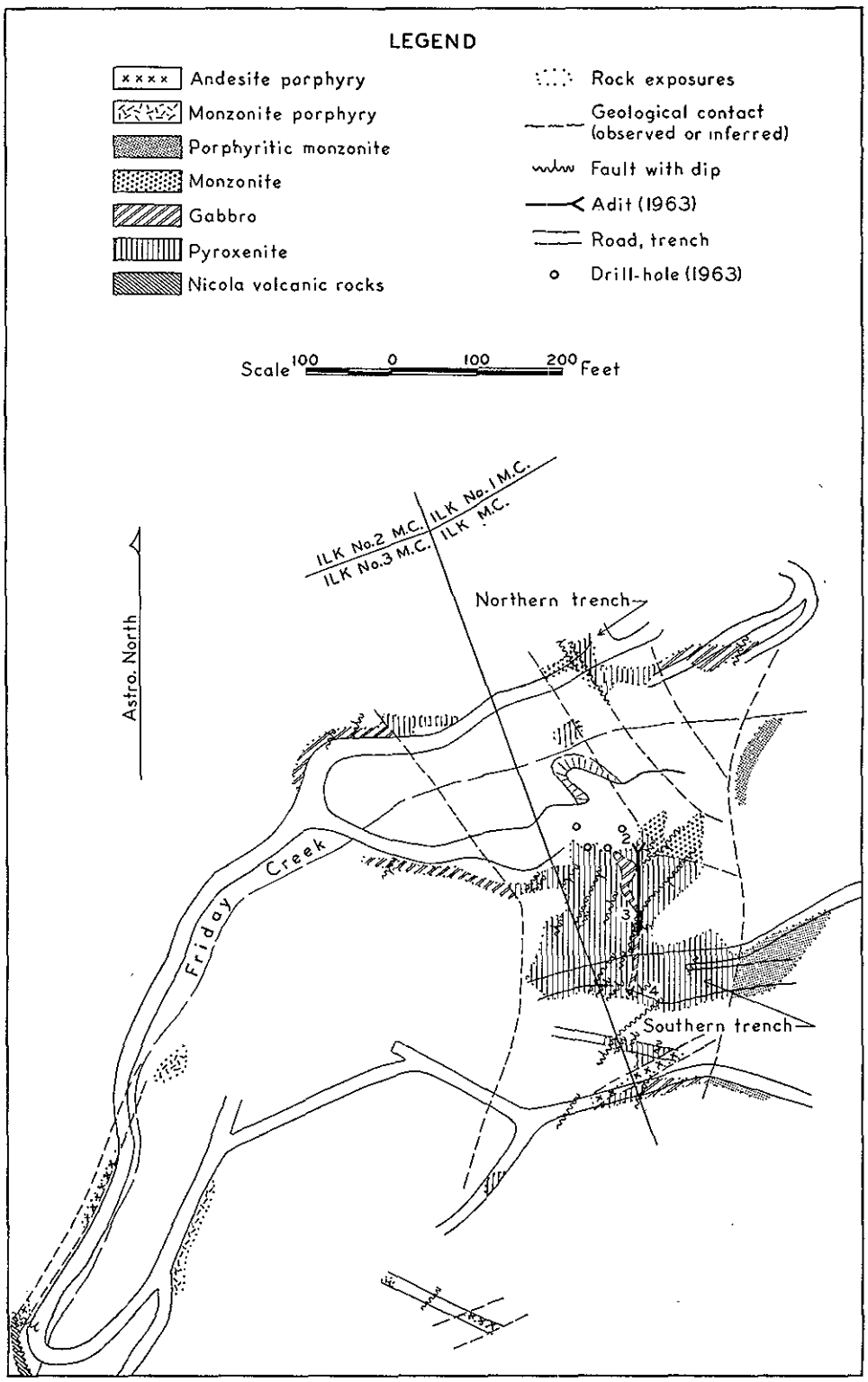


Figure 5. Geology of Friday Creek showings. Princeton Exploration Ltd.

in four holes, all near the adit, and stripped on both sides of the creek. The showings have partly been described in the Annual Reports for 1960 and 1962 and are in the Copper Mountain stock near its western margin. Figure 5 illustrates the geology and is based on a pace and compass survey of the showings. Pyroxenite, gabbro, monzonite, and porphyritic monzonite are all parts of the stock and were probably emplaced successively in that order. A separate, probably later intrusion of monzonite porphyry occurs between the stock and sheared Nicola volcanic rocks farther southwest. Small dykes of red feldspar pegmatite cut the stock and possibly the monzonite porphyry also, and are older than dykes of andesite or diorite porphyry which cut the same rocks. The pegmatite dykes occur either singly or, more often, in groups and networks, and they are especially numerous in pyroxenite and gabbro. Their widths range from a fraction of an inch to as much as several feet, and their attitudes are both flat and steep. Many of the steep pegmatites strike northeastward and cannot be traced for more than a few feet. Faults near the showings are mostly in pyroxenite or gabbro and are either flat or steep. Only the steep faults are shown in Figure 5; they strike predominantly northeastward and dip either way. Flat faults are rather irregular in attitude; some of them end at steep faults, whilst others continue across the latter and seem to offset them. Some faults lie along pegmatite dykes, and others cut and displace the pegmatites. Near faults the rocks are brecciated and altered and contain plentiful biotite and epidote. Pyroxenite altered in this way contains much disseminated pink feldspar. Many faults carry a thin seam of brown gouge that formed after brecciation of the wallrock.

Mineralization is localized chiefly near faults. It consists principally of bornite and chalcopyrite as fracture fillings and local disseminations in brecciated, altered rocks and as bunches and stringers in calcite or quartz veins in faults. Pyrite is disseminated, partly adjacent to copper mineralization. Most mineralized exposures are moderately or slightly oxidized and contain malachite or azurite. Where strongly oxidized, they contain limonite without copper minerals.

The best mineralization seen is all in pyroxenite and occurs at the following four places, which are numbered on Figure 5 and lie approximately on a north-south line passing through the adit. (1) North of the creek in new stripping near an old caved glory-hole, mineralization extends eastward for about 15 feet from a faulted monzonite contact and lies about 50 feet to the west of another mineralized exposure, which is about 9 feet across. (2) South of the creek in the adit, a steep irregular lens of mineralization extends north-northeastward from a steep northeasterly fault near the portal, and may join below rail-height a flat mineralized body that is exposed just north of the adit, where it lies close to a flat fault and is several feet thick in drill-holes. (3) In the west wall of the adit, between 70 and 90 feet from the portal, mineralization is part of a shoot that lies in the north wall of a steep northeasterly fault and is intersected for about 14 feet by a flat hole diamond drilled westward. From 85 to 90 feet a sample collected across the fault and its north wall assayed: Gold, trace; silver, 1.2 ounces per ton; copper, 4.21 per cent. This shoot apparently extends to surface, where the exposed rock is mineralized. An inclined hole was drilled from near the adit portal but was stopped short of the distance required to intersect the shoot in depth. (4) Farther south a small, partly oxidized body of mineralization was exposed temporarily in the south wall of the southern trench and apparently occurs in the western hangingwall of a northeasterly fault at its intersection with a flat fault.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1960, p. 56; 1961, p. 56; 1962, pp. 61–62.]

Copper-Iron

Lela (Copper Basin Mines Ltd.)*

(49° 120° S.W.) Company office, Room 2, 615 West Pender Street, Vancouver 2. J. W. Gallagher, president; E. N. Rhodes Elliott, secretary. This company holds about 30 recorded claims in the Kay, Jap, and May groups on Kennedy Mountain, west of the Hope–Princeton highway, about 10 miles by road south of Princeton. The company also holds the adjoining Lela and Key West Crown-granted claims on option from The Granby Mining Company Limited. In 1960 work was done about one claim length west of the adjoining Copper King claim and included trenching and diamond drilling one hole in the vicinity of a showing reported to contain magnetite and copper mineralization. In 1962 work was done on the Lela claim and consisted of stripping the surface and diamond drilling two holes totalling about 300 feet in length.

The showing on the southern part of the Lela claim is in altered volcanic rocks of the Nicola Group, which are extensively intruded by syenodiorite porphyry and latite porphyry. The mineralized zone apparently trends northward and is enclosed on either side by faults, of which a western fault separates the mineralized rocks from westward-dipping schistose volcanic rocks and argillite, and one or more eastern faults are poorly exposed and trend either northward or northeastward. The rocks of the zone are strongly fractured and contain magnetite and partly oxidized chalcopyrite mineralization as veinlets and disseminations over a length of as much as 700 feet and a possible width of 200 feet. It is reported that the results of drilling indicate that the zone dips westward.

Copper

Ray (Copper Mountain Consolidated Limited)*

(49° 120° S.W.) Company office, 1500, 355 Burrard Street, Vancouver 1. R. Collishaw, president. This company holds by record 14 claims and fractions in the Ray group on the west bank of the Similkameen River about 10 miles by road south of Princeton. It also holds a number of claims in a separate block about 2 miles farther south known as the Deep Gulch property, on which no work was done in 1962 or 1963. The main showings on the Ray group are on the Ray No. 3 claim and Ray No. 4 fractional claim, which are partly a restaking of the cancelled Homestake No. 2 Crown-granted claim. The showings are north of the Red Buck mine and slightly more than 1 mile distant from the Copper Mountain mine, and they occupy a steep, southeast-facing rock bluff which overlooks the river at elevations ranging approximately from 2,750 to 2,950 feet. Work on the Ray group in 1962 and 1963 was done by an average crew of five men supervised by R. Collishaw. It included bulldozer trenching above the bluff, construction of a road to the foot of the bluff at an elevation of about 250 feet above the river and of several ladders down the face, sampling the exposures, and diamond drilling six flat or gently inclined holes from set-ups at the foot of the bluff.

The bluff is composed of strongly altered, dark massive volcanic rocks and dark-grey to pink intrusive dykes. The volcanic rocks probably are andesites or basalts of the Nicola Group in which most of the primary structure is obscured. Some of the rocks are breccias, as shown by their high content of semi-rounded igneous fragments. The rocks are traversed by persistent widely spaced joints. which may indicate the stratification and which dip to the north or northwest at about 35 degrees. Under the microscope the rocks have an irregular hornfelsic texture and their composition is clearly modified by alteration.

* By J. M. Carr.

Most of the dykes strike slightly to the west of north, dip fairly steeply westward, and are of syenodiorite porphyry. Each may be as much as 30 feet wide, and in some cases they occur close together. One distinctive pink dyke of latite porphyry about 10 feet wide strikes approximately north and dips west at about 60 degrees. Although less altered than the volcanic rocks, the dykes commonly possess altered margins. Together with the adjacent rocks, they are traversed by joints which range in trend from north-northeast to northwest and which dip mostly westward at fairly steep angles.

Rock alteration gives many rocks the appearance of a breccia. Veins, patches, and larger masses of altered rock are composed of a variety of minerals, including augite, biotite, pink orthoclase feldspar, white albite feldspar, grey scapolite, chlorite, epidote, calcite, and small amounts of quartz. Magnetite is unevenly disseminated and, since it occurs locally in fractures, is partly an alteration product.

Sulphide mineralization took place apparently after most of this alteration, and was followed by the deposition in places of the red zeolite, heulandite. Chalcopyrite and pyrite occur either together or separately as disseminations and fine seams in the altered rocks. Locally malachite and limonite have been produced by a limited degree of oxidation. Some of the best mineralization seen is close to the latite porphyry dyke, in drill core on the east side of the dyke and in outcrop on the west side. Apparently the mineralization, if in shoots, may trend approximately parallel to the dykes. Other mineralized outcrops contain small pods of disseminated material which are localized in more extensive zones of orthoclase alteration, whose trend is irregular. Well-defined faults were seen only in drill core as occasional sheared, sericitic sections. In outcrop near the bottom of No. 5 ladder, a gash vein of calcite and chloritic material with small amounts of sulphide has a north-northeasterly strike and a steep easterly dip.

PRINCETON

Copper

G.E., Regal (Climax Copper Mines Limited)*

(49° 120° S.E.) This group of 41 recorded claims is controlled by Climax Copper Mines Limited, a subsidiary of Silver Standard Mines Limited, 808, 602 West Hastings Street, Vancouver 2; mine office, Princeton. A. C. Ritchie, managing director; D. D. Campbell, consulting geologist. It is situated on the east side of Allison Creek valley 2½ miles northeast of Princeton. The property includes the former Regal group, which is briefly described in the Annual Reports for 1918, pages 214, and 1929, page 278.

The working area with which this report is concerned comprises, from the Regal showing, about three claim lengths east-northeast by four claim lengths south-southeast.

The working area is underlain by volcanic rocks of the Nicola Group. North of the Regal showing the rocks are coal-bearing sediments of the Princeton Group. The exact position of the Nicola-Princeton contact is not known, but it is north of the Regal showings, and the gully crossing the G.E. 2 and G.E. 4 mineral claims is believed to be underlain by Princeton sediments.

The Nicola rocks are tuffs, breccias, and andesitic lavas, all altered to chlorite and carbonate and to a lesser degree to epidote and zoisite. It was found that almost all rock specimens would react to hydrochloric acid. Two small exposures of limestone occur toward the southeast side of the G.E. 3 claim, and a volcanic breccia exposed in a rock bluff near the northeast corner of the G.E. 16 claim con-

* By N. D. McKechnie.

tains a high proportion of limy fragments. In a closely trenched area on the G.E. 47 claim a crystalline rock is exposed which is reddish in colour and coarser grained than the lavas. It has the appearance of an intrusion, but thin-section examination shows it to be essentially of the same composition and degree of alteration as the andesitic lavas. No definitely intrusive relations were observed, and this rock is presumed to be a phase of the Nicola lavas. No rocks within the working area were recognized as intrusive.

Strikes and dips on bedding are not readily apparent; limited information indicates a general strike of south-southeast to southeast and dips of 40 to 55 degrees northeastward. On the eastward side of the area, strikes nearly east-west and dips steeply north were observed.

The area is crossed by two and possibly four faults. The best exposed extends south 20 degrees east from the Regal showing and is traced in trenches and a road cut across the G.E. 3, G.E. 6, and into G.E. 16 claims for a strike length of 3,200 feet. It is about 100 feet wide and the dip is near vertical. The second fault is exposed in trenches on the G.E. 7 and G.E. 8 claims. It strikes south 5 degrees west, dips nearly vertical, is about 50 feet wide, and has an apparent length of 2,200 feet. Swampy ground on the east side of the G.E. 5 claim is about on strike and may indicate the presence of this fault some 2,500 feet south of the last exposure. The existence of faults between these two is shown by sheared ground in, respectively, a trench on the side of the gully on the G.E. 2 claim and in a short adit by a jeep-road near the southward boundary of the same claim. The short exposures at these workings do not permit reliable dip and strike readings, so it is not known whether or not they may be on the same fault. Sheared rock also is exposed in trenches on the G.E. 7 and G.E. 9 claims near their joint boundary.

Mineralization consists of very sparsely disseminated chalcopyrite, pyrite, and bornite, chiefly in the original Regal showings on the G.E. 4 claim and in the reddish andesite in the trenched area of the G.E. 47 claim. Specular hematite is fairly common, mostly as disseminated grains, and some of the andesite is slightly magnetic due to magnetite. Some very fine-grained metallic mineral was identified as chalcocite. Native copper was seen in a piece of drill core in hole No. 4. Malachite and azurite occur occasionally in the faults. The most prominent occurrence is in the Regal showing. The writer found no primary copper sulphides, which appeared to follow structures in the faults or which were associated with them.

In an effort to obtain some data on a possible source of the secondary copper minerals in the faults, 11 specimens were taken along exposures on the jeep-road crossing the G.E. 8 claim. The rocks are cut by the south 5 degree west fault described above; the rocks on the eastern side are altered andesite; those on the western side are tuffs. The specimens were tested by semi-quantitative spectographic analysis. Of the 11, five showed the presence of copper in fractions of one-tenth of 1 per cent. One tuff specimen was included in the five. Chalcopyrite was identified in one thin-section in finely brecciated andesite; in the others the copper appeared to occur solely as chalcocite.

Copper-bearing volcanic beds, then, may be in part the source of secondary copper minerals in the faults. The secondary minerals are noticeably more evident in the Regal showing than elsewhere, and this may be indicative of a stronger primary mineralization nearby.

The group southward has been quite well prospected; that to the north, perhaps under the Princeton sediments, may be worth more attention.

In 1963 exploration work consisted of a geophysical survey, geological mapping, and an induced potential survey, and a total of 3,535 feet of diamond drilling.

Numerous trenches were dug in conjunction with the geological mapping. A crew of five men was employed under the direction of A. C. Ritchie.

CAWSTON

Molybdenum-Copper

King Edward (Friday Mines Limited)*

(49° 119° S.W.) Company office, 230 West Broadway, Vancouver 10. N. H. McDiarmid, president; G. E. Leonard, geologist. This property consists of 14 recorded mineral claims, four of which were held by option from B. Williams, of Keremeos. The claims lie 7 miles south of Keremeos and about 3 miles west of the Similkameen River, and are located on Susap Creek. Access was by pack-trail. Four short X-ray diamond-drill holes were drilled. Bulk sampling was done on the upper adit. Geophysical and geological surveys were carried out. A crew of four was employed.

Gold-Silver

Horn Silver (Santos Silver Mines Limited)*

(49° 119° S.W.) Mine office, Box 217, Keremeos. C. J. Cryderman, resident engineer. The property includes the Horn Silver and Silver Bell Crown-granted claims, and seven recorded claims—the Silver Bell 1 to 5 and Silver Bell 7 and 8. The property is on the east slope of Richter Mountain, 16 miles south of Keremeos and 4 miles north of the International Boundary. Access is by road from Keremeos to a point near the foot of Richter Mountain; the adit portals at the 2,622-foot elevation are reached by a steep jeep-road approximately 1 mile long. A total of 300 feet of surface diamond drilling was completed in 1963. A programme of resampling was carried out. A crew of three men was employed.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1928, p. 258; 1958, p. 32; 1960, pp. 58–60.]

OLIVER

Gold-Silica

Conway Mines*

(49° 119° S.W.) Mine office, Box 221, Oliver. Partnership, R. Conrad and G. McKay. The property consists of the three Conway claims on the north shore of Sawmill Lake, approximately 5 miles northwest of Oliver. Some stripping was carried out on a mineralized quartz vein, and one car of siliceous ore was shipped to the Trail smelter. A crew of two men was employed.

Smuggler*

(49° 119° S.W.) Mine office, Box 106, Okanagan Falls. Owner, K. G. Ewers. This old property, of seven recorded claims and the leased Powis Crown-granted claim, lies just west of the golf course, about 4 miles southwest of Oliver. A small amount of stripping was done and some bulk material stockpiled with the intention of shipping a silica product to Trail. Two men were employed.

OSOYOOS

Copper

Gem, Dividend-Lakeview†

(49° 119° S.E.) The Gem group, consisting of 14 recorded mineral claims, 3 mineral leases, and the Gem Crown-granted claim, is owned by Kenneth Butler, R.R. 1, Osoyoos. It is situated about one-half mile west of Osoyoos Lake at

* By David Smith.
† By N. D. McKechnie.

the International Boundary. It surrounds on three sides the old Dividend-Lakeview property, which to 1949 had produced 122,636 tons of gold-copper ore.

The geology of the region is shown on the following Geological Survey of Canada maps: Map 341A, Keremeos, 1940; Map 538A, Kettle River West Half, 1940; Map 15-1961, Kettle River West Half, 1961. The geology of the Dividend-Lakeview claims is described and illustrated in Geological Survey of Canada Memoir 179, 1935, pages 20 to 26.

The claims to the east, northeast, and southeast of the Dividend-Lakeview group are underlain by sedimentary and volcanic rocks of the Kobau Group, of probable Cache Creek age. To the south and southwest of the Dividend-Lakeview, the Kobau rocks are intruded by a dioritic rock to which no name has been given; it is described in Memoir 179 as " altered diorite." North of the Dividend-Lakeview the Kobau is intruded by diorite of the Osoyoos batholith, and this in turn is intruded by a younger granite not described in Memoir 179.

In the localities examined by the writer, the Kobau rocks are either skarns composed of a mosaic of quartz and garnet, with subordinate calcite, epidote, and hematite, or are volcanic flow rocks. The flow rocks are highly altered andesites and basalts now composed of a matte of sericitized and carbonatized feldspar laths which may appear only as vague outlines, and of ferromagnesians now wholly changed to chlorite, calcite, and iron oxide. Epidote and zoisite are present to prominent. Calcite stringers cut all other minerals.

The " altered diorite " in hand specimen is greenish-grey in colour and has a somewhat mottled appearance. It is not everywhere easily distinguished from altered Kobau volcanic rocks. In thin-section the rock is seen to be finely brecciated, the plagioclase highly altered to saussurite, the pyroxene wholly altered to chlorite, carbonate, and iron oxide. The relict texture is that of a coarse-grained holocrystalline rock and is different from that of the Kobau volcanic rocks.

The Osoyoos diorite here is grey to greenish in colour, medium grained, and with, locally, a porphyritic appearance due to prominent grains of secondary calcite. The feldspars are saussuritized, and the ferromagnesians are wholly altered to chlorite and carbonate. These minerals are more or less brecciated, and are veined and partially replaced by fresh orthoclase and quartz.

Mineralization consists of quartz, pyrite, chalcopyrite, arsenopyrite, and magnetite in the Kobau volcanic rocks and the " altered diorite." Molybdenite occurs in the granite that is intrusive into the Osoyoos diorite.

On the Manx Crown-granted claim a pit exposes a shear 2 feet wide striking north 70 degrees west and dipping 75 degrees southwestward; the hangingwall is quartz-garnet skarn and the footwall is altered andesite. The shear is mineralized with pyrite and chalcopyrite. About 50 feet to the southwest a parallel shear is exposed, the footwall of which is altered andesite and the hangingwall is the " altered diorite." This shear is mineralized with massive pyrite and arsenopyrite veined by magnetite. To the southeast a shallow depression striking north crosses the strike of these shears, and although outcrops are numerous and some magnetite occurs on the east side of the depression, no certain indication of the presence of the shears was found beyond it. East to southeast of the two pits a distance of about 1,000 feet and still on the Manx claim, a pit in altered andesite exposes a shear 10 feet wide striking south 85 degrees west and dipping 55 degrees north. The shear contains magnetite stringers.

On the Chukar No. 5 claim, a pit in altered basalt exposes a mineralized fault 5 feet wide; strike north 15 degrees east and dip 50 degrees eastward. The rock in the fault is very chloritic but is not notably schistose. Mineralization consists

of quartz and chalcopyrite; most of the chalcopyrite occurs in the quartz. The fault is in line with a topographic depression which is traceable for about 1,000 feet.

A small shear lies near and to the west of the fault; it is about 10 inches wide, strikes north 20 degrees east, and dips 45 degrees eastward; it may be part of the same zone.

South of these showing, and still on the Chukar No. 5 claim, a copper-stained quartz vein strikes south 85 degrees west and dips 60 degrees north. It ends here against an unmineralized fault striking north 75 degrees west and dipping 45 degrees northward. The vein is exposed on the west side of a deep gully trending north 20 degrees east.

On the Chukar No. 4 claim, a 3-foot-wide zone of quartz stringers striking north 30 degrees west and dipping 50 degrees northeastward is in altered andesite exposed in an old crosscut. The quartz carried chalcopyrite and pyrite.

On the Gem Crown-granted claim, disseminated molybdenite occurs in a granite dyke striking south 85 degrees west and dipping irregularly near vertical. The wallrocks are Osoyoos diorite. The dyke is from 3 to 10 feet wide and is exposed for a length of about 40 feet. The dyke pinches out eastward, and a second dyke is exposed for a few feet of length in echelon to the left. A third dyke is exposed in the south wall of the first, striking north and dipping 50 degrees west.

In 1963 an option was taken by Sheep Creek Mines Limited, 490 Baker Street, Nelson, on the Gem group and also on the Dividend-Lakeview group, owned by D. P. Simpson, of Osoyoos. Exploration was conducted on the combined property under the direction of D. M. Edwards. Magnetometer and self-potential surveys were carried out, and 15 holes totalling 2,404 feet were drilled.

WESTBRIDGE

Gold

Amcana Gold Mines Limited*

(49° 118° N.W.) Company office, 4181 Miller Street, Vancouver 12. H. A. Thielman, managing director. This company holds 20 claims and fractions, including the Barnato Crown-granted claim, on Horseshoe Mountain. The property is reached by 20 miles of good logging-road up the Kettle River from Westbridge and then by 5 miles of mine road to the Amcana camp. Work done in 1963 consisted of stripping by bulldozer and diamond drilling totalling 660 feet. A crew of three men was employed under the direction of H. A. Thielman.

[Reference: *Minister of Mines,* B.C., Ann. Rept., 1938, pp. D 17–D 22.]

BEAVERDELL

Silver-Lead-Zinc

Highland-Bell (Mastodon-Highland Bell Mines Limited)*

(49° 119° S.E.) Company office, 502, 1200 West Pender Street, Vancouver 1; mine office, Beaverdell. K. J. Springer, president; O. S. Perry, manager; A. Zelmer, mine superintendent. The property consists of 32 Crown-granted and 4 recorded claims. Production for 1963 was obtained from the 2850, 2900, and 3000 levels, the main haulage being the 2900 adit. Development work underground has been continued on all levels. In 1963 the normal production of 75 tons per day was raised to 95 tons per day, of which 87 tons was put through the flotation cells and the remaining 8 tons was sorted and discarded as waste. This has been accomplished by the introduction of

* By David Smith.

a washing and picking belt in the crusher-room. Some further exploration and diamond drilling was carried out on the Sally and underground on the Bell.

The following is a summary of operations for 1963: Drifting and crosscutting, 1,586 feet; raising, 397 feet; diamond drilling, 8,623 feet; a total of 2,851 tons of lead and zinc concentrate was shipped to Trail. An average crew of 40 men was employed, of whom 22 worked underground.

PHOENIX

Copper-Gold-Silver

Phoenix Copper Company Limited*

(49° 118° S.W.) Company office, 1111 West Georgia Street, Vancouver 5; mine office, Phoenix. L. T. Postle, president; P. R. Matthew, manager; J. S. Kermeen, mine superintendent; G. Hingley, mill superintendent. The property consists of 111 claims, of which 55 are Crown granted, 43 are recorded, and 13 are held under four leases. Twenty-six Crown-granted claims were purchased during the year. These include the Rawhide, Brooklyn, and Stemwinder, former producing mines adjoining Phoenix.

All mining is by open-pit method, with production coming from three pits—Old Ironsides, 478,875 tons; Snowshoe, 75,196 tons; and Idaho, 108,724 tons. The total ore mined, 662,795 tons, required the removal of 2,167,073 tons of waste rock.

Three shovels were used in 1963, with dipper capacities of 1½ cubic yards, 2½ cubic yards, and 4½ cubic yards. Two 20-ton Euclid trucks and two 35-ton Haulpak trucks were used for hauling ore and waste. Drilling was done mainly with an Ingersoll-Rand Drillmaster, which proved quite successful in drilling holes in caved ground and back filled stopes. Gardner-Denver air-tracs were also used for drilling. Contractor's trucks were used only as required. Blasting is done with AN/FO, which is mixed on the property.

A power-line was extended 2,000 feet from the old Brooklyn workings to a small lake north of Phoenix. The diesel pump formerly used at this lake was replaced with an electric pump. A three-bay repair-shop was constructed in 1963 to service trucks, shovels, and bulldozers.

The mill treated 645,083 tons of ore during 1963, all concentrates produced being shipped to Japan. A propane-fired drier was used to reduce the moisture content of the concentrates to below 7 per cent. A 15-by-90-foot addition to the flotation section of the mill was constructed. Six No. 30 Denver cells were added to the flotation section. Three 12-inch hydro-cyclones were added to the grinding circuit to increase classification.

A total crew of 105 men was employed, as follows: Surface, 15; open pit, 40; mill, 33; and staff, 17.

ROSSLAND

Copper-Gold

Velvet (Mid-West Copper & Uranium Mines Ltd.)*

(49° 117° S.W.) Company office, 201, 535 Howe Street, Vancouver 1; mine office, Rossland. R. W. Liversidge, president; A. G. Ditto, mine manager. The property is on the western slope of Sophie Mountain, 11 miles from Rossland on the Rossland–Cascade highway.

On No. 8 level 350 feet of drifting was done, and a raise 200 feet long was driven to the 706 orebody. The No. 7 level was extended a total of 150 feet, and subdrifting under the 706 orebody amounted to 220 feet during 1963.

* By P. E. Olson.

All production came from the 706 orebody and amounted to approximately 7,000 tons. Stoping is done by the open-stope method, and broken ore is scraped to chutes and loading points by air-operated slushers. The dip of the orebody ranges between 10 and 45 degrees.

Diamond drilling amounting to 1,210 feet was done from No. 4 level to test extensions of the 706 orebody.

The company concentrator treated 5,100 tons of ore during 1963 and the concentrates were shipped to Tacoma, Wash. Employment averaged 11 men, most of whom lived in Rossland.

TRAIL

Gold

W.D.*

(49° 117° S.W.) The W.D. Mining Company Limited, owned by F. Donelly and Associates, of Trail, operated the W.D. mine until June, 1963, after which the mine remained closed. The property is on the west side of the Columbia River, 5 miles south of the old Trail bridge along the Casino road.

Development consisted of 105 feet of crosscutting and 75 feet of raising. Stoping was done on the No. 1 vein between No. 1 and No. 3 levels. One stope which was abandoned by Casino Gold Mines Limited in 1962 was extended about 40 feet.

A total of 2,741 tons of ore was shipped to the Trail smelter, grading approximately 0.33 ounce gold per ton. Work was done on a part-time basis by three partners in the company.

NELSON

Gold-Silver

Venango (Venango Gold Mines Limited)*

(49° 117° S.E.) D. H. Norcross, of Nelson, has the Venango under lease. This property is located beside the Kenville mine on Eagle Creek. The portal on the No. 2 vein was re-opened and the main drift was extended 38 feet. A raise was driven 48 feet from the drift face. A total of 63 tons of gold ore was recovered from this work and shipped to the Trail smelter. All work was done by Mr. Norcross.

YMIR

Gold-Silver-Lead-Zinc

Yankee Dundee (Cayzor Athabaska Mines Limited)*

(49° 117° S.E.) Company office, 3669 West 35th Avenue, Vancouver 13. J. D. Lippmann, president. Capital: 3,500,000 shares, no par value. D. C. Smith, exploration engineer. Cayzor Athabaska Mines Limited has the property under option from Yankee Dundee Mines Limited.

All work done in 1963 was on the Yankee Girl vein in the Wildhorse adit, which is at an elevation of 2,800 feet. Drifting on the vein amounted to 415 feet, 315 feet of which was eastward and 100 feet westward. Diamond drilling amounted to 725 feet of EX core from two holes drilled southeastward from the southern section of the Wildhorse adit.

Work started on July 3rd and was completed on November 30th. During that time an average crew of eight men was employed.

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* By P. E. Olson.

SALMO

Erie Creek (49° 117° S.E.)

Gold

New Arlington*

This property is leased by G. D. Fox, 3307 Dahlia Crescent, Trail, from J. Russell, Borrega Springs, Calif. The property is on Rest Creek, 7 miles by road from Salmo. The lessee and his two partners, Don and Ron Tjader, drove about 90 feet of new crosscut in the vicinity of the old " 40-foot " level, from which about 90 tons of shipping ore was sorted. A total of 1,357 tons of ore, most of which was sorted from old dumps, was shipped to the Trail smelter. The gold content was 348 ounces.

Sheep Creek (49° 117° S.E.)

Silica

Kootenay Belle*

K. Belle Enterprise Company Limited, Linden, Alta., leased the dumps of the old Kootenay Belle mine from M. M. Arishenkoff, of Shoreacres, from January to September. This company hauled 4,923 tons of dump material to the Trail smelter for flux; the gold content is paid for in addition to the silica. After September, Brian's Transfer, of Trail, hauled 1,283 tons of dump material to the Trail smelter.

Aspen Creek (49° 117° S.E.)

Lead-Zinc

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited)*

Company office, Trail; mine office, Salmo. D. S. Campbell, property superintendent; R. R. McMichael, mine superintendent; P. Conder, mill superintendent. The H.B. mine is on the west side of Aspen Creek, with the main camp on the north side of Sheep Creek, 7 miles by road from Salmo. The ore occurs as galena-sphalerite replacement of dolomite. The main production comes from the No. 1 orebody, in which the ore is mined by long-holing from sublevels located on the ore-boundary and is scraped to ore-passes from draw points in scram drifts. The total long-hole footage for the year was 74,876 feet, and this accounted for 79 per cent of the tonnage mined. The remainder is mined in flat-lying orebodies named the X-1, X-2, and No. 4 orebodies. Mining in these areas is done by slashing and benching with jacklegs, using a system of panels and pillars to maintain roof support. Development: Drifting and crosscutting, 1,804 feet; sublevels, 2,345 feet; raising, 2,542 feet; total, 6,691 feet. Underground diamond drilling was 12,536 feet, and surface diamond drilling was 5,065 feet.

AN/FO explosive was used in all types of stoping, including long-hole, and amounted to 74 per cent of explosives used.

The concentrator treated 473,099 tons of ore in 1963, an average of 39,426 tons per month. The average number of men employed was 116, 50 of whom were employed underground.

There was one lost-time accident over six days in 1963, the first in almost six years. The mine-rescue team competed in the West Kootenay competition.

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* By P. E. Olson.

IRON MOUNTAIN (49° 117° S.E.)

Lead-Zinc

Jersey (Canadian Exploration Limited)*

Head office, 700 Burrard Building, Vancouver; mine office, Salmo. R. G. Weber, mine manager; J. W. Robinson, mine superintendent; R. W. Gould, mill superintendent. This company is a wholly owned subsidiary of Placer Development Limited. The property is reached by two roads which leave the Nelson–Nelway highway 4 and 4½ miles respectively south of Salmo, the north road being the main access road. The lead-zinc concentrator is beside the Nelson–Nelway highway and is served by a conveyor system from the underground crusher at the mine. The mine, offices, and camp are located on the summit between Sheep Creek and Lost Creek.

All production came from the Jersey mine. The majority of production came from relatively thin, flat, although sometimes locally steeply dipping beds, and is being mined by conventional open stoping with jacklegs and slushers above the trackless mine, and is hauled from chutes or loading points to the coarse-ore bins on the surface. The trackless production was 348,378 tons; the remainder was 1,969 tons from the track mine, 9,051 tons from the open pit, and 12,973 tons from pillar recovery. Mining from the track mine was completed, and all rail, pipe, and other services were removed in 1963.

The pillar recovery programme is continuing on a retreating basis. Pillar drilling has been standardized with the use of timber stagings, the construction of which has been facilitated by the use of prefabricated steel corner connectors. Stagings 40 feet in height with five 16- by 16-foot decks have been erected and dismantled with a minimum of effort.

Total development was 7,680 feet, consisting of 206 feet of 16- by 16-foot drifting, 6,776 feet of 5- by 7-foot subdrifting, and 698 feet of 6- by 6-foot raising.

AN/FO explosive was in continuous use during the year and constituted 70 per cent of the total explosives used.

The surface exploration programme started in 1962 on the Truman and TK groups was completed in 1963.

The concentrator treated 368,673 tons of ore during 1963. Concentrates were shipped to the Bunker Hill smelter at Kellogg, Idaho, and to the Trail smelter.

A mine-rescue team, captained by J. F. Ablett, competed in the West Kootenay Mine Rescue Competition at Nelson. The average number of men employed, including staff, was 167, of whom 68 worked underground.

NELWAY

Lead-Zinc

Reeves MacDonald Mines Limited*

(49° 117° S.E.) Company office, 410 Metropolitan Building, 837 West Hastings Street, Vancouver 1; mine office, Remac. L. M. Kinney, Metalline Falls, Wash., general manager; F. R. Thompson, manager; W. Pollock, mine superintendent; J. M. McDearmid, mill superintendent. Capital: 3,000,000 shares, $1 par value. The Reeves MacDonald mine is on the Pend d'Oreille River, on the Nelway–Waneta road 4 miles west of Nelway. Lead-zinc replacement orebodies in limestone have been developed from the 1900 main haulage level.

The operation worked at full capacity until May 5, 1963, when strike action closed the plant. The dispute was settled on December 20, 1963, and limited crews started work on December 23rd to rehabilitate the mine. Production was not

* By P. E. Olson.

resumed in 1963. Prior to the strike the operation employed a total of 113 men, 49 of whom were engaged underground.

Mining is done with long-hole machines, drilling down-holes from horizontal slots. These slots are usually slashed to the ore outline and are at 50-foot intervals. On deeper levels, instead of slashing horizontal slots, hanging and footwall subdrifts have been driven and the long-hole drilling is done from the sublevels. In all cases a vertical slot is taken out along the main longitudinal pillar and the down-holes are blasted toward the vertical slot. Drilling is done with 2⅛-inch (39,076 feet) and 3-inch (13,123 feet) tungsten carbide bits.

Total development was 2,360 feet, consisting of 791 feet of primary drifting, 570 feet of sublevels, 695 feet of ore-pass raising, and 304 feet of slot-raising. In addition to drilling blast-holes, long-hole machines were used to drill 1,477 feet of test-holes.

A total of 145,966 tons of ore was milled prior to the strike. Zinc concentrates were shipped to the Trail smelter, and lead concentrates were shipped to the smelter at Kellogg, Idaho.

SUMMIT CREEK

Gold

Bayonne (Bayonne Mine Ltd.)*

(49° 116° S.W.) Company office, 404, 409 Granville Street, Vancouver 2. W. E. Garnett, president; W. G. Hainsworth, consulting geologist in charge of operations. Except for intermittent work by lessees, the property has not been worked since 1946. A new road, 5.6 miles long, was built from the north side of the Salmo–Creston highway, starting 4.7 miles east of the summit. Mine buildings, damaged beyond repair by snow loads, were demolished, and the 24-man bunk-house was renovated. New ore-bins were constructed, and concrete footings were poured to accommodate a new mill building. The No. 8 main vein level portal was retimbered, and the track gauge was widened from 18 inches to 24 inches. During road construction 19 men were employed, but the number was reduced to four by the end of 1963.

NORTH KOOTENAY LAKE

RIONDEL (49° 116° N.W.)

Silver-Lead-Zinc

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)*

Company office, Trail; mine office, Riondel. J. B. Donald, property superintendent; N. Anderson, mine superintendent; T. F. Walton, mill superintendent. This property is at Riondel, on a small peninsula 1½ miles long, on the east shore of Kootenay Lake, 6 miles by road north from the Southern Trans-Provincial highway at Kootenay Bay ferry-landing. The mine is serviced by No. 1 shaft, inclined at 35 degrees. The levels are at intervals of 150 vertical feet. All levels service the Kootenay Chief zone on the south, with No. 2 level and No. 5 level extending north to the Bluebell and Comfort zones.

Mining methods are open stoping and cut-and-fill stoping with deslimed tailings. Backfilling totalled 87,783 cubic yards, including 83,675 cubic yards of tailings and 4,108 cubic yards of waste rock. Some fill was placed in open stopes to aid in pillar recovery.

When it was found from diamond drilling that excessive thermal water would be encountered, the No. 9A level was abandoned and the No. 2 winze was sealed off

* By P. E. Olson.

with a concrete bulkhead. All equipment and material were salvaged from the area before it was allowed to flood.

Development work done in the three mining zones totalled 11,443 feet. Drifting and crosscutting amounted to 6,273 feet and raising amounted to 5,170 feet.

Ventilation of the Kootenay Chief area of the mine was maintained at 200,000 cubic feet of air per minute, and the Comfort and Bluebell zones were provided with 70,000 cubic feet per minute. Auxiliary fans of the aerofoil type are used to supply ventilation within the mine as required. Regular tests are made to determine the level of carbon dioxide gas in the mine air. Stand-by power consisting of three diesel units, two 375-kva. and one high-speed 187.5-kva., are installed at the mine. In the event of power outages these units will supply power to the main fans, some auxiliary fans, No. 6 level hoist, and essential pumping.

On No. 5 level the north drift was extended into the limestone to explore well to the north of any present workings. Ore which was previously drilled from the surface will be explored from this drift. Diamond drilling totalled 13,607 feet. Drilling was for exploration purposes and for safety holes ahead of drifting.

Production for 1963 was 256,484 tons. This ore came from cut-and-fill stopes (45 per cent), open stopes (30.8 per cent), pillars (10.2 per cent), and development (14.0 per cent).

Mine-rescue and first-aid classes were held. Two teams competed in the West Kootenay Mine Rescue Competition at Nelson. The team captained by P. Rowan won this competition and later won the competition for the Provincial championship at Victoria.

Ainsworth (49° 116° N.W.)

Silver-Lead-Zinc

Crown and Anchor*

These claims are owned by D. H. Norcross, of Nelson, who has worked the property since early 1962. The claims straddle the ridge between Cedar Creek and the south fork of Woodbury Creek. The workings are accessible by 4 miles of old logging-road which leaves the Ainsworth–Kaslo road 2 miles north of Ainsworth. In 1962 a shipment of 13 tons of ore to the Trail smelter contained 1,253 ounces of silver, 2,445 pounds of lead, and 1,025 pounds of zinc. This ore came from a discovery on the Crown, which has since been exposed by open cuts. In 1963 an old portal was cleaned out and 12 feet of raise driven in the mineralized zone.

Kaslo (49° 117° N.E.)

Silver-Lead-Zinc

Utica (Peerless Canadian Explorations Limited)*

Company office, 906, 357 Bay Street, Toronto; mine office, Kaslo. L. Dillman, president; W. W. Tyler, mine manager. This company has an option on 17 claims of the Utica Mine group. The mine is located at the head of Twelve Mile Creek, about 15 miles west of Kaslo. Twenty-three men were employed at the mine from April to October. Along the West vein on No. 4 level 600 feet was reconditioned, and 150 feet of raises were driven to test the vein in this area. On No. 5 level 65 feet of crosscut was driven. To test the East vein on this horizon, 750 feet of EX diamond drilling was done from No. 5 level. Five surface diamond-drill holes amounting to 700 feet were put down on the Sol and Andrew J veins.

* By P. E. Olson.

RETALLACK-THREE FORKS

Silver-Lead-Zinc

Wellington (Blue Star Mines Limited)*

(50° 117° S.E.) Company office, 400, 837 West Hastings Street, Vancouver 2; mine office, Retallack. E. L. Borup, president; C. E. Lind, manager. The property is north of Retallack, at an elevation of 4,300 feet, and is reached by 2.3 miles of road which leaves the Kaslo–New Denver highway at Retallack. The Matheson adit was extended 869 feet in 1963 to a total length to date of 2,174 feet. On the Wellington vein 298 feet of drifting was done. On the Whitewater vein 400 feet of drift was reopened and 98 feet of raise was subsequently driven. Three hundred and fifty feet of open cut was put in on the Whitewater vein to trace the vein extensions.

Early in 1963 a heavy flow of water encountered in the Matheson adit flowed for six months before returning to normal. The company employed an average of four men in 1963.

Antoine (Antoine Silver Mines)†

(50° 117° S.E.) Company office, Box 509, Kaslo. This is a private company of L. N. Garland and Associates. L. N. Garland is mine manager. The property consists of the Antoine group of five Crown-granted and three recorded mineral claims. The Soho group of eight Crown-granted mineral claims, which adjoins the Antoine, is held under option. The property is in an alpine basin on the western shoulder of Reco Mountain and is reached by about 9 miles of road from the old Rambler siding on the New Denver–Kaslo road, about 8 miles from New Denver. In 1962 a road was built to the property from the Rambler mine road; this was improved in 1963 and the Rambler mine road was widened in several places.

Work was continuous throughout 1963, employing four or five men. Supplies for the start of 1964 were hauled to the mine during the latter part of 1963 in order to avoid snow-ploughing. A total of 77 tons of sorted ore was shipped to the Trail smelter. Gross metal content: Silver, 13,315 ounces; lead, 72,410 pounds; zinc, 26,513 pounds. A total of 220 feet of drifting and crosscutting and 40 feet of raising was done in 1963. A dry-room and an ore-sorting building were constructed.

It was reported that L. N. Garland purchased control of the company late in 1963.

The Antoine is one of the oldest claims in the district. Shipments of hand-sorted ore from 1895 to 1927 totalled 1,541 tons, with an average content of 156 ounces of silver per ton and 36.3 per cent lead. The workings consist of an inclined shaft connecting at 150 feet vertical depth with an adit level known as No. 5. There is a short winze level 35 feet below No. 5, and a 240-foot sublevel above, known as No. 4 level. The rocks are slaty sediments, porphyry dykes, and one lamprophyre dyke. Figure 6 shows the ore zone on No. 5 level. Production has come from a northeast-striking vein dipping 65 degrees to the southeast, mineralized for a length of 230 feet on No. 5 level. Most of the ore has been mined in the footwall of a 2- to 5-foot lamprophyre dyke that follows the vein for a distance of about 165 feet. At the innermost end of the level the vein rolls flatly to the east into the bedding. At the southwest end of the ore zone the vein continues in part as a steeply dipping fracture, but a good deal of the vein structure flattens and passes to the west into the bedding.

A steep northeast fracture, locally mineralized, lies about 40 to 50 feet in the hangingwall of the vein. It has been followed for a total distance of 200 feet. It is

* By P. E. Olson.
† By M. S. Hedley and P. E. Olson.

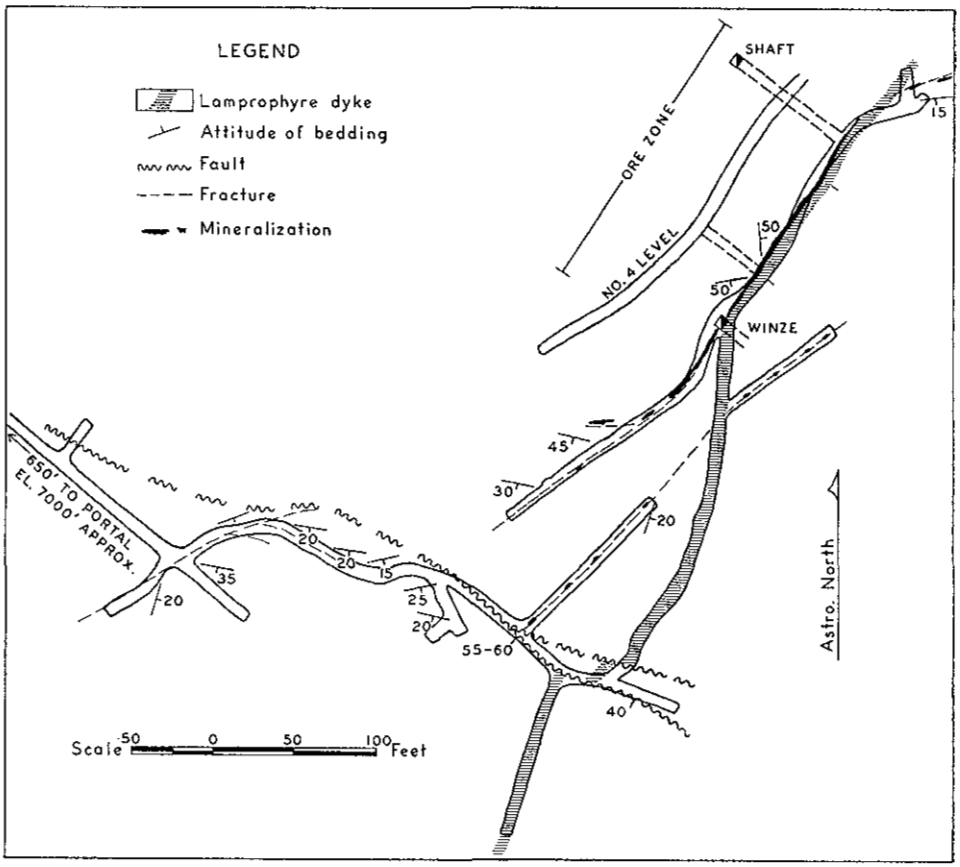

Figure 6. Geology of the Antoine ore zone.

one of a set of joints prominent in the vicinity, other members of which, not mineralized, are to be seen underground.

Continuation of the vein to the southwest is a matter of doubt. A southwest-dipping fault zone offsets the lamprophyre dyke a distance of 40 feet, but it should not be assumed that the vein is offset a similar distance by the same fault. The vein is not necessarily a single, continuous fissure, but is, rather, a locus of movement (probably no more than a few feet) that follows or is deflected into local structures. Outside the ore zone the vein movement meets the bedding at an acute angle and rolls into it, becoming distributed among the planes of bedding rather than along a single fracture. It is a significant fact that mineralization occurs where the vein movement is channelled along a joint, particularly in a situation where the sedimentary rocks are folded or are intruded by porphyry dykes. In such situations the competency of the fissure walls is increased, and, because the joint direction is one of regional tension, there is opportunity for the walls to separate and permit the formation of breccia and vein filling rather than of shearing and gouge.

The Antoine ore zone is in an enlarged member of the regional joint set in a situation where there are porphyry dykes, rolls in the bedding, which is in general flatter than the vein, and a lamprophyre dyke that locally occupies the same fissure as the vein. There is not necessarily a continuous vein to be found on No. 5 level

(or at any single horizon), but an apparently unmineralized fracture seen 775 feet from the portal of the adit may be the equivalent of the Antoine vein.

Mr. Garland discovered ore in the hangingwall of the lamprophyre dyke on No. 4 level. The winze level was extended and presumably will provide most of the immediate ore. It was water filled at the time of examination in July.

SANDON

Silver-Lead-Zinc

Ruth-Hope (Silmonac Mines Limited)*

(49° 117° N.E.) Company office, 808, 602 West Hastings Street, Vancouver 2; mine office, New Denver. During the year this company was formed from the Silmonac Syndicate, which previously operated the property. Violamac Mines Limited continues to manage the venture; J. C. Black, mine manager. The company has control of a group of 59 Crown-granted claims and fractions near Sandon, formerly held by Kelowna Exploration Limited. In addition, some special rights pertaining to the Carnegie holdings are held by Silmonac Mines Limited. The mining plant, which is at the portal of the Ruth No. 5 level, is reached by 2 miles of road from Sandon. Sixteen men were employed at the mine throughout 1963, performing the work shown below:—

	Ft.
Drifts and crosscuts	3,022
Box-holes and raises	127
Diamond drilling (A core)	3,708

The Company was formed chiefly to explore the ground west of the Silversmith-Ruth orebodies on the Ruth No. 5 level (elevation, 4,025 feet). The main Ruth-Silversmith-Slocan Star lode passes through the old Hope working (now caved) at an elevation of about 4,900 feet, and the prime target was the downward projection of the lode beneath the Hope workings.

It was presumed that the lode, west of the Ruth No. 5 orebodies, would be found to be offset to the north on one or more northwesterly trending fault zones, much as the lode is offset in the old Ruth and Silversmith workings (*see* Bull. No. 29, Geology and Ore Deposits of the Sandon Area, 1952, pp. 103–116). Neither the attitude nor the position of such fault or faults was known, nor was the position of the lode, in wholly unexplored ground. The work started early in 1963 and demonstrated the difficulty of geological projection in this part of the Slocan. The lode was finally encountered in September, in an unforeseen situation, and was followed west by drift for about 600 feet by the end of 1963. The lode was reported to be mineralized but not to constitute ore.

Work began 100 feet from the Kelowna Exploration face of 1946 (*see* Fig. 14, Bull. No. 29). A crosscut was driven 600 feet northwestward and then 250 feet westward without encountering the lode. The distribution of " porphyry " was not as expected. After some diamond drilling it was decided that this new face must be some distance in the footwall (north) of the lode. Consequently a return was made to the Kelowna Exploration face, and a general westerly course was followed for a total distance of about 1,650 feet. A large fault zone was encountered 250 feet from the start of this second drive, dipping 50 degrees to the southwest. This fault has produced an apparent offset of the lode of possibly as much as 700 feet, although the position of neither of the fault-lode intersections has yet been demonstrated.

* By P. E. Olson and M. S. Hedley.

Silversmith, Richmond-Eureka, etc. (Carnegie Mining Corporation Limited)*

(49° 117° N.E.) Company office, 416, 25 Adelaide Street West, Toronto; mine office, New Denver. A. W. White, president; J. C. Black, manager. Capital: 5,000,000 shares, no par value. This company is controlled by Violamac Mines Limited. The property consists of 46 Crown-granted and 6 recorded claims and fractions, which include the Silversmith, Slocan Star, Richmond-Eureka, Ruth-Hope, and Slocan King mines on Sandon Creek, south of Sandon.

Lessees E. Perepolkin and son shipped 23 tons of crude ore to the Trail smelter and 463 tons to the Carnegie mill. Concentrates produced from the latter were 25 tons of lead concentrate and 81 tons of zinc concentrate.

Lessees E. Perepolkin and J. Irwin shipped 223 tons of ore to the Carnegie mill, from which 27 tons of lead concentrate and 10 tons of zinc concentrate were produced.

During 1963 the Carnegie mill treated a total of 1,754 tons of ore and produced 159 tons of lead concentrate and 287 tons of zinc concentrate.

Diamond drilling on Carnegie ground amounted to 2,103 feet of A core in six holes and employed two men for about six months.

Wonderful (Silver Ridge Mining Company Limited)*

(49° 117° N.E.) Company office, 373 Baker Street, Nelson; mine office, Sandon. H. F. Magnuson, president; R. A. Grimes, managing director. Capital: 5,000,000 shares, 50 cents par value. The property is about 1 mile west of Sandon on the Idaho Peak road. The surface plant was reconditioned, and the portals of No. 2, No. 3, and No. 4 levels were reopened. On No. 2 level 350 feet of crosscut was driven to test the downward extension of vein outcrops. Ten men were employed during the second half of 1963.

Victor (Violamac Mines Limited)*

(49° 117° N.E.) Company office, 416, 25 Adelaide Street West, Toronto; mine office, New Denver. A. W. White, president; J. C. Black, mine manager. Capital: 1,000,000 shares, $1 par value. The Victor mine is 2½ miles by road southeast of Three Forks. Activity on the Victor in 1963 was limited to leasing operations. Lessees L. Fried and E. DeRosa worked on Nos. 9 and 5 levels and mined a total of 465 tons of ore; 10 tons was shipped to the Trail smelter and 455 tons was trucked to the Carnegie mill. Lessees E. Anderson and J. Stewart worked on No. 4 level of the Victor and produced a total of 627 tons of ore; 14 tons was shipped to the Trail smelter and 613 tons to the Carnegie mill. Production: 1,091 tons. Gross content in ore and concentrates: Gold, 28 ounces; silver, 23,579 ounces; lead, 178,687 pounds; zinc, 233,621 pounds; cadmium, 1,561 pounds.

SLOCAN LAKE

Silver-Lead-Zinc

Hecla (Johnsby Mines Limited)†

(49° 117° N.E.) Company office, Suite 1011, 2200 Yonge Street, Toronto 12; mine office, Silverton. J. C. Byrne, president; R. C. Phillips, managing director; R. T. Avison, mine superintendent. Capital: 3,500,000 shares, $1 par value. The main shareholders in Johnsby are Rayrock Mines Limited and Faraday Uranium Mines Limited.

* By P. E. Olson.
† By M. S. Hedley and P. E. Olson.

In 1962 work was begun to explore the hangingwall branch of the Standard lode, east of the Standard mine. This hangingwall branch follows a general easterly course to the Mammoth mine, which lies about 1 mile to the east. The average dip is about 45 degrees to the south, but the lode varies considerably in both dip and strike. The Mammoth orebody has been explored from the lode apex at 6,000 feet to No. 12 level at 4,300 feet. Between the Mammoth and Standard mines are the Monarch and Hecla ore zones, which have been mined above a westerly extension of the Mammoth No. 7 level.

An adit site was chosen on the north boundary of the Standard claim at 4,166 feet elevation, west of Emily Creek, and a road was built to it from the old Standard camp. The crosscut started in 1962 was continued to the northeast in 1963, to intersect the lode on the Robin claim at a distance of 1,400 feet from the portal. The intersection is northeast of the face of the Standard No. 5 level and about 500 feet above it. The Standard-Mammoth lode was followed, mostly in the footwall but partly in the hangingwall, for 3,300 feet almost due east. Drifting was then stopped. The drift face is down dip from and about 850 feet below the general Hecla ore zone on the Mammoth No. 7 level. The drift face is also about 2,400 feet short of and about 100 feet below the intersection of the lode on the Mammoth No. 12 level crosscut.

In many places where it was encountered in the drift or in diamond-drill holes, the lode was found to be mineralized, although nowhere did the mineralization constitute ore.

A total of 3,390 feet of drifting was done, 1,215 feet of crosscutting, and 3,558 feet of diamond drilling. The average number of men employed was 16.

Westmont (Sterling Silver Mines Ltd.)*

(49° 117° N.E.) Company office, 535 Howe Street, Vancouver 1. R. W. Liversidge, president. The property consists of nine Crown-granted mineral claims and fractions on the north side of Enterprise Creek, opposite the Enterprise mine. Peter Lewontowitz and partner drove 240 feet of tunnel under the old Westmont workings. A large portion of this drive was in overburden, which required special timber support. A total of 500 feet of diamond drilling was done on the property during the year. Two men were employed at the Westmont for seven months.

SPRINGER CREEK

Silver

Anna (Silver King Mines Limited)*

(49° 117° N.E.) The Anna group is owned by Silver King Mines Limited; mine office, Slocan City. Benjamin Marasek, president and manager. The workings are located on the northern side of Springer Creek and east of the Ottawa mine. It is accessible by 5 miles of good road from Slocan City.

The mine was worked intermittently for nine months by Mr. Marasek and his son. No. 4 level was driven 56 feet, and a 15-foot crosscut was driven toward the footwall from the end of No. 4 level. A band of mineralization up to 6 inches wide, containing native silver, was encountered while drifting, but was found to be discontinuous. Six feet of winze was driven on the ore from No. 4 level about 50 feet from the face. Fifty-one tons of ore was shipped to the Trail smelter from a section of weak mineralization about 450 feet from the portal of No. 4 level.

* By P. E. Olson.

Arlington (Arlington Silver Mines Ltd.)*

(49° 117° N.E.) Company office, 809, 525 Seymour Street, Vancouver 2. Work on the property was under the direction of B. I. Nesbitt, who controls the company. The property consists of Crown-granted and recorded mineral claims covering a 2-mile-long strip of land along the Arlington lode. The property is on the north side of Springer Creek, 6.7 miles by road from Slocan City.

The "A" and "B" levels were rehabilitated, roads to the property were repaired, and some new road was constructed. Preparatory to advancing the "B" level in 1964, 500 feet of track and compressed-air lines were laid. Some bulldozer trenching was done, and 326 tons of dump rock from the "B" level was shipped to the Trail smelter.

Ottawa (Ottawa Silver Mines Ltd.)*

(49° 117° N.E.) Company office, 19 North Bernard Street, Spokane, Wash.; mine office, Slocan City. T. C. Hughes, president; C. Thickett, mine manager. The mine is 5 miles by good road from Slocan City. The company mill is 2½ miles from Slocan City on the same road.

In 1963, 2,521 feet of drift and 1,045 feet of raise were driven, mainly on No. 9 level. Diamond-drill holes, totalling 240 feet, were put in to test ore extensions below No. 8 level. A total of 384 tons of ore, containing about 113 ounces of silver per ton, was shipped to the Trail smelter, and about 3,000 tons of ore was stockpiled at the mine. In 1963, 16 men were employed at the mine.

Mill construction was started in June and completed late in December, but no milling was done in 1963. The flow-sheet included both flotation cells and vibrating tables. The more important components of the mill were formerly in a mill constructed at Woodbury Creek in 1953 by Can-Amer Mining & Milling Company Ltd. The mill capacity is expected to be 75 tons per day, and eight men will be employed during operation. Twenty men were engaged to construct the mill.

Calumet (Slocan-Hughes Mines Ltd.)*

(49° 117° N.E.) Company office, 19 North Bernard Street, Spokane, Wash.; mine office, Slocan City. T. C. Hughes, president; C. Thickett, manager. Capital: 5,000,000 shares, no par value. The property consists of 11 Crown-granted claims under lease and 41 claims held by record. The property is accessible by 4 miles of road from Slocan City and is located immediately south of and across Springer Creek from the Ottawa mine. Bulldozer trenching exposed several shears near the old Calumet and Hecla mines, which were last worked in the early 1900's.

Meteor (Cultus Explorations Ltd.)*

(49° 117° N.E.) Company office, 11810—112th Street, Edmonton; mine office, Slocan city. J. F. Sullivan, president; Tony Semeniuk, manager. The property consists of 19 Crown-granted and recorded mineral claims and fractions at the head of Tobin Creek, a tributary of Springer Creek. The mine is 9 miles by road from Slocan City.

The Meteor No. 6 level adit was rehabilitated, and new services were installed from the portal to a point 800 feet inside the level. During the rehabilitation, 265 tons of vein material was accumulated and later shipped to the Trail smelter.

* By P. E. Olson.

Some raising and stoping was done from No. 6 level, and the broken ore left in the raises. Underground diamond drilling on No. 6 level was 400 feet. Surface stripping with a bulldozer disclosed a mineralized vein about 150 feet below No. 6 level.

A Cully mill was erected near the portal of No. 6 level but was not ready for operation in 1963. The nominal capacity of this plant is 50 tons per day. Bunkhouses, a cook-house, and a combination compressor-house and dry were erected near the No. 6 level adit. About 15 men were employed throughout the year.

NORTH LARDEAU

Silver-Lead

Teddy Glacier (Sunshine Lardeau Mines Limited)*

(50° 117° N.W.) Company office, 401, 1033 Davie Street, Vancouver 5. L. G. White, president; J. Sullivan, consulting engineer. The property consists of 23 claims, including the Bell and Moonlight groups, which form one contiguous block of claims. The property is situated at the head of the middle fork of Sable Creek, about 10 miles due north of Beaton.

Prior to 1924 prospectors had noted boulders of float ore containing galena and pyrite which were strewn along the slopes below the glacier. During 1924 the ice retreated sufficiently to expose a vein of the same material. Some underground exploration followed the discovery of ore in place.

During 1963 Sunshine Lardeau Mines Limited mapped and sampled the underground workings and surrounding area. Six diamond-drill holes, totalling 500 feet, were drilled near the portal of the old adit to explore the downward extension of mineralization.

Six men were engaged at the property under the direction of J. Sullivan. The operation was serviced by helicopter, which was based at Revelstoke.

MOYIE

Lead-Zinc

Stoney (The Consolidated Mining and Smelting Company of Canada, Limited)†

(49° 115° N.W.) This property is 6 miles southwest of Moyie, on Stone Creek on the South side of Moyie River. It is a lead-zinc showing and comprises 15 recorded claims, which were optioned by The Consolidated Mining and Smelting Company of Canada, Limited, for exploration during the latter part of 1963. A 2½-mile road was built to the property, and approximately 2,500 cubic yards of trenching was done by bulldozer. Two men were employed under the direction of G. L. Weber, Cominco geologist.

Gold-Silver

Midway (Calix Gold Mines Ltd.)†

(49° 115° N.W.) This property is adjacent to the No. 3 highway, 5 miles southwest of Moyie. It comprises 16 mineral claims, which were optioned or recorded by Moyie Mines Ltd. in 1962 for exploration. The present company, formed in 1963, optioned the property, but as yet activities have been restricted to a surface survey by a crew of two.

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* By P. E. Olson.
† By D. R. Morgan.

Silver-Lead-Zinc

St. Eugene, St. Eugene Extension, Aurora*

(49° 115° N.W.) This property is south of Moyie and is adjacent to the No. 3 highway. It comprises 23 Crown-granted claims owned by The Consolidated Mining and Smelting Company of Canada, Limited, and 81 Crown-granted and 4 recorded claims owned by St. Eugene Mining Corporation. The property is astride lower Moyie Lake and includes the old St. Eugene mine area. The two companies jointly continued an exploration programme that was started in 1962. Two diamond-drill holes were drilled from the surface, using BX wire-line equipment. One hole was drilled 3,707 feet and the other 1,684 feet. The longer hole is believed to be a depth record in British Columbia for metallic mineral exploration. Both holes were drilled on the east side of the lake, in the vicinity of the St. Eugene mine. Eight men were employed, and the work was under the direction of R. E. Gifford, Cominco geologist.

KIMBERLEY

Silver-Lead-Zinc

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited)*

(49° 115° N.W.) Company office, Box 1510, Station B, Montreal 2; W. S. Kirkpatrick, president. Western headquarters, Trail; D. D. Morris, vice-president and general manager. Sullivan mine office, Kimberley; S. M. Rothman, general superintendant; R. M. Porter, assistant manager of mines; H. J. Chalmers, superintendent, Sullivan concentrator. The Sullivan mine is on Mark Creek, 2 miles north of Kimberley, and the concentrator is at Chapman Camp, 2 miles south of Kimberley. The holdings include 678 Crown-granted claims and fractions. The following report prepared by the management is a synopsis of the operations.

" During 1963 the mine produced and the concentrator treated about 2,595,000 tons of ore, 69% of which came from above the 3900 level and 31% from below the 3900. The largest blast during the year was 0–12–30, 430,000 tons.

" The concentrator operated 263 days during 1963 at an average of 9,866 tons of ore per day. Employees at the year-end totalled 721 at the mine and 309 at the concentrator.

"Approximately 9,800 tons of slag were loaded and shipped to Trail from the old smelter site at Marysville.

" The total development footage was about 34,000 feet. This includes drifting on the 2600 and 2700 levels, stope development on the 2700 level and completion of the ventilation connections from the 2600 to 2850 levels.

" The total backfill placed was 700,000 cubic yards. This consisted of 450,000 cubic yards of planned cave, 240,000 cubic yards of float rock placed in eight stopes below the 3900 level and 10,000 cubic yards of development waste.

" The ventilation system supplied and exhausted about 900,000 c.f.m. of air. A new forced air intake (No. 39 Shaft) to supplement 3900 level ventilation circuits was completed and will be ready for operation early in 1964.

" Yieldable and rigid steel arches are being used in one area of the mine for ground control.

" Experimental work in noise suppression has reached the point where all stopers, jacklegs and longhole drills are equipped with noise suppressing devices. Earplugs are in general use.

* By D. R. Morgan.

"In 1963 the Sullivan mine had 25 lost-time accidents including one fatality. There were three lost-time accidents at the Sullivan concentrator. Accident frequency at the mine was 18.4 accidents per million man-hours worked and 4.8 at the concentrator. The severity rate was 1,360 calendar days on compensation per million man-hours worked for the mine and 380 for the concentrator.

"Nine Sullivan mine and concentrator employees obtained or renewed their Industrial First Aid Certificates and ninety-five employees passed their St. John's First Aid examinations. A Sullivan mine team won the East Kootenay Senior Men's First Aid Competition. Fourteen employees obtained their Mine Rescue certificates, making a total of 301 since 1930."

Lead-Zinc

Western Exploration (Reeves MacDonald Mines Limited)*

(49° 115° N.W.) Head office, 410 Metropolitan Building, 836 West Hastings Street, Vancouver 1; mine office, Remac. L. M. Kinney, Metaline Falls, Wash., general manager; F. R. Thompson, superintendent. This property is located between the headwaters of the east fork of Mark Creek and Mather Creek. It is 10 miles north of Kimberley, and can be reached by an old forestry road leading from the open-pit area of the Sullivan mine. The property consists of 110 Crown-granted claims, which have been optioned from the Western Exploration Company Limited of Silverton, and six mineral claims held by record, at the north end of the group.

A party of three men conducted a geophysical survey on the property for a period of four weeks during the summer of 1963. The work was under the direction of Roy Anderson, chief engineer of the Pend Oreille Mines and Metals Company of Metaline Falls, Wash.

WASA

Silver-Lead-Zinc

Estella (Copper Soo Mining Company Limited)†

(49° 115° N.W.) Executive office, Osoyoos; mine office, Cranbrook. T. G. Wilson, managing director; A. G. Ditto, superintendent; H. Hill & L. Starck & Associates Ltd., consulting engineers. This old property is in a basin at the head of Tracy Creek, about 5 miles east of Wasa, 11 miles north of Fort Steele. A good road leads to the mine at 6,100 feet elevation, 17 miles from Wasa.

The Estella property was located in the 1890's. Some surface work was done at an early date, and the Rover adit was driven in the vein zone. The Estella crosscut stopped short of the vein zone. The property was optioned by The Consolidated Mining and Smelting Company of Canada, Limited, in 1927, and some diamond drilling was done. An extensive examination was made of the mine area in 1944 by the same company, but nothing further was done.

In 1950 Estella Mines Limited was formed, and immediate plans were made to bring the mine into production. A 150-ton mill was built at Wasa, and milling commenced November 1, 1951. In February, 1953, the ore reserves were exhausted, and the mill was shut down. A little ore had been encountered in a prospect winze below the southeast end of the Estella (6100) level, and a two-compartment internal shaft was sunk to the 6000 level, 125 feet vertically below the Estella level. The 1953 Annual Report (p. 151) states that from the bottom of the new shaft "crosscutting to the hangingwall showed the extension of the Estella orebody to be a narrow stringer along which subsequent drifting, to a point 100 feet

* By D. R. Morgan.
† By M. S. Hedley.

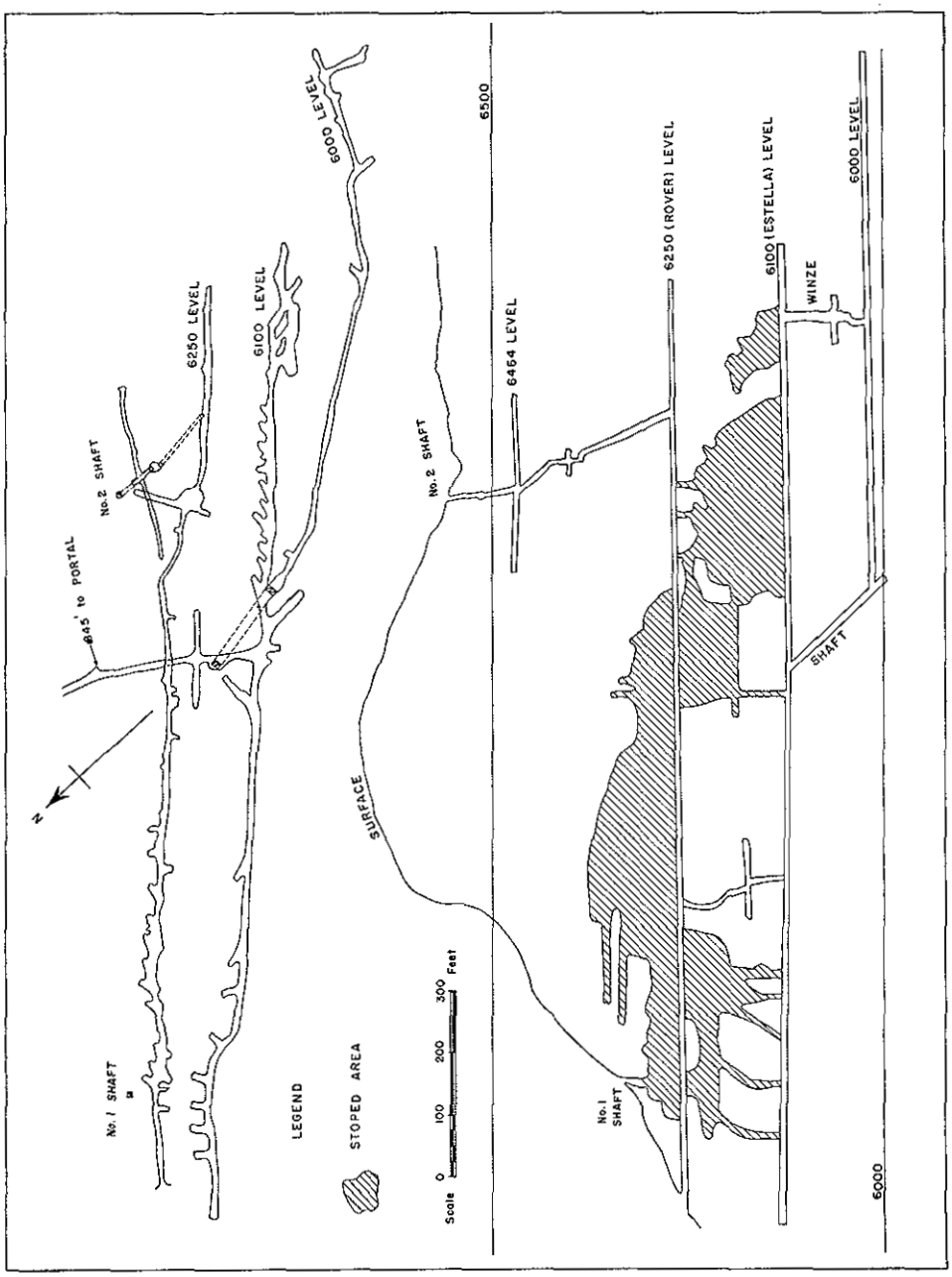

Figure 7. Estella mine—plan and section.

south of the winze, failed to find ore of commercial width or value." The operation closed completely in December, 1953. In 1955 the company was reorganized to form United Estella Mines Ltd., and some additional work was done, principally on the 6000 level.

In 1951 the Department of Mines published in the Annual Report, pages 186 to 190, the results of an examination and sampling campaign. The tonnage of "reasonably well assured" ore was calculated to be, without dilution, 47,800 tons of ore of an average width of 5.8 feet and with an average grade of: Silver, 1.9

ounces per ton; lead, 5.8 per cent; and zinc, 19.0 per cent. This same zone produced, during the life of the milling operation, 66,660 tons with an approximate average grade, calculated from the metal content of the concentrates, of: Silver, 1.6 ounces per ton; lead, 5.5 per cent; and zinc, 10.5 per cent.

A raise had been driven in 1952, part way from the 6250 (Rover) level to the old No. 2 (Rover) shaft, but ore was not encountered, in spite of the fact that good ore was reported to exist in the shaft. In 1956 H. Hill & L. Starck & Associates Ltd. made an examination that revealed that the Rover raise had been driven on a fault about 20 feet in the hangingwall of the ore. Three surface holes were diamond drilled at this time, and ore was picked up below the No. 2 shaft.

In 1962 Copper Soo Mining Company purchased the property and set about rehabilitating the mine and making a thorough examination. The downward continuation of the ore was found beneath the No. 2 shaft, and the 6464 level was driven on it for a length of about 200 feet. Ore was trucked to the railway at Wasa and shipped to the concentrator at Trail. Production started in August, 1963, and work stopped for the winter in October.

The lode is a zone of fracturing and light shearing, dipping to the southwest at angles between about 40 and 70 degrees. It is in argillites and quartzites in the Aldridge Formation and in intrusive diorite. The main ore zone rakes at a very low angle to the southeast, following in general the diorite contact, and it would appear that the contact is the over-all controlling feature. The mine was not re-examined geologically, but the 1951 Annual Report states the lode is ". . . semi-bedded in the sedimentary rocks and penetrating diorite in the mine workings. The over-all structure appears to be simple, but the details are not known, and minor flexures and crumples seen on the surface may or may not influence the location of orebodies. The ore is a replacement by sphalerite, galena, and pyrite, accompanied by more or less silica."

The main ore zone appears to have been worked out. Exploration on the 6000 level (not seen by the writer) has been disappointing. The present ore zone is separate from the main zone. As known, it extends from about the 6400 level to surface, a vertical distance of about 150 feet, and is 170 feet long on the 6464 level. The zone fades out at the southeast end of the 6464 level and is faulted to the north at the northwest end, where the continuation has been encountered in drill-holes. The over-all extent of the ore zone is not known. The ore is 2 to 3 feet wide for the most part, and the average grade, for 2,674 tons shipped in 1963, is: Silver, 6.2 ounces per ton; lead, 11.8 per cent; and zinc, 23.05 per cent.

The operation was active for a period of six months during 1963, and a crew of eight men was employed.

WINDERMERE

Toby Creek (50° 116° S.E.)

Silver-Lead-Zinc

Mineral King (Sheep Creek Mines Limited)*

Company office, 6, 490 Baker Street, Nelson; mine office, Toby Creek. J. R. Pyper, president; J. S. McIntosh, managing director; J. B. Magee, resident manager. This mine is at Toby Creek, 28 miles southwest of Athalmer. The workings are in a mountain ridge between Toby and Jumbo Creeks. They are entered by four levels, three of which, numbered 2, 3, and 7, have been driven at various elevations from the Toby Creek side, and the other, No. 9 level, from the Jumbo Creek side. There are four intermediate levels which do not extend

* By D. R. Morgan.

to the surface. The mine is operated by the open-stope method, and the workings are in four irregularly shaped orebodies known as the "A," "B," "C," and "D" zones. The main haulage system is on the No. 7 and No. 9 levels. A detailed description of the property is included in the 1959 and 1962 Annual Reports.

The mine produced 203,942 tons of lead-zinc ore during 1963, most of the ore being mined from a number of stopes above No. 4 level. The remainder was mined in the course of development work. Total development included 3,546 feet of drifting and crosscutting, 1,215 feet of raising, and 30,966 feet of diamond drilling. The newer development included further driving on the Nos. 7, 8, and 9 levels. Progress on No. 9 level was stopped for a time owing to the emission of flammable gas from a diamond-drill hole. This was later sealed.

During 1963, 1,921 tons of barite was produced, mainly from the "C" and "D" zones above No. 3 level. The reserves in this area are rapidly nearing depletion, and preparations are being made for future shipments to be made from the lower levels. The barite is sold in the crude state. It is trucked to Invermere for shipment by rail.

The mine is ventilated by both mechanical and natural means. Approximately 29,000 cubic feet of air per minute was exhausted from the workings, and of this quantity 18,000 cubic feet per minute was supplied by a 15-horsepower electrically driven fan, which is located in the No. 2 intake airway. The remainder was by natural means. This quantity was found to be sufficient for the requirements of the workings.

The concentrator operated throughout the year and produced 15,895 tons of zinc concentrates, which averaged 56.7 per cent zinc, and 5,583 tons of lead concentrates, averaging 67.5 per cent lead. There were no major changes in the concentrating methods, and the concentrates were trucked to Invermere for shipment by rail.

The number of men employed was 97, of whom 56 were employed underground.

Silver-Lead

Delphine (Western Beaver Lodge Mines Ltd.)*

Registered office, Suite 303, 1075 Melville Street, Vancouver 5. D. F. Farris, president. This property is on the north side of Delphine Creek, a tributary of Toby Creek, and is approximately 22 miles southwest of Athalmer. It consists of three Crown-granted and three recorded claims. A detailed description of the property is included in the 1915 Annual Report. The present company acquired the property in the fall of 1963 for exploration.

In 1963 a 2-mile access road was built to the property and a certain amount of geological mapping was done. There were four men employed for a period of two months, and preparations are being made to drive an adit on the vein. The work was under the direction of R. Renshaw, consulting engineer.

Silver-Copper

Ptarmigan (Belle Tahsis Mines Ltd.)*

(50° 116° N.E.) Office address, 10th Floor, Credit Foncier Building, 850 West Hastings Street, Vancouver 1. This property is at an elevation of 8,600 feet, at the headwaters of Red Line Creek, a tributary of McDonald Creek, which in turn is a tributary of Horsethief Creek. It can be reached by a 29-mile logging-road leading from the village of Wilmer. The property was formerly operated by

* By D. R. Morgan.

Selkirk Ptarmigan Mines Limited and was optioned by the present company in 1963 for exploration. A description of the property has been given in past Annual Reports.

The work done in 1963 included a geological and geophysical survey, and a crew of six men drilled 10 diamond-drill holes totalling 650 feet on the surface and in the mine. The work was under the direction of D. R. Morgan, geologist.

REVELSTOKE

Lead-Zinc

King Fissure, S.B., C.R., and Deby*

(51° 118° S.E.) This proprty, known as the River Jordan lead-zinc property, consists of 16 Crown-granted claims owned by Jordan Mines Limited and 11 recorded claims owned by Bralorne Pioneer Mines Limited. The office of both companies is 355 Burrard Street, Vancouver. The property is on the upper northern slope of Mount Copeland, about 12 miles northwest of Revelstoke. Mineralization consists of an aggregate of fine-grained pyrite, pyrrhotite, galena, and sphalerite disseminated in a single layer of metamorphosed sedimentary rock in a sequence of schists and gneisses. There are two mineralized layers which strike eastward and dip at moderate angles to the south and which join at both the western and eastern ends of the property. They are thought to have the form of a syncline plunging at a low angle to the east, but the structure has not been determined with certainty. The property has been described by C. Riley in a paper in Transactions of the Canadian Institute of Mining and Metallurgy for 1961, pages 268 to 272.

The mineralization, well exposed in cliffs and outcrops between elevations of 5,800 and 7,500 feet, has been known for many years. Exploratory work since about 1950 has been mapping, trenching, and sampling. In 1963 five holes with a total length of 4,929 feet were diamond drilled to test the continuity of the mineralization in depth. The holes were steeply inclined, and the longest was 1,500 feet. Two holes intersected both lodes several hundred feet from their outcrop. The camp was serviced by helicopter from Revelstoke, and a trail to the property constructed during previous exploratory work was not used.

Eight men were employed under the direction of D. H. James, geolgist.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1956, p. 114; 1958, p. 53; *C.I.M.M.*, Trans., Vol. LXIV, 1961, pp. 268–272.]

RUDDOCK CREEK

Lead-Zinc

It, In, and To (Falconridge Nickel Mines Limited)†

(51° 118° N.W.) Exploration office, 1112 West Pender Street, Vancouver 1. Alex. Smith, manager; H. R. Morris, geologist in charge. About 94 claims are held by record on the southern slopes of Gordon Horne Peak, a 9,500-foot summit between the head of Ruddock Creek, which flows east into the Columbia River, and Oliver Creek, which flows north and west into the Adams River. The main showing is at the head of Ruddock Creek, at an elevation of 7,600 feet.

A tent camp at 7,000 feet was serviced entirely by helicopter, from a supply depot on the Big Bend highway 65 miles north of Revelstoke. Geological work continued in 1963, and 12,093 feet of diamond drilling was done in 25 holes. This included the main showing and showings nearly 3 miles to the west on the steep slope above Oliver Creek.

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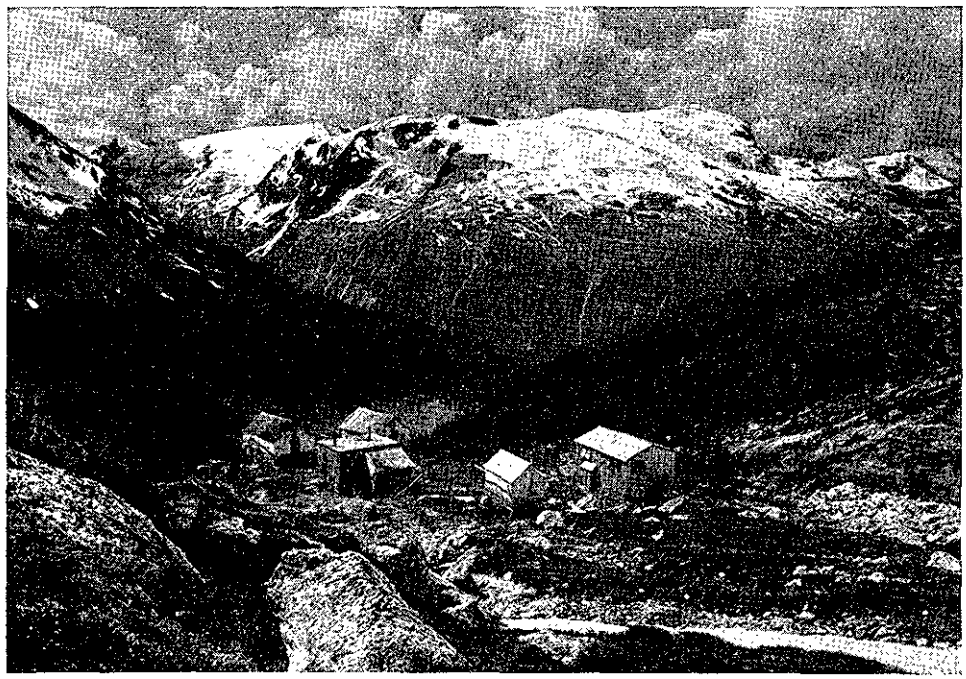
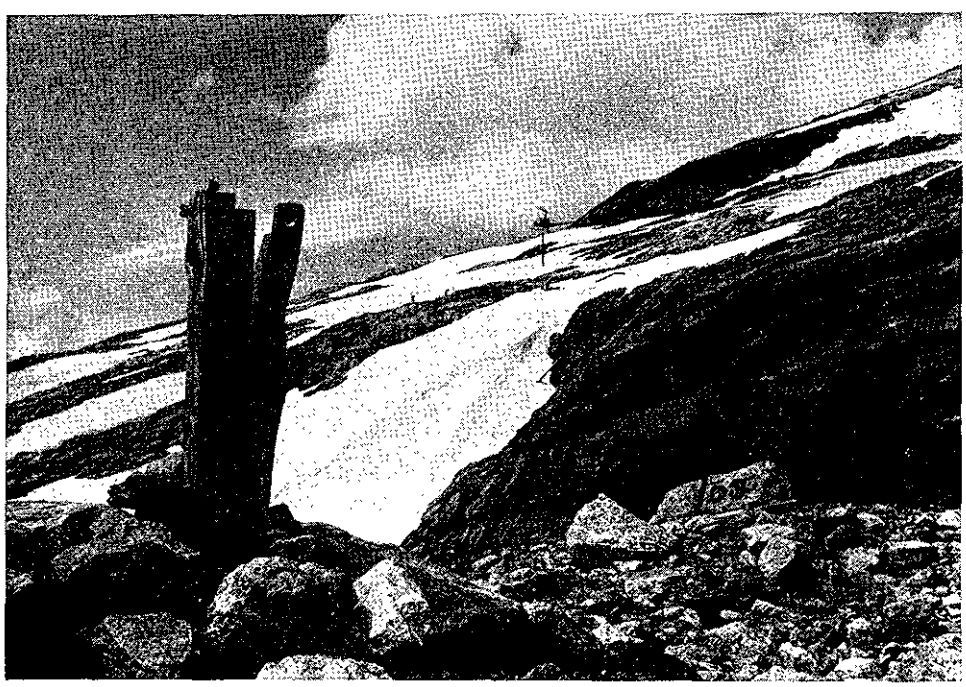
* By James T. Fyles.
† By M. S. Hedley.



Falconbridge Nickel Mines Limited. Ruddock Creek camp. Looking southwest across Oliver Creek.



Claim posts on Ruddock Creek main showing. Note helicopter in distance bringing in diamond-drill equipment.

Lead-zinc mineralization, consisting dominantly of sphalerite, occurs in schists and gneisses of the Shuswap terrain. Mineralized layers, which in places indicate remarkable continuity, appear to be bedded and are involved in intricate folding of the layered rocks. Though contorted, the rocks in general dip to the southwest at moderate angles, more or less parallel to the hillside. There is much post-mineral intrusive pegmatite that occurs as sills and dykes, and as sheets that also dip southwest with the hillside. The sheets are as much as 150 feet thick, and much layered rock has been obliterated by the pegmatite in the general area.

Mineralization of ore grade contains about five times as much zinc as lead, although in submarginal material the two metals may be about equal in amount. The ore is associated with quartz, and the better-grade material consists of abundant dark sphalerite spotted finely with grains and small clots of quartz that in at least some instances appear to consist of crushed aggregates. Pyrrhotite is about the only other sulphide. Fluorite, barite, and epidote are associated with the ore zone.

The main ore zone extends on surface for about 600 feet along the central part of a fold that has been referred to as a syncline but is actually a flat compressed crumple open to the south. The hinge line of the crumple plunges flatly in the same direction as the common lineation of the area, north 70 degrees west. The ore has been followed down dips of 35 to 40 degrees by diamond drilling to the hinge line, a distance of about 500 feet. The ore in the main zone is as much as 40 feet thick and has the appearance of a greatly thickened layer, repeated in the crumple. A second, much thinner, ore layer lies 15 to 30 feet outside the first.

Detailed mapping and diamond drilling have demonstrated a considerable tonnage of ore containing about 10 per cent zinc in holes drilled within a few hundred feet of the outcrop of the ore. Drilling farther afield, to follow westward down the plunge of the ore in the axial zone of the fold (where it is thickest), failed to locate ore beyond a north-trending fault which apparently drops the ore zone down on the west. The deepest hole was drilled to a depth of some 1,900 feet.

The ore appears to follow a horizon which is closely associated with a band of grey to white marble a few feet thick. The marble is itself in places sparingly mineralized. The ore horizon is siliceous, but it is not certain how much of the quartz represents original quartzite and how much may have been introduced. The ore is in places limy. In spite of excellent exposures, the ore structure cannot be traced continuously because of the pegmatite sheets. A locus of sphalerite mineralization, for the most part about 4 feet thick, has reportedly been traced for some 3 miles, over the ridge of Gordon Horne peak at 8,000 feet elevation, round to the north of the peak, and down the steep westerly slopes above Oliver Creek. A large fold is indicated to lie north and west of the crumple of the main showing, and it is presumably this fold that changes abruptly the direction of surface trace of mineralization west of the main showing, from westerly to northerly.

The main mineralization has the appearance of a bedded layer, for the most part about 4 feet thick, which is involved in the regional complex folding and, because of the folding, is locally greatly thickened, particulary in the core of the flat crumple in the main showing. The origin of this ore is of very great interest, as the nature of the occurrence determines not only the problems of development, but greatly affects the techniques of search for new deposits. Whatever the age of the mineralization and its ultimate origin, it is plain that it is older than the pegmatite sheets and plain also that it has to some extent been involved in the complex folding characteristic of the Shuswap terrain.

SKAGIT RIVER

Copper

A.M. (Canam Copper Company, Ltd.)*

(49° 121° S.E.) Company office, 405, 25 Adelaide Street West, Toronto 1. S. A. Perry, president; W. M. Sharp, resident engineer. The A.M. group, consisting of eight Crown-granted claims, is on the western boundary of Manning Park and is 4 miles by road southerly from about Mile 30 on the Hope–Princeton highway. The company also holds 54 located claims in the same area. From 1930, when the property was first located, to 1961 a considerable amount of underground exploration has been carried out from nine adit levels, from No. 3 at 5,850 feet elevation to No. 15 at 4,300 feet elevation.

Detailed descriptions of the geology of the property have been given in previous Annual Reports. The mineralization occurs in a pipe-like zone of brecciated sediments which has a known vertical range of 1,500 to 1,800 feet and a width of about 400 feet; the principal mineral of economic interest is chalcopyrite. At the end of 1961 the company estimated reserves of potential ore at 2,069,500 tons, grading 1.49 per cent copper, 0.026 ounce of gold, and 1.00 ounce of silver per ton.

In 1963 work was started on October 6th and finished on December 20th. The camp and surface buildings were rehabilitated, and No. 15 level (4300 main crosscut) was cleaned out and retimbered where necessary. A total of 1,052 feet of diamond drilling was done in this section of the mine. Two holes totalling 133 feet were diamond drilled on the surface south of No. 7 adit.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1959, pp. 122–124; 1954, pp. 152–159; 1949, pp. 210–213.]

HOPE

Nickel-Copper

Pride of Emory (Giant Mascot Mines Limited)*

(49° 121° S.W.) Company office, 844 West Hastings Street, Vancouver 1; mine office, P.O. Box 820, Hope. W. Clarke Gibson, president; H. Hill & L. Starck & Associates Ltd., consulting management engineers; F. Holland, general superintendent; C. Coffey, mill superintendent; O. G. Gilroy, surface superintendent. The property is at the head of Stulkawhits (Texas) Creek, which flows eastward into the Fraser River about 6 miles north of Hope. From a point on the Trans-Canada highway 10 miles north of Hope, a good gravel road 5.1 miles long leads up Stulkawhits Creek valley to the mill and surface buildings at the 2600 adit portal, the adit number being the elevation above sea-level.

The ore occurs in a number of separate orebodies, the principal ones being the Pride of Emory, the Brunswick Nos. 1, 2, 5, and 7, the 2663, and 1600. The orebodies are steeply plunging pipe-like deposits and occur in an irregular stock-like intrusion of ultrabasic rocks approximately 1½ square miles in area. They comprise disseminated and massive sulphides, of which pyrrhotite, pentlandite, and chalcopyrite are the most common. The mine is developed from two adit levels—the 3550 level, with portals on both the west and east side of the mine, and the 2600 level, which is the main haulage level. An ore-pass and an internal inclined shaft join the two adit levels. Three other levels at 3,400, 3,250, and 2,950 feet elevation respectively have been developed from the inclined shaft. The ore is mined by horizontal and vertical long-hole blasting. The long blast-holes are usually loaded with a commercial form of AN/FO. The ore is drawn off at mucking-machine draw points, where it is loaded directly into cars. Six Atlas L.M. 56H loaders, one

* By A. R. C. James.

Eimco 24, and one Eimco 21 are in use. At the 2600 level the ore is loaded from the ore-pass into 6-ton Granby cars and hauled to surface by trolley locomotive.

The following is a summary of mining and development in 1963:—

	Ft.
Drifting	1,621
Crosscutting	3,154
Raising	4,260
Diamond drilling	58,647
Long-hole drilling (blast-holes)	209,206

Most production in 1963 was from the Brunswick No. 2 orebody, which has now been extensively mined above 2950 level, but substantial production was also obtained from the Brunswick No. 5 and the Pride of Emory.

Principal development work done in 1963 was as follows:—

(1) The Pride of Emory "B" and "C" zones were fully developed and brought into production between the 3550 and 3815 levels.

(2) Further development was done on the 1600 orebody above the 3550 level, and at the year-end this portion of the orebody was ready for production.

(3) An exploration raise was driven up 200 feet on the 1400 orebody, and undercutting in preparation for mining was under way at the year-end.

(4) In the 512 orebody, the B.C. Nickel raise was rehabilitated and some diamond drilling done.

(5) On the 3250 level a crosscut was advanced to a point 800 feet north of the shaft in the Pride of Emory area. A raise was driven to the 3550 level, and diamond drilling was completed to "B," "C," and "D" zones, ready for stope development.

(6) The 3254 crosscut was advanced to a point 2,200 feet east of the shaft in the 1600 orebody area. A raise was driven through to the 3550 level, and diamond drilling to outline the orebody started. At the year-end one drawpoint had been established in the orebody and raising in preparation for undercutting was started.

(7) On the 2600 level a raise was driven through to the 2950 level to develop an offshoot of the 2663 orebody. This was mined and brought into production during the year.

(8) A crosscut was advanced 600 feet to the west on the 2600 level to the Brunswick No. 2 area, a raise was driven through to 2950 level, and the Brunswick No. 2 orebody developed and prepared for production above the 2800 level.

The mill continued to produce a bulk nickel concentrate, which is supplied to the Sumitomo Metal Mining Company Ltd. The concentrates are trucked from the property to Vancouver Wharves Ltd. bulk-loading plant in North Vancouver by truck-trailer units. In 1963 a total of 313,836 tons of ore was milled. A total of 20,107 tons of bulk concentrate was shipped, containing 4,250,000 pounds of nickel and 2,050,000 pounds of copper. The crew in December comprised 154 men (including staff), of whom 86 were employed underground.

Silver

Eureka Victoria (Tru-West Explorations Ltd.)*

(49° 121° S.W.) Company office, 1272 West Pender Street, Vancouver 1. W. Ferguson, president; J. Willey, manager. This company controls 4 Crown-granted claims (including the two oldest Crown grants in the Province) and 30 recorded claims on Silver Peak, 5 miles due south of Hope.

* By A. R. C. James.

The showings are at an elevation of 5,700 feet in rugged terrain. For a short period the property acquired some fame as one of the first producing lode mines in the Province, and high-grade silver shipments were made in the years 1868 to 1874.

The property is reached by turning west off the Skagit road near Silver Lake and following a series of logging-roads up the mountain. These roads terminate at an elevation of 4,100 feet, and from here a small aerial tram-line gives access to the lower adit at 5,200 feet elevation.

The present company started work in 1962, and continued in 1963. The lower adit was extended 196 feet to a point 413 feet from the portal. A survey was also made of the existing workings. A crew of six men was employed. Work was terminated on December 20th.

HARRISON LAKE

Molybdenum

Gem (Gem Explorations Limited)*

(49° 121° N.W.) Company office, 1272 West Pender Street, Vancouver 1; registered office, 850 West Hastings Street, Vancouver 1. Raymond W. Caskey, president; J. A. Willey, managing director; H. H. Cohen, consulting engineer. The property comprises 101 mineral claims held by record and situated between 2,500 and 5,000 feet elevation near the crest of the Lillooet Range at the head of Clear Creek, a tributary of Big Silver Creek. Big Silver Creek flows south into Harrison Lake, 20 miles north of Harrison Hot Springs. A four-wheel-drive vehicle can get to within 4 miles of the Gem Exploration camp on logging-roads; a foot-trail leads from the end of the road to the camp. Normally access is by helicopter from Harrison Hot Springs air-strip. The camp is at about 2,500 feet elevation.

The geology of the region in the immediate vicinity of the property has not been mapped. Geological Survey of Canada Map 737A, Hope, shows the geology to about 1 mile of the property. The main contact between the sedimentary-volcanic group and the granitic rocks passes through the western side of the property. The intruded rocks close to the granitic contact are biotite hornfelses and paragneisses.

The intrusive rocks, in which the mineralization occurs, were seen by the writer for about three-quarters of a mile along Clear Creek and to about one-half mile up a southward-flowing tributary locally termed Ore Creek. The older intrusive rocks are in part gneissic, and all of them contain cordierite as well as minor garnet. The prominent and common ferromagnesian is biotite.

The oldest intrusive rock is diorite, containing hornblende in part altered to biotite. It is intruded by a gneissic biotite granite, in which no hornblende was seen in the one thin-section examined. Separated from the gneissic biotite granite by a fault is a massive quartz monzonite which may be related to the diorite. The gneissic biotite granite in turn is intruded by a massive light-coloured biotite granite. This granite lies southwest of the older granite and diorite, extending downstream along Clear Creek for more than a thousand feet and at least one-half mile up Ore Creek.

Dykes are of three kinds: a banded pegmatitic dyke with quartz along the centre, intrusive into the gneissic biotite granite; a felsite intrusive into the younger granite and containing a small amount of sanidine; and aplite, also intrusive into the younger granite. The relative ages of the dykes are not known.

* By N. D. McKechnie.

The gneissic structure strikes north 4 to 10 degrees east and dips 35 to 45 degrees east. Two faults appear to be post-mineral; one strikes north-south and dips 70 degrees west; the other strikes north 30 degrees west and dips 75 degrees southwestward.

The mineralization is molybdenite in quartz. It occurs as quartz veins from 1 to 3 feet thick, in thin stringers in joint planes, and as disseminated grains in the diorite and granites. It was not recognized in any of the dykes.

The principal quartz-molybdenite vein showings are on either side of Clear Creek at an elevation of about 3,000 feet and some 2,000 feet upstream from the camp. The exposures are on either side of a post-mineral fault which strikes north-south and dips 70 degrees west. On the southeast side of Clear Creek and about 150 feet above it in elevation, a quartz-molybdenite vein 1 to 3 feet wide is exposed, which strikes north 12 degrees east and dips 65 degrees westward. On the southeast side of the creek but on the footwall side of the fault and 60 feet lower in elevation than the first exposure, a lenticular quartz-molybdenite vein up to 1 foot wide strikes north 20 degrees east and dips 65 degrees eastward. On the northwest side of Clear Creek and on the footwall side of the fault, a thinner quartz-molybdenite vein outcrops at creek-level, strikes north 12 degrees east, and dips 80 degrees westward. About 50 feet upstream a similar quartz-molybdenite vein at creek-level strikes north 12 degrees east and dips 70 degrees westward, or almost exactly parallel to the vein on the southeast side of the creek and on the hanging-wall side of the north-south striking fault. If parts of the same vein are indicated, then the horizontal displacement along the fault is about 500 feet to the left.

Thin quartz-molybdenite stringers and molybdenite coatings in joint planes are particularly noticeable in parts of the light-coloured massive granite. In an area on the northwest side of the creek and just downstream from the adit, they are numerous enough to warrant investigation.

An adit was started on the southeast side of Clear Creek to test the north 12 degrees east, 65 degrees east quartz-molybdenite vein; the projected length was 500 feet.

A crew of five men was employed.

HOWE SOUND

Copper-Zinc

Britannia (The Anaconda Company (Canada) Ltd.)*

(49° 123° N.E.) Head office, Eighth Street, New Toronto; mine office, Britannia Beach. J. Van Der Ploeg, president; J. D. Knaebel, general manager; B. B. Greenlee, mine manager; V. Gladman, mill superintendent. The property is on the east side of Howe Sound, 40 miles by road from Vancouver. This large mine with its extensive workings has been in operation since the beginning of the century. In January, 1963, the property was purchased by The Anaconda Company (Canada) Ltd. from the former owners, the Howe Sound Company.

The main haulage tunnel of the mine is on the 4100 level, with the main portal at Britannia Beach. This now extends for approximately 4 miles along the Britannia shear structure. Orebodies are at present being mined in the Victoria, Bluff, and No. 8 sections of the mine. The Victoria section is serviced from the Victoria shaft, which extends from the surface above the 1800 level down to the main haulage at the 4100 level, 3.8 miles from the portal. The Victoria workings at present extend from the 2800 level to the 4100 level and include the Victoria, Empress, and other

* By A. R. C. James.

orebodies. The Bluff section is serviced from the No. 7 shaft, which extends from the 2200 level to the 4100 level, and is 2.25 miles from the 4100 portal. The Bluff workings extend from the 3500 level down to the 4100 level. The No. 8 section is mined from the No. 8 shaft, 1.8 miles from the 4100 portal, which extends from the 4100 level down to the 5700 level. The present No. 8 workings extend from the 4100 level to the 5100 level. Methods of mining at Britannia include cut and fill, square-set, sublevel caving, and blast-hole methods.

The following is a summary of development work done in 1963:—

	Ft.
Drifting	10,896
Raising	10,327
Crosscutting	4,116
Diamond drilling	39,547

Important items of development work undertaken during the year include the following:—

(1) A new ventilation raise was driven from the 4100 level to the 3500 level in the Bluff section, and a new fan was being installed at the year-end at the 2700 level. This is part of a scheme to improve ventilation in the Bluff section by conducting the return air from No. 8 section via No. 6 shaft and the new raise up to surface, and providing independent ventilation for the Bluff section.

(2) An ore-pass raise was started from the 4100 level to tap the No. 4 shaft orebody in the Bluff mine.

(3) Drifting and development was carried out in the west end of the Victoria section in the Empress and 179 zones.

(4) A start was made in driving the 5250 level from No. 8 shaft for further development in the No. 8 section.

(5) Exploratory drifting and diamond drilling was continued on the 5700 level, the deepest level of the mine, in No. 8 section.

The concentrator milled 493,700 tons of ore, from which 19,895 tons of copper concentrate and 7,045 tons of zinc concentrate was produced.

The average number of men employed was 446, of which 179 were employed underground.

SQUAMISH

Copper

High Hopes* (49° 123° N.E.) This group of four claims is held by record in the names of Harold Hopkins and Alfred W. Hendrickson, of Brackendale. It is situated on the Cheekye River about 3 miles east of its confluence with the Cheakamus River, and it is reached by a jeep-road on the north side of the river.

The mineralization is exposed in a short adit and consists of quartz carrying spotty concentrations of chalcopyrite and lesser molybdenite with pyrite and minor bornite. The quartz lies in fractures in foliated diorite and has a maximum width of about 2 feet. The fractures strike north 40 degrees west, dip 35 degrees northeastward, and are in echelon to the left. Quartz stringers are exposed on surface to about 25 feet into the hangingwall of the adit zone. Sulphides are scarce in these stringers.

The diorite is veined by a dark-green chlorite, which is found as inclusions in the quartz. The quartz is veined by pink calcite.

* By N. D. McKechnie.

ALTA LAKE

Copper

London (New Jersey Zinc Exploration Company (Canada) Ltd.)*

(50° 122° S.W.) Company office, 905, 525 Seymour Street, Vancouver 2. The London group comprises Mineral Lease M9, which includes six formerly Crown-granted mineral claims and one fractional claim and five recorded claims. It is on the southwest side of Fitzsimmons Creek, about 4 miles from Alta Lake. A jeep-road connects the property with the Squamish–Pemberton motor-road. There is no published geological map of the region along Fitzsimmons Creek. The geology along the Pacific Great Eastern Railway, at the downstream end of the creek, is described in Geological Survey of Canada Summary Report for 1918, Part B, pages 12 to 28, Map 1711; the geology at the head of the creek, about 2 miles upstream from the London group, is shown on Geological Survey of Canada Map 8—1956, Pitt Lake. Map 1711 shows a band of sediments, schists, and volcanic rocks extending along the railroad about 7 miles wide. Map 8—1956 shows an area of metamorphosed sediments and volcanic rocks at the headwaters of Fitzsimmons Creek. The two areas are on line of strike and probably are on the same band of rocks. On lithologic grounds they are assigned to an Upper Palæozoic or younger age.

Early work on the property, formerly known as the Green Lake group, was done by the Green Lake Mining and Milling Co. In 1910 this company drove an adit 527 feet on the London claim at an elevation of about 4,200 feet. No other work of any consequence was done on the group until 1963, when the present owners did geological mapping and 679 feet of diamond drilling on and near the London claim.

The rocks in the London claim area consist of schistose granitic rocks in the Fitzsimmons Creek valley below an elevation of about 4,300 feet. The granitic rocks are intrusive into metamorphosed volcanic rocks, now composed chiefly of chlorite, calcite, quartz, and pyroxene, and which possibly were basaltic flows. Interbedded with the metamorphosed basalts are discontinuous magnetite-epidote-calcite-quartz skarns and quartzose granulites. The granitic rocks are metamorphosed in varying degree to a quartz-sericite schist; they may be suitably grouped for present purposes as schistose granodiorite.

Metamorphic rocks and a small sill of schistose granodiorite about 50 feet in elevation above the portal of the London adit strike north 20 degrees west and dip 25 degrees southwestward. About 200 feet south the bedding strikes north 40 degrees east and dips 40 degrees northwestward. It is thought that the second strike and dip probably are more nearly representative of the structure for the following reasons:—

(1) The London adit is driven on a bearing of south 40 degrees west in schistose granodiorite for its entire length; if the north 20 degrees west strike and 25-degree westerly dip were continuous, the adit would enter the volcanic rocks at less than 250 feet from the portal.

(2) The rise of the granodiorite-volcanic contact along the side of the valley is equivalent to an apparent dip of 23 degrees northwestward; correction to a true dip on a north 40 degrees east strike gives a value of 38 degrees, the same as the dip of the bedding.

The intrusives at Alta Lake are shown on Map 1711 to have concordant relations with the intruded rock, so it is not unlikely that the granodiorite along the Fitzsimmons Creek valley is essentially a sill, and that the structure on and near

* By N. D. McKechnie.

the London claim is an assemblage of volcanic flows and granodiorite sills striking north 40 degrees east and dipping 40 degrees northwestward.

There are two directions of schistosity; one strikes north 20 degrees east to north 5 degrees west and dips 35 to 50 degrees westward, and the other strikes northwest and dips 30 to 45 degrees southwestward. There is some evidence that schist of the latter attitude curves into that of the former and may be the older.

Sulphide mineralization consists of chalcopyrite and pyrite. In the London adit it is seen occasionally in the schistose granodiorite, but at no place is it prominent. The strongest sulphide mineralization is in the magnetite skarns, which are limited bodies traceable only for tens of feet, and the nature of the control of their distribution is obscure. They are confined to the volcanic rocks, but their trend is north-south to east of south, which does not correspond to any structure apparent in these rocks. The London adit passes under the zone in which they are most numerous without showing any change of fracturing or of mineralization.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1910, pp. 147–149; 1930, p. 312.]

Copper

Azure (The Mining Corporation of Canada, Limited)*

(50° 122° S.W.) The Azure group of 107 recorded claims is owned by The Mining Corporation of Canada, Limited, 44 King Street West, Toronto. J. S. Scott, 402 West Pender Street, Vancouver 1, consulting geologist. The property is on Fitzsimmons Creek and includes both sides of the creek from its mouth at Green Lake to about 4 miles upstream. Access is by motor-road from Squamish, or by Pacific Great Eastern Railway to Alta Lake station. A jeep-road connects the property to the motor-road on the east side of Alta Lake.

During the summer of 1963, magnetometer and self-potential surveys were run, and limited geochemical work was carried out. Diamond drilling was started in September and continued to December 15th; 13 holes totalled 7,588 feet.

The geology near the railway line is described in Geological Survey of Canada Summary Report, 1917, Part B, pages 12 to 23, and Map 1711.

The principal showing at the time of the writer's visit in August was a stripped area on the west side of Fitzsimmons Creek, at creek-level and about a mile upstream from the main road. The stripping is about 500 feet long, north-south, and up to 150 feet wide.

The rocks in the stripped area are quartz-sericite schists. In only one of seven thin-sections examined is there recognizable relict texture, that of a medium-grained holocrystalline rock and probably part of the granodiorite mapped along the railway. The schist is quite uniform in composition and probably is all derived from one original rock type.

Included with the schist is a porphyritic rock comprised of phenocrysts of zoisite in a matrix of zoisite, chlorite, and carbonate; some chlorite masses have the outlines of pyroxene phenocrysts. This rock forms the footwall of a fault at the north end of the stripping and is there about 5 feet wide. It appears to be parallel to the schistosity, but the exposure is limited and the metamorphism indicates that it probably represents a pre-schist intrusive into the granitic rock. About 30 feet eastward a 2-foot width of rock darker than the normal schist has definite contacts parallel to the schistosity. Thin-section examination showed no essential difference to the rest of the quartz-sericite schist, save a somewhat finer grain size. If these rocks do represent pre-schist intrusions into the granodiorite, then there were at least two periods of pre-schist fracturing.

* By N. D. McKechnie.

The schistosity strikes north 40 degrees west and dips 50 degrees to 75 degrees southwest. Faulting, marked by thin mud seams, essentially parallels the schistosity.

Mineralization consists of quartz, chalcopyrite, and pyrite. Calcite pseudomorphous after pyrite is locally prominent. The chalcopyrite is disseminated through the schist and is associated either with fine quartz stringers or with the more highly siliceous parts of the schist. Locally the chalcopyrite is found in lenses of quartz up to 1 foot wide. The quartz is subparallel to the schist. Malachite and azurite are prominent throughout the stripped area.

Copper

Fitzsimmons (New Jersey Zinc Exploration Company (Canada) Ltd.)*

(50° 122° S.W.) Company office, 905, 525 Seymour Street, Vancouver 2. The Fitzsimmons group comprises six Crown-granted mineral claims. It is held under option by New Jersey Zinc Exploration Company (Canada) Ltd. The group is situated on the east side of Fitzsimmons Creek near its outlet at Green Lake. It is reached by the Squamish–Pemberton motor-road. The group is described in the Annual Reports for 1918, page 293 and 1928, page 387. In 1951 three diamond-drill holes were drilled by The Granby Consolidated Mining, Smelting and Power Company Limited.

Between April 16 and June 15, 1963, a geological and magnetometer survey was carried out, and 800 feet of bulldozer access road was constructed. An old logging-road was cleared. Three men were employed.

TEXADA ISLAND

Iron-Copper

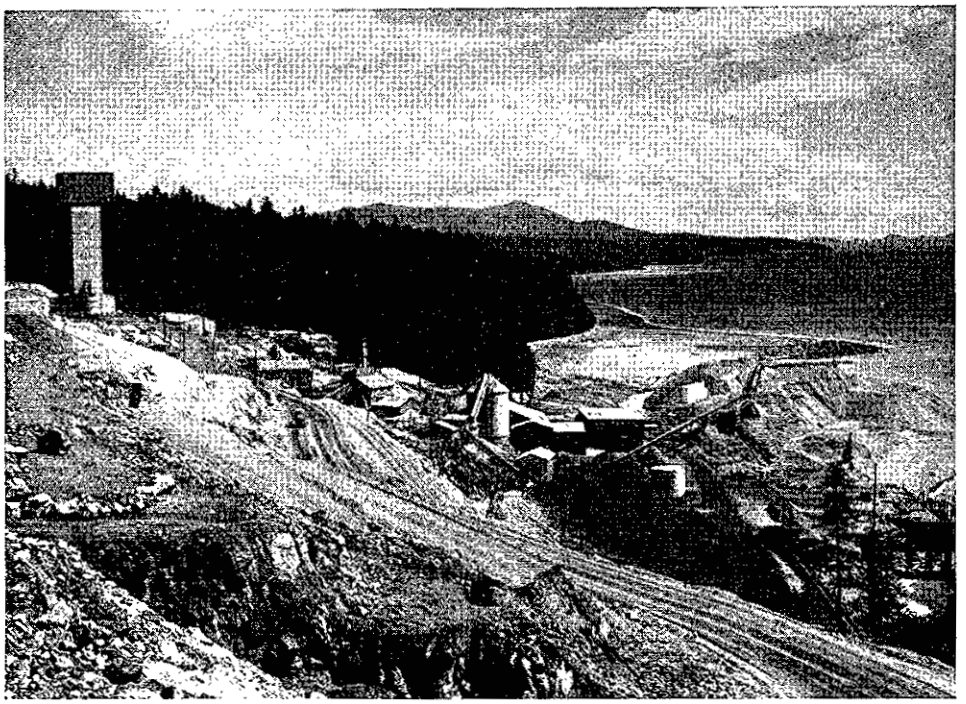
Texada Mines Ltd.†

(49° 124° N.W.) Registered office, 626 West Pender Street, Vancouver 2; mine office, Box 35, Vananda. A. D. Christensen, San Francisco, president; B. L. Alexander, general manager. This property, comprising 8 Crown-granted claims, 46 recorded claims, and 1 mineral lease, is at Welcome Bay, 3 miles northwest of the mine camp at Gillies Bay, on the southwest coast of Texada Island.

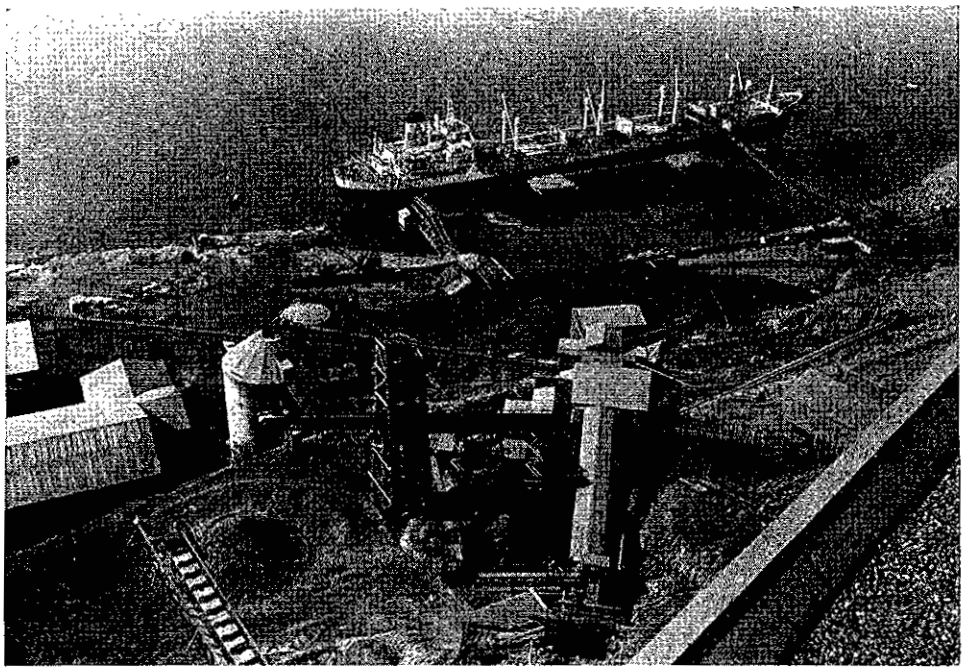
The Texada mine consists of five orebodies which, from west to east, are the Prescott, Midway, Yellow Kid, Paxton, and Lake. Four are or have been mined by open pit, but the Midway, between the Prescott and Yellow Kid, does not approach the surface. Underground development is presently concerned with only the three western orebodies.

The second stage of the underground development programme, commenced in 1962, was continued for ore production by long-hole stope mining methods in the Midway and Prescott ore zones. The five-compartment shaft was sunk an additional 107 feet to a total depth of 843 feet, and the excavation of shaft stations completed on the 220 (surface), 1855, 1655, 1575, 1510, and 1455 levels. Lateral development in drifts, crosscuts, subdrifts, draw points, and scrams totalled 9,117 feet. Raising amounted to 5,010 feet and was done in providing draw points, ore and waste passes, and ventilation raises. An inclined conveyorway, 864 feet in length, was driven from just below the north or inner end of the 1455 level to the 1575 level shaft station. A total of 169,000 cubic feet of waste rock was removed in making the excavations for the crushing-chamber, the main sump, the conveyor sump, and transformer stations. Long-hole drilling was started in the Midway area to provide an immediate source of ore as soon as the mine plant equipment has been installed.

* By N. D. McKechnie.
† By J. E. Merrett.



Texada Mines Ltd. General view of mill area, looking southeast across entrance to Prescott pit. Shaft headframe on left.



Texada Mines Ltd. Looking down on mill and loading-dock from top of headframe. Greek freighter loading iron-ore concentrate for Japan.

Underground development provided 24,882 tons of iron ore, while 926,862 tons was obtained from the open pits. Ore recovery from the Yellow Kid pit was completed, and production from the Prescott pit was curtailed. Mining in the Prescott pit broke into the underground workings, but an additional surface bench of ore remains to be removed. The remainder of the open-pit ore was obtained from the Paxton and Lake bodies. Diamond drilling and stripping in the vicinity of the Lake orebody indicated a considerably larger reserve tonnage than was initially believed to be present. Exploration diamond drilling amounted to 31,800 feet, completed in 160 holes. In stripping waste material from the ore in the various open pits, a total of 1,209,855 cubic yards of rock was removed.

The mill processed 954,591 tons of ore, from which 504,446 tons of iron concentrate and 5,802 tons of copper concentrate was obtained.

A concrete reclaiming-tunnel for the surge pile was constructed at the surface plant.

At the mine camp eight staff houses were constructed, and a new fresh-water system, including an earth-fill dam and water-lines, was installed.

The average number of men employed was 336, of whom 75 were employed underground.

QUADRA ISLAND

Copper

Copper Road* (50° 125° S.E.) This property of 38 recorded mineral claims is controlled by R. I. Bennett, of Heriot Bay. It is on the west side of Quadra Island about 2 miles northeast of Deepwater Bay and is connected by road to the ferry terminus at Quathiaski Cove. At about 9 miles north of Heriot Bay a steep logging-road leads one-half mile west and north to the principal showing, which is at the east end of the property.

In February The Anaconda Company (Canada) Ltd. optioned 19 claims from Mr. Bennett for a nine-month period. This company then completed an induced potential geophysical survey of the property. This was followed by approximately 13,000 feet of AX diamond drilling in 28 drill-holes. In preparation for the drilling, 500 feet of road was constructed. The shaft, which is on the mineralized shear, was deepened from 50 to 105 feet, producing 350 tons of ore, which was sorted and stockpiled. During the period of the Anaconda option the number of men employed increased from 3 to 21.

Seven of the twenty-eight holes, Nos. 1, 5, 7, 8, 12, 13, and 14, were logged by the writer.

The diamond drilling explored the north 80 degrees west mineralized shear (1962 Ann. Rept.) for about 2,000 feet along the strike and at two approximate horizons, 150 and 750 feet below the surface.

The rocks in the drill cores are andesitic lavas. Scarcity of flow contacts and the distribution of amygdaloidal textures suggest that some of the flows are 100 feet or more in thickness. No intrusive rocks were recognized in the cores.

The mineralized shear was cut in all the drill-holes and showed widths up to 30 feet. The dip proves to be about 80 degrees northward instead of the 80 to 85 degrees southward indicated in the surface showings.

Mineralization, comprising quartz and copper sulphides, is variable in the shear. Holes drilled in the vicinity of the shaft to cut the shear at a depth of about 200 feet did not encounter the sulphide-bearing quartz exposed at the shaft; the shear is strong, but the mineralization is only sparse bornite, chalcopyrite, and native copper. At about 1,000 feet westward, where an induced polarization anomaly

* By N. D. McKechnie and J. E. Merrett.

had been obtained, a stronger mineralization occurs in the shear at depths up to 300 feet. It comprises bornite, chalcocite, chalcopyrite, and native copper with subordinate quartz. Chalcocite has not been recognized in the shaft exposures, though its occurrence elsewhere on Quadra Island has long been known. The holes cutting the shear at the 750-foot horizon do not show chalcocite; chalcopyrite and bornite are present, as is native copper.

Native copper and, less commonly, chalcopyrite occur also as isolated grains in massive andesite. Bancroft in Geological Survey of Canada Memoir 23, page 124, mentions chalcocite in vesicles at Gowlland Harbour, 7 miles to the south.

Chalcopyrite is veined by and included in bornite and in chalcocite. Bornite commonly occurs as islands in chalcocite and as intergrowths suggesting contemporaneity. Two thin stringers of chalcocite were seen to cut bornite, so the chalcocite in part at least is the younger.

A post-sulphide movement along the shear is indicated by strongly fractured and mudded mineralized rock and quartz in the drill cores. It is uncertain how much of the shearing may be a result of this later movement.

VANCOUVER ISLAND

SAYWARD (50° 125° S.W.)

Iron

Iron Mike (Inter-Can Development Company Ltd.)*

Company office, 850 West Hastings Street, Vancouver 1. A. E. Upton, president. This company has under lease the Iron Mike (Hartt) property, 4 miles southwest of Sayward and 3 miles west of the junction of the Salmon and White Rivers. A crew of three men did 450 feet of diamond drilling in eleven drill-holes, constructed, with the aid of a caterpillar bulldozer, 4,000 feet of access road, and stripped 15,000 cubic yards of overburden off the main orebody.

NIMPKISH LAKE (50° 126° S.W.)

Iron

Nimpkish, Klaanch (Nimpkish Iron Mines Ltd.)*

Company office, 1012, 409 Granville Street, Vancouver 1; mine office, Camp A, Beaver Cove. S. V. Wines, project manager; H. M. Grenier, mine superintendent; R. W. Bick, mill superintendent. The camp is on Anutz Lake, immediately south of Nimpkish Lake, and the pit is 5 miles farther south, on the southwest bank of Nimpkish River. The crushers are immediately southeast of the pit, and the mill is across the river and adjacent to the Canadian Forest Products Limited railway. Iron concentrate was shipped by this railway to the loading-dock at Beaver Cove.

Mining of all orebodies was completed in 1963, with production of 561,675 tons of ore and 258,760 cubic yards of waste. The mill produced 307,679 tons of concentrate. The average number of men employed was 52.

PORT HARDY (50° 127° N.W.)

Copper

Little Joe (Port Hardy Copper Mines Ltd.)*

Company office, 702, 475 Howe Street, Vancouver 1; mine office, Port Hardy. John Cotowick, president and manager. This company holds 78 recorded claims in the Quatse River valley, 8 miles south of Port Hardy. Access to the property is by way of the Port Hardy airport road and the Alice Lake Logging Company road.

* By J. E. Merrett.

The mineral occurrence is a series of east-west trending limestone beds with injected bands of volcanic rocks. Skarn zones are developed in places along the limestone-volcanic contacts. The skarn zones are, in places, mineralized with magnetite, minor chalcopyrite, and rare sphalerite. Several mineralized zones have been located and in six places have been examined by extensive surface stripping and diamond drilling.

From July to December a crew of 4 to 18 men completed approximately 10 acres of surface stripping on the various outcrops and 3,000 feet of diamond drilling in 17 holes.

BENSON RIVER (50° 127° S.E.)

Iron

Empire Development Company Limited*

Company office, 1012, 736 Granville Street, Vancouver 2; mine office, Port McNeill. E. C. Oates, general manager; P. W. Billwiller, mine manager. The Empire mine lies at an elevation of 2,500 feet on the west side of the Benson River valley, approximately 2 miles south of Benson Lake and on the east side of Merry Widow Mountain. The concentrator and camp are in the valley at an elevation of 800 feet. Access to the adit is by tote-road about 3 miles in length, and ore is trucked a distance of 1 mile from the adit to a crushing plant at the top of a tram-line connecting with the concentrator. Access to the mine camp is by a 25-mile road from Port McNeill on the east coast of Vancouver Island.

A crew of 31 men, of whom 6 were underground, was employed from April 1st to October 19th; those hauling concentrate were employed to December 15th. Approximately 80,000 tons of magnetite ore was removed from the Kingfisher underground workings and trucked to the primary crusher stockpile at the top of the tram-line. The tram-line crushing plant, equipped with a magnetic conveyor-belt pulley to remove ore from waste, crushed 159,871 tons of ore. The concentrator milled 90,082 tons of ore to produce 78,428 tons of concentrate. This concentrate, together with some from the 1962 stockpile, made total shipments of 96,610 tons to Japan.

Six exploration diamond-drill holes, totalling 2,826 feet, were completed in the vicinity of the Merry Widow orebody.

Copper

Old Sport (Coast Copper Company Limited)*

Company office, Tadanac; mine office, Port McNeill. The Consolidated Mining and Smelting Company of Canada, Limited, is the principal shareholder and manages the operation. H. G. Barker, property superintendent; R. T. Trenaman replaced R. M. Matson as mine superintendent; J. Giovanetti, mill superintendent. The property comprises 48 Crown-granted claims extending southward from Benson Lake on the west side of Benson River, and adjoins the Empire property on the north and east. Access is by way of a 26-mile gravel road from Port McNeill, where an employee residence townsite is located.

With the exception of the retimbering of 449 feet of the inclined shaft, all development work was done on or above the 5500 or main adit level. This work comprised 68 feet of shaft raising, 4,477 feet of drifting and crosscutting, and 14,036 feet of diamond drilling. Shrinkage stope mining methods were used to produce 327,433 tons of ore, all of which was milled. Copper concentrate was trucked to the Empire Development Company loading-dock at Port McNeill for shipment to Japan.

* By J. E. Merrett.

Construction was started on the addition to the mill of a magnetite recovery plant having a daily production capacity of 250 tons of magnetite concentrate.

The average number of men employed was 180, of whom 105 were employed underground.

ZEBALLOS (50° 126° S.W.)

Iron

F.L., Ridge, Cordova (Zeballos Iron Mines Limited)*

Company office, 1012, 736 Granville Street, Vancouver 1. C. J. Oates, president; P. W. Billwiller, engineer in charge. The property, which was described in some detail in the 1962 Annual Report, comprises 13 Crown-granted and 15 recorded claims and is 4 miles north of Zeballos. The mineral showings, consisting of high-grade magnetite, outcrop on the west side of Zeballos River valley at an elevation of approximately 2,600 feet. The outcrop of magnetite extends in a north-south direction for 1,500 feet, averaging 70 feet thick, and it dips westward at about 40 degrees. The hangingwall is a complex of tuff, intrusive andesite, diorite, and granodiorite, locally altered to skarn and the footwall is composed largely of grey Quatsino limestone.

The present company commenced work on the property in 1959. Open-pit mining was begun in 1962, and by the end of that year 250,397 tons of iron concentrate had been shipped. On February 27, 1963, the property was closed down. After a complete reorganization of the company and change of control, the property was reopened on November 1st. It is now intended to abandon the open-pit operations and prepare for underground mining. Approximately 70,000 cubic yards of waste was stripped during the year, and 13 holes were diamond drilled, totalling 2,095 feet. A new bunk-house camp was being constructed at the end of 1963 to accommodate 60 men. A crew of 80 men was employed at the beginning of the year and about 15 men after reopening in November.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1962, pp. 100–103; 1960, p. 103.]

SYDNEY INLET (49° 126° S.E.)

Copper-Gold-Silver

Indian Chief, Prince (London Pride Silver Mines Ltd.)*

Company office, 611, 850 West Hastings Street, Vancouver 1. J. H. M. Greenwood, president; W. M. Sharp, engineer. Capital: 5,000,000 shares, 50 cents par value. This property, held under option, comprises 16 Crown-granted claims on the north side of Stewartson Inlet. This inlet forms the west arm of Sydney Inlet.

The Indian Chief and Prince groups were first located in 1898, and since that time considerable development work has been done, with some production of copper, silver, and gold. Between the years 1904 and 1938, a total of 71,889 tons of ore was mined, yielding in concentrates 722 ounces of gold, 54,895 ounces of silver, and 2,430,310 pounds of copper. The showings include magnetite, chalcopyrite, and bornite mineralization in a skarn zone within a gently dipping series of volcanic and sedimentary rocks.

The present company began work in June, 1963, and finished in September. Several underground holes were diamond drilled on the Indian Chief group, and three surface holes were drilled on the Prince group. Total length of holes drilled was 1,800 feet. A crew of six men was employed.

* By A. R. C. James.

Copper

HERBERT INLET (49° 125° S.W.)

Catface Copper Mines Limited*

This newly formed company is wholly owned by Falconbridge Nickel Mines Limited (British Columbia office, 1112 West Pender Street, Vancouver 1; Alex. Smith, exploration manager). It holds about 131 recorded claims on Catface Range, about 8 miles north-northwest of Tofino, at the southwest end of a peninsula between Bedwell Sound and Herbert Inlet. The range rises abruptly to maximum elevations of about 3,000 feet and is underlain partly by diorite, quartz diorite, quartz monzonite, and other rocks intrusive into mainly volcanic rocks of the Vancouver Group. The main showing, which was visited, is in the south part of the range and occupies a southwest-facing cliff rising steeply for many hundreds of feet from its base at about 1,600 feet elevation. It is reached from the present camp at Hecate Beach by a logging-road presently under construction and thence by an uphill trail to the old camp near the showing.

Work early in 1963 was supervised by J. J. McDougall and included 741 feet of diamond drilling, bringing the total amount of drilling done on the property to 13,243 feet, of which most is in 21 holes at the cliff showing. Between April and December a crew of five men under H. S. Lazenby did geological mapping and geophysical surveying.

The following notes on the cliff showing are based partly on the writer's observations and partly on company information. The cliff consists pirncipally of medium-grained quartz monzonite with biotite and hornblende crystals, which is cut by irregular bodies and sheets of quartz diorite porphyry. North of the showing these rocks partly underlie and enclose metavolcanic rocks. Andesite dykes, some light coloured and others grey and porphyritic, cut the other rocks steeply in several directions. Intrusion breccias are reported to occur along some contacts and as wide intersections in drill-holes. Rock fallen from the cliff partly includes this kind of breccia, consisting of small fragments of metavolcanic rock enclosed in a dioritic, porphyritic matrix. At the base of the cliff a northerly fault dips fairly steeply eastward, and quartz monzonite in the hangingwall is partly crushed and altered and is mineralized mostly with chalcopyrite and also with bornite and small amounts of molybdenite. The rocks in the lower part of the cliff are sheeted in several directions, noticeably by joints dipping steeply southeastward and others dipping southwestward. The bulk of the rock is more or less fractured and in places is stained by malachite. Quartz, chlorite, and epidote occupy fractures and replace scattered minerals in the rocks. Plagiocalse feldspar is partly rendered chalky by alteration. Sulphides have weathered at the surface but are fresh within inches of it, and were seen in most of the rock types mentioned. They occur partly in fractures containing quartz, and partly are disseminated. Flat holes drilled westward into the cliff contain mineralized intersections several hundred feet long. The mineralized zone extends some distance in a northerly direction. Other showings occur on Irishman Creek, about one-half mile farther north, and have been explored in a preliminary fashion.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1962, p. 105.]

Gold

BEDWELL RIVER (49° 125° S.W.)

Musketeer (Copper Town Mines Limited)†

Company office, 510 West Hastings Street, Vancouver 2. This company controls approximately 22 claims and fractions, including the Musketeer and Shamrock groups. The property is situated south of Bedwell River on lower Sam Craig Creek, about 8 miles from the head of Bedwell Sound.

* By J. M. Carr.
† By A. R. C. James.

The showings consist of narrow quartz veins that are mineralized with pyrite, chalcopyrite, sphalerite, and galena and contain values in gold and silver. They were discovered in 1938, and since that time a considerable amount of underground development has been done on the Musketeer and Trail veins. Production up to the end of 1963, including ore from the former Buccaneer operation, was 12,241 tons of ore, yielding 6,872 ounces of gold, 2,878 ounces of silver, and some zinc, copper, and lead.

In 1963 the company entered into an agreement with Kootenay Base Metals (Consolidated) Ltd., and further underground development was done from February 16th to April 27th, after which the property remained idle for the rest of the year. The following work was completed:—

	Ft.
Crosscutting	273
Drifting	11
Slashing	1,530

The mill was cleaned up and put into operation, using hydro power, but it was reported that a considerable amount of further work was necessary to restore the mill to a state of good operating order. At the latter end of the work period the bridge below the camp was washed out, making operations and access difficult.

Tsolum River (49° 125° N.E.)

Copper

Domineer (Qualicum Mines Limited)*

Operating company, The Consolidated Mining and Smelting Company of Canada, Limited; exploration office, 508 Marine Building, Vancouver 1. E. H. Caldwell, western district superintendent. In March this company optioned 195 located claims and 4 Crown-granted claims named Domineer from Qualicum Mines Limited, a private company controlled by Mt. Washington Copper Co. Ltd. (registered office, 404, 1111 West Georgia Street, Vancouver 1; G. L. Gibson, president). The property is on Mount Washington, which rises to a height of 5,215 feet, about 15 miles northwest of Courtenay, and lies within the land grant of the Esquimalt and Nanaimo Railway Company, with which, as owner of the base-metal rights, an operating agreement exists. Access to the property is by logging-roads from the gate of Comox Logging Company near the southeast end of Wolf Lake.

Work done in 1963 by a small crew under A. C. N. de Voogd included geological mapping, magnetometer surveying, a limited amount of stripping, and 9,678 feet of surface diamond drilling in 19 holes, of which 7 were near Murex Creek and the remainder near Breccia Ridge. At the time of a visit in August this work was at an early stage of completion.

The mountain is underlain at lower elevations by massive, dark volcanic rocks of Upper Triassic age and at higher elevations by quartzites and argillites assumed to be of Upper Cretaceous age. Both groups of strata are intruded by dacite porphyry and associated breccia, which together occupy most of Breccia Ridge to the north of the summit and occur also on the eastern slopes, on Murex Creek, and elsewhere. Quartz diorite intrudes volcanic rocks along the mine road on the northeastern slopes of the mountain and may be a separate body, older than dacite porphyry and breccia.

Where unaltered the dacite porphyry is mostly a grey-green aphanitic rock with phenocrysts principally of quartz, plagioclase, and green hornblende. It is similar lithologically to the larger porphyry body which forms Constitution Hill near Wolf

* By J. M. Carr.

Lake, and which contains brown hornblende and partly has a coarser-grained groundmass. The Mount Washington porphyry contains many broken phenocrysts, which apparently broke before the rock solidified. Some porphyry on Mount Washington possesses only a few quartz phenocrysts and may be a separate type. The form of the porphyry intrusions is largely unknown. In the Cretaceous rocks some intrusions are narrow and sill-like, whereas others are larger and apparently extend to depth.

The breccias vary in composition and appearance, but in general their fabric resembles that of breccias formed elsewhere in association with porphyry intrusions, for example, at Highland Valley. Some are merely brecciated porphyry, whereas other breccias contain a varied assemblage of fragments that are both large and small and are mostly angular and unsorted. The fragments are enclosed in a plentiful silt- or sand-sized matrix which consists largely of granular quartz and feldspar together with debris of porphyry and frequently of other rocks. Porphyry fragments are invariably present and are generally accompanied by fragments of the adjacent country rocks—namely, volcanic rocks at lower elevations and quartzite and argillite at higher elevations. A type of quartz diorite was noted rarely as fragments in some breccias at lower elevations. Some breccias contain fragments of earlier breccias, and crosscutting relationships between breccias are seen in outcrop. The contacts between breccias and other rocks vary from sharp to gradational. Some breccia bodies are large, and their shapes have not been determined. Others are narrow and sheet-like.

Rock alteration is pronounced near the showings adjoining Breccia Ridge, and has produced biotite, actinolite, chlorite, epidote, and quartz. Biotite locally replaces hornblende in porphyry and also produces a brown colouration in the matrix of some breccias. Actinolite partly replaces biotite phenocrysts and also forms coarse sheaves which partly replace breccia and are accompanied by magnetite and sulphides. Chlorite and epidote are widespread in altered rocks and in veins. Quartz principally forms veins, some of which are several feet wide and are mineralized. A relationship probably exists between faults and at least part of this alteration. The altered rocks are more or less fractured and are widely, if weakly, mineralized. At the main showings the explored quartz veins are of a type involving both fracture filling and replacement, and they follow flat shears. Major faults are assumed by company geologists to exist near the showings and elsewhere on the property, but their exact locations and attitudes are unknown. Such faults may well be steep.

At the main showings, which are on or near the Domineer claims at about 4,400 feet elevation to the northeast of Breccia Ridge, a large area has been partly explored by stripping, short diamond-drill holes, and a northerly adit as described in the Annual Report for 1962. Here the quartz veins partly follow flat, sheared contacts between porphyry and Cretaceous rocks and, with the adjacent rocks, are mineralized with chalcopyrite, bornite, covellite, arsenopyrite, and pyrite. About one-quarter of a mile farther south, at about 4,600 feet elevation on the east side of Breccia Ridge, west-dipping quartz veins are exposed in a number of old short adits and newer trenches, and together with the footwall rocks are mineralized with chalcopyrite, arsenopyrite, and molybdenite.

The Murex Creek showings are at about 2,500 feet elevation nearly 2 miles east of the main showings, and include a lower showing which was explored in 1960 and a higher showing where drilling was going on when visited in August, 1963. At the higher showing, chalcopyrite and pyrite were seen both disseminated and in quartz veinlets in dacite porphyry, breccias, and volcanic rocks.

[References: Carson, D. J. T., "Geology of Mount Washington, Vancouver Island, British Columbia," unpublished thesis on file at the *University of British Columbia,* 1960; *Minister of Mines, B.C.,* Ann. Repts., 1956, p. 119; 1957, p. 69; 1959, pp. 135–157; 1960, pp. 111–113; 1962, pp. 105–107.]

Buttle Lake (49° 125° N.W.)

Gold-Silver-Copper-Lead-Zinc

Lynx, Paramount, Price (Western Mines Limited)*

Company office, 802, 850 West Hastings Street, Vancouver 1; mine office, Box 8000, Campbell River. Western Mines Limited, together with the wholly owned subsidiaries, Myra Falls Mines Ltd. and Price Creek Mines Ltd., now holds a total of 23 Crown grants, 2 claims held by mineral leases, and 123 claims by record. The ground covers a rectangular area approximately 2 miles wide and nearly 5 miles long at the south end of Buttle Lake in Strathcona Provincial Park, central Vancouver Island. The area can be reached by road from Campbell River to Buttle Lake and then by boat for approximately 20 miles up the lake.

The Lynx property is on the north side of Myra Creek, approximately 2½ miles west of the south end of Buttle Lake. The surface mineral occurrences are at several locations between elevations of 1,200 and 1,700 feet above sea-level. The mine has been developed underground from two adits, the main or 1225 level and the 1350 level, with portals at the respective elevations. A four-compartment vertical shaft of outside dimension 7 feet 3½ inches by 26 feet 3¾ inches and located underground was sunk to 850 feet elevation, and stations were cut at the 1,075- and 925-foot level elevations. The shaft was raised 172 feet and a station cut on the 1350 level. In conjunction with the shaft operation, a total of 396 feet of raising was completed in the rope, ore-bin, and waste-bin raises. The major portion of the 3,344 feet of drifting and crosscutting was completed on the 1225 and 1350 levels, although small amounts of crosscutting were completed on the 1075 and 825 levels. In addition to the raising done in the shaft area, 484 feet of exploration raise was completed and 17,685 feet of diamond drilling was done in 78 underground holes.

On the surface an area of 25 acres was cleared for the construction of the mine plant. Two prefabricated Armco buildings were erected, one 32 by 56 feet to house shops and one 50 by 60 feet for use as a power-house. In the latter building three diesel-electric generators of 750 kilowatts total capacity and a 1,000-cubic-feet-per-minute compressor were installed.

Midway between the mine and the lake a trailer camp was installed to accommodate 88 men. The average number of men employed was 71, of whom 24 were employed underground.

The Paramount property is on the north slope of Myra Mountain and on the south side of Myra Creek, opposite the Lynx holdings of Western Mines Limited at the south end of Buttle Lake. Myra Falls Mines Ltd., which was formed in March, 1963, is a wholly owned subsidiary of Western Mines Limited. Exploration work on the 1350 level, with portal at that elevation, was done by a crew under hire from Western Mines Limited. This work comprised 1,040 feet of drifting and crosscutting and 2,772 feet of diamond drilling completed in 16 holes.

The Price property is on the east slope of Myra Mountain and 1½ miles south of the south end of Buttle Lake. Price Creek Mines Ltd., formed in March, is a wholly owned subsidiary of Western Mines Limited.

* By W. G. Jeffery and J. E. Merrett.

The sulphide orebodies at the Lynx and Paramount properties are contained within a thick series of rocks, composed mainly of volcanic breccias, agglomerates, and tuffs together with lesser amounts of fine-grained andesitic flow rocks. The base of the thick volcanic pile is not seen, but, providing there is no repetition by undetected faults, the sequence must be at least 10,000 feet thick. Lithologic variation is considerable, but the lower part of the sequence is mainly composed of well-bedded and laminated green, brown, and purple cherty tuffaceous rocks that have a siliceous appearance and conchoidal fracture. These bedded rocks change upward in a gradational manner to massive volcanic breccias and more coarsely bedded tuffs. The whole sequence is intruded by large sills of fine- to coarse-grained brown and green gabbroic rocks.

The volcanic rocks are overlain by a limestone unit with minor sandstone and argillite with a total thickness of 1,100 feet. R. W. Yole has found from palæontological studies that this limestone is early Permian (Wolfcampian-Leonardian (?)) in age. Gabbroic sills are abundant and are believed to be associated with the overlying volcanic rocks.

The volcanic rocks above the limestone lie conformably on the sedimentary rocks and form the lower part of the Karmutsen Group, usually regarded as Triassic in age because the next overlying fossiliferous unit contains Upper Triassic fossils. The Karmutsen rocks consist dominantly of pillow lavas, breccias, and basaltic flows.

Approximately 2 miles west of the operations of Western Mines Limited is a large mass of granodiorite and granite that intrudes all the rocks described above.

The regional folding has been broad and gentle in character apart from local conditions adjacent to faults or intrusive contacts. Consequently, over most of the area, dips rarely exceed about 30 degrees. There are a number of gentle flexures that combine to give an over-all anticlinal structure to the region though there is no single dominant anticlinal axis.

Faults are more important than folds in any explanation of the regional structure. Wherever the limestone unit is encountered, the fault pattern can be seen readily. Where limestone is absent, the volcanic rocks are sufficiently similar in appearance to render faulting inconspicuous, and this is particularly true in the valleys where alluvium and heavy forest-cover combine to obscure the geology. There are three main sets of faults and directions of shearing, as follows:—

(1) Northwest-southeast.
(2) North-south.
(3) East-west.

All these faults are vertical or have steep dips and their strikes vary within a few degrees of the directions given above. Field observations indicate that the northwest-trending faults are the oldest set and they may be offset by the other faults. No clear age relations between the north and east faults are yet known, but the east-trending faults offset the granite contact. In addition to the three main directions, a smaller number of faults striking northeast were observed.

The mineralization at the main property of Western Mines, the Lynx zone, is associated with chlorite-sericite schists that form a wide zone striking northwest and with steep dips to the southwest and northeast. Other rocks exposed in the 1225 and 1350 levels are massive tuff, agglomerate, fine-grained green andesite rocks and greenstone dykes. The tuff and agglomerate texture can in places be identified in the chlorite-sericite schists. The contact between the schists and massive rocks is quite sharp along the southwest boundary of the shear zone but appears gradational in character to the northeast, so that the boundary has not yet been defined by the underground exploration. However, the zone is at least 300 feet wide in the vicinity

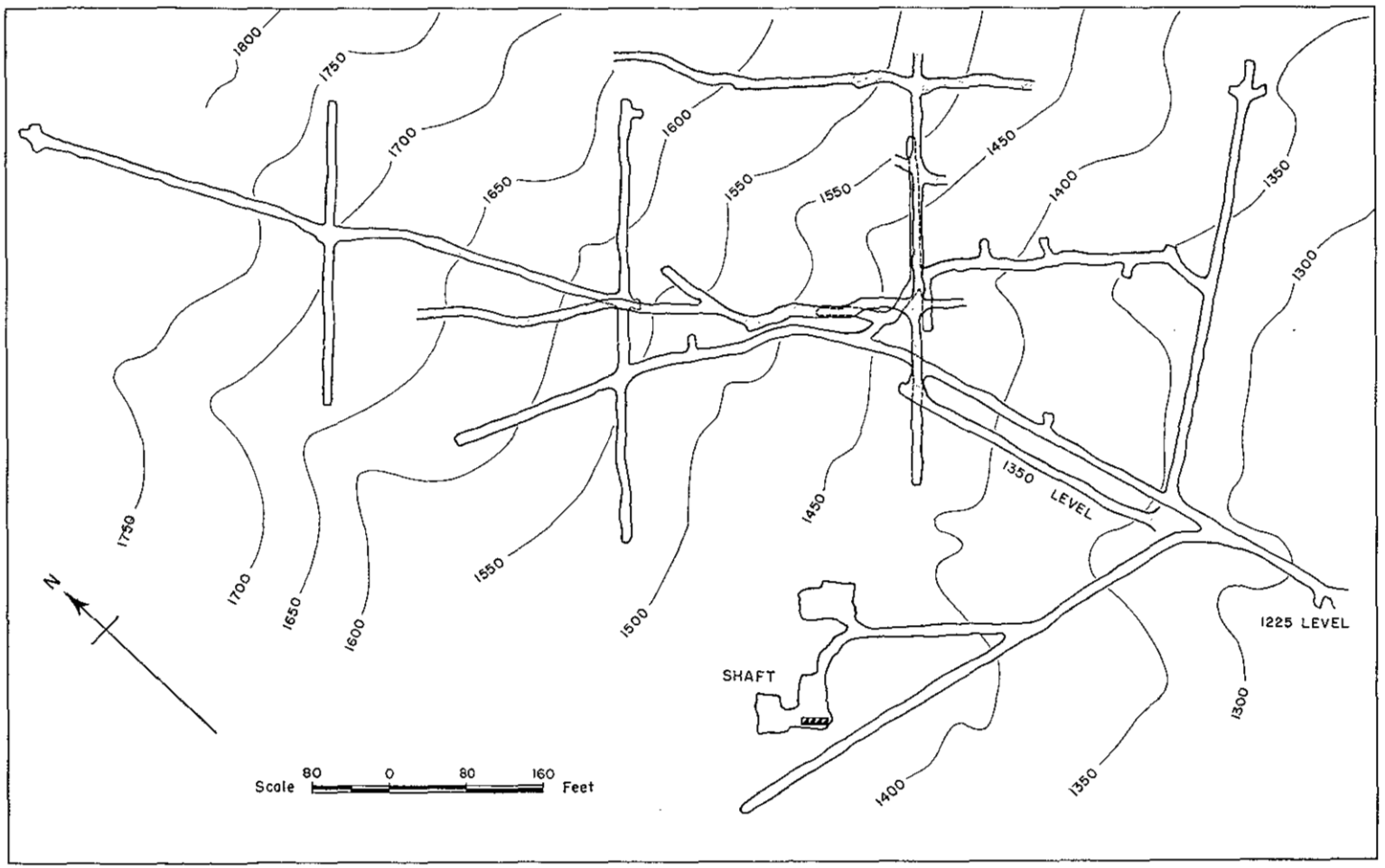


Figure 8. Western Mines Limited. Plan of Lynx workings.

of the Lynx showings, and intermittent mineralization has been indicated over a strike length of about 1,200 feet.

Northwest-trending shear zones similar in character to, but varying in the intensity of, schistosity and alteration from that on the Lynx property have been observed elsewhere in the area.

Lynx.—At the Lynx zone massive and disseminated sulphide occurs within the schists or along the western contact of the shear zone. The sulphides consist of pyrite, sphalerite, chalcopyrite, galena, and bornite. Gangue minerals consist of sericite, chlorite, quartz, calcite, and barite. The ore along the western contact is fairly regular and follows the contact closely, whereas the sulphide bodies enclosed within the shear zone appear to have irregular shapes and vary sharply in extent over short distances. The structural controls on these lenses and separate masses may be connected with folds within the schists that have a predominant gentle plunge to the north, although there are southerly plunges also.

The company's annual report for 1963 quotes the following average grade including dilution: Gold, 0.07 ounce per ton; silver, 3.1 ounces per ton; copper, 2.5 per cent; lead, 1.3 per cent; zinc, 11.1 per cent.

The sulphides are finely banded in many places. There are thin pyrite-rich, sphalerite-rich, and chalcopyrite-rich layers about 1 millimetre wide commonly superimposed on zones of the order of 2 centimetres wide that are dominantly pyrite or chalcopyrite or sphalerite but which include thin layers of the other minerals. Curved, folded, and flowage types of banded texture can be observed. In addition to this regular banding, some parts of the sulphide show banding that is clearly cataclastic in origin with granulated pyrite grains and boudin structures.

Commonly in the massive sulphide, rounded to lenticular-shaped inclusions form about 2 per cent of the ore. The equant inclusions range from about 1 to 4 millimetres across with rare larger sizes. The lenticular forms may be 1 to 2 centimetres across and 3 to 7 centimetres in length, and all the long axes lies in the ore with steep attitudes concordant with the over-all structure. The lenticular forms are schistose. No definite relation of any inclusion to the sulphide banding was seen in the visits made by the writer. All the inclusions have sharp clean contacts with massive sulphide, and in many cases parts or all of the surface of an inclusion were polished as though movement had occurred on the surface. Thus, apart from their being friable, careful excavation allowed recovery of whole inclusions, and 13 were collected. Two inclusions were too small to obtain representative thin-sections. Three of the schistose inclusions are essentially sericite schists. The remaining eight are composed dominantly of sericite and quartz with foliated but not schistose textures. Quartz occurred as streaky aggregates separated by sericite, as an equigranular texture with interstitial micaceous minerals, and also as a cataclastic texture with foliated sericite fretting the grain boundaries rather than flowing round quartz grains.

Inference from this information is not conclusive as to the origin of the inclusions, except that the idea that they represent original fragments of a volcanic breccia is not proven.

The strike of the mineralization at the Lynx property is between north 45 and 50 degrees west, and the Paramount property is in reasonable alignment along this direction, about 4,000 feet southeast of the Lynx workings. However, the over-all strike of the mineralization at the Paramount is between north 20 and 25 degrees west, and there is possibly an east-trending fault along the Myra Creek valley that may cut northwest-trending shear zones. The area between the Lynx and the Paramount properties has not been explored.

Paramount.—The underground workings at the Paramount are in the 1350 adit level, and the rocks exposed comprise quartz-sericite schist and dyke rocks, although massive volcanic breccias occur in diamond-drill cores. The over-all attitude of the foliation is vertical or dips steeply northeast.

The mineralization as exposed along the 1350 level is similar to that at the Lynx. It is mostly massive sulphide with sharp contact against the schists, and there is a very limited amount of disseminated sulphide in the schist, so that the wallrock is seldom economic. The width of the sulphide zone varies irregularly along the drive, the sulphide in places lensing along the foliation and also cutting across the schistosity. Faults cut the ore with apparent displacements of the order of 2 feet, causing abrupt changes in width, as seen in the back of the drift. The massive sulphide surrounds lenses of rock, some of which may be dyke rock, that have sharp contacts and appear to be unreplaced by the sulphides. Banding in the sulphides can be observed in places. Ore exposures appear sharper and more distinct than at the Lynx property, but the environment and characteristics are essentially similar.

A drift was driven southwest of the ore zone for diamond-drilling purposes. The rock exposed is quartz-sericite schist, and in a part of the drive a section of the schist contains disseminated sulphide. The mineralization consists of pyrite, chalcopyrite, and some tetrahedrite that occurs as wispy irregular veinlets and specks concordant with the foliation of the schist. It was reported that in places this rock contains between 1 and 2 per cent copper but that gold and silver values are negligible.

The Buttle Lake Mining Company Limited*

Company office, 1121 Marine Building, 355 Burrard Street, Vancouver 1. This company holds two groups of claims in the area at the south end of Buttle Lake. The Jay group consists of 48 claims adjoining the Lynx property of Western Mines Limited on the northwest. Southeast of Western Mines Limited there are 41 claims named the Buttle Bell, Rose, and Rick groups. From May to September, 1963, a crew of three men under the direction of P. Chilcott carried out line cutting and geological mapping.

Tranquil Inlet (49° 125° S.W.)

Gold

Fandora and Gold Flake (Tofino Mines Ltd.)†

The key claims of this property comprise five Crown-granted claims situated on the northwest side of Tranquil Creek about 2 miles from the head of Tranquil Inlet. From a beach camp near the mouth of Tranquil Creek, a jeep-road 2 miles long follows the valley of the creek to a point from which a steep trail, tractor-road, and light tram-line lead to the mine and camp-site at an elevation of 1,500 feet. The property, owned by Moneta Porcupine Mines, Limited, has in recent years been leased to W. E. McArthur, Sr., but in March, 1963, the lease was sold to New Hamil Silver Lead Mines Ltd., which has operated the property since that time.

The gold-quartz veins were discovered in the late 1930's, when surface work disclosed the veins in a shear zone adjacent to an andesite dyke. The property has been developed intermittently since 1946, and some small shipments have been made. Four adit levels have been driven at 1,500, 1,700, 1,900, and 2,100 feet elevation respectively. The quartz veins are commonly narrow and strike north 70 degrees west and dip about 75 degrees to the north.

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* By W. G. Jeffery.
† By A. R. C. James.

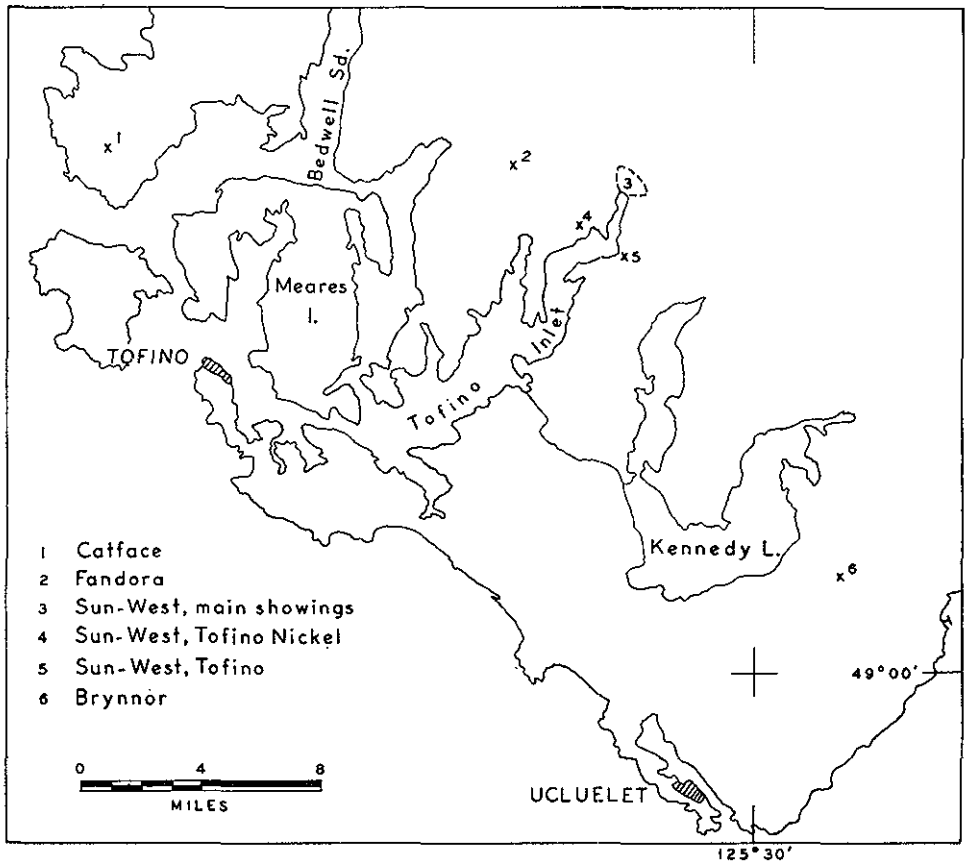


Figure 9. Properties referred to in the general Tofino area.

During the first two months of the year Mr. McArthur shipped 46½ tons of ore to the Trail smelter. This ore was mined in 1962. The 15-12 raise (driven from the 1500 level) was extended from 116 to 121 feet above the level, and two box-holes were driven to provide ore-passes for the stope. At the beach camp at the lower end of Tranquil Creek, the cabin was rebuilt on higher ground, and a telephone wire was laid from the lower camp to the mine. New Hamil Silver Lead Mines Ltd. commenced work on May 1st. This company reports the following work accomplished by the end of 1963:—

(1) The 1700 level was repaired and retimbered where required and was driven a further 700 feet. The 15-12 raise was driven a further 186 feet, and when work was temporarily stopped the head of the raise was within a short distances of the 1700 level.
(2) A 30- to 35-ton mill, comprising a rod mill, Denver jig, and three flotation cells, was erected near the 1500 level portal.
(3) A diesel-driven 125-kva. generator unit and a 600-cubic-foot portable air compressor was installed.
(4) A tailings pit was excavated, for use in the event of a change-over to the cyanide process.
(5) The kitchen was enlarged to accommodate a crew of 20 men, and a dry and two new bunk-houses were built.

(6) A tractor-road about a mile long was built from the bottom of the tramline to the 1500 portal.

In December a crew of 17 men was employed under the supervision of H. Tomlinson.

TOFINO INLET (49° 125° S.W.)

Copper-Molybdenum

Sun West Minerals Limited*

Company office, Box 111, Tofino. Lorne Hansen, president; F. C. Buckland, director; G. Lemay, foreman. This company owns 58 recorded claims at the head of Tofino Inlet on the west coast of Vancouver Island. The claims are in three blocks, as shown on Figure 10. The principal block, of 34 claims and fractions, lies across the lower courses of Tofino (Deer, Clear) and Onad (Copper) Creeks. It includes the Lida, Foremost, Foremost Copper, Canyon, Clear Creek, Velvet, and Copper Creek groups. Most of the showings are in this block. The second block comprises the Tofino Nickle group of 17 claims on the northwest side of Tofino Inlet just below Deer Bay. The third block comprises the Tofino group of 7 claims on the east side of the inlet at the entrance to Deer Bay. Access is from Tofino by boat for 18 miles up Tofino Inlet and Deer Bay. At high tide small boats with outboard motors can travel up Tofino Creek to the camp at the first bend. Larger boats must land on the east side of Deer Bay just below the mouth of Onad Creek. From this landing a tractor-road leads to the camp. Other tractor-roads lead out from the camp to many of the showings.

The area has had occasional prospecting and development since 1898. The Hetty Green group was located apparently astride the second bend of Tofino Creek. Some open cuts were made and several adits driven. In 1905 a wagon-road was built to tidewater, and 215 tons of copper ore was shipped to the Ladysmith smelter. All work ceased after 1910, and the claims were allowed to lapse. The Copper King group for a time covered roughly the same ground. In 1916 the White group, also known as the Douglas group, was located by W. Walton along the lower part of the bluffs north of the old Hetty Green ground. Intermittent prospecting and development were carried on through 1930, at least three adits being driven and a quantity of copper ore being stockpiled. The Jumbo was located in 1898 around the lowest falls on Onad Creek, where it enters the flat around the head of Deer Bay. In 1899 the Jumbo Mining Syndicate sank a 42-foot shaft, drove a 25-foot adit, and built a flume for water power. By 1916 a second shaft had been sunk 67 feet, and considerable drifting had been done from it. The Crow group was located in 1898 above the Jumbo on the south side of Onad Creek. Tofino Copper Co. drove a second adit on it in 1916.

Since 1950 the ground covered by these old claims has been staked several times and the properties have had several owners. Hansen and Buckland located the Foremost and Clear Creek groups in 1952–53. In 1954 F. C. Buckland organized Clear Creek Copper Mines Ltd. and Taiga Mines Ltd. to explore and develop the property. A new adit was driven at the south end of the old White showings, some diamond drilling was done there and on the Tofino Nickle group, and a tractor-road was built from the northwest corner of Deer Bay to the vicinity of the White and Hetty Green showings. In 1960 the property was reacquired by Hansen, and in 1962 all extant claims were made over to Sun West Minerals Limited. In 1961 and 1962 a large number of showings were stripped with a bulldozer. In 1962, 650 feet of diamond drilling was done in four holes. In 1963 a further 950 feet of diamond drilling was done in two additional holes, and small test-pits were blasted in several of the showings.

* By G. E. P. Eastwood.

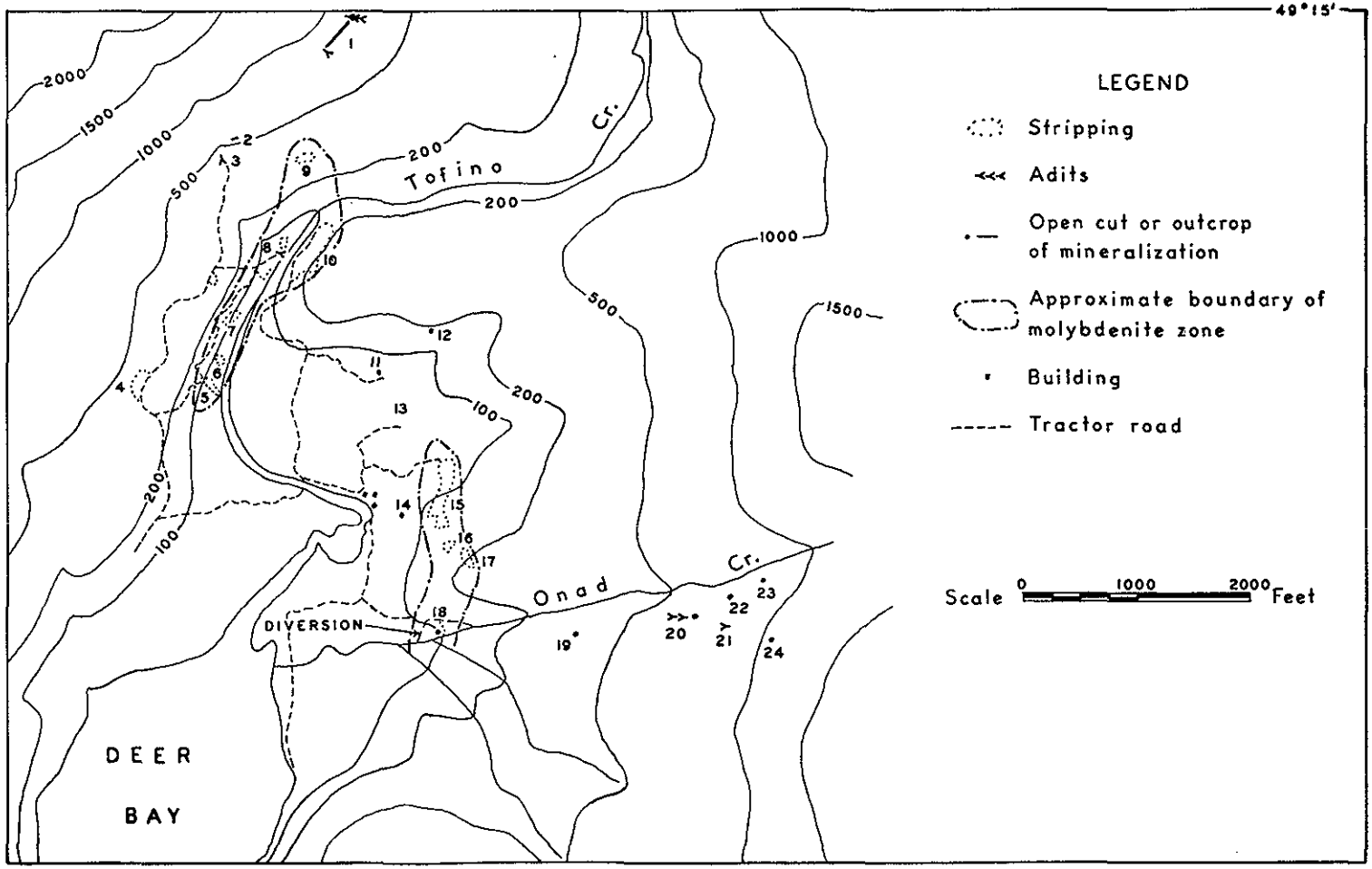


Figure 10. Mineral showings on Tofino and Onad Creeks.

Main Showings

A broad, partly alluvial flat at the head of Deer Bay terminates northward against a low transverse ridge known locally as the Horse Hump. To the east and west the flat passes into moderate mountain slopes. Northwest of the Horse Hump moderate lower slopes pass up into precipitous bluffs. Natural exposures are small and scattered away from these bluffs. The area has a high annual precipitation and is thickly covered with timber.

The geology has not been mapped and can be described only in very general terms, based on observations incidental to examination of the showings. The valley flat is underlain by an intrusive complex consisting of a greenstone complex and successive intrusions of diorite, granodiorite, minor granite, and porphyry. The greenstone complex may be partly volcanic and partly intrusive. The dominant rock type in it is dark green, fine grained, and featureless. Here and there a similar rock contains small white bodies that may have been amygdules. Another rock that occurs sporadically through the greenstone complex is fine grained, medium grey in colour, and contains both white and dark spots. A thin-section disclosed that the white spots are labradorite phenocrysts and the dark spots are aggregates of pyroxene, epidote, and chlorite. The rock is porphyritic basalt or, more likely, basalt porphyry. Here and there a dark-green gabbroic rock appears to intrude the other greenstones; it is pre-skarn and may be pre-diorite.

The greenstone complex has been broken up and pervaded by coarse-grained rocks ranging from dark diorite to white granite. In a few places these coarse-grained rocks form fairly large masses, but commonly they occur as irregular dykes a few feet or tens of feet across and as reticulate dykelets a few inches thick. The lighter varieties tend to intrude the darker. Considerable feldspar has been introduced into the greenstones near the contacts. These coarse-grained rocks have been intruded in turn by dykes of green basalt porphyry which contain large, highly altered plagioclase phenocrysts. The porphyry contacts are sharp, and the marginal zones are commonly chilled against all other rocks.

The lower walls of the valley consist predominantly of featureless greenstone and grey to white crystalline limestone. These rocks are intruded by scattered diorite bodies which are generally sill-like in form. Small lenses of limestone also occur here and there in the complex or the valley flat. The structure and ages of the rocks are unknown.

The greenstone complex and coarse-grained intrusives are in places irregularly altered to or veined by garnet - epidote - pyroxene - amphibole - calcite skarn. The limestone is little altered, containing only a few scattered crystals of garnet. The young porphyry does not show any alteration to skarn and is probably younger. The over-all distribution of the skarn is not known. Nearly all the exposures on the valley flat contain at least a little skarn, but on the lower valley walls skarn appears to be restricted to greenstone or diorite along contacts with limestone. Within outcrops or stripped areas on the valley flat the skarn distribution is irregular. Some of the skarn is in veins. Some is in irregular masses that either lie against a contact or feather out in all directions. Some skarn is disseminated through the rock. Possibly the greenstone complex has been more extensively altered, but the coarse-grained rocks have certainly been attacked, and where the intrusive pattern is intricate it is difficult to tell which rocks have been wholly replaced by skarn. The garnet is commonly yellow to light brown in colour, but in one drill core a few crystals of red garnet were seen in the yellow variety. The epidote is commonly fine grained, granular, but locally is coarse grained and euhedral. The pyroxene is consistently pale green and closely associated with the garnet. The

amphibole is coarse grained and commonly dark green to greenish black, but here and there a bluish variety is also present. The calcite is very coarse grained, but is sporadic and interstitial to the other skarn minerals. Quartz veinlets are widely scattered.

Associated with the skarn are pockets, irregular masses, and disseminations of molybdenite, chalcopyrite, magnetite, and locally bornite. Pyrite and pyrrhotite are also present in some showings. The mineralized exposures examined are shown in Figure 10. The mineralization is so irregular that any term which implies a definite body of mineral or mineralized rock is apt to be misleading. The term " zone " is here used, in a rather extended sense, to signify an area in which a given mineral occurs that can be shown at the scale of Figure 10. Where exposure is good, as in the larger stripped areas, more detailed mapping would show sub-zones that are separated by extensive barren areas, and the metal content would vary widely within the sub-zones. In some of the copper and molybdenum showings the irregularity of distribution extends right down to the hand specimen. The main molybdenite, chalcopyrite, and magnetite zones overlap, and chalcopyrite may be found closely associated with either of the other minerals, but magnetite and molybdenite have not been found together.

Two molybdenite zones are roughly outlined on Figure 10. The boundaries drawn are only approximate, mainly due to poor exposure but also due to lack of detailed mapping. A very few molybdenite crystals may be found outside these zones, but all significantly known molybdenite mineralization has been included in them. There is no evident structural control of the zones. The molybdenite does not occur uniformly through the zones, but rather in small, scattered, relatively high-grade patches and more extensive low-grade areas which are separated by areas of barren rock. The high-grade patches contain walnut-sized aggregates of molybdenite crystals and scattered individual crystals about 4 millimetres across. The low-grade areas contain smaller crystals that are more sparsely disseminated. Molybdenite is about equally common in skarn and in the coarse-grained intrusives, less common in unaltered greenstone. It has not been found in younger porphyry or limestone and does not show the tendency to occur near limestone that is demonstrated by chalcopyrite and especially magnetite. The aggregates seem to occur preferentially with coarse-grained epidote. In a few places a canary-yellow earthy substance, probably molybdic oxide, is associated with the molybdenite. Powellite has been identified in a number of places from its greenish-yellow fluorescence in ultraviolet light. It cannot be distinguished from white feldspar in ordinary light, and its distribution is not properly known. It seems to occur preferentially in granitic dykelets.

The molybdenite is difficult to evaluate. Very extensive sampling would be required to determine average grades for the surfaces of the zones, or of appreciable parts of the zones. Six holes have been diamond drilled in the east zone, two of about 450 feet at the north end and four short holes at the south end. The two longer holes passed out of molybdenite mineralization within 180 feet of the surface, but continued in and out of skarn. In view of the irregular mineralization it seems that a great deal of drilling would be required to determine whether there are blocks of ground of sufficient size and grade to make ore.

Chalcopyrite is scattered across the valley of Tofino Creek from the bluffs northwest of the Horse Hump to Onad Creek, and a little more is associated with magnetite uphill on the south side of Onad Creek. Disregarding this minor copper mineralization south of Onad Creek, the known copper mineralization occurs in two zones that coincide with the molybdenite zones and extend beyond them to the north.

The chalcopyrite occurs in skarn, greenstone, coarse-grained intrusives, and locally in limestone. It is associated with molybdenite, with magnetite, and it occurs alone. It forms high-grade pockets and lenses and is also disseminated through considerable volumes of rock. The more massive bodies are generally along contacts of limestone lenses or bands. The principal individual showings are Nos. 1, 10, and 18. Bornite was noted only at No. 18.

Magnetite occurs principally on the northwest and southeast edges of the mineralized area. The individual bodies are small bands and lenses and are not considered ore at this time. The magnetite on the northwest side occurs alone or is associated with chalcopyrite, whereas on the southeast side it is commonly associated with pyrite and pyrrhotite.

Brief descriptions of most of the individual showings follow:—

(1) White showing. A limestone band nearly 100 feet thick dips gently into the bluff face. Greenstone has been altered to skarn for several feet in the hangingwall of the limestone, and in the immediate hangingwall has been intensively replaced by chalcopyrite. Parts of this contact are covered or are inaccessible in the bluff face; therefore, it is uncertain whether the mineralization is continuous for the over-all length of 600 feet. Where seen, the chalcopyrite band is 5 to 10 feet wide. A grab sample of chalcopyrite containing remnants of skarn assayed: Gold, 0.02 ounce per ton; silver, 4.9 ounces per ton; copper, 24.22 per cent. Chalcopyrite and magnetite occur locally in the limestone footwall. One crib and about 20 sacks of chalcopyrite were seen below the north end of the showing. There are reported to be other cribs of sorted ore on this hillside.

(2) A band of magnetite 6 feet wide dips 75 degrees southeast between a diorite footwall and a limestone hangingwall. The band passes under cover at both ends.

(3) An 8-foot band of magnetite and chalcopyrite dips steeply west beneath a band of limestone. A thick band of skarn in the limestone hangingwall has a little chalcopyrite in its own hangingwall. Magnetite with minor chalcopyrite and pyrrhotite occurs at the portal of an adit, some 30 feet in the footwall of the main band.

(5) Molybdenite is sparsely disseminated through a complex of diorite and granodiorite which is somewhat altered to skarn.

(6) Greenstone along the footwall of a thin limestone band is somewhat altered to skarn and contains a little chalcopyrite, malachite, and magnetite.

(7) Greenstone in the hangingwall of a limestone band dipping gently into the hillside is partly altered to skarn and contains a little chalcopyrite and magnetite. Diorite in the greenstone hangingwall is slightly altered and contains sparsely disseminated molybdenite.

(8) A limestone band dips irregularly into the hillside. Along the footwall, greenstone and locally diorite are intensively mineralized with magnetite. At the adit shown in Figure 10 the greenstone along the immediate hangingwall of the limestone is intensively mineralized with chalcopyrite and pyrrhotite, and farther out in the hangingwall it is largely altered to skarn, which contains a few specks of molybdenite. About 100 feet to the north this skarn is in contact with the limestone and contains also veinlets of molybdenite.

(10) Main Hetty Green showing. The rocks form a typical intrusive complex and contain some ribbons of limestone beside the creek. Pockets of massive chalcopyrite and magnetite occur along these ribbons. The complex is irregularly altered to skarn and mineralized with chalcopyrite, magnetite, molybdenite, and powellite.

(11) A limestone band appears to lie on a small open anticline plunging northeast, and has 6 to 12 inches of massive chalcopyrite in its hangingwall.

(12) A limestone band has 20 inches of massive chalcopyrite in its hangingwall. This may be the same band as in No. 11.

(14) A quartz vein containing pockets and disseminations of magnetite is exposed over a length of 50 feet and a width of 5 to 10 feet.

(15–17) Typical intrusive complex is irregularly altered to skarn and mineralized with molybdenite. Chalcopyrite is sporadic.

(18) Jumbo showing. Ribbons of limestone dip upstream in the intrusive complex, which is rather intensively altered to skarn. Pockets and veins of massive chalcopyrite and bornite occur along the limestone contacts. Some chalcopyrite also occurs with disseminated molybdenite and powellite in the altered rocks above the limestone ribbons.

(19) A small open cut exposes two 5-foot bands of magnetite striking southwest through diorite and granodiorite.

(20) Main Crow workings. An open cut has been driven on 5 feet of magnetite, containing minor chalcopyrite and pyrite, along the north contact of a steep greenstone dyke in limestone. A 70-foot adit 40 feet below exposes only greenstone and limestone, but about 5 tons of magnetite is piled at the portal. A second adit, about 50 feet lower, has been driven about 140 feet in barren greenstone, limestone, and diorite.

(21) A 10-foot adit exposes 3 to 6 feet of magnetite in limestone and skarn.

(22) A small open cut exposes 1 foot of magnetite with minor chalcopyrite and malachite in skarn.

(23) Nearly massive pyrrhotite-bearing magnetite is exposed over a face 30 feet wide and 15 feet high in the creek bed.

(24) A small open cut exposes 2 feet of massive magnetite in greenstone near a tongue of limestone.

Tofino Nickle Group

A small mineralized zone lies between 1,200 and 1,270 feet elevation on the northwest side of Tofino Inlet opposite Similar Island (*see* Fig. 9). The zone is less than 50 feet wide and consists of pyrrhotite, chalcopyrite, and magnetite in a gneissic complex of granodiorite and greenstone. Much of the material in the zone gives a reaction for nickel with dimethyl glyoxime. A grab sample of rock well mineralized with pyrrhotite and chalcopyrite assayed: Gold, trace; silver, 1.4 ounces per ton; platinum, trace; palladium, 0.18 ounce per ton; copper, 3.60 per cent; nickel, 3.55 per cent. One speck of molybdenite was seen.

Tofino Group

East of Tofino Inlet, due east of Woman Island, a large composite quartz vein is exposed at about 100 feet elevation. Narrow bands of greenstone in it dip 40 degrees to the west-southwest. The over-all attitude of the vein may parallel these bands. The exposed length is 220 feet and the width 30 feet. Pyrite and less chalcopyrite are disseminated through the quartz. Two pieces of quartz showing

the most sulphides assayed: Gold, *nil;* silver, 0.2 ounce per ton; copper, 0.04 per cent. Three specks of molybdenite were seen.

[References: *Minister of Mines, B.C.*, Ann. Repts.; 1898, p. 1133; 1899, p. 792; 1905, p. 212; 1910, p. 152; 1916, pp. 332–333 and 362; 1917, p. 292; 1918, p. 264; 1919, p. 198; 1921, pp. 212–213; 1922, p. 231; 1926, p. 302; 1927, p. 344; 1928, pp. 371–372; 1930, pp. 293–294; 1955, p. 78; 1961, p. 104; 1962, p. 111.]

Kennedy Lake

Iron

Brynnor Mines Limited*

(49° 125° S.E.) Company office, Room 1700, Bank of Nova Scotia Building, 44 King Street West, Toronto 1; British Columbia office, Suite 105, 2256 West 12th Avenue, Vancouver 9; mine office, Ucluelet. R. V. Porritt, president; T. R. Wearing, manager; D. W. Burns, mine superintendent; A. W. Haggerty, mill superintendent; W. I. Nelson, Jr., geologist. This company is a wholly owned subsidiary of Noranda Mines, Limited.

The mine camp is on the Kennedy highway on the south shore of Kennedy Lake, about 8 miles from the junction with the Ucluelet–Tofino road. The mine is reached by 2½ miles of MacMillan, Bloedel, and Powell River Limited logging-road, which leaves the highway about 2 miles east of the camp. The open pit and crusher building are on the west side of Draw Creek, and the mine office is on the east side. Crushed ore is trucked 8 miles down Draw Creek and past Maggie Lake to the mill at New York Point on Toquart Bay. Magnetite concentrate is loaded from a storage pile onto ore-carriers for shipment to Japan.

The mining by standard benching methods and the milling by grinding and magnetic separation are described in the Annual Report for 1962. The highest point on the pit rim, at the south end, has an elevation of 455 feet. A safety berm has been established along the south and west sides at 300 feet elevation. By mid-September of 1963 mining above 210 feet had been virtually finished, and a bench at 150 feet elevation had been started. The mill treated 968,106 tons of ore, producing 750,901 tons of magnetite concentrate. Waste rock trucked from the open pit to the waste dump amounted to 2,275,000 tons.

Nearly 2,000 feet of diamond drilling was done in six holes from various sites on the pit floor.

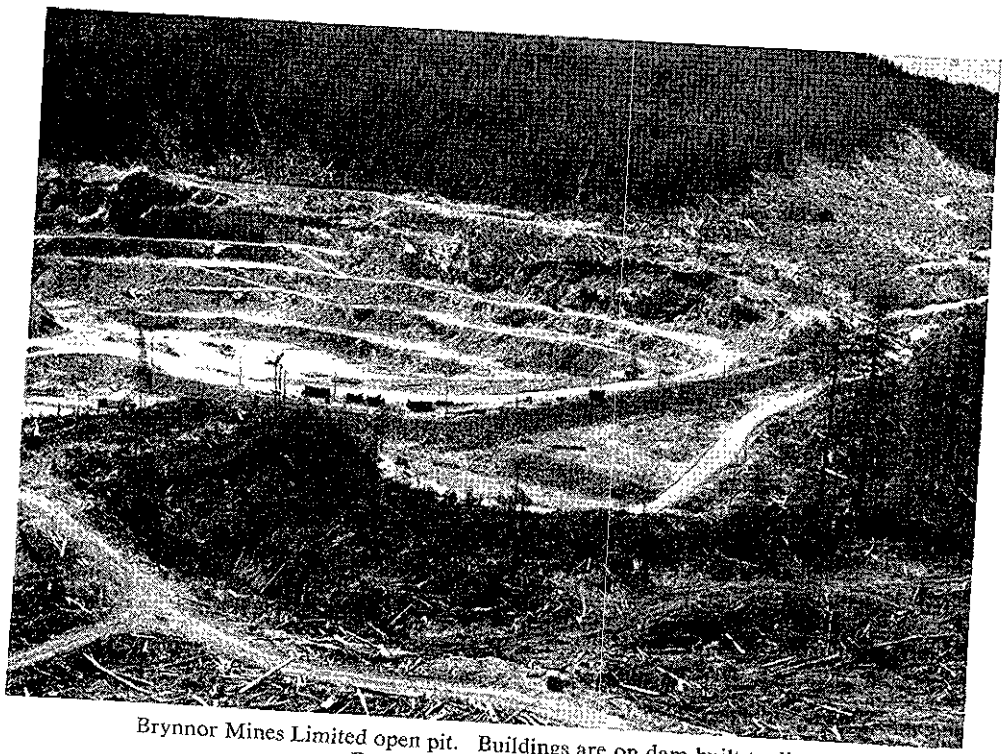
Excavation preparatory to the sinking of a shaft was begun in August. The collar is south of the open pit at 389 feet elevation. By the end of the year the shaft had been sunk 102 feet.

About 150 men were employed in the first half of the year, and the total was increased to 164 during shaft sinking. About 90 were accommodated in the camp on Kennedy Lake. The remainder lived in Ucluelet and in a small trailer camp near the office.

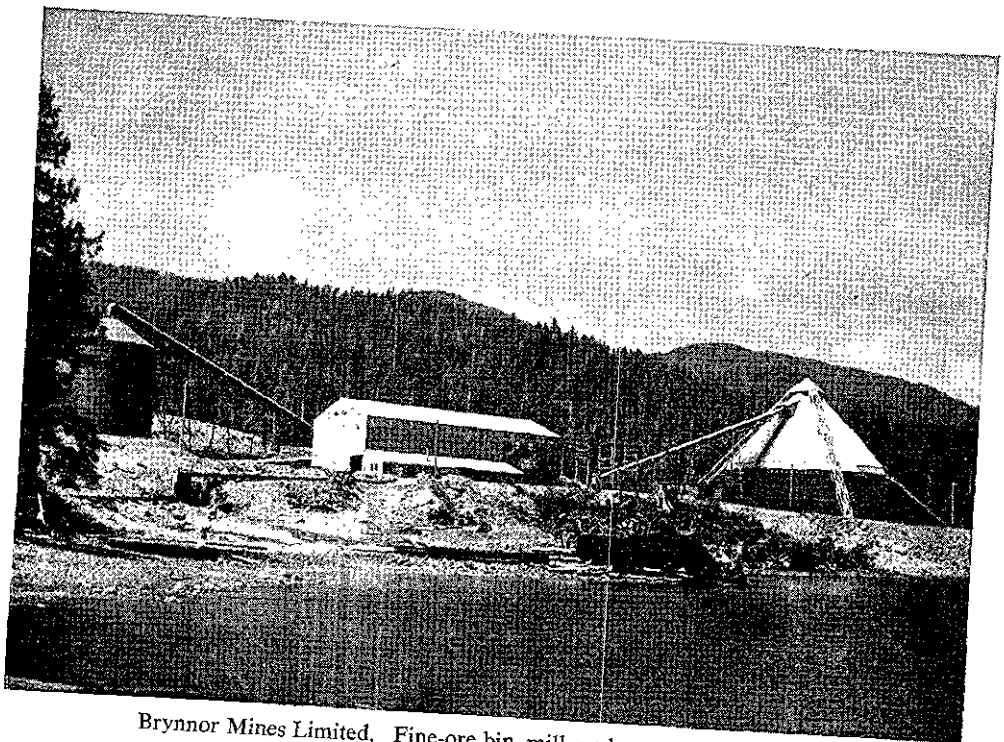
The oldest rocks in the pit are limestone and tuff of the Quatsino Formation. The limestone occurs in the east part of the pit, and the tuff in the west. It is now known that the over-all structure is anticlinal and that the tuff overlies the limestone. The layered rocks have been intruded by many small dykes and sills, and the tuff by two small stocks, of andesite. One stock extends into the middle of the pit from the southwest. The other stock is exposed in the southeast corner of the pit, in fault contact with tuff and limestone, and is known to extend a considerable distance beyond.

The layered rocks have been further injected by diorite and by two series of late dykes. A small stock of diorite extends into the pit from the west, and diorite has

* By G. E. P. Eastwood.



Brynnor Mines Limited open pit. Buildings are on dam built to divert Draw Creek from pit area.



Brynnor Mines Limited. Fine-ore bin, mill, and concentrate stockpile on shore of Toquart Bay.

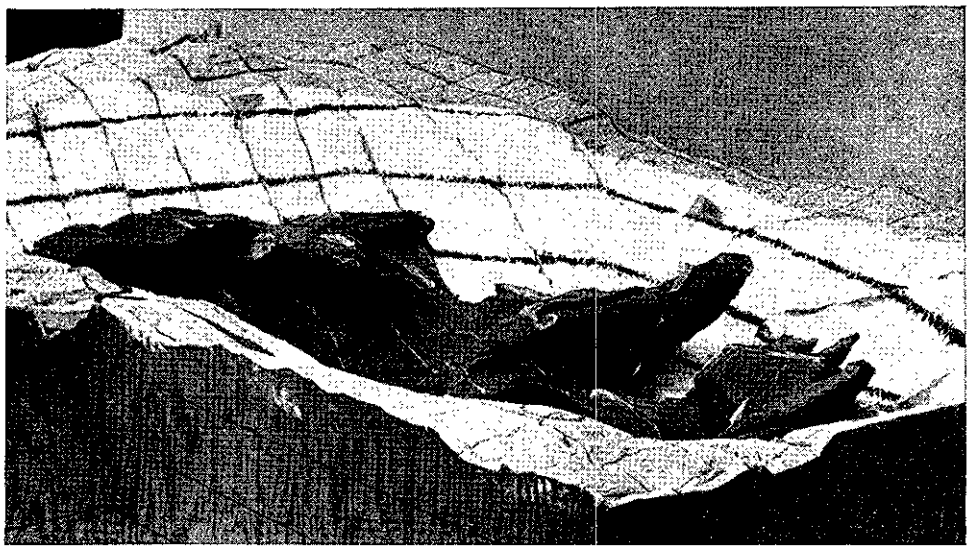
been rather pervasively introduced into tuff and some andesite dykes along the northwest side, causing considerable metamorphism. The late dykes are all gabbroic in composition; one series of dykes is light to medium grey in colour and has large feldspar phenocrysts, whereas the other series is very dark grey to greenish black and even grained. The dark late dykes clearly traverse skarn and magnetite and have been little affected by faulting. They are small and few. The porphyry dykes were previously thought by the writer to be basic offshoots of the diorite because the coarser parts of the dykes resembled it and because their relations with skarn and magnetite appeared inconclusive. It is now clear that they are younger than both diorite and mineralization. Here and there the porphyries have been seen transecting magnetite, and in one deep drill-hole a porphyry dyke was found cutting granodiorite, which in turn is known to be slightly younger than the diorite.

An anticline has been outlined for some distance northeast of the pit, with limestone in its core and tuff on its flanks. The limestone-tuff contact passes through the pit in a broad U-shaped curve, as though the anticline plunges southwest. However, the pit exposures and diamond-drill cores indicate that the dip of the contact around the base of the U is generally to the northeast below about 230 feet elevation. The fold structure cannot be outlined in detail because in many of the drill-holes the limestone and tuff are separated by considerable thicknesses of intrusive rock or ore, and the position of the original contact cannot be placed accurately. The rocks have also been broken by several faults. However, the tuff-limestone contact has been located in enough places to permit the drawing of segments of several structural contours on it. In general, the contact is almost vertical on the northwest limb of the anticline near the north end of the pit. In the central and south parts of the pit the contact dips gently southwest above about 230 feet elevation and about 55 degrees northeast between 230 and 50 feet. Between 50 feet above sea-level and 300 feet below, the mean dip is more steeply to the northeast, the steepening possibly due in part to faulting. The minus 300 structural contour can be followed in the drill core for 800 feet east from the pit, and the over-all dip there is to the north. A little farther east, intersections in two drill-holes suggest that the strike is northeast and the dip northwest.

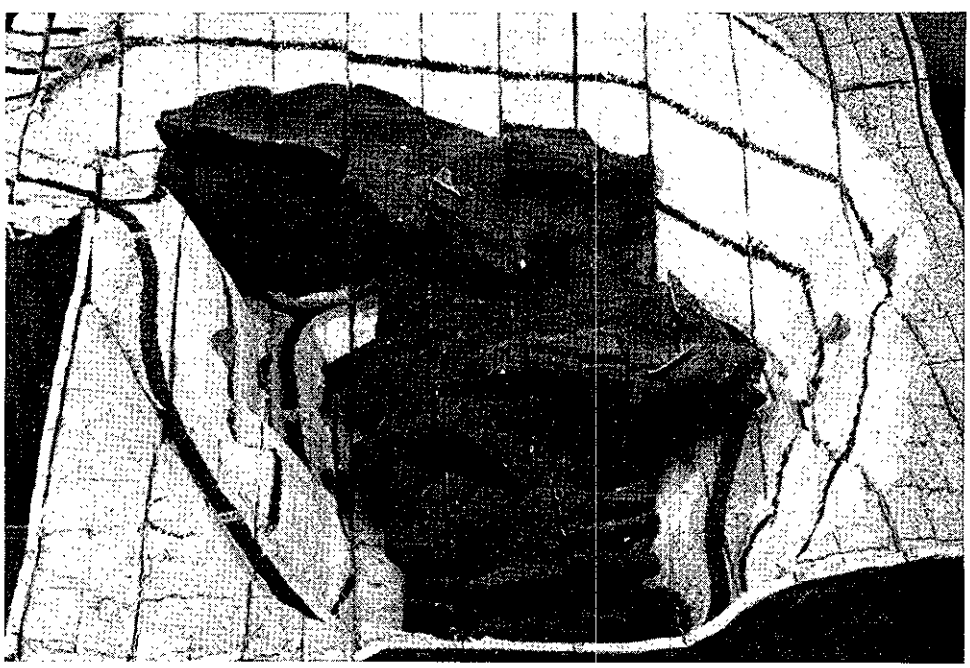
The northeastern dip of the contact on the southwest end of the anticline is believed to result from buckling of the anticline. A fault cannot be ruled out entirely, but there is no direct evidence of one, and it would be difficult to fit into the sequence of geological events. The anticlinal axis may originally have been flat or have plunged gently southwest. The structure appears to have been buckled downward and slightly backward, wracking the limestone beds and causing them to flow in places. Exploration has not been carried deep enough to show whether the buckle reverses at depth or whether the tuff continues to dip under the limestone as far as intrusive rock, which is thought to underlie the pit at depth.

The tuff has been locally replaced by skarn and magnetite, and the limestone has been locally replaced by magnetite. The small diorite stock in the west part of the pit has been slightly altered to skarn. The magnetite in turn has been grooved and polished along numerous fractures. Some serpentine has been deposited along these fractures, and it, too, is grooved and polished. Some of the limestone near magnetite has been replaced by serpentine. The principal skarn mineral is light-brown garnet. Epidote and pyroxene are less abundant but are widely distributed through the altered and mineralized tuff. The magnetite is normally dense, but it becomes visibly grained against serpentine.

The magnetite occurs as two large bodies lying more or less along the tuff-limestone contact and as several small lenses and pods. One body is currently being



Model of Brynnor open-pit orebody. Looking southwest.



Model of Brynnor open-pit orebody. Looking south.

mined in the open pit. The second lies east-southeast of the pit and has been more or less outlined by diamond drilling. It is more deeply buried than the first and is to be developed for underground mining from the shaft. The open-pit orebody has an irregular shape.

The accompanying two photographs are of a model of the orebody, built for the company by A. C. E. Mitchell. The heavy black lines represent contours on the walls of the pit as it is proposed ultimately to be excavated. In 1963 mining had not reached the level where the orebody is continuous, and the major upward projections appeared as three separate orebodies. These are termed sections in this report. Each of these sections terminates in the north against a cross-fault. There is no evidence that the magnetite has been appreciably displaced on these faults; rather, it seems that the faults helped to localize the upward projections. The south section also lies in the hangingwall of a northwest-striking fault which dips about 45 degrees southwest. The model shows that at a certain depth magnetite appears below this fault, and at greater depth spreads out and merges with the main part of the orebody. Several small isolated pods and pockets of magnetite occurred above the orebody and in the pit wall to the west and south of it.

The open-pit orebody transgresses the tuff-limestone contact slightly in plan. The north section is almost entirely in limestone, whereas most of the south section is in altered tuff. Near the north end of the south section the contact swings sharply east toward the fault contact with the second andesite stock, whereas the axis of the orebody swings only slightly. In section the orebody generally follows the contact down around the buckle, passing beneath limestone to the east and northeast, but it extends a short distance down into the altered tuff. The structural relationships bear some resemblance to those at the F.L. property near Zeballos.

[References: *Minister of Mines, B.C.*, Ann. Repts., 1961, pp. 104–110; 1962, pp. 111–124.]

Great Central Lake (49° 125° S.E.)

Gold

Apex, Morning (Sileurian Chieftain Mining Company Limited)*

Company office, Ninth Floor, 850 West Hastings Street, Vancouver 1. Walter Eilers, president. The company holds 20 claims, including the former Apex and Morning groups, north of Doran Lake between Sproat and Great Central Lakes, 26 miles west of Alberni. The showings comprise quartz veins mineralized mainly with pyrite and pyrrhotite and lesser amounts of galena, sphalerite, and chalcopyrite, and carrying gold values. A small amount of surface and underground work was done in the years 1932 to 1934. In 1960 the present company drilled four X-ray diamond-drill holes totalling 430 feet and located about 50 feet below the main Apex vein.

In 1963 the company drilled four diamond-drill holes totalling 309 feet. The work was discontinued when it was found that gold values were low.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1934, p. F4.]

Nanaimo Lakes (49° 124° S.E.)

Gold

Vulcan (Sileurian Chieftain Mining Company Limited)*

Company office, Ninth Floor, 850 West Hastings Street, Vancouver 1. Walter Eilers, president. The property consists of three claims in the vicinity of Deadhorse Creek on the west slope of Mount de Cosmos, 5 miles northwest of Nanaimo Lakes. Access to the property is by the Nanaimo

* By A. R. C. James.

Lakes road and by logging-roads within the Nanaimo Lakes operations of Crown Zellerbach (Canada) Limited.

The Vulcan property is described in some detail in the Annual Report for 1937. The mineralization, which is reported to carry values in gold and minor values in silver, occurs in a strong shear zone in altered volcanics. A shaft, believed to be 105 feet deep, was sunk many years ago, and a drift 138 feet long was driven northeastward from a point 16 feet below the collar of the shaft.

In the autumn of 1963 the present company contracted for the driving of a drift on the mineralized zone. By the end of the year approximately 100 feet of drifting had been completed. The portal was about 20 feet below the level of the collar of the old shaft. A connection underground was made with the shaft for ventilation purposes. A crew of three men was employed under the supervision of William Balez.

LADYSMITH (49° 123° S.W.)

Copper-Molybdenum

Molly*

This group of four recorded claims is owned by F. W. Wilson and Malcolm Keeble, 577 Fifth Street, Nanaimo. It is situated on the northeast slope of Mount Hayes, 1½ miles west of the head of Ladysmith Harbour. The showings are at an elevation of 600 feet, about 350 feet higher than the road which leads from the Island Highway at Cassidy airport, about 1 mile west and 3 miles south, to the foot of Mount Hayes. On the mountain, parts of an old wagon-road to the showings are still recognizable.

The occurrence is described in Geological Survey of Canada Memoir 51, 1914, page 125, as the Thistle claim.

The showing consists of a quartz-feldspar vein in a fracture in Saanich granodiorite striking north 25 degrees west and dipping 40 degrees to the southwest. An aplite dyke about 6 inches wide forms the footwall of the vein, which is mineralized with bornite, pyrite, and chalcopyrite and to a lesser degree with molybdenite. The maximum vein width observed was about 1 foot; it is exposed for a length of about 100 feet; the quartz pinches out at both ends. Some minor sheared rock was seen, but it seemed evident that movement along the fracture had been slight.

The workings comprise two adits 20 feet in elevation apart. In the lower adit the vein is exposed for 100 feet; the maximum width observed was 4 inches. A small stope lies above this adit. In the upper adit the vein is exposed for 20 feet and the maximum observed width was 1 foot.

COWICHAN LAKE (48° 124° N.E.)

Copper

Alpha, Beta, etc. (Albeta Mines Ltd.)†

Company office, 732 Cowichan Lake Road, Lake Cowichan. Allan H. Harder, president and managing director; George E. Apps, general manager. The property consists of 3 Crown-granted and 18 recorded mineral claims and fractions, as well as a mining agreement with Canadian Pacific Oil and Gas Limited covering some 4,850 acres, all situated in the Robertson River valley, approximately 7 miles south of Mesachie Lake.

A crew of three men extended the adit a distance of 340 feet to a total length of 766 feet, and completed 149 feet of raise and 67 feet of subdrift. A total of 652 feet of underground diamond drilling was completed in seven holes. In addition, 590 tons of ore with a grade of 4 per cent copper was mined and shipped to the Anaconda company concentrator at Britannia Beach.

* By N. D. McKechnie.
† By J. E. Merrett.

On the surface, reconnaissance prospecting and geological mapping was done on parts of the holdings covered by the mining agreement. Self potential geophysical surveying was done in areas of specific interest.

Anomaly* This group of eight recorded claims is owned by W. E. Fraser, of North Surrey. It is situated on Long Creek, a southwesterly flowing tributary of Robertson River about 5 miles south of Mesachie Lake Post Office.

The mineral showings are on the Anomaly claim and are about 1½ miles from the Robertson River. There are two principal exposures about 300 feet apart; the easterly exposure is on the bank of Long Creek and the westerly one extends to about 600 feet from the creek. The workings consist of 20 feet of stripping on the easterly exposure and 150 feet on the westerly exposure. Ten diamond-drill holes totalling 500 feet were drilled—six at the westerly showing, three at the easterly, and one about half-way between.

The mineralization is pyrrhotite and chalcopyrite in a sheared zone 8 to 10 feet wide, striking north 85 degrees west and dipping 75 degrees south. The sheared rock is composed chiefly of actinolite with minor garnet. The hangingwall is a chloritized fine-grained lithic tuff composed chiefly of actinolite-rich fragments; a very thin well-defined banding is seen in thin-section. The footwall is a chloritized lapilli tuff composed of andesitic fragments; no banding was recognized, even in thin-section. Amygdaloidal basalt is exposed south of the stripping. The bedding attitude was not determined, but it seems likely that the shear represents a bedding-plane fault since the wallrocks remain the same throughout the exposures.

Drill cores were not available to the writer, but, according to data supplied by Mr. Fraser, sulphides in holes 1, 3, 4, 7, 8, and 10 appear to be distributed along a plane striking nearly east-west and dipping 40 degrees south. These holes include both the easterly and westerly workings. This is in agreement with the observed strike of the shear but is 35 degrees flatter than the observed dip. Of the remaining four holes, No. 2 encountered malachite and pyrrhotite at a point which agrees with neither the observed nor the calculated planes, No. 5 appears to have been drilled too far north, No. 6 was stopped short of the objective, and No. 9, drilled close to the westerly stripping, encountered sulphides in line with the 75-degree dip. Except for No. 9, none of the holes was drilled deep enough to have cut the shear zone on the steep dip, so it is not known whether there are in fact two zones parallel in strike or whether the apparent dip in the stripping represents only a subsidiary plane.

Assays obtained by Mr. Fraser indicated a maximum of the order of 3.5 per cent copper across 3 feet; in No. 4 hole an assay of 2.03 per cent copper and 4.46 per cent zinc across 3 feet was reported.

NITINAT (48° 124° N.W.)

Copper

Mal* The Mal group of seven recorded mineral claims is owned by Marshall Creek Copper Co. Ltd.; registered office, 205 Canada Permanent Building, Victoria. The property is situated on Marchand Creek, which flows westward into Nitinat Lake 5½ miles from the head of the lake. Access is by logging company roads, either from Port Alberni or from Lake Cowichan, to the head of Nitnat Lake and from there by boat to the property. Marshall Creek Copper Co. Ltd. maintains a small camp at the lake-head.

* By N. D. McKechnie.

At the site of the mineral showing on Marchand Creek, about 1,000 feet inland from the lake, the rock is a well to highly saussuritized and silicified granitic rock. The relict textures indicate an original medium-grained holocrystalline rock. This rock is intruded by dykes of fine-grained green andesite porphyry, which in thin-section show appreciable alteration to sericite, chlorite, and calcite. Both the altered granitic rock and the andesite dykes are cut by light-grey to pinkish quartz monzonite, which shows relatively minor alteration in thin-section.

The mineralization occurs in a fault zone about 25 feet wide striking north 50 degrees west and dipping 75 degrees northeastward. The fault cuts all three rock types; a few light-coloured granitic stringers an inch or so wide and perhaps related to the quartz monzonite were intruded along the fault.

Chalcopyrite, sphalerite, and pyrite occur in the fault in bands or lenses up to about 2 feet wide. The gangue consists of quartz, chlorite, clinozoisite, actinolite, hypersthene, and a black opaque iron-aluminum silicate thought to be thuringite. The sphalerite is a dark variety and veins the thuringite, so that in hand specimen it may not be possible to estimate the proportions of sphalerite and thuringite. In the limited exposures available at the time of the writer's visit in December, it was not possible to estimate what proportion of the fault might contain high-sulphide zones.

WW*

This group of four claims is held by record by James McNulty and Wayne McNulty, 2838 Bryn Maur Road, Langford. The group is on Coleman Creek, 3½ miles east of Alberni Canal. It is reached by logging-roads from Port Alberni or, alternatively, by logging-roads from Cowichan Lake and Little Nitinat River. Mineralization exposed on the side of the logging- road consists of chalcopyrite, pyrite, and pyrrhotite in a fault about 2 feet wide striking north 80 degrees east and dipping 50 degrees north. The hangingwall is andesite and the footwall is limestone. The rock within the fault is composed chiefly of actinolite. The fault has been traced to about 100 feet down hill.

JORDAN RIVER (48° 124° S.E.)

Copper

Sunloch and Gabbro (Cowichan Copper Co. Ltd.)†

Company office, 620 Howe Street, Vancouver 1; mine office, River Jordan. Oswood G. MacDonald, president; J. R. Billingsley, mine manager. This property is on the Jordan River about 1 mile upstream from its mouth and is reached by a road which leaves the Victoria highway about one-half mile east of the River Jordan Post Office. An operating lease was obtained by Cowichan Copper Co. Ltd. from Sunro Mines Limited (controlled by The Consolidated Mining and Smelting Company of Canada, Limited) to remove ore from 18 claims which include the Cave, Central, and River ore zones.

All development work and ore removal was done in the " B " and " C " orebodies of the River ore zone. The " B " orebody produced 90 per cent of the mill tonnage. No. 1 shaft was sunk to a depth of 486 feet below the 5100 level to permit the development of three levels in the " B " orebody. The shaft was raised a distance of 50 feet above the 5100 level to provide room for the installation of a Canadian Westinghouse friction hoist with a 4-ton load-carrying capacity. At the 4700 level in No. 1 shaft a crushing-station was excavated, and a 29- by 36-inch Kue-Ken crusher with ancillary equipment was installed.

* By N. D. McKechnie.
† By J. E. Merrett.

A raise was driven from the 5700 level or River adit to the 5900 or uppermost level in developing the upper part of the " C " orebody. Considerable drifting and raising was done in developing this orebody on the 5300, 5400, and 5500 levels.

In the crushing-plant area, excavations were made and equipment installed to convey the crushed ore from No. 1 shaft to a newly installed 4¼-inch Simons cone crusher which replaced the former No. 2 crusher.

In February caving developed in the vicinity of 5,430 feet elevation in the " B " stope. In spite of considerable efforts to rock bolt the crown pillar over this stope, caving continued intermittently until December 5th, when the pillar collapsed, permitting Jordan River to flow into the mine. All persons were evacuated without incident, but no further production was possible to the end of 1963 as the river had not been diverted from the mine at that date.

Development work comprised 536 feet of shaft sinking and raising, 2,703 feet of raising, 3,394 feet of drifting, and 13,954 feet of diamond drilling completed in 116 holes. Except for development mining of the orebodies, all ore was removed by blast-hole mining methods, and to that end 79,134 feet of long-hole drilling was done. The total amount of ore mined was 340,142 tons, and 270,142 tons was milled to produce 15,782 tons of copper concentrate, which was shipped to Japan.

A crew of 150 men was employed, of whom 116 were employed underground, mining or in the crushing and milling operations.

TABLE XIV.—LODE-METAL PRODUCTION IN 1963

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
NORTHERN BRITISH COLUMBIA			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Atlin Mining Division										
Nil										
Liard Mining Division										
Nil										
CENTRAL BRITISH COLUMBIA										
Cariboo Mining Division										
Aurum	Wells	The Cariboo Gold Quartz Mining Co. Ltd., Vancouver	34,702	Bullion	18,308	3,165				
Clinton Mining Division										
Nil										
Omineca Mining Division										
Cronin	Smithers	New Cronin Babine Mines Ltd., Vancouver	362	Lead concentrates, 27 tons; zinc concentrates, 36 tons	7	3,498		30,946	41,468	562
Silver Standard	Hazelton	P. Kindrat, Smithers, lessee	27	Crude ore	5	2,405		3,957	15,500	
COAST AND ISLANDS										
Alberni Mining Division										
Brynnor	Kennedy Lake	Brynnor Mines Ltd., Vancouver	968,106	Iron concentrates, 750,901 tons						
Musketeer	Tofino	Kootenay Base Metals Ltd., Vancouver, lessee	2	Gold concentrates	80	38	12	286		
Fandora	Tofino	W. E. McArthur, Greenwood	49	Siliceous ore	331	79				

			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Nanaimo Mining Division										
Merry Widow and Kingfisher	Benson Lake	Empire Development Co. Ltd., Vancouver	159,871	Iron concentrates, 96,610 tons	.....	.....	.....	.....	.....	.....
Nimpkish	Beaver Cove	Nimpkish Iron Mines Ltd., Vancouver	561,675	Iron concentrates, 307,679 tons	.....	.....	.....	.....	.....	.....
Old Sport	Benson Lake	Coast Copper Co. Ltd., Port McNeill	327,433	Copper concentrates, 16,154 tons	16,289	27,607	9,669,840	.....	.....	.....
Texada	Texada Island	Texada Mines Ltd., Vancouver	954,591	Iron concentrates, 504,446 tons; copper concentrates, 5,820 tons	1,250	37,142	2,441,787	.....	.....	.....
New Westminster Mining Division										
Pride of Emory	Choate	Giant Mascot Mines Ltd., Vancouver	313,836	Nickel-copper concentrates, 20,107 tons; nickel content, 4,203,866 lb.	.....	.....	2,049,622	.....	.....	.....
Skeena Mining Division										
Harriet Harbour	Jedway	Jedway Iron Ore Ltd., Vancouver	724,273	Iron concentrates, 339,008 tons	.....	.....	.....	.....	.....	.....
Silbak Premier	Premier	Silbak Premier Mines Ltd., Vancouver	96	Crude ore	634	9,410	.....	5,990	8,762	.....
Vancouver Mining Division										
Britannia	Britannia Beach	The Anaconda Co. (Canada) Ltd., Britannia Beach	493,700	Copper concentrates and precipitates, 21,538 tons; zinc concentrates, 7,045 tons; tailings, 36,633 tons	9,778	52,650	13,266,984	386,271	8,459,353	42,270
Cambrian Chieftain	Pender Harbour	J. A. McKelvie, Vancouver	495	Crude ore	.....	312	13,861	.....	.....	.....
Victoria Mining Division										
Alpha, Beta, etc.	Lake Cowichan	Albeta Mines Ltd., Lake Cowichan	590	Crude ore	6	330	51,567	.....	.....	.....
Sunloch	River Jordan	Cowichan Copper Co. Ltd., Vancouver	267,675	Copper concentrates, 16,031 tons	1,816	19,124	8,255,898	.....	.....	.....
SOUTH CENTRAL BRITISH COLUMBIA										
Greenwood Mining Division										
Highland-Bell	Beaverdell	Mastodon-Highland Bell Mines Ltd., Vancouver	21,689	Lead concentrates, 1,766 tons; zinc concentrates, 734 tons; jig concentrates, 351 tons	571	877,861	.....	806,019	1,063,211	8,061
King Midas	Greenwood	King Midas Mines Ltd., Vancouver	5	Crude ore	.....	36	.....	177	31	.....
Phoenix	Greenwood	Phoenix Copper Co. Ltd., Grand Forks	645,083	Copper concentrates, 14,532 tons	11,991	65,746	7,147,775	.....	.....	.....

TABLE XIV.—LODE-METAL PRODUCTION IN 1963—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Greenwood Mining Division—Continued										
Skomac	Rock Creek	c/o Gowan and Butts, Vancouver	42	Crude ore	8	1,345		3,209	1,013	
Kamloops Mining Division										
Bethlehem	Ashcroft	Bethlehem Copper Corporation Ltd., Vancouver	1,265,988	Copper concentrates, 29,631 tons	3,191	115,496	24,828,935			
Lillooet Mining Division										
Bralorne	Bridge River	Bralorne Pioneer Mines Ltd., Vancouver	152,601	Bullion; gold concentrates, 9 tons	87,016	16,836				
Nicola Mining Division										
Craigmont	Merritt	Craigmont Mines Ltd., Vancouver	1,787,717	Copper concentrates, 108,325 tons			59,668,496			
Osoyoos Mining Division										
Conway	Oliver	Conway Mines, c/o G. R. McKay, Oliver	72	Crude ore	10	72		287	143	
Nickel Plate	Hedley	Hedley Mining Syndicate, c/o L. J. Penney, Vernon		Clean up	7	3		1	8	
Smuggler	Oliver	K. G. Ewers, Okanagan Falls	25	Siliceous ore	33	38		166	305	
Susie	Oliver	K. G. Ewers, Okanagan Falls	236		19	380		816	472	
Similkameen Mining Division										
Mazie	Princeton	Mazie Mines Ltd., Princeton	3	Crude ore		4		136		
Vernon Mining Division										
Nil										
SOUTHEASTERN BRITISH COLUMBIA										
Fort Steele Mining Division										
Estella	Wasa	Copper Soo Mining Co. Ltd., Osoyoos	2,674	Crude ore		16,549		632,929	1,232,578	

			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Humbolt	Crawford Bay	D. J. Fulton and R. A. Sutton, Cranbrook	3	Crude ore		90		2,125	668	
Sullivan	Kimberley	The Consolidated Mining & Smelting Co. of Canada, Ltd., Trail	1,742,008	Lead concentrates, 167,992 tons; zinc concentrates, 261,228 tons; tin concentrates, 610 tons; iron sinter, 61,597 tons	358	4,084,011	731,400	257,320,000	263,368,000	
Golden Mining Division										
Mineral King	Toby Creek	Sheep Creek Mines Ltd., Nelson	203,942	Lead concentrates, 5,583 tons; zinc concentrates, 15,895 tons		186,468	140,429	7,559,017	18,056,543	59,141
St. Anthony Group	Doctor Creek	Ronald Archer, Kimberley	6	Crude ore		386	56	180	56	
Nelson Mining Division										
Bonanza	Nelway	A. R. Thompson and A. A. Christensen, Metaline, Wash.	15	Crude ore	4	92		261		
Gold Belt	Salmo	A. Endersby, Fruitvale	242	Crude ore	54	47		484	747	
Golden Age	Ymir	Foremost Construction Ltd., North Burnaby	62	Crude ore	4	25		123	123	
H.B.	Salmo	The Consolidated Mining & Smelting Co. of Canada, Ltd., Trail	473,909	Lead concentrates, 4,215 tons; zinc concentrates, 39,968 tons		68,556		6,600,400	41,306,080	349,922
Jersey	Salmo	Canadian Exploration Ltd., Vancouver	368,673	Lead concentrates, 6,315 tons; zinc concentrates, 23,865 tons		28,752		10,122,433	28,348,153	233,547
Kootenay Belle	Salmo	K-Belle Enterprise Co., Linden, Alta., and M. Arishenkoff, Trail	6,206	Crude ore	751	629		12,166	11,173	
Lucky Strike	Nelson	L. C. de Kock, Nelson	4	Crude ore	6	42		102	44	
New Arlington	Erie	G. D. Fox, Trail	1,357	Siliceous ore	348	1,004		17,171	17,553	
Reeves MacDonald	Remac	Reeves MacDonald Mines Ltd., Vancouver	145,966	Lead concentrates, 2,330 tons; zinc concentrates, 8,868 tons		15,016		3,963,691	10,569,776	55,830
Trans Mountain	Blewett	Trans Mountain Mines Ltd., c/o Kennedy, Andrews & Taylor, Kamloops		Zinc concentrates, 25 tons	8	121		2,262	20,007	80
Venango	Nelson	D. H. Norcross, Nelson	63	Siliceous ore	12	25		126	126	
Revelstoke Mining Division										
Mohawk	Beaton	Mohawk Silver Mines Ltd., Beaton	9	Crude ore		434		2,993	3,746	
Slocan Mining Division										
Anna	Slocan	H. Marasek, Slocan	51	Siliceous ore		125		125	113	
Antoine	Kaslo	L. N. Garland, Kaslo	77	Crude ore		13,315		72,410	26,513	

TABLE XIV.—LODE-METAL PRODUCTION IN 1963—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
Slocan Mining Division—Continued			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Arlington	Slocan	Arlington Silver Mines Ltd., Vancouver	326	Crude ore	———	1,589	———	5,141	4,107	———
Black Diamond	Ainsworth	T. Lane, Ainsworth	10	Crude ore	———	346	———	4,372	1,845	———
Bluebell	Riondel	The Consolidated Mining & Smelting Co. of Canada, Ltd., Trail	256,484	Lead concentrates, 16,819 tons; zinc concentrates, 27,993 tons	———	350,370	408,800	24,869,808	29,301,241	131,135
Freddy	Silverton	V. C. Hanson and H. Lyon, Silverton	19	Crude ore	3	2,057	———	225	262	———
Idaho	Three Forks	M. Tarnowski and J. Nesbitt, Silverton	15	Crude ore	———	1,913	———	20,764	845	———
Krao	Ainsworth	T. Lane, Ainsworth	11	Crude ore	———	235	———	5,969	556	———
Meteor	Slocan	Cultus Explorations Ltd., Edmonton, Alta.	265	Crude ore	4	2,569	———	———	———	———
Ottawa	Slocan	Ottawa Silver Mines Ltd., Spokane, Wash.	384	Crude ore	3	43,569	———	2,238	1,279	———
Shady M.C.	Sandon	N. Sibilleau, Rossland	17	Crude ore	———	1,283	———	22,698	1,025	———
Silver Bell	Retallack	J. Nesbitt and C. Towgood, Silverton	3	Crude ore	———	223	———	2,893	193	———
Silversmith	New Denver	E. and A. Perepolkin, Hills; L. D. Irwin, New Denver	709	Lead concentrates, 52 tons; zinc concentrates, 90 tons; crude ore, 23 tons	6	10,180	———	85,115	112,899	756
Utica	Kaslo	Peerless Exploration Ltd., Toronto, Ont.	———	Lead concentrates, 1 ton; zinc concentrates, 4 tons	———	300	———	965	3,923	24
Victor	Sandon	L. Fried and E. Derosa, New Denver; J. Stewart and E. Anderson, New Denver	1,091	Lead concentrates, 107 tons; zinc concentrates, 197 tons; crude ore, 24 tons	28	23,579	———	178,687	233,621	1,561
Trail Creek Mining Division										
I.X.L.	Rossland	J. A. Ruelle and W. and J. Hermans, Rossland	19	Gold concentrates	178	32	———	77	39	———
Sunset	Paterson	K. H. Woell, Rossland	5	Crude ore	———	17	———	992	820	———
Velvet	Rossland	Mid-West Copper & Uranium Mines Ltd., Vancouver	5,100	Concentrates, 202 tons	185	894	80,690	———	———	———
W.D.	Trail	W.D. Mining Co. Ltd., Trail	2,741	Crude ore	913	240	———	5,482	7,417	———

Lode-metal Deposits Referred to in the 1963 Annual Report

The names of the properties are arranged alphabetically within five areas. Each area consists of the mining divisions listed below. The table shows the principal metals produced or indicated in the deposits in 1963:—

Northern British Columbia.—Atlin, Liard.

Central British Columbia.—Cariboo, Clinton, Omineca.

Coast and Islands.—Alberni, Nanaimo, New Westminster, Skeena, Vancouver, Victoria.

South Central British Columbia.—Greenwood, Kamloops, Lillooet, Nicola, Osoyoos, Similkameen, Vernon.

Southeastern British Columbia.—Fort Steele, Golden, Nelson, Revelstoke, Slocan, Trail Creek.

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Antimony	Page
Northern British Columbia																						
Ann	Liard	57° 131° S.W.														3						8
Copco, Liz, Cote	Liard	59° 129° S.W.	3																			6
Decker Creek	Liard	57° 131° S.W.														3						8
FAE	Atlin	58° 131° S.W.			3											3						7
Galore Creek	Liard	57° 131° S.E.			3																	8
Goat	Liard	57° 131° S.E.			3																	8
Joy	Liard	58° 129° S.E.			3																	6
McDame Belle, Bar	Liard	59° 129° S.E.		3		3																6
Mary	Liard	57° 130° S.E.														3						9
Poke	Liard	57° 132° N.E.			3																	7
Sam	Liard	57° 132° N.E.														3						7
Thorn	Liard	58° 132° N.W.			3																	6
TNA	Liard	58° 128° S.W.			3																	7
Central British Columbia																						
Aurum	Cariboo	53° 121° S.W.	1	2																		38, 126
Bell	Omineca	54° 125° S.E.														3						35
Bob	Omineca	54° 125° S.E.														3						32
Boss Mountain	Cariboo	52° 120° S.W.														3						39
Berg	Omineca	53° 127° N.E.			3											3						28
CAFB	Omineca	53° 127° S.E.														3						29
C.M. and R.W.	Omineca	54° 125° S.E.														3						34
CO	Omineca	54° 125° S.E.														3						34
Canadian Citizen, American Citizen, May, J.W.B.	Omineca	54° 127° N.E.			3																	25
Cob	Omineca	53° 127° S.E.														3						28
Cronin	Omineca	54° 126° N.W.	2	1		1	1		2													26, 126
Croydon	Omineca	55° 125° S.W.	3		3																	38
Duthie, Mamie	Omineca	54° 127° N.E.		3		3	3															25
Elk	Omineca	54° 125° S.E.														3						32
Enco	Omineca	53° 124° N.W.														3						36
Endako	Omineca	54° 125° S.E.														3						32
Glacier Gulch	Omineca	54° 127° N.E.														3						26
Jen, Beaver	Omineca	53° 124° N.W.														3						37
KO	Omineca	54° 124° S.W.														3						36
Len	Omineca	53° 127° N.E.			3											3						28
Leo, Mo	Omineca	54° 125° S.E. and 54° 124° S.W.														3						35

Shipping Mines.—(1) Metal contributed at least 10 per cent of gross value of the shipment. (2) Metal contributed less than 10 per cent of the shipment. Production for 1963 is listed in Table XIV.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

LODE-METAL DEPOSITS REFERRED TO IN THE 1963 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Antimony	Page
Central British Columbia—Cont'd																						
Lucky Ship	Omineca	54° 127° S.E.														3						28
McDonald Island	Omineca	54° 126° N.E.			3																	27
Molly, Moly, Red Canyon, Tom, Len	Omineca	55° 127° N.E.														3						24
Molly, Pogo, Sandy	Omineca	53° 124° N.W.														3						36
Moly	Omineca	54° 125° S.E.														3						32
Nithi	Omineca	53° 124° N.W.														3						37
Rob	Omineca	54° 125° S.E.														3						32
Silver Creek, Silver Lake, Trade Dollar	Omineca	54° 127° N.E.		3		3	3															26
Silver Standard	Omineca	55° 127° S.W.	2	1		2	1															126
Snowbird	Omineca	54° 124° N.W.	3																		3	38
TIT	Omineca	53° 126° S.W.														3						29
Tor	Omineca	54° 125° S.W.														3						30
Coast and Islands																						
A.M.	N. West'r.	49° 121° S.E.			3																	89
Ace, Galena	Skeena	55° 129° N.W.		3		3																12
Alice	Skeena	55° 129° N.W.														3						12
Alpha, Beta	Victoria	48° 124° N.E.	2	2	1																	122, 127
Anomaly	Victoria	48° 124° N.E.			3																	123
Anyox	Skeena	55° 129° S.W.			3																	13
Apex, Morning	Alberni	49° 125° S.E.	3																			121
Azure	Vancouver	50° 122° S.W.			3																	95
Bank, Banker, Isle, Omi, Waller	Skeena	53° 130° S.E.	3																			21
Bayview, United Empire	Skeena	55° 129° N.W.		3		3	3															11
Britannia	Vancouver	49° 123° N.E.	2	2	1	2	1		2													92, 127
Brynnor	Alberni	49° 125° S.E.								1												117, 126
Buttle Lake Mining	Alberni	49° 125° N.W.	3	3	3	3	3															109
Cambrian Chieftain	Vancouver	49° 123° N.W.		2	1																	127
Catface	Alberni	49° 125° S.W.			3																	102
Copper Road	Nanaimo	50° 125° S.E.			3																	98
Dolly Varden	Skeena	55° 129° N.W.		3		3	3															12
Domineer	Nanaimo	49° 125° N.E.		3	3																	103
East Gold and East Gold Extension	Skeena	56° 130° S.E.	3	3																		11
Empire Development (Merry Widow and Kingfisher)	Nanaimo	50° 127° S.E.								1												100, 127
Eureka Victoria	N. West'r.	49° 121° S.W.		3																		90
F.L., Ridge, Cordova	Nanaimo	50° 126° S.W.								3												101
Fandora and Gold Flake	Alberni	49° 125° S.W.	1	2																		109, 126
Fitzsimmons	Vancouver	50° 122° S.W.			3																	96
Gem	N. West'r.	49° 121° N.W.														3						91
Granduc	Skeena	56° 130° S.E.			3					3												9
H. and C.	Skeena	52° 128° N.E.			3																	21
Harriet Harbour	Skeena	52° 131° S.E.								1												16, 127
High Hopes	Vancouver	49° 123° N.E.			3																	93
Indian Chief, Prince	Alberni	49° 126° S.E.	3	3	3																	101
Iron Mike	Nanaimo	50° 125° S.W.								3												99
Jib	Skeena	52° 131° S.E.								3												18
Johnson Nickel	Skeena	52° 131° S.E.													3							18
Kay	Skeena	56° 130° N.E.	3	3		3	3															10
Keeler	Skeena	54° 128° S.E.			3																	24
Little Joe	Nanaimo	50° 127° N.W.			3																	99
London	Vancouver	50° 122° S.W.			3																	94
Lynx, Paramount, Price	Alberni	49° 125° N.W.	3	3	3	3	3															105
Mac	Skeena	52° 131° S.E.								3												18
Mal	Victoria	48° 124° N.W.			3																	123
Musketeer	Alberni	49° 125° S.W.	1	2	2	2																102, 126

LODE-METAL DEPOSITS REFERRED TO IN THE 1963 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Antimony	Page
Coast and Islands—Continued																						
Molly	Nanaimo	49° 123° S.W.			3											3						122
New Indian Mines	Skeena	56° 130° S.E.		3		3	3															10
Nimpkish, Klaanch	Nanaimo	50° 126° S.W.								1												99, 127
Northwest, Bet	Skeena	54° 128° S.E.			3																	22
Old Sport	Nanaimo	50° 127° S.E.	2	2	1																	100, 127
Pride of Emory	N. West'r	49° 121° S.W.			1										1							89, 127
Prosperity, Porter Idaho	Skeena	55° 129° N.W.		3		3	3															11
Red Wing	Skeena	55° 129° S.W.			3																	13
Silbak Premier	Skeena	56° 130° S.E.	1	1		2	2															10, 127
Sun West	Alberni	49° 125° S.W.			3											3						111
Sunloch and Gabbro	Victoria	48° 124° S.E.	2	2	1																	124, 127
Tasu	Skeena	52° 132° N.E.			3					3												13
Texada (Prescott Paxton, Lake)	Nanaimo	49° 124° N.W.	2	2	1					1												96, 127
Victory	Skeena	55° 129° N.W.		3																		12
Vulcan	Alberni	49° 125° S.E.	3																			121
WW	Victoria	48° 124° N.W.			3																	124
South Central British Columbia																						
Amcana	Greenw'd	49° 118° N.W.	3																			67
Barkley Valley	Lillooet	50° 122° S.E.	3	3																		42
Bethlehem	Kamloops	50° 120° S.W.	2	2	1																	46, 128
Bethsaida, Tom	Nicola	50° 121° S.E.			3																	46
Bralorne	Lillooet	50° 120° N.W.	1	2																		41, 128
Chataway	Nicola	50° 120° S.W.			3																	48
Conway Mines	Osoyoos	49° 119° S.W.	1	1		2	2															65, 128
Copper Canyon	Nicola	50° 121° S.E.			3																	53
Copperado	Nicola	50° 120° S.W.			3																	54
Craigmont	Nicola	50° 120° S.W.			1																	49, 128
Dave	Kamloops	50° 120° N.W.			3																	44
Dawn, B and R	Nicola	49° 120° N.W.			3					3												56
Dora Kay	Nicola	50° 121° S.E.			3																	43
Dot	Lillooet	51° 122° S.W.																	3			42
Friday Creek	Similk'n	49° 120° S.W.			3																	59
G.E., Regal	Similk'n	49° 120° S.E.			3																	63
Galaxy Minerals	Kamloops	50° 120° N.E.			3																	58
Gem, Dividend-Lakeview	Osoyoos	49° 119° S.E.			3																	65
Georgi	Nicola	50° 120° S.W.			3																	54
Har, Mid	Nicola	50° 120° S.W.			3																	52
Harper	Kamloops	51° 119° S.W.			3	3	3															59
Highland-Bell	Greenw'd	49° 119° S.E.	2	1		2	1		2													67, 127
Horn Silver	Osoyoos	49° 119° S.W.	3	3																		65
Imperial Metals	Similk'n	49° 120° N.W.								3												59
Jericho	Kamloops	50° 120° S.W.			3																	47
Judy	Nicola	50° 120° S.W.			3																	53
June, Saw	Nicola	49° 120° N.W.			3																	56
Justice	Nicola	50° 120° S.W.			3																	52
King Edward	Osoyoos	49° 119° S.W.			3												3					65
King Midas	Greenw'd	49° 118° S.W.		1		1	2															127
Laron	Nicola	50° 120° S.W.			3																	49
Laura, Earl	Kamloops	50° 120° N.E.			3																	59
Lela	Similk'n	49° 120° S.W.			3					3												62
Magna Copper, Ranch	Nicola	50° 120° S.W.			3																	53
Makao	Kamloops	50° 120° N.E.			3																	58
Mazie	Vernon	49° 119° S.W.		1		1																128
Nickel Plate	Osoyoos	49° 120° S.E.	1	2		2	2															128
Noranda Exploration	Kamloops	50° 121° S.E.			3																	47
P.G.	Kamloops	50° 120° N.W.			3																	48

LODE-METAL DEPOSITS REFERRED TO IN THE 1963 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Antimony	Page
South Central British Columbia—Continued																						
Pay	Nicola	49° 120° N.W.			3																	55
Phoenix	Greenw'd	49° 118° S.W.	1	2	1																	68, 127
Porcupine	Nicola	50° 120° S.W.			3																	54
Primer	Similk'n	49° 120° N.E.			3																	57
Quilchena	Nicola	50° 120° S.W.	3	3																		54
Ray	Similk'n	49° 120° S.W.			3																	62
Rich	Nicola	50° 120° S.W.			3																	49
Robin	Nicola	49° 120° N.W.			3																	55
Rocky, Tom, Nav	Nicola	50° 121° S.E.			3																	42
Rye, Jesse, Jack	Nicola	50° 120° S.W.			3																	52
Shamrock	Nicola	49° 120° N.W.			3																	57
Sheba, Highmont, Minex, B.X.	Nicola	50° 120° S.W.			3																	47
Skomac	Greenw'd	49° 118° S.W.	2	1		1	2															128
Smuggler	Osoyoos	49° 119° S.W.	1	2		2	2															65, 128
Spatsum	Kamloops	50° 121° N.E.			3					3												44
Susie	Osoyoos	49° 119° S.W.	1	1		2	2															128
Tom	Nicola	50° 120° S.W.			3																	51
Trojan	Kamloops	50° 120° N.W.			3																	44
WDR	Kamloops	50° 120° N.W.			3																	48
Wade, Sarg, Major	Nicola	50° 120° S.W.			3																	52
Southeastern British Columbia																						
Anna	Slocan	49° 117° N.E.		1		2	2															78, 129
Antoine	Slocan	50° 117° S.E.		1		1	1															74, 129
Arlington	Nelson	49° 117° N.E.		1		1	1															79, 130
Bayonne	Nelson	49° 116° S.W.	3																			72
Black Diamond	Slocan	49° 116° N.W.		1		1	1															130
Bluebell	Slocan	49° 116° N.W.		2	2	1	1		2													72, 130
Bonanza	Nelson	49° 117° S.E.	1	1		2																129
Calumet	Slocan	49° 117° N.E.		3		3	3															79
Carnegie Mining Corporation (Silversmith, Richmond-Eureka etc.)	Slocan	49° 117° N.E.	2	1		1	1															77, 130
Crown and Anchor	Fort Steele	49° 116° N.W.		3		3	3															73
Delphine	Golden	50° 116° S.E.		3		3																85
Estella	Fort Steele	49° 115° N.W.		2		1	1															82, 128
Freddy	Slocan	49° 116° N.W.	2	1		2	2															130
Gold Belt	Nelson	49° 117° S.E.	1	2		2	2															129
Golden Age	Nelson	49° 117° S.E.	1	1		2	2															129
H.B.	Nelson	49° 117° S.E.		2		1	1		1													70, 129
Hecla	Slocan	49° 117° S.E.		3		3	3															77
Humbolt	Fort Steele	49° 116° S.W.		1		1	1															129
I.X.L.	Trail Cr'k	49° 117° S.W.	1	2		2	2															130
Idaho	Slocan	50° 117° S.E.		1		1	2															130
It, In, and To	Revelstoke	51° 118° N.W.				3	3															86
Jersey	Nelson	49° 117° S.E.		2		1	1		2													71, 129
King Fissure, S.B., C.R., and Deby	Revelstoke	51° 118° S.E.				3	3															86
Kootenay Belle	Nelson	49° 117° S.E.	1	2		2	2															70, 129
Krao	Slocan	49° 116° N.W.		2		1	2															130
Lucky Strike	Nelson	49° 117° S.E.	1	1		2	2															129
Meteor	Slocan	49° 117° N.E.	2	1																		79, 130
Midway	Fort Steele	49° 115° N.W.	3	3																		80
Mineral King	Golden	50° 116° S.E.		2	2	1	1		2													84, 129
Mohawk	Revelstoke	49° 117° N.W.		1		1	1															129
New Arlington	Nelson	49° 117° S.E.	1	2		2	2															70, 129
Ottawa	Slocan	49° 117° N.E.	2	1		2	2															79, 130
Ptarmigan	Golden	50° 116° N.E.		3	3																	85
Reeves-MacDonald	Nelson	49° 117° S.E.		2		1	1		2													71, 129
Ruth-Hope	Slocan	49° 117° N.E.		3		3	3															76

LODE-METAL DEPOSITS REFERRED TO IN THE 1963 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Uranium	Chromium	Tin	Nickel	Molybdenum	Silica	Sulphur	Mercury	Cobalt	Antimony	Page
Southeastern British Columbia—Continued																						
St. Anthony Group	Golden	50° 116° S.E.	....	1	2	2	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	129
St. Eugene, St. Eugene Extension	Fort Steele	49° 115° N.W.	....	3	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	81
Shady	Slocan	49° 116° N.W.	....	1	....	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	130
Silver Bell	Slocan	49° 116° N.W.	....	1	....	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	130
Stoney	Fort Steele	49° 115° N.W.	....	....	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	80
Sullivan	Fort Steele	49° 115° N.W.	2	2	2	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	81, 129
Sunset	Trail Cr'k	49° 117° S.W.	....	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	130
Teddy Glacier	Revelstoke	50° 117° N.E.	....	3	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	80
Trans Mountain	Nelson	49° 117° S.E.	2	2	....	2	1	....	2	....	....	....	....	....	....	....	....	....	....	....	....	129
Utica	Slocan	49° 117° N.E.	....	1	....	1	1	....	2	....	....	....	....	....	....	....	....	....	....	....	....	73, 130
Velvet	Trail Cr'k	49° 117° S.W.	1	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	68, 130
Venango	Nelson	49° 117° S.E.	1	2	....	2	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	69, 129
Victor	Slocan	49° 117° N.E.	2	1	....	2	2	....	2	....	....	....	....	....	....	....	....	....	....	....	....	77, 130
W.D.	Trail Cr'k	49° 117° S.W.	1	2	....	2	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	69, 130
Western Exploration	Fort Steele	49° 115° N.W.	....	....	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	82
Westmont	Slocan	49° 117° N.E.	....	3	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	78
Wellington	Slocan	50° 117° S.E.	....	3	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	74
Wonderful	Slocan	49° 117° N.E.	....	3	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	77
Yankee Dundee	Nelson	49° 117° S.E.	3	3	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	69

REPORTS ON GEOLOGICAL, GEOPHYSICAL, AND GEOCHEMICAL WORK

Reports accepted to the end of 1958 for credit on assessment requirements for properties held under the *Mineral Act* and the *Placer-mining Act* since January 17, 1947, and reports on geochemical surveys accepted since April 6, 1951, are listed in the Annual Report for 1958. Starting with 1959, each Annual Report lists the reports accepted during the current calendar year. A copy of each report may be examined in the office of the Mining Recorder for the mining division in which the property is located. A second copy of each report is filed in the office of the Chief of the Mineralogical Branch, Department of Mines and Petroleum Resources, Victoria.

The property name is that which appears to be in most common use. It is not feasible to list all the claim names in each property. The author of each report is given and the principal for whom the report was written.

The co-ordinate given for each report is the southeast corner of the 1-degree quadrilateral within which the property lies.

REPORTS CREDITED FOR ASSESSMENT, 1963

Geographic Position		Property Owner or Principal Author of Report Date of Submission of Report	Report No.	Kind of Work		
1° Quadr.	Quarter			Geological	Geophysical	Geochemical
49° 117°	N.E.	AG Group Robert E. Chaplin. Robert E. Chaplin. February 18, 1963.	472	—	—	×
49° 120°	N.E.	Miss and Primer Groups McIntyre Porcupine Mines, Limited. J. W. MacLeod. June 12, 1963.	493	—	—	×
49° 120°	N.W.	K.R. Nos. 1–6 Plateau Metals Limited. C. Riley, Kol Lovang, and C. A. R. Lammle. October 8, 1963.	517	—	×	×
49° 120°	N.W.	K.R. Nos. 7–11 Plateau Metals Limited. Christopher Riley. November 19, 1963.	530	—	—	×
49° 120°	S.E.	G.E. Group Climax Copper Mines Limited. E. B. Nicholls. July 22, 1963.	488	—	×	—
49° 123°	N.E.	Bob Nos. 1–12 and Phil 4 Western Surf Inlet Mines Limited. Herbert Parliment. April 2, 1963.	494	×	—	×
49° 123°	N.E.	Bob Nos. 1–18 and Phil 1–6 Western Surf Inlet Mines Limited. J. P. Sheridan. February 22, 1963.	496	—	×	—
49° 125°	N.W.	Buttle Lake Group The Buttle Lake Mining Company Limited. P. Chilcott. December 3, 1963.	533	×	—	—
49° 126°	S.E.	Ormond and Contact Groups Van-West Minerals, Limited. D. B. Sutherland. February 18, 1963.	465	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1963—*Continued*

Geographic Position		Property Owner or Principal Author of Report Date of Submission of Report	Report No.	Kind of Work		
1° Quadr.	Quarter			Geological	Geophysical	Geochemical
50° 117°	N.W.	Sid, Arrow, and Sproat Claims Canadian Johns-Manville Company Limited. R. Jury and R. J. Janes. February 15, 1963.	469, 470	×	×	—
50° 120°	S.W.	Betty Lou Group Canex Aerial Exploration Ltd. N. Patterson and P. Walcott. October 17, 1963.	516	—	×	—
50° 120°	S.W.	Gem Nos. 1–6 and Bob Nos. 1–28 Jericho Mines Ltd. E. B. Nicholls. May 16, 1963.	483	—	×	—
50° 120°	S.W.	H.A.R. Nos. 1–8 Mid-West Copper & Uranium Mines Ltd. R. B. Richards. November 19, 1963.	531	—	×	—
50° 120°	S.W.	Kan Group Canex Aerial Exploration Ltd. D. N. Hillhouse. October 24, 1963.	519	—	×	×
50° 120°	S.W.	Mid Group Mid-West Copper & Uranium Mines Ltd. B. R. Richards. June 24, 1963.	492	—	×	—
50° 120°	N.W.	S.D. and Dave Groups Huestis Mining Corporation Ltd. E. B. Nicholls and E. L. Gregotski. September 6, 1963.	512	—	×	—
50° 120°	S.W.	T.M., J, and A Groups Toluma Mining and Development Co. Ltd. D. B. Sutherland. September 20, 1963.	503	—	×	—
50° 121°	S.E.	Bethsaida Group The Buttle Lake Mining Company Limited. J. Sullivan. December 18, 1963.	537	×	—	—
50° 121°	S.E.	Empire The Buttle Lake Mining Company Limited. A. O. Hall. July 17, 1963.	490	×	×	—
50° 121°	S.E.	K.T.I. No. 1 Claim Group Kennco Explorations, (Western) Limited. R. W. Stevenson. January 30, 1963.	477	—	×	—
50° 122°	S.W.	Azure Group The Mining Corporation of Canada, Limited. D. D. Smellie. October 22, 1963.	508	—	×	—
50° 122°	S.W.	Black and Blackwater P. Weishaupt, R. Fegan, and Bralorne Pioneer Mines Limited. E. B. Nicholls. July 4, 1963.	485	—	×	—
50° 125°	S.E.	Allen No. 1 Menzies Bay Mining Syndicate. E. B. Nicholls. July 4, 1963.	491	—	×	—
50° 125°	S.E.	RIB Nos. 1–4 Robert I. Bennett. Sigmund D. Schwartz. March 22, 1963.	478	—	×	—
50° 127°	S.E.	Minerva Fraction Consolidated Exploration Company, Ltd. F. J. Hemsworth. October 2, 1963.	502	×	×	×

REPORTS CREDITED FOR ASSESSMENT, 1963—*Continued*

Geographic Position		Property Owner or Principal Author of Report Date of Submission of Report	Report No.	Kind of Work		
1° Quadr.	Quarter			Geological	Geophysical	Geochemical
50° 128°	N.E.	Rick Nos. 1–4 Holberg Mines Ltd. P. G. Hallof and D. B. Sutherland. April 5, 1963.	497	—	×	—
51° 118°	S.E.	Robina 1–12 Great West Mining Corporation Ltd. F. L. Price. September 13, 1963.	539	—	×	—
51° 118°	S.W.	Zan Group Falconbridge Nickel Mines Limited. H. R. Morris. July 17, 1963.	486	—	—	×
51° 121°	S.E.	Pat Nos. 1–56 Kennco Explorations, (Western) Limited. C. S. Ney. November 27, 1963.	528	×	—	×
51° 123°	S.E.	Bur and Top Copper Ridge Mines Ltd. S. J. Melihercsik. October 1, 1963.	527	×	—	×
51° 123°	S.W.	Chita Nos. 1–68 Phelps Dodge Corporation of Canada, Limited. D. C. Malcolm. March 15, 1963.	473	×	—	—
51° 123°	N.E.	Nichol Nos. 1–20 Phelps Dodge Corporation of Canada, Limited. W. Meyer (endorsed by John DeLeen). December 30, 1963.	534	×	×	×
51° 131°	N.W.	Bud Nos. 1, 2, and 4–8 John Miller Russell. H. R. Morris. April 23, 1963.	482	—	×	—
51° 131°	N.W.	Bud Nos. 9–13 John Miller Russell. H. R. Morris. April 23, 1963.	481	—	×	—
52° 122°	S.E.	G.G. Group Keevil Mining Group Limited. E. G. Thompson. May 9, 1963.	487	—	—	×
52° 122°	S.E.	Zephyr Group Keevil Mining Group Limited. A. R. Clark. January 2, 1963.	468	—	×	—
53° 132°	S.W.	Magnet Nos. 1–11 Mastodon-Highland Bell Mines Limited. W. R. Bacon. May 27, 1963.	495	×	×	—
54° 124°	S.W.	KO Group Julian Mining Co. Ltd. Roderick Macrae. October 17, 1963.	521	—	—	×
54° 124°	N.W.	Snowbird, Graybird, Topside, Campsite, Ebba, Shaft Fr., and Bob Julian Mining Co. Ltd. Roderick Macrae. October 17, 1963.	520	—	×	—
54° 125°	S.E.	Bingo Nos. 1–10 and 31–40 Endako Mines Ltd. C. W. Ball, C. E. Dunn, and R. E. Cribbs. September 5, 1963.	515	×	—	×
54° 125°	S.E.	Bingo Nos. 11–30 Copper Ridge Mines Ltd. C. W. Ball, R. E. Cribbs, C. E. Dunn, and H. Paulson. August 27, 1963.	500	×	—	×

REPORTS CREDITED FOR ASSESSMENT, 1963—*Continued*

Geographic Position		Property Owner or Principal Author of Report Date of Submission of Report	Report No.	Kind of Work		
1° Quadr.	Quarter			Geological	Geophysical	Geochemical
54° 125°	S.W.	Dat Group Julian Mining Co. Ltd. Roderick Macrae. November 15, 1963.	523	—	×	—
54° 125°	S.E.	Dis Group Julian Mining Co. Ltd. Roderick Macrae. June 23, 1963.	498	—	×	—
54° 125°	S.E.	Elk and Deer Groups Julian Mining Co. Ltd. Roderick Macrae. November 15, 1963.	525	—	—	×
54° 125°	S.E.	Joe Nos. 1–12 and 14–21 Copper Ridge Mines Ltd. C. W. Ball, C. E. Dunn, and R. E. Cribbs. October 2, 1963.	526	×	—	×
54° 125°	S.E.	Pal and B.M. Groups Copper Ridge Mines Ltd. C. W. Ball, R. E. Cribbs, and C. E. Dunn. October 11, 1963.	518	×	—	×
54° 125°	S.E.	RAC Group Copper Ridge Mines Ltd. R. E. Cribbs. November 15, 1963.	524	—	—	×
54° 125°	S.E.	Rob Nos. 1–22 Utica Mines Ltd. *C. W. Ball, C. E. Dunn, and R. E. Cribbs.* September 5, 1963.	507	×	—	×
54° 126°	N.E.	East and West Groups The Granby Mining Company Limited. K. C. Fahrni. November 19, 1963.	529	×	—	—
54° 126°	N.W.	Mineral Hill and Huber Groups W. D. Yorke-Hardy. R. E. Anderson. October 10, 1963.	509, 510	—	×	×
54° 127°	N.E.	Goat, Beaver, Lynx, Fox, and Coyote Groups Climax Molybdenum (B.C.) Ltd. M. Klugman. February 19, 1963.	471	×	—	—
54° 127°	N.W.	Mamie, Canary, Payroll, Homerun, Jay, and Torrent Sil-Van Mines Limited. W. J. Scott. October 20, 1963.	505	—	×	—
54° 127°	N.E.	May Nos. 1–20 and Bob Nos. 1 and 2 W. D. Yorke-Hardy, H. Haftner, and Cyril Mehaffy. R. Wollverton and B. O. Brynelsen. *September 26, 1963.*	514	—	—	×
54° 128°	N.E.	Fossil Nos. 1–4 I. Shulman. W. E. Selnes. January 4, 1963.	466	—	—	×
55° 115°	N.E.	Valley Claim Group Kennco Explorations, (Western) Limited. P. G. Halloff and R. W. Stevenson. July 5, 1963.	504	—	×	—
55° 125°	N.E.	Duckling No. 1 Claim Group Kennco Explorations, (Western) Limited. P. G. Halloff. July 16, 1963.	513	—	×	—
55° 125°	N.E.	Duckling Nos. 1 and 3 Claim Groups Kennco Explorations, (Western) Limited. R. W. Stevenson. July 12, 1963.	511	—	×	—

REPORTS CREDITED FOR ASSESSMENT, 1963—*Continued*

Geographic Position		Property Owner or Principal Author of Report Date of Submission of Report	Report No.	Kind of Work		
1° Quadr.	Quarter			Geological	Geophysical	Geochemical
55° 125°	N.E.	Lorrex No. 1 Group Kennco Explorations, (Western) Limited. P. G. Halloff. September 4, 1963.	506	—	×	—
55° 125°	N.E.	Rhonda Nos. 1–4 Kennco Explorations, (Western) Limited. R. W. Stevenson. December 31, 1963.	532	—	—	×
55° 130°	N.E.	JO Group Newconex Canadian Exploration Limited. Joseph Sullivan. May 28, 1963.	489	×	×	—
55° 130°	N.E.	JO Group Newconex Canadian Exploration Limited. R. A. Knutson. October 17, 1963.	522	—	×	×
56° 126°	N.E.	Savage Arjay Group W. D. Savage. G. L. Holbrooke. October 22, 1962.	475	×	—	—
56° 130°	S.E.	Dawson Ross, John Bull, Arbee, and Can Groups Donald F. Ross, Wendell Dawson, and Stanley Bishop. G. D. Towle and E. F. Lahmeyer. June 18, 1963.	499	×	—	—
56° 130°	N.E.	Ken Nos. 2-4 Newmont Mining Corporation of Canada, Limited. Gordon Gutrath and G. W. H. Norman. October 22, 1963.	536	×	×	—
56° 130°	S.E.	North Group London Pride Silver Mines Ltd. D. Davidson. May 30, 1963.	484	×	—	—
57° 131°	S.W.	J.W. Nos. 1–14 Kennco Explorations, (Western) Limited. G. H. Rayner and C. S. Ney. September 3, 1963.	501	—	×	×
57° 131°	N.W.	Poke Nos. 1–24 Kennco Explorations, (Western) Limited. P. G. Halloff. October 16, 1963.	535	—	×	—
58° 127°	S.E.	West Group Conwest Exploration Company Limited. A. S. Ashton and W. P. Hammond. February 27, 1963.	467	—	×	—
58° 132°	S.E.	Fae Nos. 1–24 Kennco Explorations, (Western) Limited. C. S. Ney. August 5, 1963.	476	×	—	×

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